



Best performance for your lab.



Professional High- Performance Fluoroplastic Labware

PTFE | PFA | FEP

All information in our catalogue E1000 is based on our current technical knowledge and experience as well as on available literature and data provided by the manufacturers of the raw materials and semi-finished products used. **BOHLENDER does not take any responsibility on the currentness, accuracy and the completeness of the data and information provided.**

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It is the user's task to check the suitability of our products and the used material for his special application. Properties or possible applications cannot be derived neither express nor implied from the descriptions and data in this catalogue.

This catalogue and all products are subject to modifications and amendments without prior notice.

All specifications regarding pressure refer to an utilisation at +20 °C. Diminutions have to be considered for deviating temperature conditions.

All specifications on the thermal resistance refer to the used raw material, respectively to the lowest common working temperature if the final product is made of different materials.

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Chemraz®	by Greene Tweed	Lemo®	by Lemo
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Hastelloy®	by Haynes International	Tygon®	by Saint Gobain
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Nalgene®	by Thermo Fisher Scientific		

NEW

New products are shown with this icon.

FDA conform

The FDA icon means that all parts coming into contact with the fluid are from materials that correspond to FDA requirements. A certificate of conformity is included with each shipment..

CE

These products are conform to the CE regulations. A certificate is supplied with our operating instructions upon delivery



Mechanical strength

GLASS

Borosilicate glass



For these articles we grant special discounts for large purchase quantities.



This article is a spare part.



These articles are very popular with our customers.

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Dear customers and friends of BOHLENDER,



New products, new structure, new design – the new BOLA catalogue for professional high performance fluoroplastic labware lies in front of you.

Well-structured with clearly arranged registers and detailed product illustrations – source of information and reference for your everyday laboratory life!

We have implemented the BOLA construction system for unbrea-
kable and flexibly extendable reactor lids of PTFE – suitable for
current glass reactors with flat flange (see page 264). You will find
many practical hints and technical information from page 341.

The whole BOLA portfolio is subject to our high claim to quality,
combined with sustainability and climate protection. Already in the
5th generation in our family history I am entrepreneur and I have
always been interested in long-lasting solutions. Since ever our
claim has been to create our present days and our future sustain-
ably, sure and worth living through responsible use of our envi-
ronment and natural resources. Every day, together we are working
on safe, sustainable and environmentally friendly products for our
customers. Please find more on this on pages 14–16 and 350–351.

Being a company with own production we are looking forward to
special ideas and suggestions of our customers. Individual made-
to-measure productions according to your requirements are no
problem for us. We will be pleased to establish an offer for your
made-to-measure product free of charge and without obligation –
already for just one unit and this more inexpensive than you pro-
bably can imagine!

Just ask us – we are looking forward to new challenges!

Your

Volker Bohlender

Volker Bohlender

Managing Director

CONTENTS

6 COMPANY



- 6** This is what BOLA stands for
- 8** Quality from In-House Production
- 10** Customized – but with Pleasure !
- 12** Facts, Figures and Data
- 14** Practised Environmental Protection
- 16** Sustainable Production
- 17** Committed Company

143 COMPONENTS FOR EX-PROTECTION



- 146** Laboratory Screw Joints EX
- 154** Tubing EX
- 158** Stirrer Shafts EX
- 159** Temperature Probes EX
- 163** Reactor Lids EX

19 STIRRING AND MIXING



- 23** Stirrer Shafts, Stirrer Couplings
- 40** Blades
- 46** Stirrer Bearings
- 52** Magnetic Stirrer Couplings
- 61** Stirrer Blades
- 68** Magnetic Stirring Bars
- 80** Culture Bottles

167 SCREW FITTINGS FOR PRESSURES UP TO 5 BARS



- 168** Screw Joints
- 172** Stopcocks and Valves
- 178** Connectors

83 SCREW JOINTS/ COMPONENTS WITH GL THREAD



- 88** Laboratory Screw Joints
- 96** Multiple Distributors for Bottles
- 101** Flexible Distributors
- 105** Distributors for Reaction Vessels
- 111** Distributors for Canisters
- 113** Multiple Distributors for Barrels
- 118** Screw Caps
- 122** Gaskets
- 126** Swivelling Screw Fittings, Threaded Couplings
- 130** Tube Fittings
- 134** Stopcocks and Valves
- 139** Connectors

183 TUBING, FILMS, TILES



- 189** Tubing
- 200** Tiles, Sheets
- 202** Sealing Elements
- 204** Screws, Balls and Boiling Stones

207 GROUND JOINT COMPONENTS



- 209** Sleeves
- 212** Bellows
- 213** Stoppers
- 216** Multiple Distributors with Ground Joint
- 223** Tri-Clamp-Fittings

227 TEMPERATURE MEASUREMENT



- 232 Temperature Probes PT100
- 238 Temperature Probes PT1000
- 241 Adaptors for Temperature Probes
- 242 Temperature Probes K

245 VESSELS, DISTILLATION EQUIPMENT



- 246 Scrubber Columns - Bottles
- 248 Bottles
- 250 Round Bottom Flasks
- 253 Jars
- 255 Beakers
- 257 Dishes
- 260 Test Tubes, Centrifuge Tubes
- 263 Digestion Vessels for the Microwave
- 267 Reactor Lid
- 283 Distillation Apparatus

293 SCREW JOINTS FOR HPLC



- 295 Distributors for Bottles
- 299 Flanged Tubing
- 302 Couplings and Stopcocks
- 304 Pressure Relief Valve
- 306 Tube End Fittings and ThermoFlange Units
- 312 Fittings and Connectors

317 FILTRATION



- 320 Flow Filters
- 326 Scrubber Bottles
- 332 Membranes, Discs, Tiles, and Rods

337 PUMPS



- 338 Pumps
- 339 Adaptors for Pumps

341 TECHNICAL INFORMATION



- 342 Materials
- 347 Chemical Resistance
- 348 Elastomers
- 349 Physical Properties
- 350 Recycling of Fluoropolymers
- 352 Cleaning, Heating, Safety Advice
- 354 Magnetic Stirring
- 355 Choice of Stirring Elements
- 357 Stirrer Shafts – Maximum Revolutions per Minute
- 358 Tubing Tolerances
- 369 Tubing, Pressure Resistance and Assembly
- 362 Bending Radius and Permeation
- 365 Determination of Thread Types

370 ALPHABETICAL INDEX

THIS IS WHAT BOLA STANDS FOR

FIELD-PROVEN LABWARE MADE FROM HIGH-PERFORMANCE PLASTICS

BOHLA stands for BOHLENDER labware – run in second generation by Volker Bohlender. And for excellent products: Thought through to the smallest detail. Manufactured in our own production. Tried, tested and further optimized.

COMPETENT ADVICE

Decades of experience in treatment and processing of fluoro plastics, comprehensive industry knowledge as well as highly qualified, continuously trained staff assure highest consulting quality. Even for technical application issues.

HUGE VARIETY AND FLEXIBILITY

Our portfolio offers perfect articles for nearly every application and requirement. Everything else enables our production – no matter if single piece or large series.

FAST AND RELIABLE DELIVERY

State of the art production, well-stocked warehouse and optimised processes ensure fast order processing.

HIGHEST QUALITY AND PRECISION

We strictly follow the principles of DIN EN ISO 9001. Only tested raw materials are treated. Qualified skilled workers and modern technique ensure excellent production.



QUESTIONS ? WE ARE PLEASED TO ANSWER!



Why labware made of high-performance plastics?

Because PTFE and Co points with best characteristics: chemically resistant, unbreakable, easy to clean, sterilizable ideal for the work in the laboratory, in pharmacy and industry! Components in contact with the media are made of FDA-conform materials and labelled accordingly.

Where and how are the products manufactured?

We develop and produce ourselves: at our headquarters in Grünsfeld in Southern Germany. This guarantees best quality and enables us to react quickly to new or individual requirements.

How do BOLA products come to me?

Ordering by phone, letter, e-mail or online-shop. The handling will be made by the laboratory trade. Within Germany we deliver within one working day and within Europe within three to five working days.

What if I should not be satisfied once after all?

Best to call immediately or send an e-mail. Depending on the situation we take care for a quick exchange or we rework. If applicable, we ask for return for evaluation.

And, what about discounts?

Good that you ask. For purchase of larger quantities, we allow discounts and special prices, except special productions. Just talk to us.

IN-HOUSE PRODUCTION FOR FIRST CLASS QUALITY

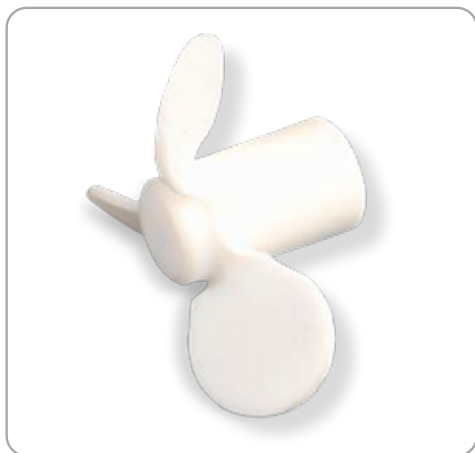
Safe results require fault free equipment. We meet this requirement: From the production of the raw material till the production of the final product in our house we ensure highest quality standards across all process steps. All our products are designed by our specialists, tested again and again and optimised in every detail. We produce in series, not before you are

satisfied. We are flexible and close to practice. Therefore, we offer such an extensive portfolio, dispose of a well-stocked warehouse and, in case of need, we develop quickly strong novelties, modifications or customized products.



Production of compression moldings

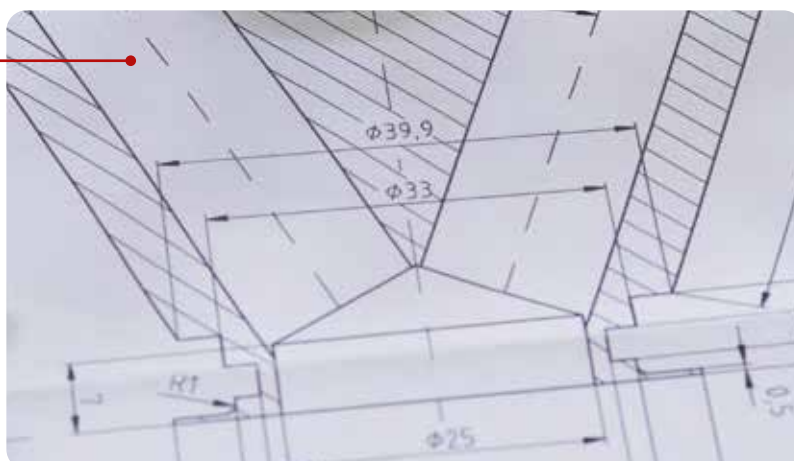
We handle high-quality PTFE plastic granulate by means of press-sintering technology from the powder to the final product in the required design.





Production of CNC milled parts

We mill press bodies, drill and turn until all fits exactly. We collect the chips for useful further processing.



Extrusion of bars

By means of RAM extrusion PTFE powder is pressed through a heated tube to get solid bars. Different heating zones take care for complete sintering.

SPECIAL REQUIREMENTS? CUSTOMIZED!



You are looking for something very special? Something that even our huge portfolio of sophisticated lab solutions does not cover?

No problem:

As developer and producer, we offer the possibility to produce individually according to your requirement. This is faster, simpler and often more economic than you can imagine. Just talk to our experts about your ideas – we advise you and support you already during the construction and produce suitable for the material exactly according to your specification. And this already from quantity 1.

For this, we just need a drawing (a rough sketch is sufficient) and some information.

Checklist for your customised product:

- » What is the article name?
- » In which application should the article be used?
- » What dimensions should the article have?
- » Are there any specific material specifications?
- » In which temperature range should the article be used?
- » What chemical stresses is the article exposed to?
- » In which quantities is the article required?
- » What cost per piece should the article not exceed?

You have a special request?
Call us on: **+49 (0) 93 46-92 86-0**

Or just send us a drawing (a rough sketch is sufficient) and some information to **info@bola.de**. We will then contact you to discuss further details and establish an offer for you free of charge.



STANDARD PLUS: MODIFICATIONS

No lab is alike. Every industry, every branch has its own requirements. Therefore, the BOLA program has already many options and extensive accessories.

However, sometimes a detail is not optimal. In this case we are pleased to adapt our standard products according to your personal requirements – for exam-

ple by a thread change or a through hole. Usually this is done in a very short time.

Your advantage:

A plus in individuality and fast availability.

Call us on number: +49 (0)9346 9286-0

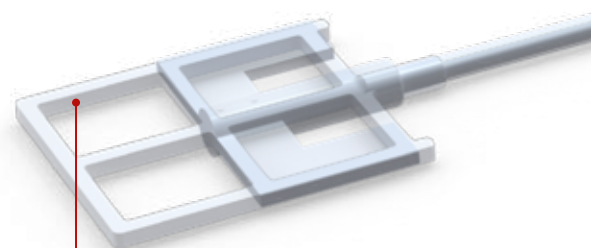
Examples for individual modifications:



More bulbous **bottle** for more volume and constant lid.



Flat ground cover with further GL connector and cut.



Anchor stirrer shaft, converted to large window stirrer shaft.



Ground components after connection. Also available with ground cores.

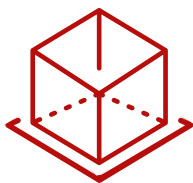
YOU CAN COUNT ON US. ALWAYS. EVERYWHERE.



75 75 employees at company headquarters in Grünsfeld

trainees/year: **5**

40% women in management positions



39.174
items

5.826 m³
of storage volume

2.842 m²
of production area



>257.000

kWh of electricity are produced every year by our photovoltaic plant. This saves **150 tons** of CO₂.



41,3%
of export quota

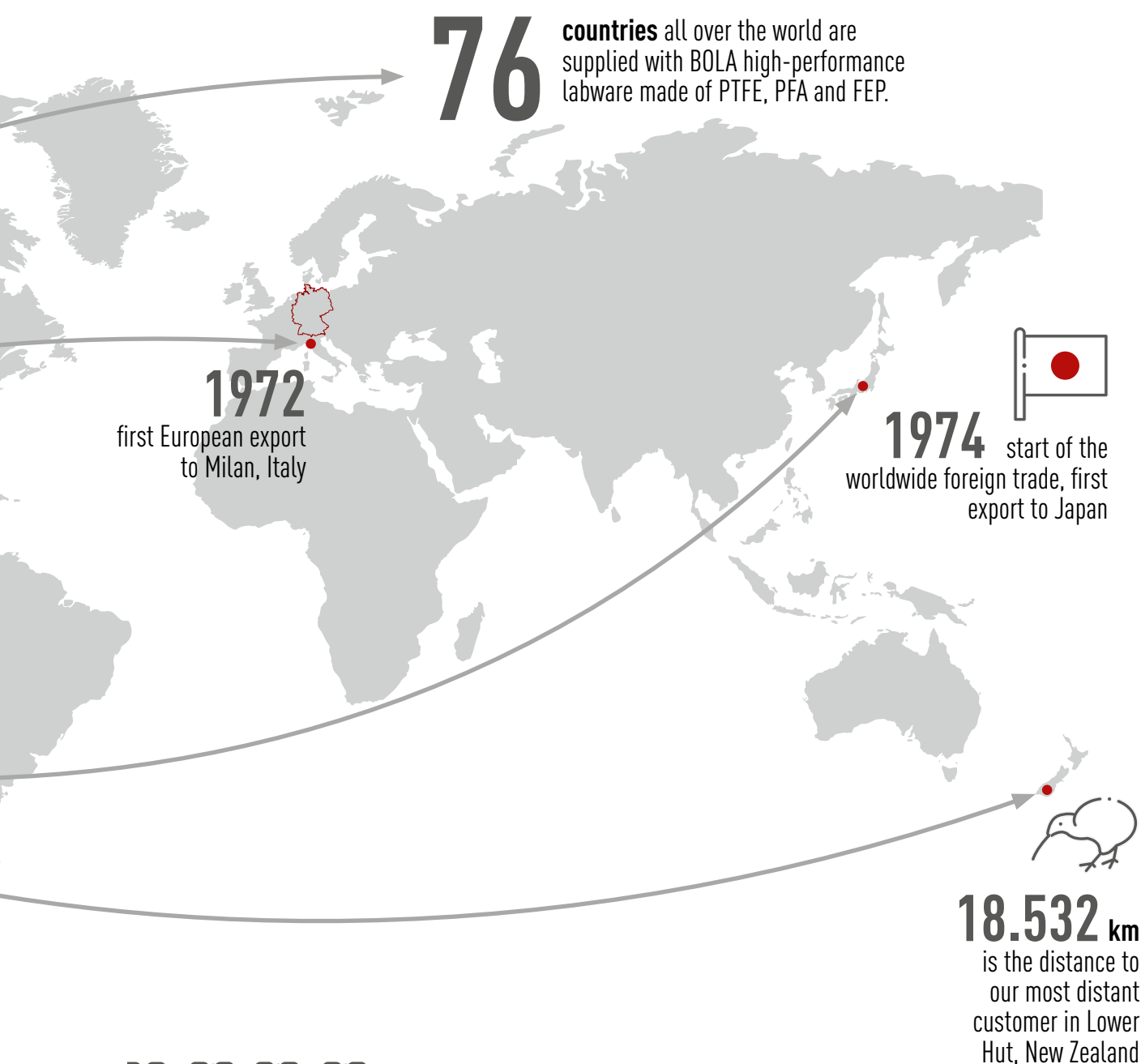


8.000

and more
parcels sent
per year

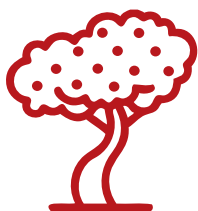
420 km

is the total length of tubing delivered in one year. This corresponds to the distance **Grünsfeld-Berlin** as the crow flies.



In the past 25 years we shipped magnetic stirring bars with a total weight of **22 tons** – this corresponds to the weight of 3,5 elephants

HIGH-TECH AND ENVIRONMENTAL PROTECTION? OF COURSE. WITH US.



2000 Years

The cultivation method of the meadoworchard has already proven itself.



Our infiltration pond returns the surface water slowly to the environment, mitigates heat waves and fills the groundwater reservoir.




>257.000

kWh generates our solar system every year, saving **150 t** of CO₂.



Climate-friendly and healthy mobility supports a functional **bicycle shelter**.



37 t  CO₂ per year are saved in machine cooling through an intelligent underground cooling system.



>5.000 **Animals** offers our flower meadow a habitat and a near-natural recreation area for our employees.



>330



Trees in our company's own forest compensate for more than 5,5 t CO₂ per year.



Species worthy of protection can find their adapted habitat on our meadows.

SUSTAINABLE PRODUCTION

Unbreakable, chemically resistant, sterilizable – high performance plastics such as Polytetrafluorethylene (PTFE) dispose of fantastic material properties and therefore, are indispensable in laboratories of this world. However, the most important raw material of all fluoroplastics, Fluorspar, belongs to the finally available resources. We, at Bohlender, see it as our responsibility to handle this with care, where possible, to save material and energy as well as to exploit

all recycling possibilities. Already for a long time there are also different possibilities for recycling for Fluoropolymers – both for processing waste as well as for products, which have reached the end of their useful life. The doctor of chemistry and expert in the field of fluoropolymers, Dr. Michael Schlipf, will present these in his lecture on page **350**

OUR FOUR PILLARS

1. Thinking ahead from the very beginning

For us, saving resources starts already in development and design. Our products are designed that they can be used multiple times and, if possible, used for years. At the same time, we take care of minimum use of materials and maximum reduction of production waste. For example, for the production of moulded parts working steps that produce chips are not required. Besides saving PTFE powder also less energy is consumed.

2. Recovery in view

Initially we process Fluoropolymers, particularly PTFE, as semi-finished products. The main products are tubes and rods or special moulded bodies. From this we produce tailor-made end products in sophisticated cutting processes.

Chips arising when drilling, turning, milling or similar are suctioned directly at the machine via a pipe system and collected. So, they do not become contaminated. We store them pure of type and free of any contaminations until we supply them to external specialist recycling companies. This applies also for remaining pieces of semi-finished products. It is also possible that the reprocessed, sintered PTFE wastes come back to us. We process them to suitable products.

3. Natural energy in use

We rely on solar energy in the manufacture of our products. Already in 2012, we installed a photovoltaic plant on our roof which does not only supply us with sufficient electric current but also saves about 150 tons CO₂ emissions.

4. Safe use and waste disposal

Products made of the well-known fluoroplastics such as PFA, FEP, ETFE or PVDF are free of softeners and solvents. This means no harmful substances are submitted to the environment.

Till 2015 the additives PFOA and APFO have been used for the production of PTFE. Both additives could be removed almost completely from the products within the frame of reconditioning and be regained mostly. Nevertheless, notable manufacturers of PTFE have committed to dispense completely with the use of this. This ensures that neither when using nor dispose our products harmful substances are submitted to human beings or environment.



A VERSATILE AND COMMITTED COMPANY



German Stem Cell Donor Registry

BOHLENDER supports the activities of German Stem Cell Donor Registry. Not only financially. Through personal typing and registration as a stem cell donor we want to give new hope to people suffering from Leukemia or other hematopoiesis disorders. Nowadays, many affected persons can be helped by means of a stem cell donation. In case in the own family no suited donor can be found, patients are dependent on a third-party donor. Every new typing and registration increases the chance for a suitable match. Become a lifesaver with a small blood donation – BOHLENDER supports this activity with all our heart.

Sports and youth promotion

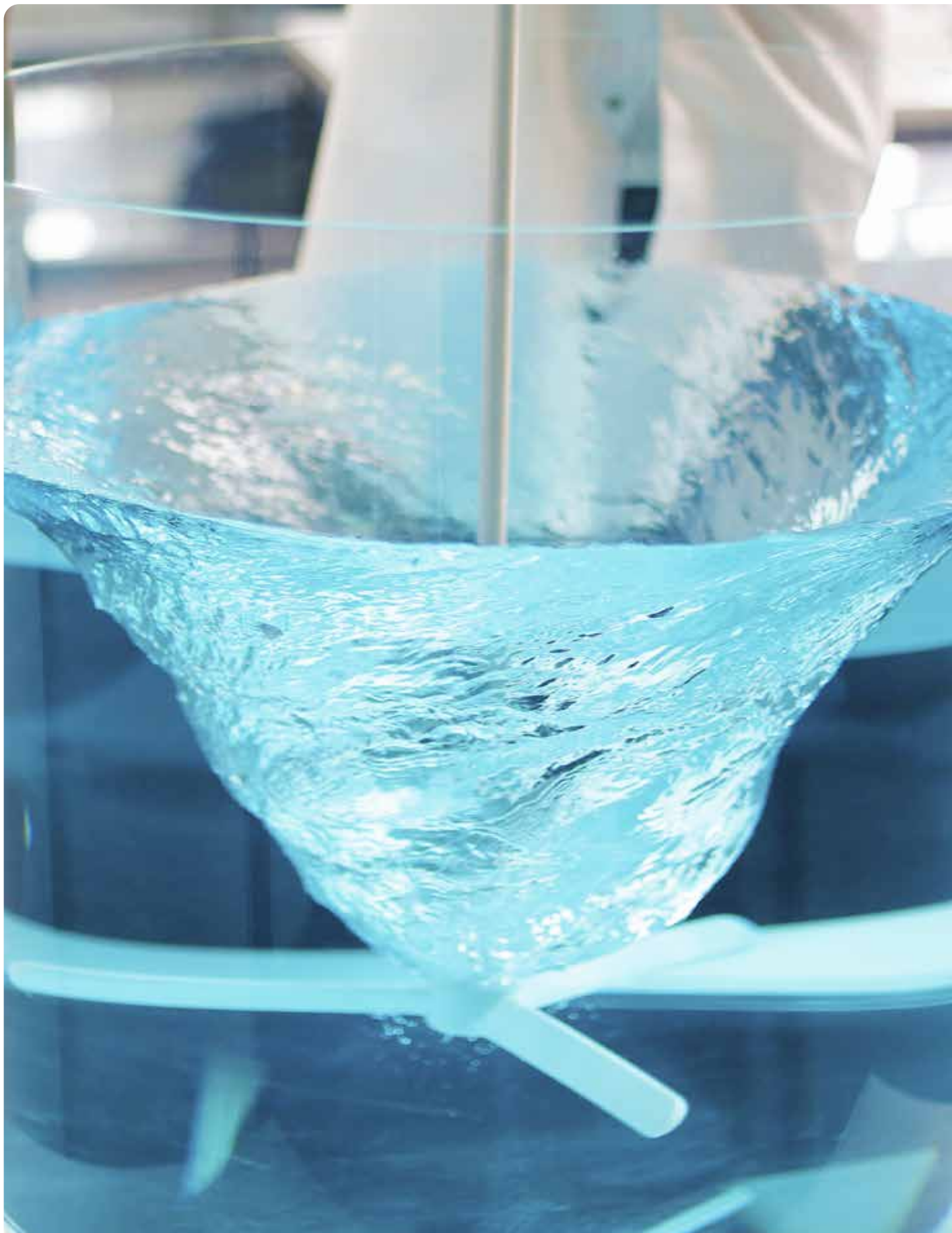
Children and youth work in the local sports clubs contributes that children, teenagers and young adults can develop their physical, personal and social skills and participate actively in social life. Already for many years the financial support through sponsoring sports clothing for the local sports clubs, who among others, are active in handball and football, is a matter of course for BOHLENDER. Because those who are healthy and fit are better able to cope with the demands of everyday private and professional life.



Community Foundation Lauda-Königshofen

The Community Foundation Lauda-Königshofen was founded end of 2013 by engaged citizens and companies. The objectives of the Community Foundation are the development, promotion and appreciation of sustainable and innovative ideas and concepts in the town of Lauda-Königshofen including all its districts. These objectives can be achieved by strengthening civic engagement and the promotion of sustainable development of the community within the fields of family, education, science, environment and nature protection, healthcare, heritage preservation and international understanding. The company BOHLENDER has its sources in Lauda and has always been closely connected to Lauda-Königshofen. We, at BOHLENDER can identify entirely with the objectives of the Community Foundation and are committed accordingly as foundation founders.

Depending on medium and vessels stirring bars and stirrer shafts need to have completely different characteristics. Certainly, you will find the optimal solution in the extensive BOLA programme – or we produce according to your wishes.





STIRRING AND MIXING



23 Stirrer Shafts and Stirrer Blades

Propeller Stirrer Shafts	23
Moon-Shaped Stirrer Shafts	24
Double-Moon-Shaped Stirrer Shafts	25
Stirrer Shafts	26
U-Shaped Stirrer Shafts	27
Maxi-Propeller Stirrer Shafts	30
Impeller Stirrer Shafts	31
Centrifugal Stirrer Shafts	32
Stirrer Blade	33
Gassing Stirrer	33
Slip-On Baffle	34
Stirrer Shafts with Two Paddles	34
Fan-Shaped Stirrer Shafts	35
Disc Stirrer Shafts	36
Double Impulse Stirrer Shafts	36
Propeller Stirrer Shafts with 4 Blades	37
Mini-Propeller Stirrer Shafts	38
Micro Surface Stirrer Shafts	38
Stirrer Blades	40-42
Solo Stirrer Shafts	43
Stirrer Shafts with Reduced Chuck Diameter	44-45
Stirrer Shafts for stirrer couplings	59
Moon-Shaped Stirrer Blades	61-62
Centrifugal Stirrer Blade	63
Bolts and Clamp Rings	63

28 Couplings and Stirrer Heads

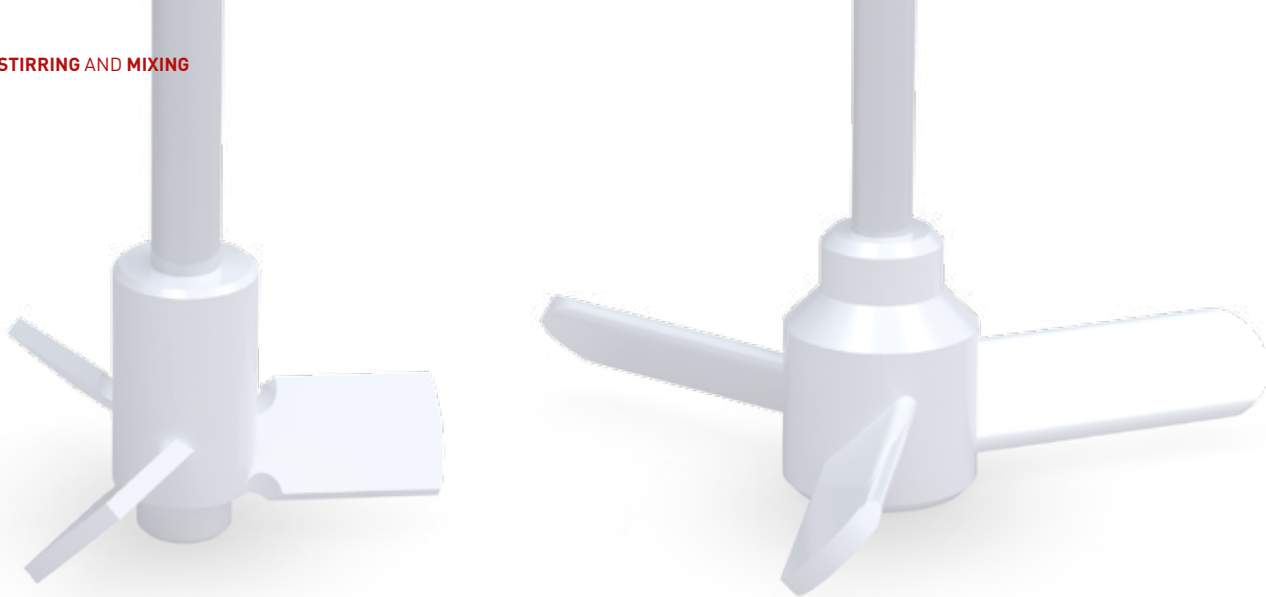
Globus stirrer couplings	28
Glass Stirrer Bearings	46
Ground Joint Stirrer Bearings	47
Standard Grinding Distributor with Stirrer Bearings	48
Special Stirrer Bearings	49
Ground Joint Magnetic Stirrer Heads	50
Magnetic Stirrer Heads	53-58

66 Magnetic Stirring Bars and Retrievers

Magnetic Stirring Bars	68-77
Magnetic Stirring Bar Retrievers	72
Breakerliners	78
Tandem Magnetic Stirring Bars	79
Culture bottle	80

80 Labware

Tweezers	80
Double Spatulas	81
Scrapers	81



BOLA Stirrer Shafts

BOLA Stirrer Shafts – What you should know about.

BOLA Stirrer Shafts consist of a PTFE-jacketed stainless steel shaft and a stirrer blade made of solid PTFE. The stainless steel core provides high mechanical stability and allows a safe fixing in the agitator.

Unbreakable

All glass stirrer shafts which are commonly used in laboratories are very fragile. Dropping, stirring solid materials or too much power transmitted from the agitator to the product can cause broken glass. Due to their solid stainless steel core, BOLA Stirrer Shafts are protected against all these possibilities of breaking.

Universal chemical resistance

Due to the thick PTFE-jacket, the product which is stirred is only exposed to PTFE. This assures an almost universal chemical resistance. PTFE-jacketed stirrer shafts can be used whenever stirrer shafts made of PP (polypropylene), glass or stainless steel are not sufficient.

Temperature resistance

Stirrer shafts made of PP (polypropylene) are deformed at temperatures exceeding +100°C and cannot be used any longer. All BOLA PTFE-jacketed stirrer shafts can be used at temperatures of up to +250°C without any negative effects on their chemical resistance. Only the mechanical strength decreases with increasing temperature.

Non-adhesive

The surfaces of glass and stainless steel stirrer shafts allow adhesion of products (in particular such as dyes and glues). BOLA PTFE Stirrer Shafts, however, are non-adhesive and therefore eliminate adhesion of dyes and glues and facilitate removal and cleaning.

Interchangeability

At present, most stirrer shafts used in laboratories are made of glass. All BOLA Stirrer Shafts are available with the same diameters, lengths and surface qualities (KPG) as stirrer shafts made of glass. Thus, the user can easily replace the glass stirrer shaft with a PTFE-jacketed stirrer shaft and does not have to change agitators, couplings and guiding devices.

Safe fixing

The upper end of the BOLA Stirrer Shaft is not jacketed with PTFE and can therefore be fixed safely into the agitator or the stirrer coupling.

Solid stirrer blade

The stirrer blade is fixed tightly to the stirrer shaft and cannot be loosened by the product which is still turning after switching off the agitator. The stirrer shafts are suitable for clockwise and counterclockwise rotation.





Frequently asked: Why don't you coat stirrer shafts?

Coating with PTFE only provides a thin plastic layer. This layer can be damaged very easily by aggressive products, friction or rough handling during storage. A possible consequence is that parts of the layer are peeled off.



The BOLA solution: A solid PTFE jacket together with solid stirrer blades. BOLA Stirrer Shafts provide a long durability and an excellent mechanical resistance.

Suitable chucking diameter of stirrer shafts

Very long stirrer shafts need to have suitable diameters to be stable enough. All BOLA Stirrer Shafts have adequate diameters and lengths. If the chucking diameter of a stirrer shaft is too big, it can mostly be reduced by machining. This machining has to be made totally self-centring to avoid eccentricity of the stirrer shaft.

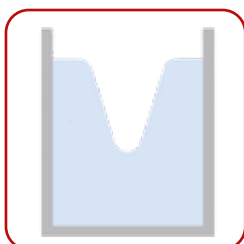
Please contact us if you need a reduced chucking diameter (see page 44).



Results of stirring – tested for you

In order to help you choose the suitable stirrer shaft for your application, we have made tests with typical data. These graphs shall give you an indication for the stirring effects of the BOLA Stirrer Shafts.

- » Speed: 500 rpm
- » Volume: 2.000 ml
- » Product: water
- » Temperature: 20°C
- » Vessel: glass beaker





BOLA Stirrer Shafts – what you should know about.

BOLA Stirrer Shafts consist of stainless-steel shafts coated with PTFE and a solid PTFE stirrer unit. The stainless-steel stirrer ensures the required stability of the stirrer and enables a safe fixing in the stirrer.



Unbreakable – stirrer consisting of stainless-steel and solid PTFE stirrer unit



Non-sticky surface, therefore no attachment of diverse media



High temperature resistance up to 250°C



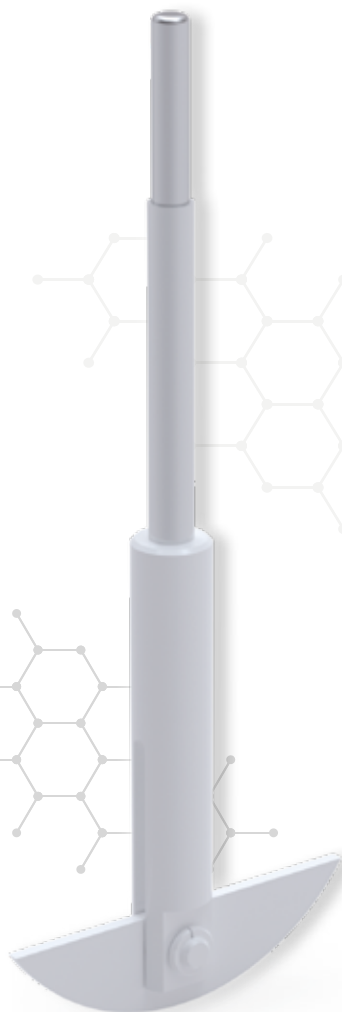
Safe fixing in the chuck due to stainless steel holder



Universal chemical resistance



Glass stirrer shafts can be exchanged against stirrer shafts made of PTFE so that stirrer shafts/drive units, couplings and guides can still be used





BOLA Propeller Stirrer Shafts

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

Stirring effect:
bottom-up



FDA conform

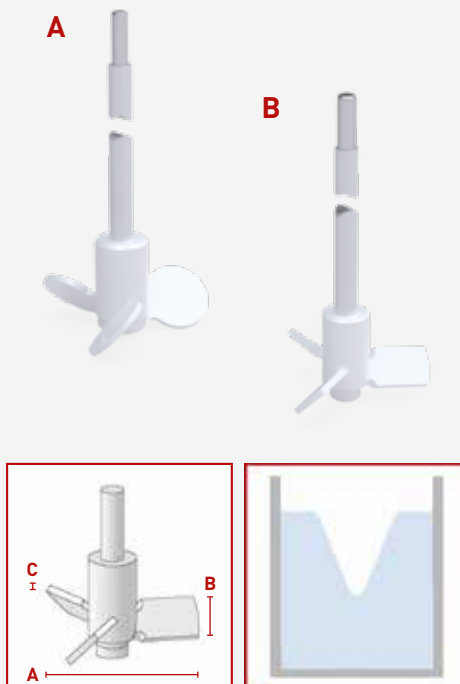
Product description:

PTFE-jacketed stainless steel shaft, propeller completely made of PTFE with three 45° angled round or angular blades. Universal chemical resistance since the product is only exposed to PTFE.

	Length mm	Shaft dia. mm	Chuckling dia. mm	Dimensions according to drawing			Cat. No.:
				A	B	C	
A	250	6	4,0	50	18	1,5	C 378-04
	350	6	4,0	50	18	1,5	C 378-06
	450	6	4,0	50	18	1,5	C 378-08
B	350	8	6,5	75	18	3,0	C 378-12
	450	8	6,5	75	18	3,0	C 378-14
	600	8	6,5	75	18	3,0	C 378-16
	450	10	8,0	50	18	3,0	C 378-17
	450	10	8,0	75	18	3,0	C 378-18
	600	10	8,0	75	18	3,0	C 378-20
	800	10	8,0	75	18	3,0	C 378-22

Applications:

The product is sucked bottom-up, good axial flow with low shear force.



#INFORMATIVE PAGE 158

Stirrer shafts made of conductive PTFE-EX.

BOLA Moon-Shaped Stirrer Shafts

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

FDA conform

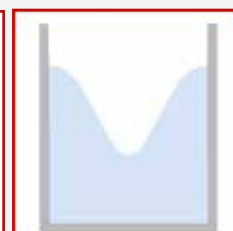
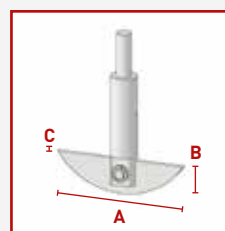
Product description:

PTFE-jacketed stainless steel shaft, tilting half-moon stirrer blade with double-sided groove and access for the stirrer shaft completely made of PTFE. Universal chemical resistance since the product is only exposed to PTFE.

Length mm	Shaft dia. mm	Chuck- ing dia. mm	For ground joint NS	Dimensions according to drawing			Cat. No.:
				A	B	C	
350	8	6,5	24/29	65	18	3,0	C 376-02
450	8	6,5	24/29	65	18	3,0	C 376-04
350	8	6,5	29/32	90	24	3,0	C 376-06
450	8	6,5	29/32	90	24	3,0	C 376-08
600	8	6,5	29/32	90	24	3,0	C 376-10
800	8	6,5	45/40	125	35	3,0	C 376-58
350	10	8,0	29/32	90	24	3,0	C 376-12
450	10	8,0	29/32	90	24	3,0	C 376-14
450	10	8,0	45/40	125	35	3,0	C 376-64
510	10	8,0	29/32	90	24	3,0	C 376-16
600	10	8,0	29/32	90	24	3,0	C 376-18
800	10	8,0	45/40	125	35	3,0	C 376-68
1.000	10	8,0	29/32	90	24	3,0	C 376-19
600	16	14,0	45/40	125	35	3,0	C 376-20
800	16	14,0	45/40	125	35	3,0	C 376-22

Applications:

Tangential flow with little turbulence. The tilting half-moon blade is ideal for stirring in round-bottom flasks with ground joint necks. Blades (see Cat. No. C 400-... on page 62) are available separately and can be mounted additionally.



#INFORMATIVE PAGE 158
Stirrer shafts made of conductive PTFE-EX.



BOLA Double-Moon-Shaped Stirrer Shafts

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

FDA conform

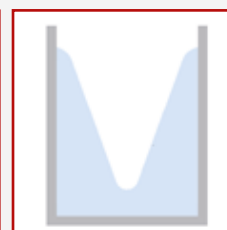
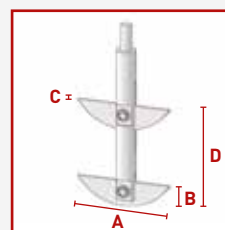
Product description:

PTFE-jacketed stainless steel shaft, two each tilting half-moon stirrer blades with double-sided groove and access for the stirrer shaft completely made of PTFE. Universal chemical resistance since the product is only exposed to PTFE.

Length mm	Shaft dia. mm	Chucking dia. mm	Dimensions according to drawing				Cat. No.:
			A	B	C	D	
350	10	8,0	90	24	3,0	140	C 374-12
450	10	8,0	90	24	3,0	140	C 374-14
600	10	8,0	90	24	3,0	140	C 374-18

Applications:

Tangential flow with little turbulence. Ideal for high and narrow vessels. The tilting half-moon blade is ideal for stirring in round-bottom flasks with ground joint neck. Blades (see Cat. No. C 400-.. on page 62) are available separately and can be mounted additionally.



#SUITABLE PAGE 46
Stirrer bearings for BOLA stirrer shafts

BOLA INNOVATION



#1 Stirrer Shafts – solid and chemically resistant

Glass stirrer shafts can break, metal stirrer shafts are not chemically resistant. In comparison, BOLA Stirrer Shafts with stainless steel core are unbreakable and have an almost universal chemical resistance.

see page 22

BOLA **Stirrer Shafts with One Paddle**

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

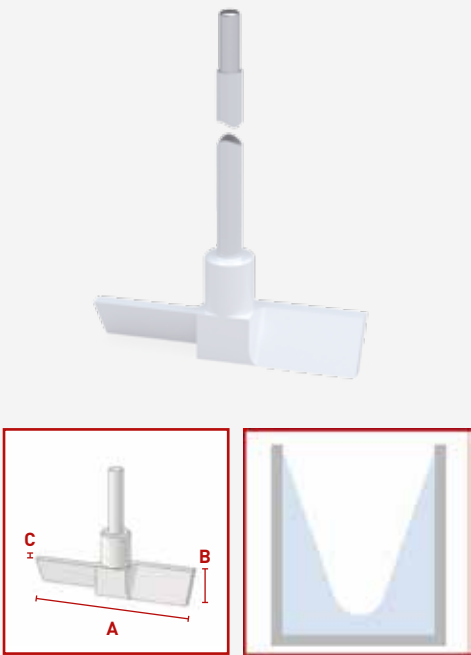
Stirring effect:
bottom-up

FDA conform

Product description:
PTFE-jacketed stainless steel shaft, paddle completely made of PTFE with two 45° angled blades. Universal chemical resistance since the product is only exposed to PTFE.

Length mm	Shaft dia. mm	Chuck dia. mm	Dimensions according to drawing			Cat. No.:
			A	B	C	
450	8	6,5	80	18	4,0	C 379-02
600	8	6,5	80	18	4,0	C 379-04
800	8	6,5	80	18	4,0	C 379-06
600	10	8,0	110	20	5,0	C 379-08
800	10	8,0	110	20	5,0	C 379-10
1.000	10	8,0	110	20	5,0	C 379-12
1.000	16	14,0	140	25	12,0	C 379-18

Applications:
The product is sucked bottom-up, very good axial flow with low shear force.





BOLA U-Shaped Stirrer Shafts

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal



FDA conform

Product description:

PTFE-jacketed stainless steel shaft, u-shaped stirrer blade completely made of PTFE.
Universal chemical resistance since the product is only exposed to PTFE.

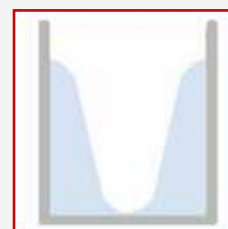
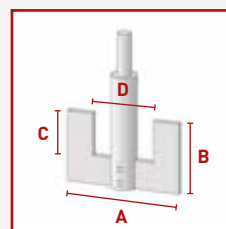
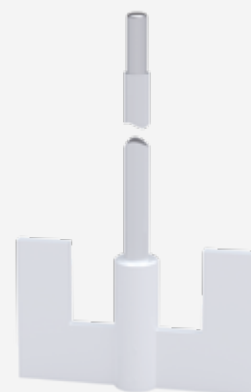
Length mm	Shaft dia. mm	Chuck dia. mm	Dimensions according to drawing				Cat. No.:
			A	B	C	D mm	
350	8	6,5	40	35	20	26	C 384-01
350	8	6,5	60	40	25	30	C 384-02
450	8	6,5	60	40	25	30	C 384-04
450	8	6,5	80	50	30	44	C 384-06
600	8	6,5	80	50	30	44	C 384-08
600	8	6,5	100	60	35	56	C 384-10
800	8	6,5	60	40	25	30	C 384-11
350	10	8,0	80	50	30	44	C 384-16
450	10	8,0	80	50	30	44	C 384-17
450	10	8,0	100	60	35	56	C 384-07
450	10	8,0	130	80	55	80	C 384-19
600	10	8,0	80	50	30	44	C 384-22
600	10	8,0	100	60	35	56	C 384-24
800	10	8,0	100	60	35	56	C 384-28
1.000	10	8,0	100	60	35	56	C 384-32
1.200	10	8,0	100	60	35	56	C 384-40
600	10	8,0	130	80	55	80	C 384-44
800	10	8,0	130	80	55	80	C 384-48
800	16	14,0	150	120	90	90	C 384-52
1.000	16	14,0	150	120	90	90	C 384-58
1.200	16	14,0	150	120	90	90	C 384-64
1.600	16	14,0	180	140	100	110	C 384-74

Applications:

Strong, tangential flow with high shear rate in the margin area, little sediments on the wall of the vessel. Ideal for mixing viscous liquids.



#SUITABLE PAGE 40
Additional stirrer blades



BOLA PRACTICAL-TIP
Big effective circular diameter, but small vessel neck?

No problem if you use our tilting moon-shaped or centrifugal stirrer shafts.

see page 24

BOLA **Globe Stirrer Couplings**Material:
POMTemperature resistance:
from -30 °C to +100 °CChemical resistance:
++ very good

Product description:

Made of POM, a plastic material with a good mechanical strength, powerful transmission of up to 300 Ncm, suitable for a speed of up to 1.200 rounds per minute, maximum misalignment of axes 10 mm.

NEW

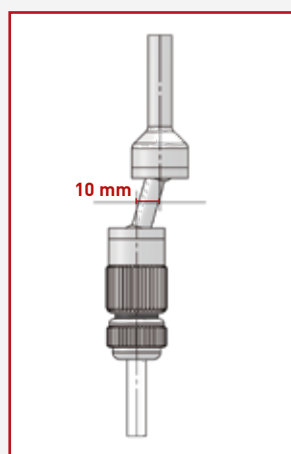
	Opening for stirrer shaft mm	Upper dia. mm	Total length mm	Cat. No.:
A	Ø 4,0	8	190	C 394-01
A	Ø 4,0	10	190	C 398-04
NEW B	Ø 6,5 and 10,0	8	190	C 394-02
B	Ø 6,5 and 10,0	10	190	C 398-08
NEW B	Ø 8,0 and 10,0	8	190	C 394-03
B	Ø 8,0 and 10,0	10	190	C 398-12
C	Inner-square SW6	SW8	180	C 399-12
D	GL 10	10	170	C 393-12

Benefits:

- » very low centrifugal forces due to low weight
- » suitable for both left- and right-handed rotation (except for GL 10 thread: no left-handed rotation possible)
- » no resonance
- » simple assembly by means of screw joints with clamp rings
- » pivot (length 90 mm) can be shortened by the user

Applications:

Ideal for balancing misalignment of axes between agitator and stirrer shaft, suitable for glass, metal or BOLA stirrer shafts.

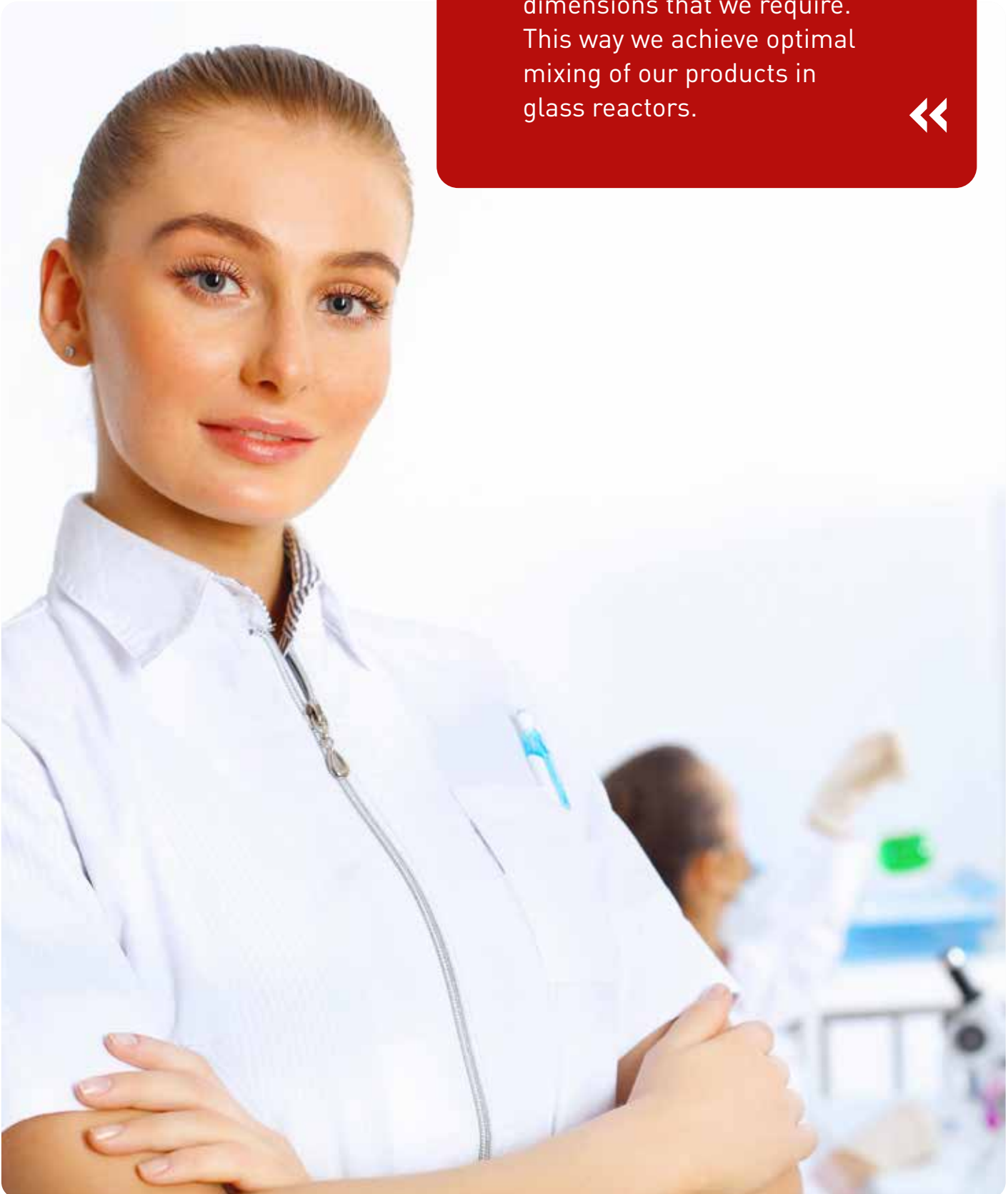
**Spare Parts for** Globe Stirrer Couplings

Description	Material	Packing Unit	for stirrer shaft-Ø	suitable for Cat. No.	Cat. No.:	
Replacement Clamping Nut	POM	Pack size: 3 pieces	4 mm 6,5; 8; 10 mm	C 398-04 C 398-08 / C398-12	C 901-01 C 901-02	
Replacement Reducing Sleeve	PTFE-GF	Pack size: 3 pieces	6,5 mm 8,0 mm	C 398-08 C 398-12	C 911-01 C 911-02	



BOLA **Stirrer Shafts**

At BOLA we get custom made stirrer shafts with exactly the dimensions that we require. This way we achieve optimal mixing of our products in glass reactors.



BOLA Maxi Propeller Stirrer Shafts

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

Stirring effect:
bottom-up

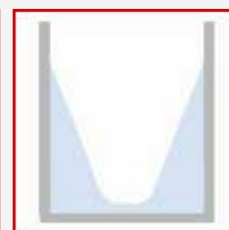
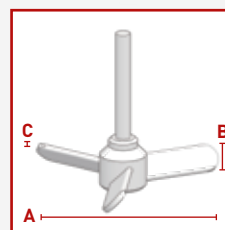


FDA conform

Product description:

PTFE-jacketed stainless steel shaft, propeller completely made of PTFE with three 45° angled blades. Universal chemical resistance since the product is only exposed to PTFE.

Length mm	Shaft dia. mm	Chucking dia. mm	Dimensions according to drawing mm			Cat. No.:
			A	B	C	
450	10	8,0	140	20	4,0	C 392-28
600	10	8,0	140	20	4,0	C 392-34
800	10	8,0	140	20	4,0	C 392-40
1.200	10	8,0	140	20	4,0	C 392-42
800	16	14,0	140	26	6,0	C 392-44
1.000	16	14,0	140	26	6,0	C 392-46
600	16	14,0	200	26	6,0	C 392-52
800	16	14,0	200	26	6,0	C 392-58
1.000	16	14,0	200	26	6,0	C 392-64
1.200	16	14,0	200	26	6,0	C 392-70
1.200	16	14,0	400	26	8,0	C 392-90



Applications:

The product is sucked bottom-up, very good axial flow with low local shear force.





BOLA Impeller Stirrer Shafts

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal



FDA conform

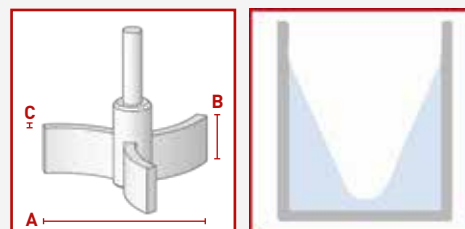
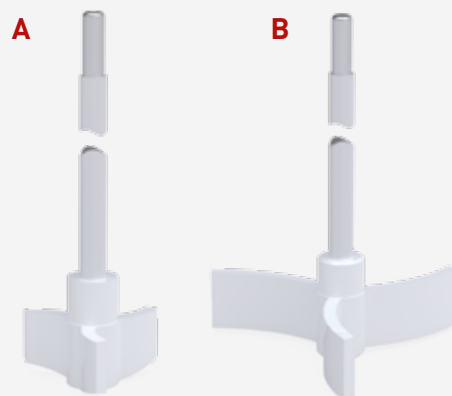
Product description:

PTFE-jacketed stainless steel shaft, impeller completely made of PTFE with three blades bent backwards, lower side of impeller either even or 15° angled. Universal chemical resistance since the product is only exposed to PTFE.

	Length mm	Shaft dia. mm	Chuck dia. mm	Angle	Dimensions according to drawing mm			Cat. No.:
					A	B	C	
A	350	10	8,0	15°	45	22	5	C 389-18
	350	10	8,0	15°	60	25	5	C 389-20
	450	10	8,0	15°	60	25	5	C 389-22
B	450	10	8,0	0°	100	25	5	C 389-28
	600	10	8,0	0°	100	25	5	C 389-32
	800	10	8,0	0°	100	25	5	C 389-36
	600	10	8,0	0°	150	25	5	C 389-62
	800	10	8,0	0°	150	25	5	C 389-66

Applications:

Very good and gentle stirring due to blades which are bent backwards, low shear force. The 15° angled impellers are ideal for stirring in vessels with round bottom.



BOLA Centrifugal Stirrer Shafts

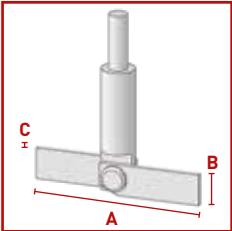
Material: PTFE Temperature resistance: from -200 °C to +250 °C Chemical resistance: +++ universal

FDA conform

Product description:
PTFE-jacketed stainless steel shaft, stirring unit (movable paddles, bolt and receiver for paddles) completely made of PTFE. The paddles open up at increasing speed. Universal chemical resistance since the product is only exposed to PTFE.

Length mm	Shaft dia. mm	Chuck dia. mm	Dimensions according to drawing			Cat. No.:
			A	B	C	
350	6	4,0	50	17	2,0	C 377-04
350	8	6,5	90	17	2,0	C 377-08
450	8	6,5	90	17	2,5	C 377-10
350	10	8,0	90	17	2,5	C 377-12
450	10	8,0	90	17	2,5	C 377-14
600	10	8,0	90	17	2,5	C 377-16

Applications:
The stirrer shaft can be used for stirring in narrow mouth vessels or in vessels with ground joint opening (starting at size NS 24).



For ground joint starting at NS 24



#SUITABLE PAGE 63
Additional stirrer paddles



BOLA Stirrer Shafts with Blade

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

FDA conform

Product description:

PTFE-jacketed stainless steel shaft, blade completely made of PTFE. Universal chemical resistance since the product is only exposed to PTFE.

Length mm	Shaft dia. mm	Chuck dia. mm	Dimensions according to drawing			Cat. No.:
			A	B	C	
450	8	6,5	90	20	5,0	C 381-04
600	8	6,5	90	20	5,0	C 381-06
450	10	8,0	120	30	5,0	C 381-08
600	10	8,0	120	30	5,0	C 381-10
800	10	8,0	120	30	5,0	C 381-12

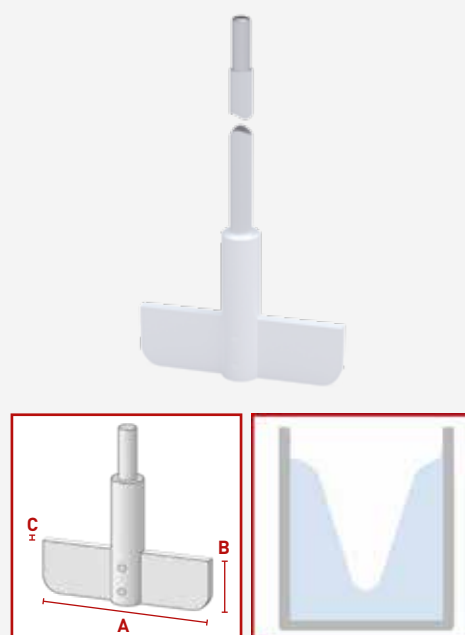
Applications:

Tangential flow with little turbulence, gentle stirring.



#INFORMATIVE PAGE 357

Information on maximum revolutions per minute for BOLA stirrer shafts



BOLA Gassing Stirrer with 4 Blades

Material:
PTFE

Temperature resistance:
-200 °C to +250 °C

Chemical resistance:
+++ universal

Vacuum:
suitable

autoclave:
121°

FDA conform

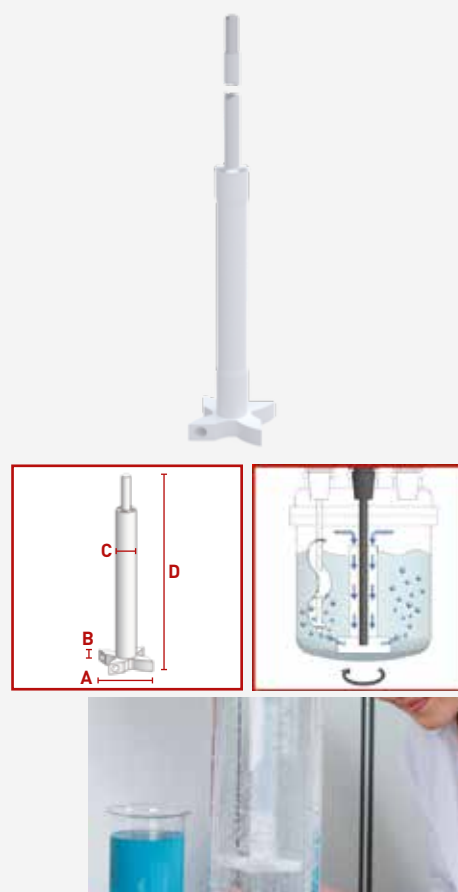
Product description:

PTFE-jacketed stainless steel shaft, propeller with four blades completely made of PTFE. Clockwise rotation of the shaft produces a vacuum behind the stirrer blades. By this vacuum, the gas is transported from the gas compartment through the hollow shaft and into the product. The rotation speed depends on the fluid level and the immersion depth: e. g. 430 rpm are necessary at 150mm, and 690 rpm are necessary at 350 mm. The length of the shaft and the suction pipe can be adapted individually. Minimum one baffle is imperative for proper operation (Cat.No. C 490-..). Universal chemical resistance since the product is only exposed to PTFE.

Length mm	Shaft dia. mm	Chuck dia. mm	Dimensions according to drawing				Cat. No.
			A	B	C	D mm	
484	10	8,0	72	12	20	187	C 488-08
559	10	8,0	72	12	20	272	C 488-14
657	10	8,0	72	12	20	387	C 488-20

Applications:

Reduced reduction times compared to stirring without gassing due to high aeration of the product. Strong radial flow, ideal for gassing of liquids.



BOLA **Slip-On Baffle**Material:
PTFETemperature resistance:
from -200 °C to +250 °CChemical resistance:
+++ universalVacuum:
suitableautoclave:
121°**FDA conform**

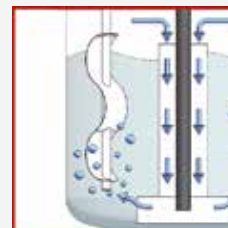
Product description:

Completely made of PTFE, supporting ring made of PFA. The baffle can be mounted at any position on a temperature probe or a solo stirrer shaft. Design based on DIN 28131. Universal chemical resistance since the product is only exposed to PTFE.

For ground joint NS	Width mm	For shaft dia. mm	Fitting length mm ca.	Cat.No.:
19/26	15	8,0	125	C 490-10
29/32	23	8,0	125	C 490-12

Applications:

Prevents rotation of the stirring products and provides an axial flow for better mixing. For gassing stirrers, one baffle is imperative. The position in the reactor can be optimized with BOLA Swivelling Screw Fittings (see Cat.No. D 690-... Page 127 and D 692-... Page 126).

**#SUITABLE PAGE 193****BOLA temperature probes for assembly of a baffle.**BOLA **Stirrer Shafts with Two Paddles**Material:
PTFETemperature resistance:
from -100 °C to +240 °CChemical resistance:
+++ universalStirring effect:
bottom-up**FDA conform**

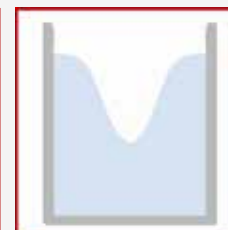
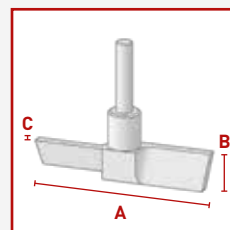
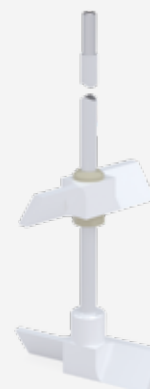
Product description:

PTFE-jacketed stainless steel shaft, two PTFE paddles arranged crosswise at 90°. Upper paddle is fixed by means of clamp screws made of PEEK compound.

Length mm	Shaft dia. mm	Chucking dia. mm	Distance of blades mm	Dimensions according to drawing mm			Cat. No.:
				A	B	C	
450	8	6,5	50	80	18	4,0	C 380-02
600	8	6,5	50	80	18	4,0	C 380-04
600	10	8,0	100	110	20	5,0	C 380-08
800	10	8,0	100	110	20	5,0	C 380-10
1.000	10	8,0	100	110	20	5,0	C 380-12
600	16	14,0	150	140	25	12,0	C 380-14
800	16	14,0	150	140	25	12,0	C 380-16
1.000	16	14,0	150	140	25	12,0	C 380-18

Applications:

The product is sucked bottom-up, very good axial flow with low local shear force. The upper paddle can be positioned individually.





BOLA Fan-Shaped Stirrer Shafts

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal



FDA conform

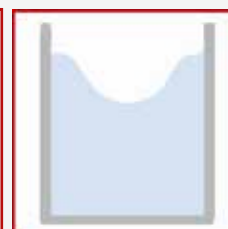
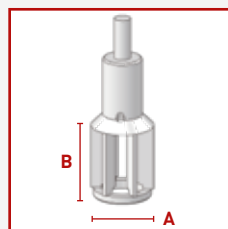
Product description:

PTFE-jacketed stainless steel shaft, fan-shaped stirring unit completely made of PTFE.

Length mm	Shaft dia. mm	Chuck dia. mm	For ground joint NS	Dimensions according to drawing		Cat. No.:
				A	B	
300	8	6,5	29/32	24	35	C 382-02
300	8	6,5	45/40	38	45	C 382-06
450	8	6,5	45/40	38	45	C 382-08
600	10	8,0	60/46	53	55	C 382-14

Applications:

The mixture is drawn off from the bottom. Ideal mixing due to centrifugal forces. Ideal for stirring in narrow mouth vessels or in vessels with ground joint openings.



#SUITABLE PAGE 23
Globe stirrer couplings

BOLA Discs Stirrer Shafts

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

FDA conform

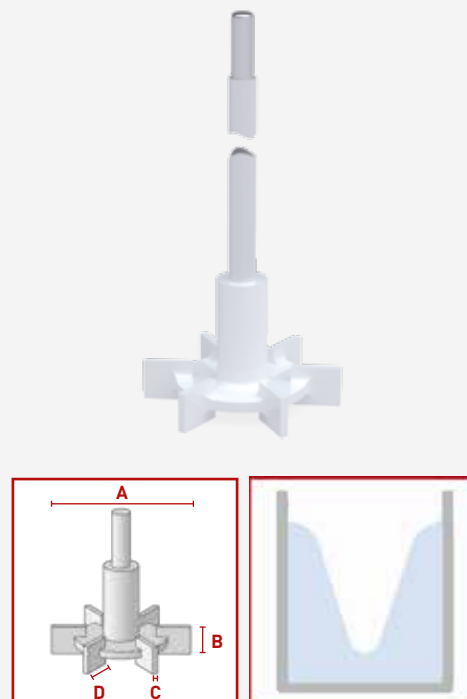
Product description:

PTFE-jacketed stainless steel shaft, discoidal stirrer blade with six radial paddles completely made of PTFE, similar to a "Rushton Turbine" stirrer shaft. Universal chemical resistance since the product is only exposed to PTFE.

Length mm	Shaft dia. mm	Chuck- ing dia. mm	Suitable for		Dimensions according to drawing				Cat. No.:
			NS	NW	A	B	C	D	
350	6	4,0	29/32		25	5	2	6,3	C 598-12
350	6	4,0	45/40		38	8	2	10	C 598-16
450	6	4,0	45/40		38	8	2	10	C 598-18
350	10	8,0		60	50	10	2	12,5	C 598-22
600	10	8,0		60	50	10	2	12,5	C 598-26
350	10	8,0		100	75	15	3	18,8	C 598-32
600	10	8,0		100	75	15	3	18,8	C 598-36
600	10	8,0		150	140	28	4	35	C 598-42
1.000	10	8,0		150	140	28	4	35	C 598-46
1.000	10	8,0		200	180	36	4	45	C 598-56

Applications:

Axial suction of mixture, strong radial flow. Ideal for aerating liquids.



BOLA Double Impulse Stirrer Shafts

Material:
PTFE

Temperature resistance:
from -100 °C to +240 °C

Chemical resistance:
+++ universal

Stirring effect:
bottom-up

FDA conform

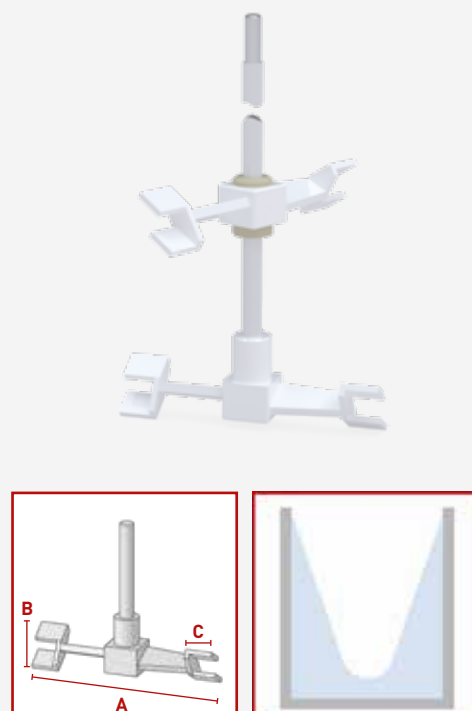
Product description:

PTFE-jacketed stainless steel shaft, two paddles arranged crosswise at 90° completely made of PTFE. Upper paddle is fixed by means of clamp screws made of PEEK compound. Universal chemical resistance since the product is only exposed to PTFE.

Length mm	Shaft dia. mm	Chuck- ing dia. mm	Distance of blades mm	Dimensions according to drawing			Cat. No.:
				A	B	C	
600	10	8,0	150	140	34	19	C 391-18
800	16	14,0	150	140	34	19	C 391-28

Applications:

The inner stirring surfaces provide an upswing, while the parallel paddle ends provide a downward movement. Even viscous liquids are mixed ideally. The upper paddle can be positioned individually.





BOLA Propeller Stirrer Shafts with 4 Blades

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

Stirring effect:
bottom-up



FDA conform

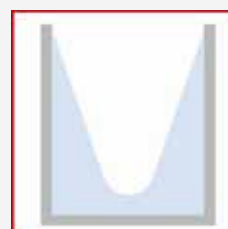
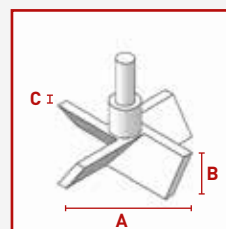
Product description:

PTFE-jacketed stainless steel shaft, propeller completely made of PTFE with four 45° angled blades. Universal chemical resistance since the product is only exposed to PTFE.

Length mm	Shaft dia. mm	Chuckling dia. mm	Dimensions according to drawing			Cat. No.:
			A	B	C	
350	8	6,5	50	18	4,0	C 484-18
600	8	6,5	100	20	5,0	C 484-22
450	10	8,0	75	20	5,0	C 484-32
600	10	8,0	75	20	5,0	C 484-34
600	10	8,0	100	20	5,0	C 484-36
800	10	8,0	140	22	6,0	C 484-40
1.000	10	8,0	100	20	5,0	C 484-44
1.000	16	14,0	200	25	8,0	C 484-50

Applications:

The product is sucked bottom-up, good axial flow with low shear force.



BOLA PRACTICAL-TIP

Big effective circular diameter, but small vessel neck?

No problem if you use our tilting moon-shaped or centrifugal stirrer shafts.

s. page 24

BOLA Mini Propeller Stirrer Shafts

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

Stirring effect:
bottom-up

FDA conform

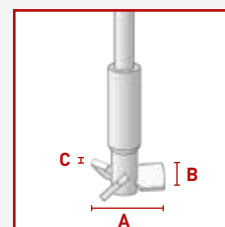
Product description:

PTFE-jacketed stainless steel shaft, propeller completely made of PTFE with three 45° angled angular blades. Universal chemical resistance since the product is only exposed to PTFE.

Length mm	Shaft dia. mm	Chuck- ing dia. mm	Suitable for NS	Dimensions according to drawing			Cat. No.:
				A	B	C	
200	6	4,0	29/32	25	8	2	C 482-08
350	6	4,0	29/32	25	8	2	C 482-12
200	6	4,0	45/40	40	12	2	C 482-20
350	6	4,0	45/40	40	12	2	C 482-24

Applications:

The product is sucked bottom-up, good axial flow with low shear force. The small stirring diameter allows stirring in narrow mouth vessels or in vessels with ground joint openings.



BOLA Micro Surface Stirrer Shafts

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

FDA conform

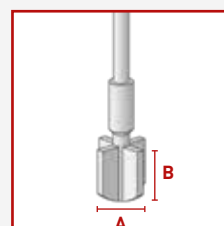
Product description:

PTFE-jacketed stainless steel shaft, blade completely made of PTFE with four round paddles. Universal chemical resistance since the product is only exposed to PTFE.

Length mm	Shaft dia. mm	Chuck- ing dia. mm	Dimensions according to drawing		Cat. No.:
			A	B	
120	3,5	2,5	8	8	C 486-08
180	3,5	2,5	12	12	C 486-12
200	4,0	3,0	14	14	C 486-16
200	4,0	3,0	16	16	C 486-20

Applications:

Ideal for stirring in test tubes or vessels with narrow mouth, optimum mixing in vessels with round bottom and low fill level.



Also made by Bohlender.

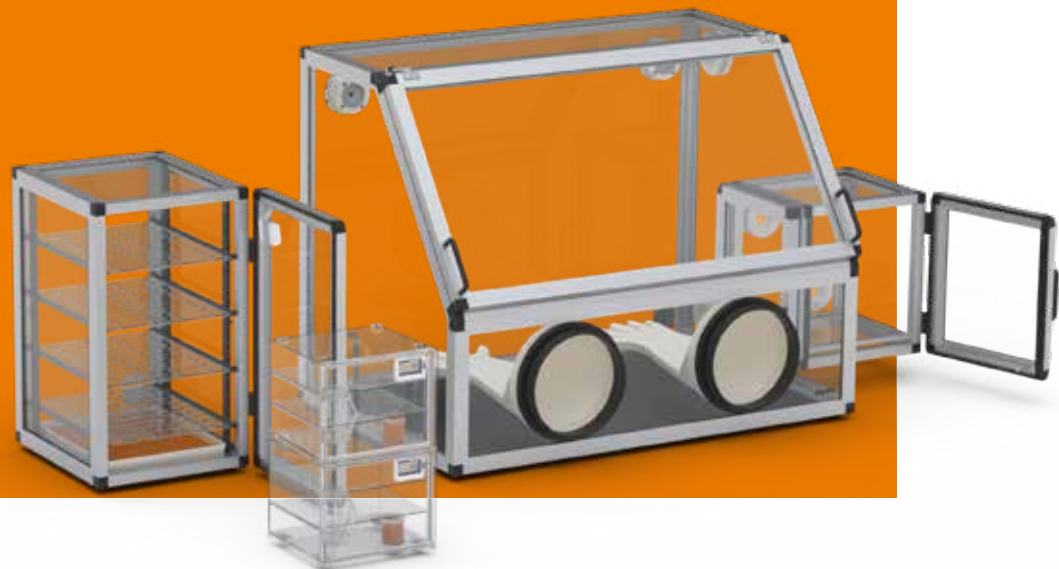


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A BRAND OF BOHLENDER

BOLA Stirrer Blades

These solid stirrer blades are made of PTFE and have a set of clamp screws made of a PTFE/PEEK compound. The blades can be fixed tightly on BOLA Stirrer Shafts by means of the clamp screws. A spanner wrench is included for easy assembly.

Applications:

For flexible testing of optimum geometry and arrangement of blades on stirrer shafts. Usable to create stirrers with one single stage or with several stages.



Material:
PTFE

Temperature resistance:
from -100 °C to +240 °C

Chemical resistance:
+++ universal

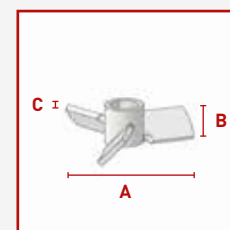
Type : BOLA Propeller Blades

FDA conform

Shaft dia. mm	Wrench size	Dimensions according to drawing			Cat. No.:
		A	B	C	
8	15	75	18	3	C 440-08
10	19	75	18	3	C 440-10

Applications:

The product is sucked bottom-up, good axial flow with low shear force.



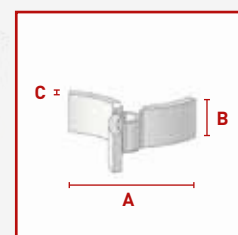
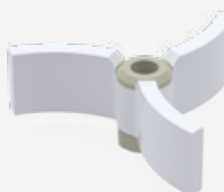
Type : BOLA Impeller Blades

FDA conform

Shaft dia. mm	Wrench size	Dimensions according to drawing			Cat. No.:
		A	B	C	
10	19	60	25	6	C 443-08
10	19	100	25	6	C 443-10
10	19	150	25	6	C 443-14

Applications:

Very good and gentle stirring due to blades which are bent backwards, low shear force.



Type : BOLA Propeller with 4 Blades

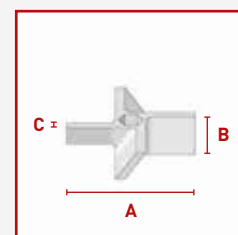
FDA conform

Shaft dia. mm	Wrench size	Dimensions according to drawing			Cat. No.:
		A	B	C	
8	15	50	18	4	C 448-08
10	19	75	20	5	C 448-09
10	19	100	20	5	C 448-10
10	19	140	20	5	C 448-20
10	19	200	20	5	C 448-28
16	32	140	25	12	C 448-36
16	32	200	25	12	C 448-42

NEW

Applications:

The product is sucked bottom-up, good axial flow with low shear force.





BOLA Stirrer Blades

Material:
PTFE

Temperature resistance:
from -100 °C to +240 °C

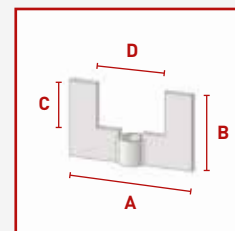
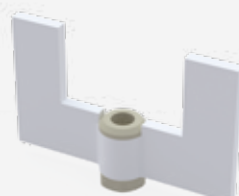
Chemical resistance
+++ universal



Type : BOLA U-Shaped Blades

FDA conform

Shaft dia. mm	Wrench size	Dimensions according to drawing mm				Cat. No.:
		A	B	C	D	
8	15	60	40	22	30	C 445-08
8	15	100	60	35	56	C 445-12
10	19	80	50	30	44	C 445-16
10	19	100	60	35	56	C 445-20
10	19	130	80	55	80	C 445-30
10	19	150	120	90	90	C 445-34
16	32	130	80	55	80	C 445-40
16	32	150	120	90	90	C 445-44



Applications:

Strong, tangential flow with high shear rate in the margin area, little sediments on the wall of the vessel. Ideal for mixing viscous liquids.

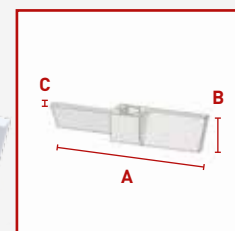
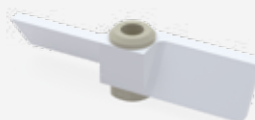
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or send us a drawing (a rough sketch is sufficient) and some information to **info@bola.de**. We will then contact you to discuss the details and provide you with a free quote.

Type : BOLA Paddle

FDA conform

Shaft dia. mm	Wrench size	Dimensions according to drawing mm			Cat. No.:
		A	B	C	
8	15	80	18	4	C 446-08
10	19	80	20	5	C 446-10
10	19	110	20	5	C 446-12
10	19	140	20	5	C 446-14
16	32	140	25	12	C 446-16



Applications:

The product is sucked bottom-up, very good axial flow with shear force.

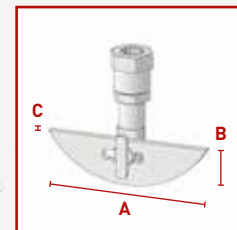
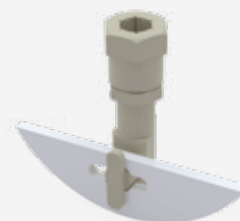
BOLA **Stirrer Blades**Material:
PTFETemperature resistance:
from -100 °C to +240 °CChemical resistance:
+++ universalType : BOLA **Moon-Shaped Blades**

FDA conform

Shaft dia. mm	For ground joint NS	Wrench size	Dimensions according to drawing			Cat. No.:
			A	B	C	
8	24/29	15	65	18	3	C 442-08
10	29/32	19	90	24	3	C 442-10

Applications:

Tangential flow with little turbulence, the tilting half-moon blade is ideal for stirring in round-bottom flasks with ground joint necks. Blades are available separately (see Cat. No. C 400-.. on page 62) and can be mounted additionally.

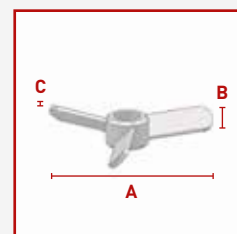
Type : BOLA **Maxi Propeller Blades**

FDA conform

Shaft dia. mm	Wrench size	Dimensions according to drawing			Cat. No.:
		A	B	C	
10	19	140	20	4	C 441-10
10	19	200	20	6	C 441-12
16	32	140	26	6	C 441-14
16	32	200	26	6	C 441-16

Applications:

The product is sucked bottom-up, very good axial flow with local shear force.

**BOLA PRACTICAL TIP**
For an easier assembly of blades:

Slide blade on the stirrer shaft, add clamp piece from above and nut from below and tighten it with a wrench.

**Spare Parts for:** Stirrer Blades

Description	Material	Packing Unit	Shaft dia.	suitable for Cat. No.:	Cat. No.:	
Replacement clamp screws	PTFE-PEEK Compound	Pack size: 5 pieces	8 mm	all stirrer blades for shaft dia. 8 mm	C 950-01	
Replacement clamp screws	PTFE-PEEK Compound	Pack size: 5 pieces	10 mm	all stirrer blades for shaft dia. 10 mm	C 950-02	
Replacement clamp screws	PTFE-PEEK Compound	Pack size: 5 pieces	16 mm	all stirrer blades for shaft dia. 16 mm	C 950-03	



BOLA Solo Stirrer Shafts

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

FDA conform

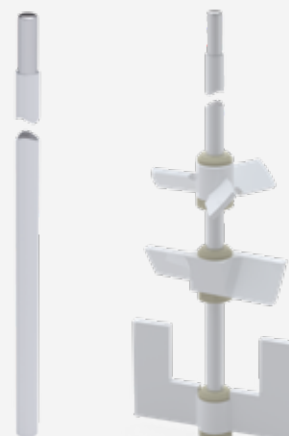
Product description:

PTFE-jacketed stainless steel shaft with fused lower end. Universal chemical resistance since the product is only exposed to PTFE.

Length mm	Shaft dia. mm	Chuck dia. mm	Cat. No.:
350	8	6,5	C 472-08
600	8	6,5	C 472-20
350	10	8,0	C 474-08
600	10	8,0	C 474-20
800	10	8,0	C 474-30
1.000	10	8,0	C 474,34
1.200	10	8,0	C 474-40
1.200	16	14,0	C 476-40
1.600	16	14,0	C 476-60

Applications:

Ideal as basic stirrer shaft to be equipped with BOLA additional stirrer blades (from page 40) which can be positioned freely on the shaft in height and stirring direction. The solo stirrer shafts can also be used as stirrer rod for manual stirring.



BOLA INNOVATION



#1 Stirrer shaft kit

Consisting of solo stirrer shaft and stirrer blades. Stirrer shafts can be composed individually since the blades can be fixed in the requested height and direction.

BOLA Stirrer Shafts with Reduced Chucking Diameter (RCD)

For some applications, it is necessary to use very long stirrer shafts. These stirrer shafts must have suitable diameters to be stable enough. It can occur that the chucking diameter of these long stirrer shafts is too big for the agitator. All BOLA Stirrer Shafts listed below have a professionally reduced chucking diameter of 10 mm and can be fixed safely in all common agitators.

You need a smaller diameter, or a different stirrer shaft? No problem: Simply indicate the requested diameter and the catalogue number of the stirrer shaft.



Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

Type : BOLA Stirrer Shafts with Blade RCD

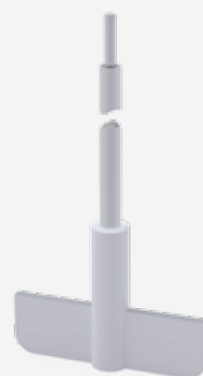
FDA conform

PTFE-jacketed stainless steel shaft, blade completely made of PTFE. Universal chemical resistance since the product is only exposed to PTFE. Blade dimensions see Cat. No. C 381-.. on page 33.

Length mm	Shaft dia. mm	Chucking dia. mm	Cat. No.:
1.000	16	10	C 581-18

Applications:

Tangential flow with little turbulence, gentle stirring.



Type : BOLA Moon-Shaped Stirrer Shafts RCD

FDA conform

PTFE-jacketed stainless steel shaft, tilting half-moon stirrer blade with double-sided groove and access for the stirrer shaft completely made of PTFE. Universal chemical resistance since the product is only exposed to PTFE. Blade dimensions see Cat. No. C 376-.. on page 24.

Length mm	Shaft dia. mm	Chucking dia. mm	Cat. No.:
600	16	10	C 576-20
800	16	10	C 576-22

Applications:

Tangential flow with little turbulence. The tilting half-moon blade is ideal for stirring in round-bottom flasks with ground joint necks. Blades are available separately and can be mounted additionally.



Type : BOLA Maxi Propeller Stirrer Shafts RCD

FDA conform

PTFE-jacketed stainless steel shaft, propeller completely made of PTFE with three 45° angled blades. Universal chemical resistance since the product is only exposed to PTFE. Blade dimensions see Cat. No. C 392-.. on page 30.

Length mm	Shaft dia. mm	Chucking dia. mm	Cat. No.:
600	16	10	C 592-52
800	16	10	C 592-58
1.000	16	10	C 592-64
1.200	16	10	C 592-70

Applications:

The product is sucked bottom-up, very good axial flow with low local shear force.





Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal



Type : BOLA Stirrer Shaft with Two Paddles RCD

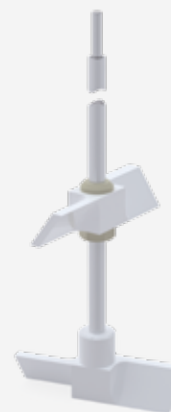
FDA conform

PTFE-jacketed stainless steel shaft, two paddles arranged crosswise at 90° completely made of PTFE. Upper paddle is fixed by means of clamp screws made of PEEK compound. Blade dimensions see Cat. No. C 380-.. on page 34.

Length mm	Shaft dia. mm	Chuckling dia. mm	Cat. No.:
600	16	10	C 580-14
1.000	16	10	C 580-18

Applications:

The product is sucked bottom-up, very good axial flow with low local shear force. The upper paddle can be positioned individually.



Type : BOLA U-Shaped Stirrer Shafts RCD

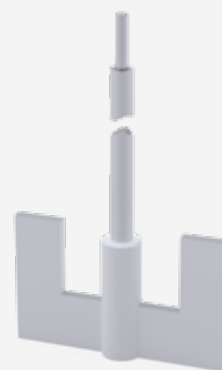
FDA conform

PTFE-jacketed stainless steel shaft, U-shaped stirrer blade completely made of PTFE. Universal chemical resistance since the product is only exposed to PTFE. Blade dimensions see Cat. No. C 384-.. on page 27.

Length mm	Shaft dia. mm	Chuckling dia. mm	Cat. No.:
800	16	10	C 584-52
1.000	16	10	C 584-58
1.200	16	10	C 584-64

Applications:

Strong, tangential flow with high shear rate in the margin area, little sediments on the wall of the vessel. Ideal for mixing viscous liquids.



BOLA INNOVATION



#1 Stirrer Shafts – solid and chemically resistant

Glass stirrer shafts can break, metal stirrer shafts are not chemically resistant. In comparison, BOLA Stirrer Shafts with stainless steel core are unbreakable and have an almost universal chemical resistance.

BOLA **Stirrer Bearings**Material:
PTFE, PPSTemperature resistance:
from -15 °C to +200 °CChemical resistance:
+++ universal

FDA conform

Product description:

Ground joint cone made of PTFE with sealing rings on the outside to prevent sticking of the connection and to reduce danger of breaking glass. A special gasket made of PTFE and an FPM o-ring which is compressed by a GL screw cap provide a good sealing of the stirrer shaft. This gasket can be exchanged after wearing.

Cone NS European standard	For stirrer shaft dia. mm	Total length mm	Thread of screw cap GL	Cat. No.:
NS 19/26	6	63	18	C 424-04
NS 19/26	8	65	25	C 424-05
NS 24/29	8	69	25	C 424-08
NS 24/29	10	70	25	C 424-09
NS 29/32	6	72	18	C 424-12
NS 29/32	8	74	25	C 424-13
NS 29/32	10	72	25	C 424-14
NS 45/40	10	80	25	C 424-16
NS 45/40	16	86	32	C 424-18

Cone US standard	For stirrer shaft dia. mm	Total length mm	Thread of screw cap GL	Cat. No.:
24/40	8	80	25	C 429-14
24/40	10	80	25	C 429-18

Applications:

Suitable for vacuum, perfect bearing for stainless steel, glass and BOLA Stirrer Shafts

**Spare Parts for:** Stirrer Bearings

Description	Material	For stirrer shaft dia. mm	For Thread of screw cap GL	suitable for Cat. No.	Cat. No.:	
Replacement Special Gaskets The gaskets provide sealing of the stirrer shafts.	PTFE and FKM-O-Ring	6 mm 8 mm 10 mm 16 mm	GL 18 GL 25 GL 25 GL 32	C 424-04 / C 424-12 C 424-05 / C 424-08 / C 424-13 C 424-09 / C 424-14 / C 424-16 C 424-18	C 425-69 C 425-70 C 425-71 C 425-72	
Replacement Screw Caps Screw caps compress the o-ring of the special gasket and provide sealing of the stirrer shaft.	PPS	6 mm 8 mm 10 mm 16 mm	GL 18 GL 25 GL 25 GL 32	C 424-04 / C 424-12 C 424-05 / C 424-08 / C 424-13 C 424-09 / C 424-14 / C 424-16 C 424-18	C 425-82 C 425-84 C 425-86 C 425-88	



BOLA Glass Stirrer Bearings

Material:
PTFE, PPS

Temperature resistance:
from -15 °C to +200 °C

Chemical resistance:
+++ universal



FDA conform

Product description:

Combination of a borosilicate glass piece with ground joint, an interior PTFE shaft guide with integrated special gasket and a GL screw cap made of PPS. The special gasket made of PTFE and an FPM o-ring which is compressed by a GL screw cap provide a good sealing of the stirrer shaft. This gasket can be exchanged after wearing.

Cone NS European standard	For stirrer shaft dia. mm	Total length mm	Thread of screw cap GL	Cat. No.:
NS 29/32	6	90	25	C 425-06
NS 29/32	8	90	25	C 425-08
NS 29/32	10	90	25	C 425-09
NS 45/40	10	110	25	C 425-12
NS 45/40	16	118	32	C 425-14

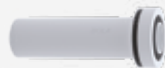



Cone US standard	For stirrer shaft dia. mm	Total length mm	Thread of screw cap GL	Cat. No.:
24/40	8	103	25	C 428-08
24/40	10	103	25	C 428-12

Applications:

Suitable for vacuum, perfect bearing for stirrer shafts made of stainless steel, glass and for BOLA Stirrer Shafts.



Spare Parts for: Glass Stirrer Bearings

Description	Material	For stirrer shaft dia. mm	For Thread of screw cap GL	suitable for Cat. No.	Cat. No.:	
Replacement Shaft Guides With integrated, exchangeable special gasket	PTFE and FKM-O-Ring	6 mm 8 mm 10 mm 16 mm		C 425-06 C 425-08 / C 428-08 / C 426-08 C 425-09 / C 425-12 / C 428-12 / C 426-09 C 425-14	C 425-57 C 425-58 C 425-59 C 425-60	
Replacement Special Gaskets The special gaskets provide sealing against the stirrer shaft.	PTFE and FKM-O-Ring	6 mm 8 mm 10 mm 16 mm	GL 25 GL 25 GL 25 GL 32	C 425-06 C 425-08 / C 428-08 / C 426-08 C 425-09 / C 425-12 / C 428-12 / C 426-09 C 425-14	C 425-69 C 425-70 C 425-71 C 425-72	
Replacement Screw Caps	PPS	6 mm 8 mm 10 mm 16 mm	GL 25 GL 25 GL 25 GL 32	C 425-06 C 425-08 / C 428-08 C 425-09 / C 425-12 / C 428-12 C 425-14	C 425-83 C 425-84 C 425-86 C 425-88	
Replacement Glass Parts Ground joint core and GL thread	Borosilicate glass		GL 25 GL 25 GL 25 GL 32	C 425-06 / C 425-08 / C 425-09 C 428-08 / C 428-12 C 425-12 C 425-14	C 425-50 C 425-51 C 425-53 C 425-55	

BOLA **Ground Joint Distributor with Stirrer Bearing**Material:
PTFETemperature resistance:
from -15 °C to +200 °CChemical resistance:
+++ universalautoclave:
121°**FDA conform****Product description:**

Completely made of PTFE. With ground joint NS 45/40 and three GL-threaded necks. Center neck serves as stirrer bearing. A special gasket made of PTFE and an FPM o-ring which is compressed by a GL screw cap provide a good sealing of the stirrer shaft. The lateral necks can be used for connection of tubes and tubing by means of BOLA Laboratory Screw Joints. Integrated special nut for unlocking of stuck ground joint components. Universal chemical resistance, the product is only exposed to PTFE.

Dia. of. stirrer shaft mm	Center neck GL	Lateral necks GL	For outer diameter of tubing mm	Cat. No.
8	25	2 x 14	2 x 8	C 435-08
10	25	2 x 14	2 x 8	C 435-10

**Applications:**

For bottles and reaction vessels with ground joint. Mixing of liquids and addition of further products via the lateral GL-necks at the same time.

**BOLA PRACTICAL TIP**
Grease for ground joints?

Forget about it. If you use our sleeves with ribs or with gripping ring, you don't need any more grease.

see page 209



BOLA Special Stirrer Bearings

Material: PTFE, ETFE Temperature resistance: from -50 °C to +150 °C Chemical resistance: +++ universal Pressure: low Vacuum: suitable



FDA conform

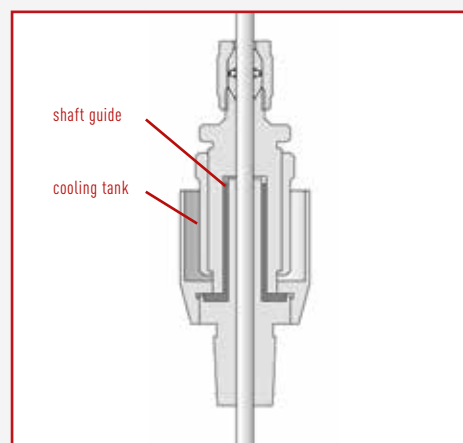
Product description:

The 29/32 ground joint of these bearings provides a safe seat in the reactor lid. The stirrer shaft is held by an invisible shaft guide made of borosilicate glass which has an adjustable vacuum sealing. The stirrer can be adjusted in height by means of a lock nut. There is no abrasion. A cooling tank for an optional lubricant against overheating is also included. Suitable for vacuum up to at least 700 mm Hg and for low overpressure. Speeds of up to 500 rpm – temporarily even 1000 rpm – are admissible.


Ground Joint NS	For stirrer shaft dia. mm		Cat. No.
29/32	8		C 430-20
29/32	10		C 430-28

Applications:

Particularly suitable for long-term use. For all stirrer shafts made of stainless steel, glass or for BOLA Stirrer Shafts with a diameter of 8 or 10 mm.



Spare Parts for: Special Stirrer Bearings

Description	Material	Packing Unit	For stirrer shafts dia. mm	suitable for Cat. No.	Cat. No.:	
Replacement Guide Sleeve	borosilicate glass	1 piece	1 piece	C 430-20 / C 430-28	C 960-01	

BOLA **Ground Joint Magnetic Stirrer Heads (MRK)**Material:
PTFE, PFATemperature resistance:
from -15 °C to +250 °CChemical resistance:
+++ universalVacuum:
suitable

Product description:

Gastight permanent magnetic coupling with ball bearing encapsulated in ceramics and square connection for cardan joint. PTFE cone size 29 with release nut made of PTFE with glass fibre for easy removal of the ground joint. All products which are exposed to the medium do not contain any metals. The 8 mm shaft guide provides guidance without friction of stirrer shafts up to a speed of 800 rpm. The stirrer head can also be fixed directly into the chuck by mounting the included metal adaptor on the square connection (6 mm).

Torque Ncm	Ground joint NS	Viscosity up to mPas	Volume up to ml	Speed rpm max.	Total length mm	Cat. No.:
20	29/32	1.500	2.000	800	203	C 450-16
40	29/32	2.500	4.000	800	215	C 450-24

Applications:

For absolute vacuum.



BOLA INNOVATION

#1 **Magnetic Stirrer Heads**

All wetted parts are metal-free. An almost universal chemical resistance is provided due to the use of fluoroplastics.





BOLA Magnetic stirrer couplings – what you should know about.

The magnetic stirrer couplings P-MRK are optimal for the use of PTFE-covered stirrer shafts from BOLA with a shaft diameter of 8 to 10 mm. The power is transmitted from the stirrer drive via the drive magnet to the rotor magnet connected to the stirrer shaft. This makes the magnetic stirrer coupling a self-contained, gas-tight system that is perfectly suited for applications under vacuum. Depending on the design, the reactor cover is sealed either by a ground joint core (NS 29/32 or NS 45/40) or as a flat flange (DN40 or DN50), so that gases produced during the mixing process cannot escape.

An efficient power transmission up to 90 ncm and rotation speeds up to 1.500 rotations per minute are ideal for the most varied applications in the lab or production. BOLA magnetic stirrer couplings P-MRK do not need any lubricants and are specially made for permanent use. Due to the guide in a stirrer shaft holder, which is connected to the drive magnet, there is no abrasion on the guide or the stirrer shaft that could contaminate the medium. For cleaning all components can be disassembled and, if necessary, be exchanged.

+ Simple disassembly of components for cleaning

+ Efficient power transmission up to 90 ncm

+ Excellent chemical resistance

+ High durability



+ No grease required, save to run dry

+ High rotation speeds up to 1.500 rpm

+ Free-standing drive-on bell for your safety

+ Gas-tight power transmission through magnets, suitable for vacuum



BOLA Magnetic Stirrer Heads (P-MRK)

Material:
PTFE

Temperature resistance:
from -100 °C to +240 °C

Chemical resistance:
+++ universal



FDA conform



GLASS

Product description:

Ideal stirrer head for PTFE-jacketed stirrer shafts from BOLA. Consisting of capsuled drive shaft (stainless steel) with ball bearings, rotor and lower bearing made of PEEK-Compound and a hollow shaft made of borosilicate glass or Hastelloy®. Requires little space due to compact construction. No leakage or memory effects due to non-porous, welded rotor. Compression fittings for safe fixing of stirrer shaft and optimum power transmission. Joint-Cone with nut (Safe-Lab) for easy locking and unlocking of the ground joint. Square size 6 mm for accepting an agitator or a stirrer coupling.

A Receiver made of borosilicate glass

» universal chemical resistance

All parts coming in contact with the medium are metal-free, i.e. they are made of different plastic compounds or glass and provide a very good chemical resistance. Especially suitable for applications with chemically highly aggressive or highly pure products and biocompatible.

For stirrer shaft dia. d mm	Height H mm	Size NS	L2 Insertion length of shaft mm	Drive shaft D O.D. mm	Cat. No.
8	145	29/32	95	50	C 520-24
10	145	29/32	95	50	C 520-28
10	145	45/40	95	50	C 520-48

NEW



B Receiver made of Hastelloy®

» robust construction

Compared to glass, Hastelloy® is unbreakable and provides high chemical resistance. Especially suitable for applications with frequent disassembly of the stirrer shaft as there is no risk of glass breakage when inserting the stirrer shaft into the receiver.

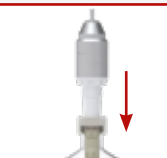
For stirrer shaft dia. d mm	Height H mm	Size NS	L2 Insertion length of shaft mm	Drive shaft D O.D. mm	Cat. No.
8	145	29/32	95	50	C 530-08
10	145	29/32	95	50	C 530-10
10	145	45/40	95	50	C 530-15

Applications:

- » Suitable for all BOLA Stirrer Shafts jacketed with PTFE. Ideal for reactor lids with center ground joint.
- » L1 The max. shaft length corresponds to the internal height from the top of the ground joint to the vessel bottom.



Loosen combi nut



Insert ground joint body



Fix ground joint body



Bake ground joint



Loosen ground joint



Free ground joint

BOLA PRACTICAL TIP Protecting glass stirrer shafts effectively

For protection against breaking, for example: due to misalignment of axes simply use our globe stirrer coupling. It is very lightweight and therefore has only low centrifugal force.

see page 28

BOLA Magnetic Stirrer Heads (P-MRK) with Flat Flange

Material: PTFE, Glass
 Temperature resistance: from -100 °C to +240 °C
 Chemical resistance: +++ universal

FDA conform

CE

GLAS

Product description:

Ideal stirrer head for PTFE-jacketed stirrer shafts from BOLA. Consisting of capsuled drive shaft (stainless steel) with ball bearings, rotor and lower bearing made of PEEK-Compound and a hollow shaft made of borosilicate glass or Hastelloy®. Requires little space due to compact construction. No leakage or memory effects due to non-porous, welded rotor. Compression fittings for safe fixing of stirrer shaft and optimum power transmission. Suitable for flat flanges of Duran (former Schott AG), sealing to be made with a gasket of your choice. Square size 6 mm for accepting an agitator or a stirrer coupling.

A Receiver made of borosilicate glass

» universal chemical resistance

For stirrer shaft dia. d mm	Height H mm	Flat Flange DN	L2 Insertion length of shaft mm	Drive shaft D O.D. mm	Cat. No.
10	160	40	95	50	C 522-40
10	160	50	95	50	C 522-50

CE



B Receiver made of Hastelloy®

» robust construction

For stirrer shaft dia. d mm	Height H mm	Flat Flange DN	L2 Insertion length of shaft mm	Drive shaft D O.D. mm	Cat. No.
10	160	40	95	50	C 532-22

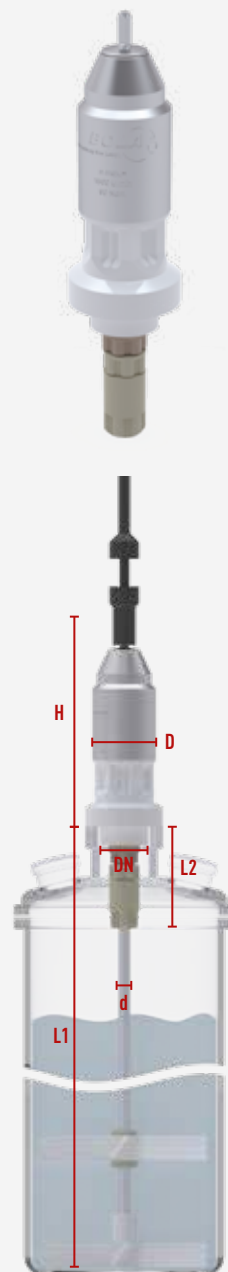
NEW

Product advantages:

- » gastight stirrer head for perfect vacuum
- » stirrer shaft's height adjustable, approx. 40 mm
- » also suitable for shortened stirrer shafts
- » powerful transmission of up to 90 Ncm
- » excellent chemical resistance
- » no grease required / save to run dry
- » high speed of up to max. 1.500 rpm
- » drive shaft fixed for your safety
- » high durability
- » easy disassembly of all parts for cleaning

Applications:

- » Suitable for all BOLA Stirrer Shafts jacketed with PTFE. Ideal for reactor lids with flat flange.
- » L1 The max. shaft length corresponds to the internal height from the top of the ground joint to the vessel bottom, plus 15 mm.



BOLA INNOVATION



#1 Metal-free Magnetic Stirrer Heads

Many chemicals react with metal magnetic stirrer heads. Therefore, all wetted parts of BOLA Magnetic Stirrer Heads P-MRK (Cat.No. C 522-40 and C 522-50) are metal-free and thus more economic.



Spare Parts for : Magnetic Stirrer Heads (P-MRK)



Description	Material	Packing Unit	size	suitable for Cat. No.	Cat. No.:	
Replacement Driving Bell P-MRK	Stainless steel	1 piece	NS 19/26 NS 29/32 NS 45/40	for all Magnetic Stirrer Heads P-MRK	C 932-03	
Replacement Guiding Assembly P-MRK	PTFE	1 piece	NS 29/32 NS 45/40 DN 40 DN 50	C 520-24 / C 520-28 C 530-08 / C 530-10 C 520-48 / C 530-15 C 522-40 / C 532-22 C 522-50 / C 532-32	C 921-01 C 921-02 C 921-03 C 921-04	
Replacement "Safe-Lab" Nuts	PTFE,GF	1 piece	NS 29/32 NS 45/40	C 520-24 / C 520-28 C 530-08 / C 530-10 C 520-48 / C 530-15	K 1349-10 K 1349-16	
Replacement Rotor P-MRK	PTFE-PEEK Compound	1 piece		for all Magnetic Stirrer Heads P-MRK	C 935-01	
Replacement Set Screw P-MRK	PTFE-PEEK Compound	Pack size: 10 pieces		for all Magnetic Stirrer Heads P-MRK	C 934-01	
Replacement Wearing Disc P-MRK	PTFE-PDR	Pack size: 3 pieces		for all Magnetic Stirrer Heads P-MRK	C 931-01	
Replacement Guiding P-MRK	PTFE-PDR	1 piece		for all Magnetic Stirrer Heads P-MRK	C 922-01	
Replacement Receiver P-MRKP-MRK	Borosilicate glass	1 piece		C 520-24 / C 520-28 / C 520-48 C 522-40 / C 522-50	C 936-01	
	Hastelloy®	1 piece		C 530-08 / C 530-10 / C 530-15 C 532-22 / C 532-32 C 540-08 / C 540-10	C 936-02	
Replacement Clamp Screw P-MRK	PTFE-PEEK Compound	Pack size: 3 pieces		for all Magnetic Stirrer Heads P-MRK	C 926-01	
Replacement O-Ring P-MRK	PFA/Silicone	Pack size: 3 pieces		C 520-24 / C 530-08 / C 540-08 C 520-08 / C 520-48 / C 522-40 C 522-50 / C 530-10 / C 530-15 C 532-22 / C 532-32 / C 540-10	C 937-01 C 937-02	
Replacement Clamp Ring P-MRK	PTFE-PEEK Compound	Pack size: 5 pieces		C 520-24 / C 530-08 / C 540-08 C 520-28 / C 520-48 / C 522-40 C 522-50 / C 530-10 / C 530-15 C 532-22 / C 532-32 / C 540-10	C 927-01 C 927-02	
Replacement Clamp Nut P-MRK	PTFE-PEEK Compound	Pack size: 3 pieces		for all Magnetic Stirrer Heads P-MRK	C 925-01	
Replacement Reducing Bush P-MRK	PTFE	Pack size: 3 pieces		C 520-24 / C 530-08 / C 540-08	C 938-01	

BOLA **Magnetic Stirrer Heads (P-MRK) Rodaviss**

Material:	Temperature resistance:	Chemical resistance:
PTFE	from -100 °C to +240 °C	+++ universal

NEW



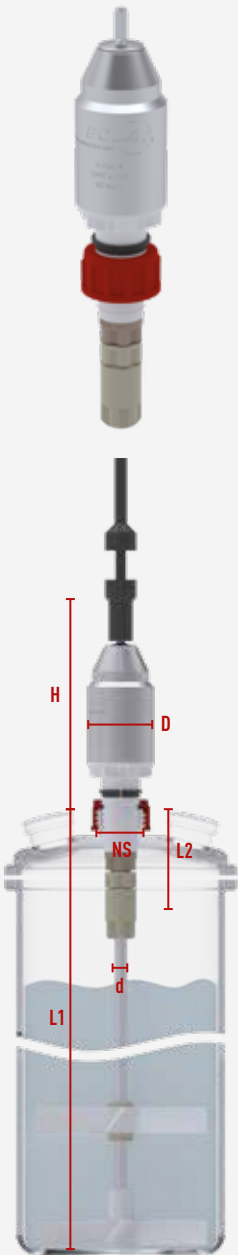
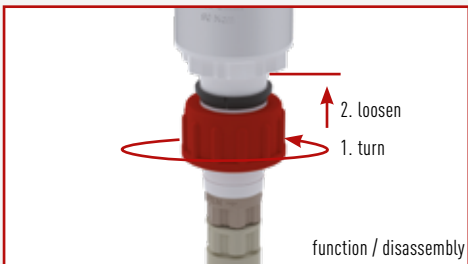
Product description:
Ideal stirrer head for PTFE-jacketed stirrer shafts from BOLA. Consisting of capsuled drive shaft (stainless steel) with ball bearings, rotor and lower bearing made of PEEK-Compound and a hollow shaft made of Hastelloy®. Requires little space due to compact construction. No leakage or memory effects due to non-porous, welded rotor. Compression fittings made of PEEK-Compound for safe fixing of stirrer shaft and optimum power transmission. Joint-Cone with Rodaviss® fixing system for easy locking and unlocking of ground joint connections with Rodaviss®-thread. Rodaviss® screw cap, sealing ring and expanding ring are included in the scope of delivery.

A With receiver made of Hastelloy®
» for improved durability

For stirrer shaft dia. d mm	Height H mm	For ground joint NS	L2 Insertion length of shaft max. mm	Drive shaft O.D. D mm	Cat.No.:
8	145	29/32	95	50	C 540-08
10	145	29/32	95	50	C 540-10

- Product advantages:**
- » Gas-tight stirrer coupling for perfect vacuum
 - » Stirrer shafts adjustable in height approx. 40 mm
 - » Also suitable for shortened stirrer shafts
 - » High-performance power transmission up to 90 ncm
 - » Excellent chemical resistance
 - » Without lubricant/ suited for dry running
 - » High speed up to 1.500 rpm
 - » Fixed drive bell – for your safety
 - » Long service life
 - » Simple disassembly of individual parts for cleaning

- Applications:**
- » Suitable for all BOLA Stirrer Shafts jacketed with PTFE. Ideal for reactor lids with Rodaviss center ground joint.
 - » L1 The max. shaft length corresponds to the internal height from the top of the ground joint to the vessel bottom.



Spare parts for : Magnetic Stirrer Heads P-MRK Rodaviss

Description	Material	Packing Unit	Size	Suitable for Cat.No.:	Cat.No.	
Guiding Assembly P-MRK	PTFE	1 piece	NS 29/32	C 540-08 / C 540-10	C 921-05	
Screw Set RODAVISS®	PBT, Nitril, PA	1 set	each with 1 cap, 1 expanding ring, 1 sealing ring	C 540-08 / C 540-10	C 940-01	



BOLA

Magnetic Stirrer Couplings

The magnetic Stirrer Couplings are particularly useful for working under vacuum. Finally, a really tight stirring lock.



BOLA **Magnetic Stirrer Heads (G-MRK)**Material:
PTFE, GlassTemperature resistance:
from -100 °C to +240 °CChemical resistance:
+++ universal**Product description:**

Perfect combination of drive shaft with ball bearings, rotor and lower bearing made of PTFE/PEEK and a conductor made of borosilicate glass. Requires little space due to compact construction. No leakage or memory effects due to non-porous, welded rotor. This rotor holds the stirrer shaft by means of three stud screws which are fixed in the counterbores of the stirrer shaft. This provides optimum power transmission and a safe fixing. The 6 mm square can be fixed into the stirrer coupling or into the agitator.

Stirrer shaft Ø d mm	Height H mm	Conductor NS	Top of ground joint to top of stirrer shaft mm L2	Insertion length of shaft mm L4	Cat.No.
6	90	19/26	20	63	C 512-08
8	148	29/32	33	97	C 502-08
10	148	29/32	33	97	C 502-16

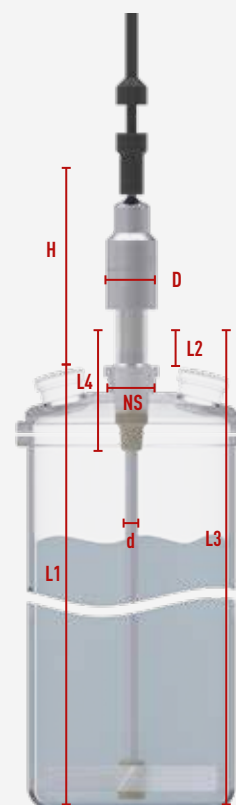
Product advantages:

- » powerful transmission
for ground joint size 19/26: 15 Ncm
for ground joint size 29/32 and 45/40: 50 Ncm
- » no grease required
- » all products which are exposed to the medium do not contain any metals
- » high speed of up to max. 1.500 rpm
- » high working temperatures up to +250°C are possible
- » excellent chemical resistance
- » safe to run dry
- » long durability
- » space-saving drive shaft O.D.'s
for ground joint size 19/26: 28 mm
for ground joint size 29/32 and 45/40: 38 mm

Applications:

Ideal for reactor lids with a center ground joint, suitable for stirrer shafts made of glass or stainless steel with counterbores (see page 44) for a safe fixing into the rotor.

- » L1 Internal height from the top of the ground joint to the vessel bottom.
- » L3 maximum total length of stirrer shaft = L1+L2





BOLA Stirrer Shafts for Magnetic Stirrer Heads (G-MRK)

Material:
Glass

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

FDA conform

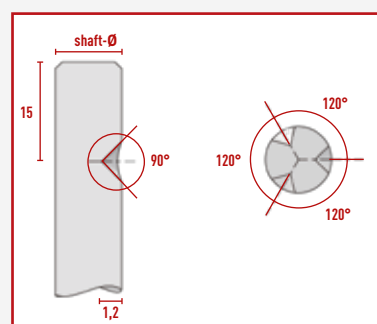
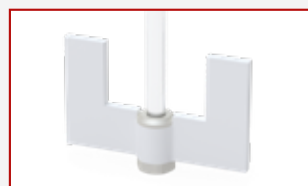
Product description:

Ground and polished borosilicate stirrer shaft with integrated counterbores for the three stud screws of the rotor of the BOLA Magnetic Stirrer Head.

Length mm	Stirrer shaft dia. mm	Cat.No.:
400	10	C 492-16
800	10	C 492-24

Applications:

Accessory for BOLA Magnetic Stirrer Head (see page 58). Ideal for use together with BOLA Stirrer Blades which can be fixed individually. Shaft can be shortened on demand.



#SUITABLE PAGE 40
Additional stirrer paddles



Spare Parts for : Magnetic Stirrer Heads (G-MRK)

Description	Material	Packing Unit	size	suitable for Cat. No.	Cat. No.:	
Replacement Driving Bell	Stainless steel	1 piece	NS 19/26 NS 29/32	C 512-08 C 502-08 / C 502-16	C 932-01 C 932-02	
Replacement Conductors for Magnetic Stirrer Heads	Borosilicate glass	1 piece	NS 19/26 NS 29/32	C 512-08 C 502-08 / C 502-16	C 463-19 C 463-29	
Replacement Rotor	PTFE-PEEK Compound	1 piece	NS 19/26 NS 29/32 NS 29/32	C 512-08 C 502-08 C 502-16	C 923-01 C 923-02 C 923-03	
Replacement Lower Bearing	PTFE-GF	1 piece	NS 19/26 NS 29/32 NS 29/32	C 512-08 C 502-08 C 502-16	C 928-01 C 928-02 C 928-03	
Replacement Locking Ring	PTFE-PEEK Compound	Pack size: 5 pieces	NS 19/26 NS 29/32	C 512-08 C 502-08 / C 502-16	C 929-01 C 929-02	
Replacement Wearing Disc	PTFE-Glimmer	Pack size: 5 pieces	NS 19/26 NS 29/32 NS 29/32	C 512-08 C 502-08 C 502-16	C 930-01 C 930-02 C 930-03	
Replacement Clamping Nut	PTFE-Glimmer	Pack size: 3 pieces	NS 19/26	C 512-08	C 924-01	
Replacement Set Screw	PTFE-PEEK Compound	Pack size: 10 pieces	NS 29/32 NS 29/32	C 502-08 C 502-16	C 933-01 C 933-02	

BOLA **GT Glass Stirrer Shafts**Material:
PTFE, GlassTemperature resistance:
from -200 °C to +250 °CChemical resistance:
+++ universal**FDA conform**

Product description:

KPG stirrer shaft made of borosilicate glass, tiltable moon-shaped stirrer blade with angular groove and clamping bolts completely made of PTFE. For vessels with a 29/32 ground joint. Universal chemical resistance since the product is only exposed to PTFE and glass.

Length mm	Chuckling O.D. mm	Shaft dia. mm	Blade dimensions mm	Cat.No.:
290	8	10	50 x 24 x 3,0	C 375-02
340	8	10	68 x 24 x 3,0	C 375-04
390	8	10	68 x 24 x 3,0	C 375-06
490	8	10	90 x 24 x 3,0	C 375-08
560	8	10	90 x 24 x 3,0	C 375-10

Applications:

Tangential flow with little turbulence. The tilting half-moon blade is ideal for stirring in round-bottom flasks with ground joint necks. Blades are available separately and can be mounted additionally.



For ground joint NS 29/32

BOLA **KPG Glass Stirrer Shafts**Material:
PTFE, GlassTemperature resistance:
from -200 °C to +250 °CChemical resistance:
+++ universal**FDA conform**

Product description:

KPG stirrer shaft with double pivot made of ground and polished borosilicate glass, tiltable moon-shaped stirrer blade with double-sided groove completely made of PTFE. For vessels with a 29/32 ground joint. Universal chemical resistance since the product is only exposed to PTFE and glass.

Length mm	Chuckling O.D. mm	Shaft dia. mm	Blade dimensions mm	Cat.No.:
350	8	10	50 x 24 x 3,0	C 387-05
350	8	10	75 x 24 x 3,0	C 387-07
350	8	10	90 x 24 x 3,0	C 387-09
400	8	10	50 x 24 x 3,0	C 387-11
400	8	10	75 x 24 x 3,0	C 387-13
400	8	10	90 x 24 x 3,0	C 387-15

Applications:

Tangential flow with little turbulence. The tilting half-moon blade is ideal for stirring in round-bottom flasks with ground joint necks. Blades are available separately and can be mounted additionally.



For ground joint NS 29/32





BOLA Stirrer Blades

Why have stirrer blades to be „tiltable“?

Only a tiltable stirrer blade can be pulled through a narrow neck.

All BOLA Stirrer Blades have a central bore to fix them on a shaft. It is important that this bore is slightly out of the middle. Otherwise, it would be difficult to draw a shaft with mounted blade through e.g. a NS 29 neck of a round bottom flask.

By the way: As soon as the shaft rotates, the centrifugal forces push the blade into the correct horizontal position and optimal mixing is assured.



BOLA Moon-Shaped Stirrer Blades

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

FDA conform

Product description:

Completely made of PTFE, with angular groove. For vessels with a 29/32 ground joint.

Suitable for ml	Bore dia. mm	Blade dimensions mm	Cat.No.:
100	5,8	50 x 24 x 3,0	C 401-02
250	5,8	68 x 24 x 3,0	C 401-04
1.000	5,8	90 x 24 x 3,0	C 401-08

Applications:

For glass stirrer shafts and KPG glass stirrer shafts (Cat.No. C 375- ... on page 60).



BOLA **Moon-Shaped Stirrer Blades**Material:
PTFETemperature resistance:
from -200 °C to +250 °CChemical resistance:
+++ universal**FDA conform**

Product description:

Completely made of PTFE, with one-sided groove and bore dia. 10 mm.

Suitable for ml	For ground joint NS	Blade dimensions mm	Cat. No.:
100	29/32	50 x 18 x 3,0	C 402-07
100	29/32	50 x 24 x 3,0	C 402-09
250	29/32	68 x 24 x 3,0	C 402-16
500	29/32	75 x 24 x 3,0	C 402-21
1.000	29/32	90 x 24 x 3,0	C 402-24
2.000	29/32	110 x 24 x 3,0	C 402-26
4.000 / 6.000	29/32	125 x 24 x 3,0	C 402-31

Applications:

For glass stirrer shafts with one-sided pivot. (see Cat.No.: C 387-... on page 60).

BOLA **Moon-Shaped Stirrer Blades**Material:
PTFETemperature resistance:
from -200 °C to +250 °CChemical resistance:
+++ universal**FDA conform**

Product description:

Completely made of PTFE, with double-sided groove.

Suitable for ml	Bore dia. mm	For ground joint NS	Blade dimensions mm	Cat.No.:
100	8,5	24/29	50 x 18 x 3,0	C 400-06
100	8,5	29/32	50 x 24 x 3,0	C 400-08
250	8,5	24/29	65 x 18 x 3,0	C 400-12
250	8,5	29/32	68 x 24 x 3,0	C 400-14
500	8,5	24/29	75 x 18 x 3,0	C 400-16
500	8,5	29/32	75 x 24 x 3,0	C 400-18
1.000	8,5	29/32	90 x 24 x 3,0	C 400-20
2.000	8,5	29/32	110 x 24 x 3,0	C 400-22
2.000	12,5	45/40	125 x 35 x 3,0	C 400-24
4.000/6.0000	8,5	29/32	125 x 24 x 3,0	C 400-26
4.000/6.0000	12,5	45/40	145 x 35 x 4,0	C 400-28

Applications:

For glass stirrer shafts with double pivot, KPG glass stirrer shafts (Cat.No. C 387- ... on page 60) and PTFE-jacketed stainless steel stirrer shafts (Cat. No. C 376-... on page 24).





BOLA Centrifugal Stirrer Blades

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

FDA conform

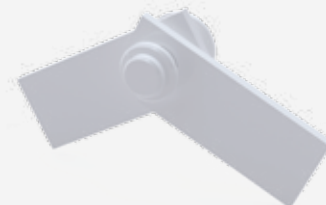
Product description:

Completely made of PTFE, consisting of 2 paddles, bolt and clamp ring. For vessels with a 24/29 ground joint (or bigger).

Stirring dia. mm	Blade dimensions mm		Cat. No.:
50	2		C 407-04
70	2		C 407-06
90	2,5		C 407-08

Applications:

For centrifugal stirrer shafts (Cat. No. C 377-.. on page 32).



For ground joint starting at NS 29/32

BOLA Bolts and Clamp Rings

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

FDA conform

Product description:

Completely made of PTFE, bolts are available in 2 different versions:

A Cylindrical shape

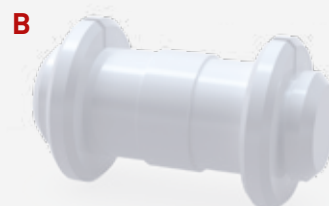
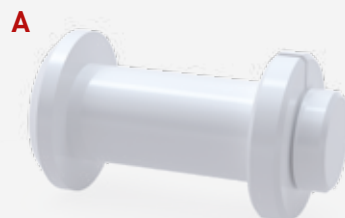
Bolt dia. mm	Usable length mm	For blades with bore dia. mm	Cat. No.:
6	12	6,5	C 410-02
12	16	12,5	C 410-06

B With a distance piece between blade and stirrer shaft. The blade remains movable.

Bolt dia. mm	Usable length mm	For blades with bore dia. mm	Cat. No.:
8	12	8,5	C 410-04
12	19	12,5	C 410-08

Applications:

For moon-shaped stirrer blades with double-sided groove (Cat. No. C 400- .. on page 24).



SPECIAL REQUIREMENTS? CUSTOMIZED!



You are looking for something very special? Something that even our huge portfolio of sophisticated lab solutions does not cover?

No problem:

As developer and producer, we offer the possibility to produce individually according to your requirement. This is faster, simpler and often more economic than you can imagine. Just talk to our experts about your ideas – we advise you and support you already during the construction and produce suitable for the material exactly according to your specification. And this already from quantity 1.

For this, we just need a drawing (a rough sketch is sufficient) and some information.

Checklist for your customised product:

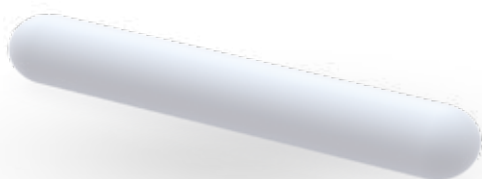
- » What is the article name?
- » In which application should the article be used?
- » What dimensions should the article have?
- » Are there any specific material specifications?
- » In which temperature range should the article be used?
- » What chemical stresses is the article exposed to?
- » In which quantities is the article required?
- » What cost per piece should the article not exceed?

You have a special request?
Call us on: **+49 (0) 93 46-92 86-0**

Or just send us a drawing (a rough sketch is sufficient) and some information to **info@bola.de**. We will then contact you to discuss further details and establish an offer for you free of charge.



BOLA Stirring Bars



Magnetic stirring and mixing

What you should know about

For optimum results, both drive magnet and stirring bar are decisive. For optimum efficiency, the distance between the magnetic poles of the drive magnet and the length of the stirring bar should be equal. A magnetic stirring bar which is too small will eventually gravitate toward one of the poles of the drive magnet. Stirring efficiency is influenced by the material, by the thickness of the cover plate and the thickness of the vessel. For the best magnetic coupling, the distance between the magnets should be minimized.



HELPFUL: page 354
Detailed information on
magnetic stirring

The choice of stirring bars – What you should know about

Improperly selected stirring bars often cause flickering of the bars in the vessel, respectively ineffective mixing of the product. You can find an overview of the most common stirring bars here below:

Cylindrical Magnetic Stirring Bars:

They are the most commonly used magnetic stirring bars. Due to their simple shape they can be offered at very attractive prices. Cylindrical magnetic stirring bars offer excellent centering and smooth running characteristics.

Power Magnetic Stirring Bars:

Due to special magnetic material, their torque loads are larger than those of conventional magnetic stirring bars. Power magnetic stirring bars are mainly used for agitating viscous liquids or for bridging larger distances between the magnetic stirring machine and the magnetic stirring bar.

Magnetic Stirring Bars with Pivot Ring:

Their interrupted surface provides greater surface area and added turbulence. Only their pivot ring and one end of the magnetic stirring bar touch the bottom of the vessel. Therefore these magnetic stirring bars have a more steady spinning position and a better longevity.

Square Magnetic Stirring Bars:

They are particularly suitable for big vessels due to the high magnetic force. Solids are released or removed from the bottom of the vessel.

Egg-Shaped Magnetic Stirring Bars:

They are particularly suitable for round-bottom flasks. Their shape mimics that of the flasks and assures complete mixing. Those magnetic stirring bars have an egg-shaped magnetic core which assures a better force transmission than a cylindrical core.

Triangular Magnetic Stirring Bars:

Such magnets are useful for mixing reagents which resist dissolving or for avoiding any residues at the bottom of the vessels. They provide strong turbulence at relatively low speeds.

Glass Magnetic Stirring Bars:

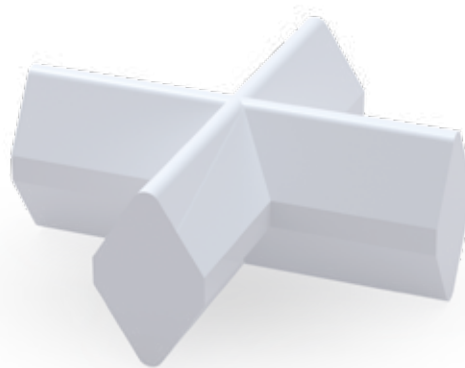
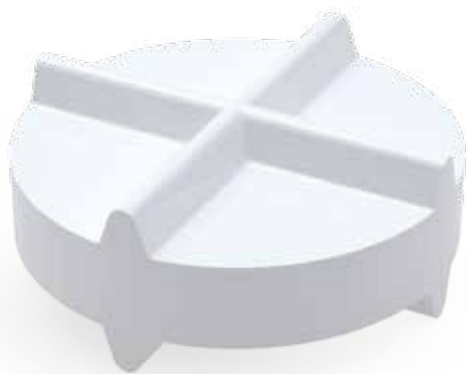
They have a non-porous and smooth glass-coating. All following processes are not affected by any carry-over. There is an increased abrasion between glass vessels and glass stirring bars.

Star Head Magnetic Stirring Bars:

Optimum stirring in tall, narrow diameter vessels. Ideal stirring bar for cuvettes or test tubes.

Centre Magnetic Stirring Bars:

These magnetic stirring bars provide better stirring action and a more stable spinning position due to the punctual position.



Tolerances of the magnetic stirring bars

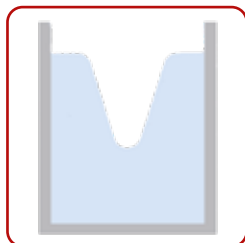
- » The dimensions of the magnetic stirring bars are nominal dimensions which can have a tolerance of $\pm 5\%$ in length and $\pm 10\%$ in diameter.



Results of stirring – tested for you

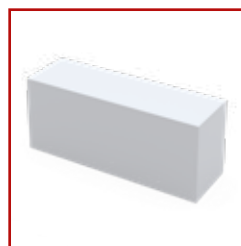
In order to help you choose the suitable magnetic stirring bar for your application, we have made tests with these data under real conditions. You will find graphs for each magnetic stirring bar on the next pages.

- | | |
|---------------------------|-------------------------------|
| » Speed: 500 rpm | » Temperature: 20°C |
| » Volume: 2.000 ml | » Vessel: glass beaker |
| » Product: water | |



We “meliorate” your specific magnetic stirring bars

- » These stirring bars can for example be built in devices or can be used for special applications.
- » The diameter of the magnetic stirring bars can be machined with a tolerance of up to $\pm 0,02$ mm.
- » The magnetic stirring bars are ground to obtain a seamless amplitude.
- » The ends are polished to receive a round or any other shape.
- » The surface is becoming extremely smooth and even, so that contaminations cannot adhere.
- » Reproducibility both in diameter and surface are granted.



BOLA Cylindrical Magnetic Stirring Bars

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal



FDA conform

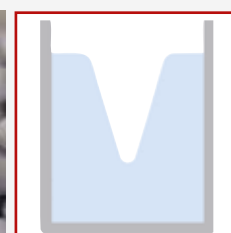
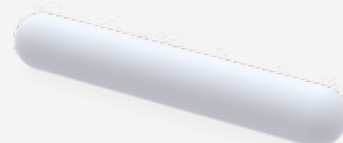


Product description:

PTFE-encapsulated magnetic core (Alnico 5), standard magnetic stirring bar, universal chemical resistance.

Length mm	Dia. mm	Cat. No.:
2	2	C 350-01
3	3	C 350-02
5	2	C 350-03
6	3	C 350-04
7	2	C 350-05
8	2	C 350-06
8	3	C 350-07
10	3	C 350-08
10	6	C 350-09
12	4,5	C 350-10
13	3	C 350-11
15	2	C 350-12
15	4,5	C 350-13
15	6	C 350-14
20	3	C 350-15
20	6	C 350-16
20	7	C 350-17
25	5	C 350-18
25	6	C 350-19
25	7	C 350-20

Length mm	Dia. mm	Cat. No.:
30	6	C 350-21
30	7	C 350-22
30	10	C 350-41
35	6	C 350-23
40	7	C 350-24
40	8	C 350-25
40	10	C 350-26
45	8	C 350-27
50	7	C 350-28
50	8	C 350-29
55	12	C 350-30
60	7	C 350-31
60	9	C 350-32
70	9	C 350-33
70	13	C 350-34
80	10	C 350-35
110	27	C 350-36
120	12	C 350-37
127	12	C 350-38
155	27	C 350-39



Applications:

Cylindrical magnetic stirring bars offer excellent centering and smooth running characteristics.



#HELPFUL PAGE 354

Detailed information on magnetic stirring



BOLA Square Magnetic Stirring Bars

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

FDA conform

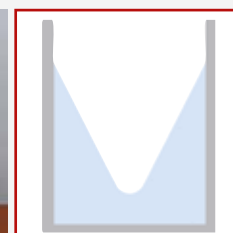
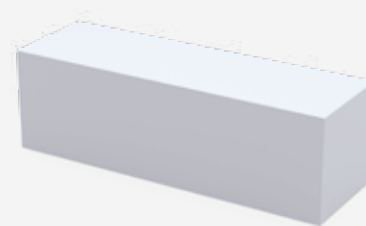
Product description:

PTFE-encapsulated magnetic core (Alnico 5), universal chemical resistance.

Dimensions mm			Cat. No.:
14 x 14 x 45			C 361-03
14 x 14 x 90			C 361-06

Applications:

They are particularly suitable for big vessels, strong turbulences at low speed; solids are released or even avoided.



BOLA PRACTICAL TIP Removing magnetic stirring bars

Even for aggressive liquids you can use our magnetic stirring bar retriever which is also available with a very strong magnet.

see page 72

BOLA Magnetic Stirring Bars with Pivot Ring

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

FDA conform

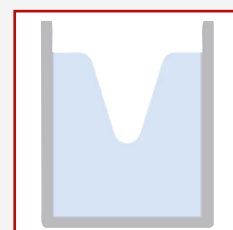
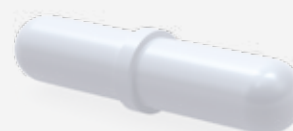
Product description:

PTFE-encapsulated magnetic core (Alnico 5), cylindrical shape with pivot ring, universal chemical resistance.

Length mm	Dia. mm	Cat. No.:	Length mm	Dia. mm	Cat. No.:
8	3	C 354-02	35	6	C 354-20
12	5	C 354-05	40	8	C 354-23
15	5	C 354-08	45	8	C 354-26
20	6	C 354-11	50	8	C 354-29
25	6	C 354-14	60	9	C 354-32
30	6	C 354-17	70	9	C 354-35

Applications:

They provide a bigger surface area. Very steady spinning position with additional turbulences.



BOLA Triangular Magnetic Stirring Bars

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

FDA conform

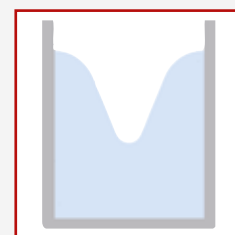
Product description:

PTFE-encapsulated magnetic core (Alnico 5), universal chemical resistance.

Length mm	Dia. mm	Edge length mm	Cat. No.:
12	8	6	C 357-03
20	8	8	C 357-06
25	8	8	C 357-09
25	14	15	C 357-12
35	10	10	C 357-15
40	14	15	C 357-18
50	12	12	C 357-21
55	14	15	C 357-24
80	17	16	C 357-27
130	38	44	C 357-30

Applications:

For big vessels, strong turbulence at relatively low speeds. Useful for mixing reagents which resist dissolving or for avoiding any residues at the bottom of the vessels.



BOLA Egg-Shaped Magnetic Stirring Bars

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

FDA conform

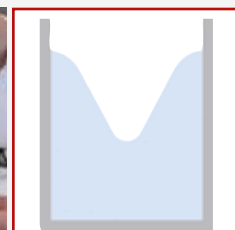
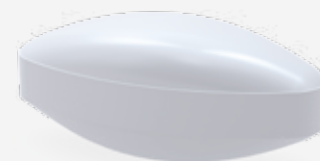
Product description:

PTFE-encapsulated magnetic core (Alnico 5), universal chemical resistance.

Length mm	Dia. mm	Suitable for round bottom flasks (DIN 12 348) ml	Cat. No.:
20	10	25	C 358-02
25	12	50	C 358-04
30	15	100	C 358-06
35	15	250	C 358-08
40	20	500	C 358-10
50	20	1.000	C 358-12
65	20	4.000	C 358-14
70	20	10.000	C 358-16

Applications:

Ideal for stirring in round bottom flasks. Shape mimics the one of the flasks and assures complete mixing.



#HELPFUL PAGE 354

Detailed information on magnetic stirring



BOLA Power Magnetic Stirring Bars

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

FDA conform

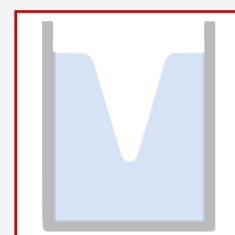
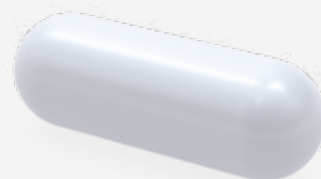
Product description:

PTFE-encapsulated magnetic core made of a very strong magnetic material (rare earth magnet samarium-cobalt), torque loads transmitted are about 4 times larger than those of conventional magnetic stirring bars. No risk of demagnetization, sterilisable, extremely smooth surface avoiding contaminations, universal chemical resistance.

Length mm	Dia. mm	Cat. No.:
20	8	C 365-20
40	14	C 365-40
50	19	C 365-50

Applications:

They are mainly used for agitating viscous liquids or for bridging larger distances between the magnetic stirring machine and the magnetic stirring bar. Optimum mixing in vessels with a big volume or in tall graduated cylinders.



BOLA INNOVATION



#1 Power Magnetic Stirring Bars

The Samarium-Cobalt rare-earth magnet is encapsulated in PTFE. Compared with common magnetic stirring bars, its torque is four times higher. These stirring bars are ideal for mixing highly viscous liquids.

BOLA Magnetic Stirring Bar Set

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

FDA conform

Product description:

Consisting of the most common magnetic stirring bars and a retriever with a length of 150 mm. Each one piece of (length x diameter in mm):

Cylindrical 10 x 6, 15 x 4,5, 20 x 6, 25 x 6, 30 x 6, 40 x 8, 50 x 8, 60 x 9;
Pivot ring 15 x 5, 25 x 6, 40 x 8;
Triangular 25 x 8, 40 x 14

Dimensions of box mm	Cat. No.:
175 x 110 x 30	C 348-10

Applications:

Ideal for beginners, for testing different kinds and dimensions of magnetic stirring bars.



BOLA Magnetic Stirring Bar Retrievers

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal



FDA conform



Product description:

PTFE-encapsulated stirring bar retriever with strong permanent magnet (Alnico 5), universal chemical resistance.

Length mm	Lower end dia. mm	Bar dia. mm	Cat. No.:
150	10	8	C 372-02
200	10	8	C 372-04
250	10	8	C 372-06
300	10	8	C 372-08
350	10	8	C 372-10
400	10	8	C 372-12
600	10	8	C 372-18

Applications:

For the removal of stirring bars from aggressive liquids, prevents loss of stirring bars.



BOLA Jumbo Magnetic Stirring Bar Retrievers

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

FDA conform

Product description:

PTFE-encapsulated stirring bar retriever with extra strong permanent magnet (Neodym), universal chemical resistance.

Length mm	Lower end dia. mm	Bar dia. mm	Cat. No.:
700	16	12	C 371-16

Applications:

For the removal of stirring bars from aggressive liquids. Especially for big and heavy stirring bars up to 400 g.





BOLA Glass Magnetic Stirring Bars

Material:
Glass

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

FDA conform

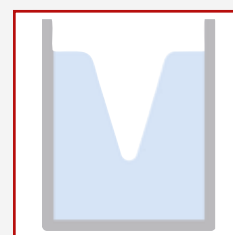
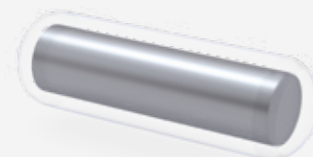
Product description:

Magnetic core (Alnico 5) encapsulated in borosilicate glass, cylindrical shape, extremely smooth surface prevents from penetration of substances, non-porous, non-contaminating, universal chemical resistance.

Length mm	Dia. mm	Cat. No.:
15	8	C 351-03
20	8	C 351-06
25	8	C 351-09
30	8	C 351-12
40	8	C 351-15
55	8	C 351-19

Applications:

They are mainly used for high-purity work or trace analysis.



BOLA Colour Magnetic Stirring Bars

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

FDA conform

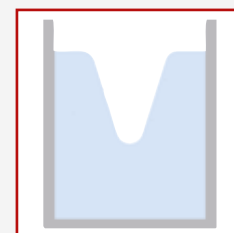
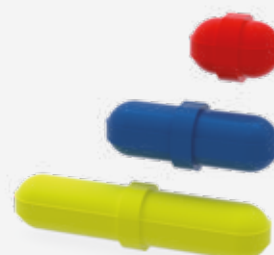
Product description:

Magnetic core (Alnico 5) encapsulated with coloured PTFE, universal chemical resistance.

Length mm	Dia. mm	Colour	Cat. No.:
13	8	yellow	C 368-08
25	8	yellow	C 368-12
38	8	yellow	C 368-16
50	8	yellow	C 368-20
13	8	blue	C 368-28
25	8	blue	C 368-32
38	8	blue	C 368-36
50	8	blue	C 368-40
13	8	red	C 368-48
25	8	red	C 368-52
38	8	red	C 368-56
50	8	red	C 368-60

Applications:

Predestined for use in colour labs, ultra-pure media or trace analysis.



BOLA Star Head Magnetic Stirring Bars

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

FDA conform

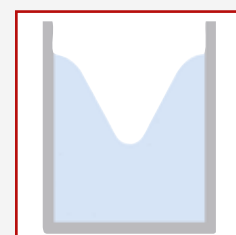
Product description:

PTFE-encapsulated magnetic core (Alnico 5), universal chemical resistance.

	Dia. mm	Height mm		Cat. No.:
	10	8		C 360-04
	14	10		C 360-07
	17	13		C 360-10
	22	15		C 360-13
	30	12		C 360-16
	35	12		C 360-19
	40	14		C 360-22
	58	15		C 360-25

Applications:

Optimum stirring in tall, narrow diameter vessels due to symmetrical fins on both sides. Ideal stirring bar for cuvettes or test tubes.



BOLA PRACTICAL-TIP Your magnetic stirring bar flutters?

To prevent this, the lengths of driving magnet in the stirrer and stirring bar should be approximately the same. In addition, the distance between these two should be as small as possible.

BOLA Dumbbell-Shaped Magnetic Stirring Bars

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

FDA conform

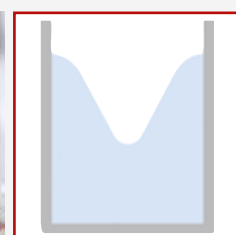
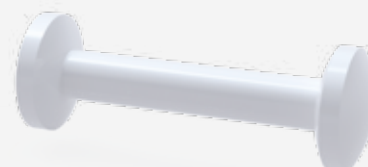
Product description:

PTFE encapsulated magnetic core (Alnico 5), universal chemical resistance.

	Length mm	Dia. of discs mm ca.		Cat.No.:
	37	20		C 359-03
	58	19		C 359-06

Applications:

Stable discs on both sides provide an excellent stirring.





BOLA Center Magnetic Stirring Bars

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

FDA conform

Product description:

PTFE encapsulated magnetic core (Alnico 5), conically tapered ends, universal chemical resistance.

Length mm	Dia. mm		Cat. No.:
20	7		C 367-20
30	8		C 367-30
40	8		C 367-40
50	9		C 367-50

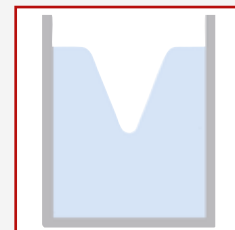
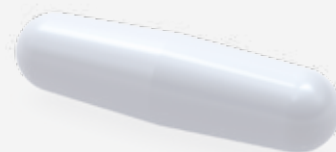
Applications:

Extremely steady mixing due to small center seat.



#HELPFUL PAGE 354

Detailed information on magnetic stirring



BOLA Crosshead Magnetic Stirring Bars

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

FDA conform

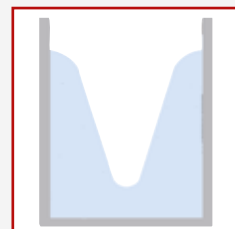
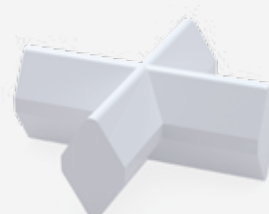
Product description:

PTFE encapsulated magnetic core (Alnico 5), universal chemical resistance.

Length x Width mm	Height mm		Cat. No.:
10 x 10	5		C 369-10
19 x 19	9		C 369-19
25 x 25	10		C 369-25
32 x 32	13		C 369-32
38 x 38	15		C 369-38

Applications:

Safe and quiet mixing, optimum stirring due to stable position.



BOLA Chamfer Magnetic Stirring Bars

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

FDA conform

Product description:

PTFE-encapsulated magnetic core (Alnico 5), crosswise chamfered top side, flat bottom, universal chemical resistance.

Diameter mm approx.	Height mm approx.	Cat. No.:
9	6	C 356-02

Applications:

Ideal for the use in 10 mm-tubes. The crosswise chamfers on the top side work like a baffle and provide good mixing.



BOLA Ball Magnetic Stirring Bars

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

FDA conform

Product description:

PTFE-encapsulated magnetic core (Alnico 5), universal chemical resistance.

Diameter mm approx.	Cat. No.:
12	C 355-02

Applications:

The spherical form is ideal for the use in narrow vessels like e. g. test tubes. When used in beakers, the ball magnetic stirring bar is pushed to the vessel wall by the centrifugal forces for good eccentric stirring.





BOLA Star Magnetic Stirring Bars

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

FDA conform

Product description:

PTFE-encapsulated magnetic core (Alnico 5), universal chemical resistance.

Length x width mm approx.	Height mm approx.		Cat. No.:
9 x 9	6		C 352-02
10 x 10	6		C 352-04
20 x 20	10		C 352-06
30 x 30	12		C 352-08

Applications:

The belly form allows good centering in narrow round-bottom vessels, the four arms provide even and smooth mixing.



BOLA Magnetic Stirring Bars with Blade

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

FDA conform

Product description:

PTFE-encapsulated magnetic core (Alnico 5), tapered blade with fixed cylindrical stirring bar, universal chemical resistance.

Length x width mm approx.	Height mm approx.	For vessel I. D. mm	Cat. No.:
5,5 x 5,5	9	6 - 7	C 349-02
8,0 x 8,0	11	9 - 10	C 349-04
10,0 x 10,0	16	11 - 12	C 349-06

Applications:

Perfectly suitable for the use in test tubes or vessels with tapered bottom. Triangular blade for centric position in the vessel and good mixing.



BOLA **Beakerliners**Material:
PTFETemperature resistance:
from -200 °C to +250 °CChemical resistance:
+++ universalVacuum:
suitableautoclave:
121°**FDA conform**

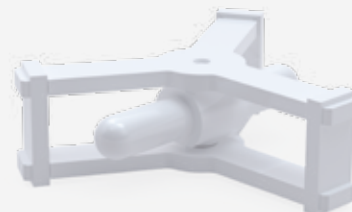
Product description:

PTFE-encapsulated magnetic core (Alnico 5) axially mounted in a guide cage made of PTFE, universal chemical resistance.

For Beakers low form ml	Cage O.D. mm	Cage height mm	Stirring bar length mm	Cat. No.
5, 10	15	8,5	10 x 3	C 362-02
25	25	10	20 x 3	C 362-04
50, 100	30	12,5	25 x 5	C 362-05
150, 250	47	17,5	35 x 6	C 362-07
400	67	21	50 x 8	C 362-08
600	74	28	60 x 9	C 362-12
800, 1.000	85	28	70 x 9	C 362-14
2.000	103	32	80 x 10	C 362-16
3.000, 5.000	125	48	106 x 25	C 362-20
10.000	185	50	155 x 26	C 362-24

Applications:

No shear action on the bottom of the beaker, smooth running in glass beakers also on an uneven bottom. The cage acts like a baffel and thus provides optimum mixing results.

**BOLA INNOVATION****#1 Beakerliner**

A magnetic stirring bar mounted in a guide cage prevents shear action on the bottom of the beaker. The liquid is mixed carefully. Easy handling since the cage can easily be inserted or removed.



BOLA Tandem Magnetic Stirring Bars

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

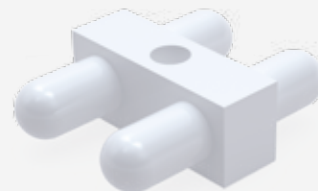


FDA conform

Product description:

PTFE-encapsulated magnetic cores (Alnico 5), center bore for receiving the BOLA Bearing Neck or a glass neck (available from a glassblower), universal chemical resistance. Bearing neck not included in delivery.

Magnetic stirring bar length x O.D. mm	Bearing neck dia. mm	Recommended height of neck mm	Block dimensions mm	Cat. No.:
40 x 10	8	15	34 x 14 x 14	C 363-26
55 x 12	8	19	44 x 18 x 14	C 363-30
110 x 24	12	37	84 x 36 x 36	C 363-36
155 x 24	12	37	84 x 36 x 36	C 363-39




Applications:

Extremely strong mixing of the product, ideal transmission of the magnetic force of the stirrer to the tandem magnetic stirring bar. Reduction of running surface to a ring minimizes friction and increases lifespan. Tandem magnetic stirring bars do not touch the bottom and therefore do not wear.



Spare Parts for : Tandem Magnetic Stirring Bars

Description	Material	Packing Unit	Bearing Neck-Ø	suitable for Cat. No.	Cat. No.:	
Replacement Bearing Necks	PTFE, PEEK Compound	1 piece	8 mm 12 mm	C 363-26 / C 363-30 C 363-36 / C 363-39	C 364-08 C 364-16	

BOLA Culture Bottles

Material: PTFE, PP
Temperature resistance: from 0 °C to +250 °C
Chemical resistance: ++ very good

- Product description:
- » Bottle made of borosilicate glass
 - » Screw cover for center neck made of PP with glass fibre
 - » Screw caps for sidearms made of PPS
 - » Stirrer made of PTFE and stainless steel is continuously adjustable in height from the outside
 - » Complete unit can be sterilized
 - » Universal chemical resistance
 - » Suitable for both low and high speeds (max. 1000 rpm)

Usable volume ml	I.D. of center neck mm	Thread of bottle GL	Thread of sidearms GL	Cat. No.:
50	30	45	2 x 14	C 420-03
125	30	45	2 x 18	C 420-05

- Applications:
- » Stirring unit is driven by a common magnetic stirrer
 - » Magnetism causes rotation
 - » For gentle mixing of cell cultures
 - » The sidearms can be connected to tubing, probes or sensors (suitable laboratory screw joints can be found on page 90)



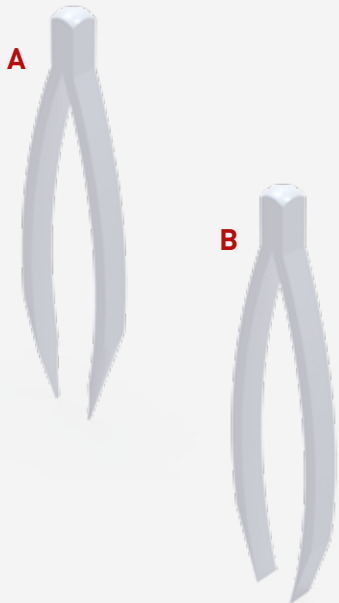
BOLA Tweezers

Material: PTFE
Temperature resistance: from -200 °C to +250 °C
Chemical resistance: +++ universal

FDA conform

Product description:
Precast tweezers made of PTFE with pointed or blunt ends. Universal chemical resistance.

	Length mm		Pointed end Cat. No.:
A	100		H 909-02
	150		H 909-04
	200		H 909-06
	Length mm		Pointed end Cat. No.:
B	100		H 912-02
	150		H 912-04
	200		H 912-06





BOLA Double Spatulas

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

FDA conform

Product description:

Spatulas made of PTFE with tapered ends. Universal chemical resistance.

Length mm	Width of ends mm		Cat. No.:
120	16		H 915-02
150	16		H 915-04
180	16		H 915-06



BOLA Scrapers

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

FDA conform

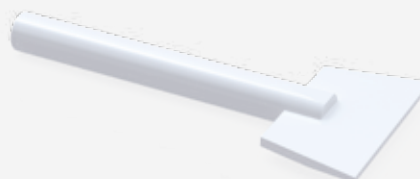
Product description:

Scrapers made of PTFE with tapered end. Ideal handling due to big handle and wide blade. Universal chemical resistance.

Total length mm	Width of blade mm	Dia. of handle mm	Cat. No.:
160	50	20	H 916-02
200	90	20	H 916-06
200	120	20	H 916-08

Applications:

For a very gentle peeling of products.



Quick and uncomplicated for a customized appliance:
you can adapt flexibly to your current requirements with
easily screwable elements from BOLA which can be
combined in many different ways.





SCREW FITTINGS / COMPONENTS WITH GL-THREADS JOINTS

88 The GL-Screw Joint System

Laboratory Screw Joints	88	One-Sided Gaskets	122
Replacement Inner Parts	89	Double-Sides Gaskets	122
Replacement Screw Cone Caps	89	Gaskets for Screw Caps	123
Laboratory Screw Joints HT	90	SVL Gaskets	123
Replacement Inner Parts HT	92	GL Dispensers	124
Fork wrench	93	GL Funnels	125
Replacement Screw Cone Caps HT	93	Ground-Joint Swivelling	
Plugs for Screw Caps	94	Screw Fittings	126/127
Multiple Distributors for Bottles	96/98	Threaded Couplings	127
Multiple Distributors for Bottles with Stopcocks	97	Rigid Threaded Couplings	128
Threaded Adaptors	99	Reducing Screw Thread Adaptor	
Flexible Distributors	101/103	Couplings	128
Wrench for Screw Caps	103	GL Bellows	129
Distributors for Reaction		Dirt Traps	129
Vessels	105/106	Adaptors for Prominent®	
Screw Caps High Chem	106	Pumps	129
GLS Reductions	108/109	GL Tube Fittings	130
Multiple Distributors for Canisters	111	GL Tube Fittings T	131
Multiple Distributors for Barrels	113	GL Tube Fittings Elbow	131
Ring Wrench	113	GL Tube Fittings Cross	132
Barrel Aeration	114	GL Quick Connectors	132
Sets for Pressure Compensation	114	Thread Adaptor GL	133
Barrel GL Adaptors	115	GL Screw-in Tube Fittings	133
GL Aeration	115	GL Stopcocks	134
Screw Caps „PPS“	118	Ground Joint GL Stopcocks	136
Screw Caps HT	119	GL Distributor with Stopcock	136
Screw Caps „PTFE“	119	GL Stopcocks	137
Screw Caps „PBTP“	120	Pressure-Relief Valves	137
Screw Caps „PP“	120	GL Control Valves	138
		Hose Connectors with Nut	139/140



BOLA Modular Construction System – what you should know about.



No determination at the beginning of the construction



Compatible with glass devices with GL thread



Large creative freedom



Independent tube diameter



Easily screwable, without any tool



Can be extended optionally



The Modular Construction System

The GL thread is one of the most current thread for glass devices. From BOLA you can obtain a complete modular construction system with different components with GL threads, which can be combined and thus ensure a simple transition from glass to plastics.

On the one hand, by means of the laboratory screw joints, tubes and hoses made of glass, metal or plastics can be connected easily to GL threads, no matter if a reaction vessel lid made of glass, a BOLA GL fitting made of PTFE or a multiple distributor made of PP is applied.

On the other hand, the construction of the laboratory screw joints v-ring, sealing ring and tapered ring ensures a tight connection, suitable for both vacuum as well as overpressure.

Beside this, exchanging the inner parts, tubes with different outer diameter can be connected to the same GL thread; e. g. for GL 14 this would be tubes with an outer diameter of 0,8 to 8 mm. Therefore, GL connecting pieces can also be used for the installation of a tube reduction.



Laboratory Screw Joint HT
Cat. No.: D 628-26
see page 90



Laboratory Screw Joint HT
Cat. No.: D 628-66
see page 90



Laboratory Screw Joint HT
Cat. No.: D 628-82
see page 90



T-Connecting Piece GL
Cat. No.: D 540-14
see page 131



Multiple Distributor for Bottles
Cat. No.: D 614-08
see page 96



Glass Reaction Vessel Lid
on customer side or made of PTFE, see page 264

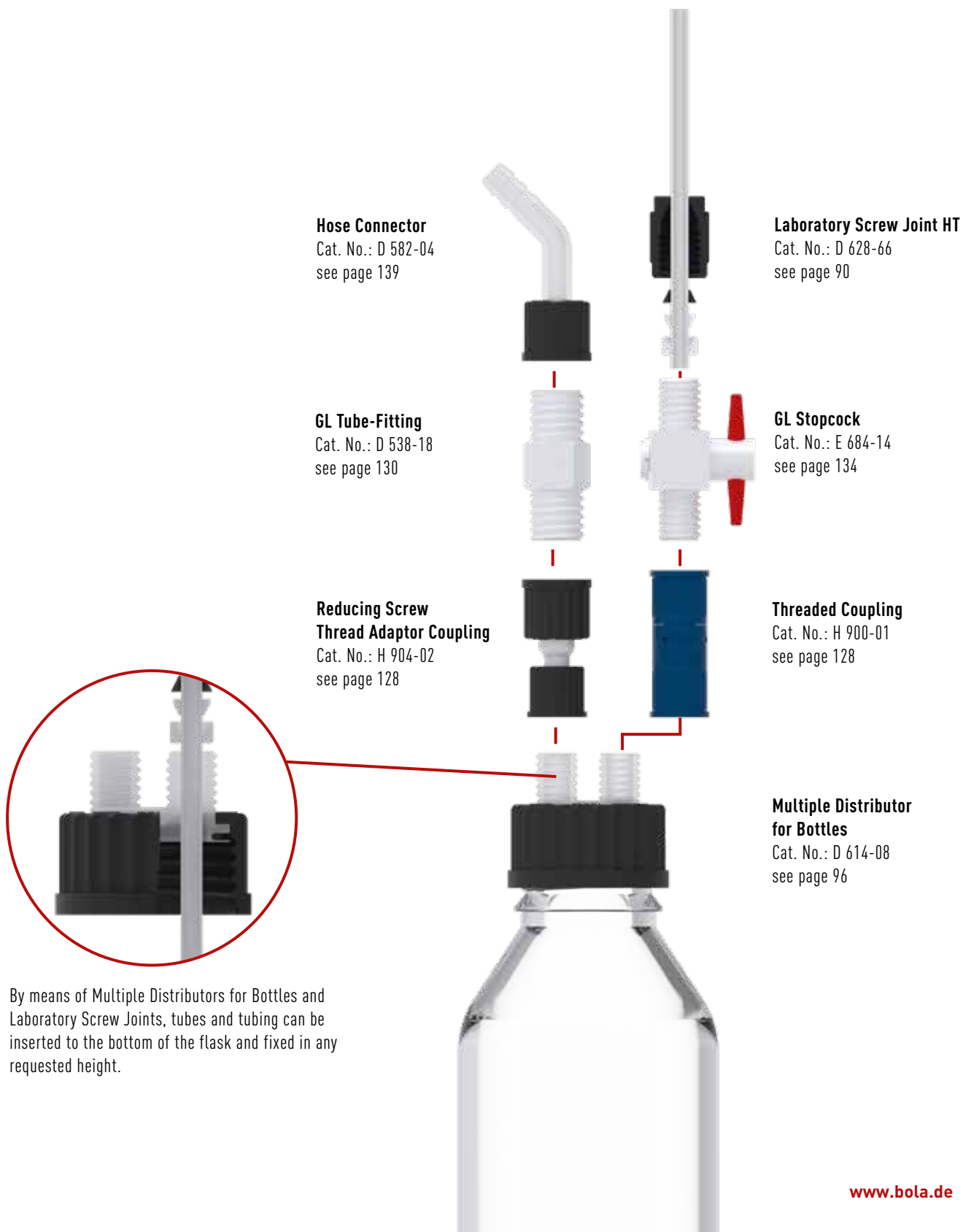
What you should know about the GL screw joint system:

The BOLA GL Screw Joint System offers more opportunities than only joining tubes/tubing.

The GL thread offers unlimited combinations of the different components and allows to create complete equipment. Furthermore, all assembled equipment is compatible with standard glass components and expandable at any time.

Being made of fluoroplastics or other high-performance plastics such as PPS and ETFE, all products have a very good thermal resistance and are suitable for high temperatures up to +250 °C.

The schematic drawing shows how to combine our different components of the BOLA GL Screw Joint System:



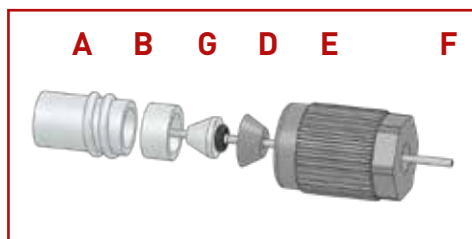
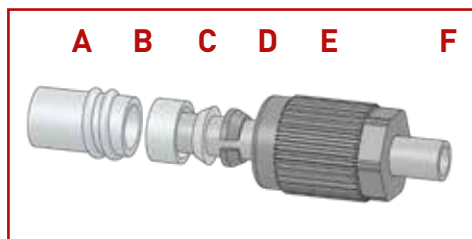


The GL Screw Joint System



Assembly made easy – how quickly you get to your goal

- A** GL-threaded neck
- B** Sealing ring
- C** Tapered ring
- D** V-ring
- E** Screw cap with internal cone
- F** Tubing or tube
- G** Tapered ring with O-Ring behind PTFE sealing lip (only for screw joints for tubing dia. under 3 mm)



Assembly:

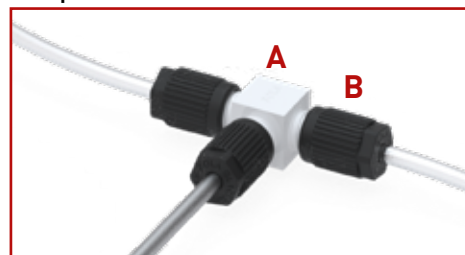
1. Push the screw cap on the tubing/tube
2. Push V-ring, tapered ring and then sealing ring on the tubing/tube
3. Tighten the screw cap on the GL-threaded neck – ready

How to make your order:

A screw joint always consists of two elements

1. Fitting (straight, elbow, T-shape or a GL thread of a glass device)
2. Laboratory screw joint as connection between fitting and tubing/tube

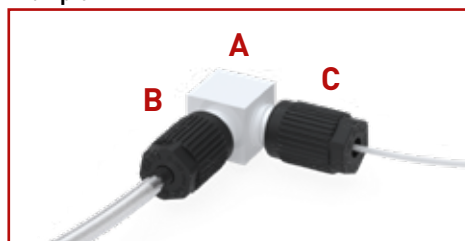
Example 1:



If you want to connect three tubes/ tubings with O.D. 6 mm you will need:

- A** 1 piece of GL Tube Fitting T GL 14 – Cat. No. D 540-14, see page 131
- B** 3 pieces of Laboratory Screw Joints HT GL 14 for tubing O.D. 6 mm, Cat. No. D 628-74, see page 90

Example 2:



If you want to connect tubing with different O.D. (2 mm and 6 mm) in an angle of 90°, you will need:

- A** 1 piece of GL Tube Fitting Elbow GL 14 – Cat. No. D 539-14, see page 131
- B** 1 piece of Laboratory Screw Joints HT GL 14 for tubing O.D. 6 mm, Cat. No. D 628-74, see page 90
- C** 1 piece of Laboratory Screw Joints HT GL 14 for tubing O.D. 2 mm, Cat. No. D 628-34, see page 90

BOLA Laboratory Screw Joints

In practice, there are many applications where it is necessary to connect hard-walled tubing (e.g. made of PTFE, PFA, FEP) or tubes (e.g. made of glass, metal, plastic) with devices with GL thread (glass thread). BOLA Laboratory Screw Joints are ideal for making these connections.

Components

Each laboratory screw joint consists of a screw cap with a female GL thread and bore as well as three inner parts: v-ring, tapered ring and sealing ring

Assembly and function

Assembly can easily be made by hand:

First, the screw cap and the inner parts are pushed on the tubing in the right order. After that, the tubing has to be put into the counterpiece and the screw cap has to be tightened. The screw cap presses the sealing ring and tapered ring tightly on the counterpiece. At the same time, the v-ring is compressed and the tubing is fixed tightly. The connection is absolutely tight and even suitable for vacuum. The laboratory screw joints for GL 14, GL 18 and GL 25 resist pressures of max. 10 bar at room temperature.

Choice

It is easy to choose the suitable laboratory screw joint:

First of all, the outer diameter of the tubing or tube and the size of the GL thread to which the laboratory screw joint shall be connected have to be determined. The size of the GL thread corresponds to the outer diameter of the thread, i.e. a GL 25 thread has an outer diameter of 25 mm. Further assistance for the determination of threads can be found in our Technical Information (page 366).

Also the application is decisive: Will there be temperatures of more than +150°C? If so, the BOLA HT Laboratory Screw Joints made of PPS black (page 77), which also provide a good chemical resistance, are the right choice. Or is it more important to have a very high chemical resistance? Then you have to choose BOLA Laboratory Screw Joints (page 90) made of ETFE (red). These can be used up to temperatures of +150°C.

For big flexibility, all screw caps and inner parts are available separately.

You will find suitable tubing on page 189.

BOLA Laboratory Screw Joints

Material:
PTFE, ETFE

Temperature resistance:
from -50 °C to +150 °C

Chemical resistance:
+++ universal

Pressure: Vacuum:
10 bar suitable

FDA conform

Product description:

Red screw cap made of glass-fibre reinforced ETFE, inner parts consisting of a v-ring (ETFE), a tapered ring and a sealing ring (both PTFE) as well as an o-ring (FKM) for tubing diameters under 3 mm (not exposed to the medium). Very good chemical resistance, suitable for temperatures from -50°C to +150°C.

For tubing O.D. mm	Cat. No.: Thread GL 14	Cat. No.: Thread GL 18	Cat. No.: Thread GL 25
0,8	D 593-02		
1,0	D 593-04		
1,6	D 593-06	D 593-26	
2,0	D 593-10	D 593-30	
2,4	D 593-12		
3,0	D 590-02	D 590-10	D 590-22
3,2	D 590-08	D 590-20	D 590-24
4,0	D 590-04	D 590-12	D 590-26
6,0	D 590-06	D 590-14	D 590-28
6,35	D 590-62		
8,0		D 590-16	D 590-30
10,0		D 590-18	D 590-32
12,0			D 590-34
14,0			D 590-36

Applications:

Connecting equipment and fittings with GL threads with hard-walled tubing or tubes made of glass, plastic or metal. Fixing probes, thermometers, dip tubes or cables in reaction vessels. Ideal for use in aggressive ambience (e.g. with aggressive vapours or evaporation)





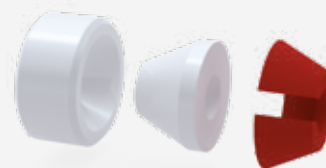
BOLA Replacement Inner Parts

Material: PTFE, ETFE Temperature resistance: from -50 °C to +150 °C Chemical resistance: +++ universal Pressure: 10 bar Vacuum: suitable

FDA conform

Product description:

Consisting of a v-ring (ETFE), a tapered ring and a sealing ring (both PTFE) as well as an o-ring for tubing diameters under 3 mm (not exposed to the medium). Very good chemical resistance, suitable for temperatures from -50°C to + 150°C.



For tubing O.D. mm	Cat. No.: Thread GL 14	Cat. No.: Thread GL 18	Cat. No.: Thread GL 25
0,8	D 598-02		
1,0	D 598-04		
1,6	D 598-06	D 598-26	
2,0	D 598-10	D 598-30	
2,4	D 598-12		
3,0	D 597-02	D 597-10	D 597-22
3,2	D 597-08	D 597-20	D 597-24
4,0	D 597-04	D 597-12	D 597-26
6,0	D 597-06	D 597-14	D 597-28
6,35	D 597-62		
8,0		D 597-16	D 597-30
10,0		D 597-18	D 597-32
12,0			D 597-34
14,0			D 597-36



#SUITABLE PAGE 189
Tubing for all screw joints.

BOLA Practical-TIP

For an easier assembly of laboratory screw joints:

Either sharpen the tubing with a simple sharpener or cut it diagonally with a knife.

see page 361

BOLA Replacement Screw Cone Caps

Material: ETFE Temperature resistance: from -50 °C to +150 °C Chemical resistance: +++ universell

Product description:

Red screw cap made of glass-fibre reinforced ETFE, with handy knurl and hexagon. Very good chemical resistance, suitable for temperatures from -50°C to + 150°C.

Thread GL	Tubing/tube O.D. mm	Cat. No.:
14	up to 6,35	D 600-04
18	up to 10,0	D 600-08
25	up to 10,0	D 600-12
25	bigger than 10,1	D 600-16



BOLA Laboratory Screw Joints HT (High Temp)

Material: PTFE, PPS Temperature resistance: from -50 °C to +150 °C Chemical resistance: +++ universal Pressure: 10 bar Vacuum: suitable

FDA conform

Product description:

Black screw cap made of PPS, inner parts consisting of a v-ring (PPS), a tapered ring and a sealing ring (both PTFE) as well as an o-ring for tubing diameters under 3 mm (not exposed to the medium). Good chemical resistance, suitable for temperatures from -20°C to + 250°C.

For tubing O.D. mm	Cat. No.: Thread GL 14	Cat. No.: Thread GL 18	Cat. No.: Thread GL 25	Cat. No.: Thread GL 32	Cat. No.: Thread GL 45
0,8	D 628-10				
1,0	D 628-18				
1,6	D 628-26	D 629-18	D 630-18		
2,0	D 628-34	D 629-22	D 630-22		
3,0	D 628-50	D 629-34	D 630-34		
3,2	D 628-58	D 629-42	D 630-42		D 632-18
4,0	D 628-66	D 629-46	D 630-46		
5,0	D 628-70				
6,0	D 628-74	D 629-54	D 630-54	D 631-38	D 632-26
6,35	D 628-78	D 629-56	D 630-58	D 631-42	
8,0	D 628-82	D 629-62	D 630-62	D 631-46	D 632-32
9,52		D 629-68	D 630-68	D 631-52	
10,0		D 629-74	D 630-74	D 631-56	D 632-40
12,0			D 630-80	D 631-60	D 632-44
12,7			D 630-84	D 631-66	
14,0			D 630-90	D 631-72	D 632-48
16,0				D 631-78	D 632-54
18,0				D 631-82	D 632-56
19,5				D 631-84	
20,0				D 631-88	D 632-60
22,0					D 632-68
25,4					D 632-74
26,0					D 632-76
30,0					D 632-84
32,0					D 632-90

Applications:

Connecting equipment and fittings with GL threads with hard-walled tubing or tubes made of glass, plastic or metal. Fixing probes, thermometers, dip tubes or cables in reaction vessels.



BOLA INNOVATION



Laboratory Screw Joints

Many common screw joints can only be used for one specific tubing diameter. BOLA Laboratory Screw Joints with exchangeable inner parts can be assembled with many different tubing diameters.

see page 90

»» **BOLA Laboratory Screw Joints**
have very low tolerances on
outer diameter and wall
thickness. This ensures
fittings and screw joints
always fit together.



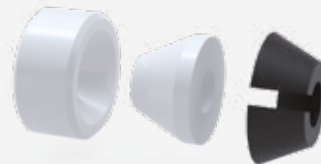
BOLA **Replacement Inner Parts HT (High Temp)**

Material: **PTFE, PPS** Temperature resistance: **from -50 °C to +150 °C** Chemical resistance: **+++ universal** Pressure: **10 bar** Vacuum: **suitable**

FDA conform

Product description:

Consisting of a v-ring (PPS), a tapered ring and a sealing ring (both PTFE) as well as an o-ring for tubing diameters under 3 mm (not exposed to the medium). Good chemical resistance, suitable for temperatures from -20°C to + 250°C.



For tubing O.D. mm	Cat. No.: Thread GL 14	Cat. No.: Thread GL 18	Cat. No.: Thread GL 25	Cat. No.: Thread GL 32	Cat. No.: Thread GL 45
0,8	D 638-10				
1,0	D 638-18				
1,6	D 638-26	D 639-18	D 640-18		
2,0	D 638-34	D 639-22	D 640-22		
3,0	D 638-50	D 639-34	D 640-34		
3,2	D 638-58	D 639-42	D 640-42		D 642-18
4,0	D 638-66	D 639-46	D 640-46		
5,0	D 638-70				
6,0	D 638-74	D 639-54	D 640-54	D 641-38	D 642-26
6,35	D 638-78	D 639-56	D 640-58	D 641-42	
8,0	D 638-82	D 639-62	D 640-62	D 641-46	D 642-32
9,52		D 639-68	D 640-68	D 641-52	
10,0		D 639-74	D 640-74	D 641-56	D 642-40
12,0			D 640-80	D 641-60	D 642-44
12,7			D 640-84	D 641-66	
14,0			D 640-90	D 641-72	D 642-48
16,0				D 641-78	D 642-54
18,0				D 641-82	D 642-56
19,5				D 641-84	
20,0				D 641-88	D 642-60
22,0					D 642-68
25,4					D 642-74
26,0					D 642-76
30,0					D 642-84
32,0					D 642-90



BOLA Fork Wrenches

Material: **PA** Temperature resistance: **-10 °C to +100 °C** Chemical resistance: **+ good**

Product description:

Made of glass-fibre reinforced polyamide, black, low weight

For thread GL	Wrench size mm	Cat. No.:
14/18/ 25	17/ 22/ 27	D 647-08
32/ 45	32/ 42	D 647-24

Applications:

For tightening or opening BOLA Laboratory Screw Joints also at high working temperatures. Low weight reduces risk of injury or damage.



BOLA Replacement Screw Cone Caps HT (High Temp)

Material: **PPS** Temperature resistance: **-20 °C to +250 °C** Chemical resistance: **+ good**

Product description:

Black screw cap made of glass-fibre reinforced PPS, with handy knurl and hexagon. Good chemical resistance, suitable for temperatures from -20°C to + 250°C.

Thread GL	From tubing O.D. to tubing O.D mm	Cat. No.:
14	0,8 - 6,0	D 634-10
14	6,1 - 8,0	D 634-14
18	8,0 - 10,0	D 634-20
25	8,0 - 10,0	D 634-30
25	10,0 - 14,0	D 634-34
32	0,8 - 10,0	D 634-40
32	10,0 - 16,0	D 634-44
32	18,0 - 20,0	D 634-48
45	1,6 - 10,0	D 634-50
45	11,0 - 16,0	D 634-54
45	17,0 - 22,0	D 634-58
45	23,0 - 32,0	D 634-62



BOLA **Plugs for Screw Caps**

Material: **PTFE** Temperature resistance: **from -50 °C to +150 °C** Chemical resistance: **+++ universal**

FDA conform

Product description:
Plugs completely made of PTFE, suitable for replacement caps made of ETFE and PPS. The plug is inserted into the cap and snaps in as soon as the cap is tightened. It can easily be removed for cleaning.

Thread GL	Bore dia. mm	Suitable for cap Cat. No.:(page 83)	Suitable for cap Cat. No.:(page 93)	Cat. No.:
14	6	D 600-04	D 634-10	D 549-14
18	10	D 600-08	D 634-20	D 549-18
25	10	D 600-12	D 634-30	D 549-25
32	16		D 634-44	D 549-32
45	22		D 634-58	D 549-45

Applications:
Safe plugging of unused ports of glass devices or GL connecting parts.

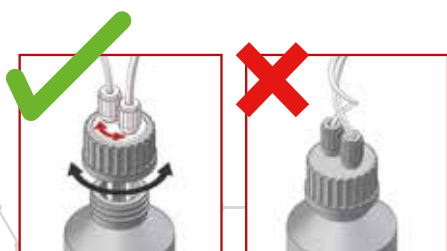




BOLA Multiple Distributors for Bottles – what you should know about.

How can liquids be taken out of a bottle or reaction vessel and simultaneously be distributed to several recipients without spillage? How can I pour different liquids into my vessel without loss? These questions were the beginning of BOLA Multiple Distributors for Bottles. They consist of a screw cap with GL thread and a movable body with GL-threaded necks. These necks allow the connection and insertion of hard-walled tubing (e.g. PTFE, PFA, FEP see page 189) or tubes made of different materials (glass, metal, plastic) by means of BOLA Laboratory Screw Joints (see page 90).

The distributors are not only the basis of a distribution system which can be operated under pressure and vacuum. It is also possible to insert probes or electrodes into the GL-threaded necks and to fix them by means of laboratory screw joints. A possible unevenness of the bottle neck is adjusted by an o-ring behind an elastic sealing lip, and the bottle is closed tightly. The product is only exposed to the body of the distributor. The special feature: the body of the distributor can be turned independently from the screw cap. This means, that the completely assembled distributor can be removed and fixed on another bottle without the risk of disarranging the tubing.



+ No disarrangements thanks to 360° clearance of distributor body

+ High temperature resistance up to 200°C

+ Universal connecting options thanks to GL threads



+ Suitable for over- and underpressure

+ Integrated seal ensures perfect sealing

+ Handy cap geometry ensures a good grip

Using Multiple distributors for bottles in combination with laboratory screwing tubes can be inserted till the bottom of the bottle and fixed in the desired height.

BOLA **Multiple Distributors for Bottles**

Material: **PTFE, PPS** Temperature resistance: **from -50 °C to +150 °C** Chemical resistance: **+++ universal** Vacuum: **suitable** autoclave: **121°**



FDA conform

Product description:

Black screw cap made of PPS for bottle thread GL 45, body made of PTFE or PFA. Insertion of tubing with a max. O.D. of 8,5 mm. Very good chemical resistance, for working temperatures up to +200°C

Material	Necks GL		Cat. No.:
PFA	2 x GL14		D 614-08
PTFE	3 x GL14		D 615-08

Applications:

Drawing or inserting liquids. Inserting tubing, tubes and probes into vessels.



#SUITABLE PAGE 90
Laboratory screw joints

BOLA **Multiple Distributors for Bottles**

Material: **PP** Temperature resistance: **-0 °C to +110 °C** Chemical resistance: **++ very good** Vacuum: **suitable** autoclave: **121°**

FDA conform

Product description:

Green screw cap made of PP for bottle thread GL 45 and body made of PP. Insertion of tubing with a max. O.D. of 8,5 mm. Restricted chemical resistance, for working temperatures up to +110°C.

Necks GL			Cat. No.:
2 x GL14			D 612-08
3 x GL14			D 613-08

Applications:

Drawing or inserting liquids. Inserting tubing, tubes and probes into vessels.





BOLA Multiple Distributors with Stopcocks

Material: PTFE Temperature resistance: -20 °C to +110 °C Chemical resistance: +++ universal Pressure: 1 bar autoclave: 121°

FDA conform

Product description::

Black screw cap made of PPS for bottle thread GL 45, body made of PTFE. Each neck with stopcock. Tubing can not be inserted through the stopcocks. Bores with press fit on the lower side allow the connection of tubing with O.D. 6 mm so that a connection to the bottom can be made. Very good chemical resistance, for working temperatures up to +110°C.

For tubing O.D. max. mm	Stopcocks	Stopcock bore dia. mm	Necks GL	Cat. No.:
8	2	4	2 x 14	D 616-08
8	3	4	3 x 14	D 616-16

Applications:

Drawing or inserting aggressive or pure liquids. Inserting tubing, tubes and probes into vessels.



The special feature: The body of the distributor can be turned independently from the screw cap. This means, that the completely assembled distributor can be removed and fixed on another bottle without the risk of disarranging the tubing.

BOLA Multiple Distributors with Stopcock

Material: PTFE Temperature resistance: -20 °C to +110 °C Chemical resistance: +++ universal Pressure: 1 bar autoclave: 121°

FDA conform

Product description::

Black screw cap made of PPS for bottle thread GL 45, body made of PTFE. One stopcock for all connectors. Very good chemical resistance.

For tubing O.D. max. mm	Stopcocks	Stopcock bore dia. mm	Necks GL	Cat. No.:
8	1	8	4 x 14	D 617-08

Applications:

Drawing or inserting aggressive or pure liquids. Inserting tubing, tubes and probes into vessels.



BOLA **Multiple Distributors for Bottles**Material:
PTFE, PPSTemperature resistance:
from -50 °C to +150 °CChemical resistance:
+++ universalVacuum:
suitableautoclave:
121°

FDA conform

Product description:

Black screw cap made of PPS for thread according to chart below. Body made of PTFE

	For thread	For tubing O.D. max. mm	Necks GL	Cat. No.:
A	GL 25	2 x 6	2 x 14	D 619-04
	GL 25	3 x 6	3 x 14	D 619-08

	For thread	For tubing O.D. max. mm	Necks GL	Cat. No.:
A	GL 32	2 x 8	2 x 14	D 621-04
	GL 32	3 x 8	3 x 14	D 621-08

	For thread	For tubing O.D. max. mm	Necks GL	Cat. No.:
A	S 40	2 x 8	2 x 14	D 624-04
	S 40	3 x 8	3 x 14	D 624-08

	For thread	For tubing O.D. max. mm	Necks GL	Cat. No.:
B	GL 45	3 x 10	3 x 18	D 618-16
	GL 45	2 x 6 / 1 x 14	2 x 14 / 1 x 25	D 618-24
	GL 45	2 x 14	2 x 25	D 618-44
	GL 45	3 x 14	3 x 25	D 618-46
	GL 45	4 x 14	4 x 25	D 618-48

#SUITABLE PAGE 90
Laboratory screw joints**A****B**BOLA **Multiple Distributors for Bottles**Material:
PTFE, PPSTemperature resistance:
from -50 °C to +150 °CChemical resistance:
+++ universalVacuum:
suitableautoclave:
121°

FDA conform

Product description:

Blue screw cap made of PPS for thread according to chart below. Body made of PTFE.

	For thread	For tubing O.D. max. mm	Necks GL	Cat. No.:
	33/430	2 x 8	2 x 14	D 651-04
	38/430	2 x 6	2 x 14	D 651-08





BOLA Threaded Adaptors

Material:
PTFE

Temperature resistance:
-200 °C to +250 °C

Chemical resistance:
+++ universal

FDA conform

Product description:

Allow the use of BOLA Multiple Distributors for Bottles (see page 96) with female thread GL 45 also on bottles with GL 32, GL 40 and S 40 threads.

Example 1 for Cat. No. H 978-30:

Transition from GL 32 to GL 45

Suitable for bottles with GL 32 thread, e.g. from DWK Life Science (formerly Duran Group)

Example 2 for Cat. No. H 978-40:

Transition from GL40/S40 to GL 45

Suitable for Merck® bottles with GL 40 thread or for all PFA-, PTFE bottles and jars with thread GL 40 and S 40



	Bottle thread GL/S	Top thread GL		Cat. No.:
A	32	45		H 978-30
B	40	45		H 978-40

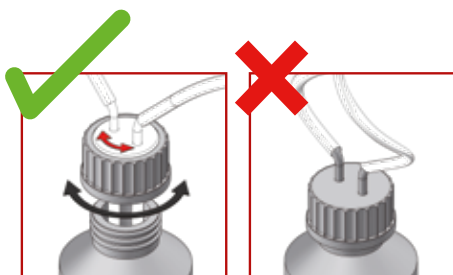




BOLA Flexible Distributors – what you should know about.

BOLA Flexible Distributors have been designed especially for the connection of elastic tubes such as Silicone, Viton[®] or Typon[®]. They consist of a screw cap suitable for bottle thread GL 45 or GLS 80 as well as of a freely rotatable distributor body with olives on top and bottom surface. Elastic tubing can simply be pushed on the olives and thus a continuous connection till the bottom of the bottle can be established. The bent connecting olives prevent a bending of the tubes. The distributor body can be moved independently from the screw cap.

This ensures that the flexible distributor with completely assembled body can be put on another bottle without any disarrangement of the fixed tubes.



+ No disarrangements thanks to 360° clearance of distributor body

+ Integrated seal ensures perfect sealing

+ Bent olives prevent a bending of the tubes



+ High temperature resistance up to 110°C

+ Handy cap geometry ensures good grip



BOLA Flexible Distributors

Material: PP Temperature resistance: from -20 °C to +110 °C Chemical resistance: ++ very good Vacuum: suitable autoclave: 121°

FDA conform

Product description:

Screw cap green made of PP for bottle thread GL 45 and distributor body with hose connectors made of PP. Bent hose connectors on the upper side, straight hose connectors on the bottom side. Restricted chemical resistance, for working temperatures up to max. +110 °C.

	Number of hose connectors	O.D. of hose connector mm	Bore of hose connectors mm	Cat. No.:
A	2	8,8	6	D 800-24
B	3	8,8	6	D 800-36
C	2	10,8	7	D 800-48

Applications:

Drawing or inserting liquids. For elastic tubing (e.g. Viton®, Tygon®, silicone).



BOLA Flexible Distributors

Material: PP, PBTP Temperature resistance: from 0 °C to +110 °C Chemical resistance: ++ very good Vacuum: suitable autoclave: 121°

FDA conform

Product description:

Screw cap red made of PBTP for bottle thread GL 45 and distributor body with hose connectors made of PP. Three bent 2-step hose connectors on the upper side, two straight hose connectors on the bottom side. Restricted chemical resistance, for working temperatures up to +110 °C.

Number of hose connectors	2-step hose connectors		Bore of hose connectors mm	Cat. No.:
	O.D. 1	O.D. 2 mm		
3	9	12	6	D 802-24

Applications:

Drawing or inserting liquids. For elastic tubing (e.g. Viton®, Tygon®, silicone).





»» **Multiple Distributors for Bottles**

The tight and safe assembly with suitable screw joints has convinced. And finally no disarranged tubing or tubes anymore.





BOLA Flexible Distributors

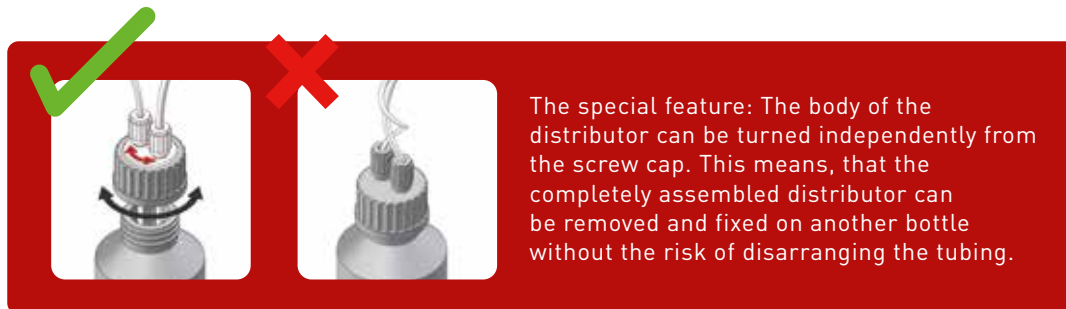
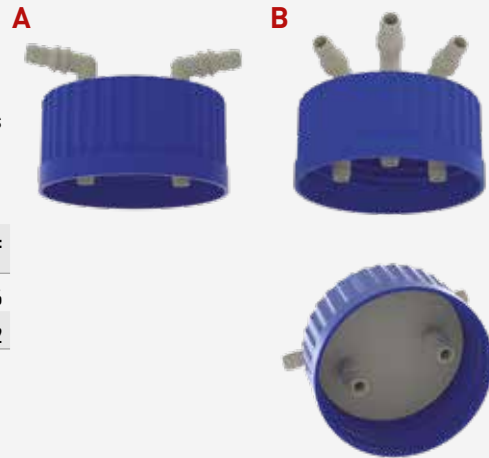
Material: PP Temperature resistance: from 0 °C to +110 °C Chemical resistance: ++ very good Vacuum: suitable autoclave: 121°

FDA conform

Product description:

Screw cap blue made of PP for bottle thread GLS 80 and distributor body with hose connectors made of PP. Bent 2-step hose connectors on the upper side, straight hose connectors on the bottom side. Restricted chemical resistance, for working temperatures up to max. +110 °C.

	Number of hose connectors	2-step hose connectors		Bore of hose connectors mm	Cat. No.:
		O.D. 1	O.D. 2 mm		
A	2	9	12	6	D 804-06
B	3	9	12	6	D 804-12



BOLA Wrench for Screw Caps

Material: PA Temperature resistance: -10 °C to +100 °C Chemical resistance: ++ good

NEW

Product description:

Made of polyamide reinforced with glass fibers. Suitable for knurled screw caps with thread GL 45 or GLS 80. For opening and closing of screw caps.

	for thread	Cat. No.:
A	GL 45	D 646-45
B	GLS 80	D 646-80

Applications:

For tightening and loosening of BOLA screw caps and multiple distributors. Its low weight reduces the risk of damages on equipment when it slips or falls down.

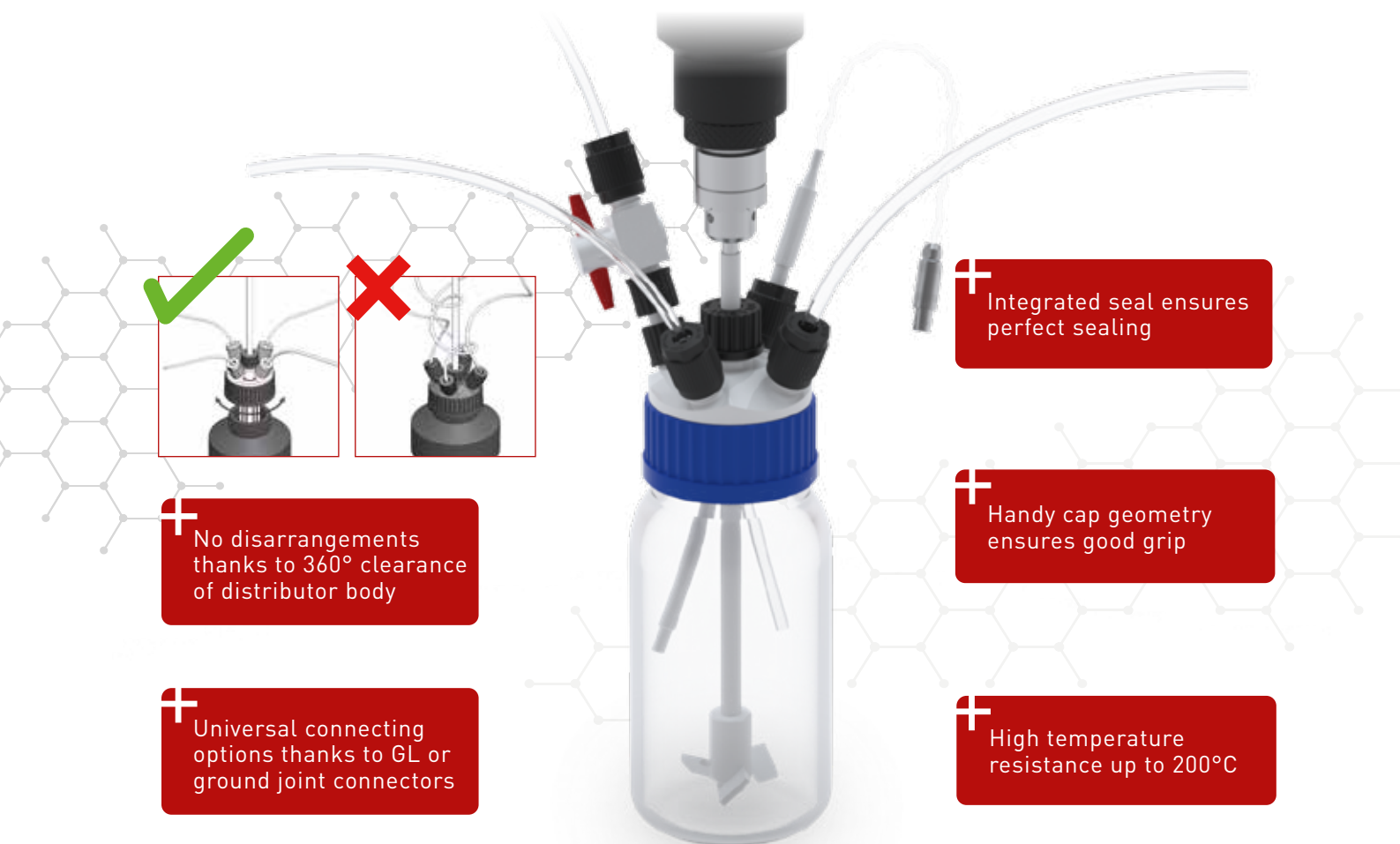




BOLA Distributors for Reaction Vessels – what you should know about.

Suitable for bottles with GLS 80 thread from DWK Life Science (formerly Duran Group). Consisting of a screw cap with GLS 80 thread and a movable body with several lateral necks and one central neck. The GL-threaded necks allow the connection of hard-walled tubing (PTFE, PFA, FEP) or tubes (glass, metal, plastic) by means of BOLA Laboratory Screw Joints (see page 90). It is also possible to insert and fix probes or electrodes. In addition, the connection of elastic tubing can be made by means of BOLA Hose Connectors (see page 139). The type "Center Neck with Ground Joint" allows the use of a stirrer bearing which assures a central position of a stirrer shaft in the vessel. Other components with ground joint (e.g. condensers, funnels etc.) can also be connected easily.

The type "Center Neck with GL Thread" is supplied with an exchangeable stirrer bearing for the center neck. A possible unevenness of the bottle neck is adjusted by an o-ring behind an elastic sealing lip, and the bottle is closed tightly. The product is only exposed to the body of the distributor. The special clou: the body of the distributor can be turned independently from the screw cap. This means that the completely assembled distributor can be removed and fixed on another bottle without the risk of disarranging the tubing.





BOLA Distributors for Reaction Vessels (S)

Material:
PTFE, PP

Temperature resistance:
from 0 °C to +110 °C

Chemical resistance:
+++ universel

Vacuum:
suitable

autoclave:
121°

FDA conform

Product description:

Blue screw cap made of PP with GLS 80 thread, body made of PTFE with center ground joint and lateral GL-threaded or ground joint necks. Very good chemical resistance, for working temperatures up to max. +200°C (PP screw cap max. +110°C)

	Lateral necks		Center neck	For tubing O.D. max. mm	Cat. No.:
	GL	NS			
4x 18			1x 29/32	4x 10	D 748-16
2x 18		2x 29/32	1x 29/32	2x 14	D 748-40
		2x 29/32 2x 14/23	1x 29/32		D 748-60

Applications:

Drawing or inserting aggressive or pure liquids. Inserting tubing, tubes and probes into vessels. Use of a stirrer bearing in center neck for central position of a stirrer shaft.



#SUITABLE PAGE 90
Laboratory screw joints



The special feature: The body of the distributor can be turned independently from the screw cap. This means, that the completely assembled distributor can be removed and fixed on another bottle without the risk of disarranging the tubing.

BOLA Distributors for Reaction Vessels (R)

Material:
PTFE, PPTemperature resistance:
from 0 °C to +110 °CChemical resistance:
+++ universalVacuum:
suitableautoclave:
121°

FDA conform

Product description:

Blue screw cap made of PP with GLS 80 thread, body made of PTFE. Center neck with GL 25 thread for connecting tubing or tube up to a max. O.D. of 15 mm, four lateral necks with GL 18 thread. Exchangeable shaft guide (PTFE page 47) with screw cap (PPS page 47) for inserting and fixing a stirrer shaft in the center neck included. Very good chemical resistance, for working temperatures up to max. +200°C (PP screw cap max. +110°C)

Lateral necks GL	Center neck GL	For tubing O.D. max. mm	Dia. of stirrer shaft mm	Cat. No.:
4x 18	1x 25	4x 10	8	D 744-16
4x 18	1x 25	4x 10	10	D 744-24

Applications:

Drawing or inserting aggressive or pure liquids. Inserting tubing, tubes and probes into vessels. Use of a stirrer bearing in center neck for central position of a stirrer shaft.



BOLA Screw Caps High Chem

Material:
PTFE, PPTemperature resistance:
from 0 °C to +110 °CChemical resistance:
+++ universalVacuum:
suitableautoclave:
121°

FDA conform

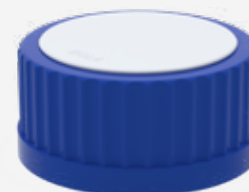
Product description:

Knurled blue screw cap made of PP with GLS 80 thread. Sealing insert made of PTFE with elastic sealing lip and an o-ring for balancing unevenness on the bottle neck. Very good chemical resistance, the product is only exposed to PTFE.

Thread GLS	Cat. No.:
80	H 998-18

Applications:

- » suitable for glass bottles with GLS 80 thread
- » for the storage of highly aggressive or pure chemicals
- » tight sealing even at high thermal fluctuations





BOLA **Multiple Distributors for Bottles**

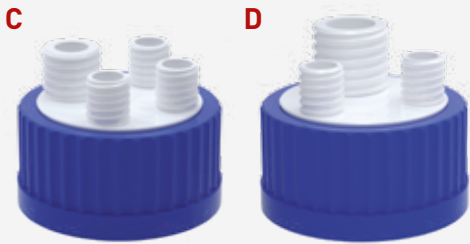
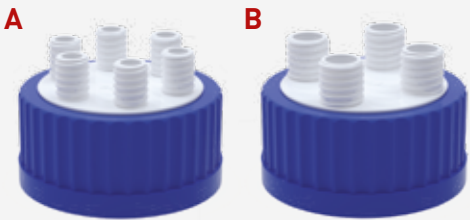
Material: PTFE, PP Temperature resistance: from 0 °C to +110 °C Chemical resistance: +++ universal Vacuum: suitable autoclave: 121°



FDA conform

Product description:
Blue screw cap made of PP with GLS 80 thread, body made of PTFE.

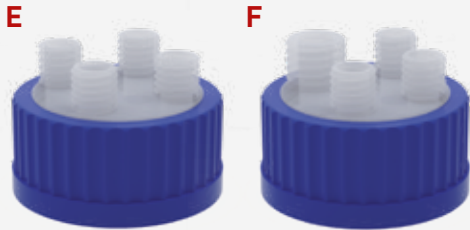
	For tubing O. D. max. mm	Necks	Cat. No.:
A	6x 8,0	6x GL14	D 754-08
B	4x 12,7	4x GL18	D 754-16
C	3x 12,7 / 1x 14	3x GL18 / 1x GL25	D 754-24
D	2x 12,7 / 1x 21	2x GL18 / 1x GL32	D 754-36



FDA conform

Product description:
Blue screw cap made of PP with GLS 80 thread, body made of PP.

	For tubing O. D. max. mm	Necks	Cat. No.:
E	4x 12,7	4x GL18	D 750-16
F	3x 12,7 / 1x 14	3x GL18 / 1x GL25	D 750-24



#SUITABLE PAGE 90
Laboratory screw joints

BOLA GLS Reductions

Material: PTFE, PPS Temperature resistance: from 0°C to +110 °C Chemical resistance: ++ very good

FDA conform

Product description:
Blue screw cap made of PP, movable reduction body made of PP with O-Ring made of FPM for transition to GL threads. The body can be moved independently from the screw cap so that the completely assembled reduction can be removed and fixed on another vessel without the risk of disarranging the tubing or cable.

Cap GLS	Reducing thread GLS	For tubing-Ø mm	Cat. No.:
80	14	0,8 - 8,0	D 787-08
80	18	1,6 - 10,0	D 787-16
80	25	1,6 - 14,0	D 787-24
80	45	3,2 - 32,0	D 787-40



Material: PTFE, PP Temperature resistance: from 0 °C to +110 °C Chemical resistance: +++ universal Vacuum: suitable autoclave: 121°

FDA conform

Product description:
Blue screw cap made of PP with GLS 80 thread, movable insert with GL 45 thread made of PTFE. Transition from GLS 80 bottles to a GL 45 thread. The body can be moved independently from the screw cap so that the completely assembled reduction can be removed and fixed on another vessel without the risk of disarranging the tubing or cable. The product is only exposed to PTFE.

Cap GLS	Reducing thread GLS		Cat. No.:
80	45		D 785-24





BOLA GL Reductions

Material: **PTFE, PPS** Temperature resistance: **from -20°C to +250°C** Chemical resistance: **+++ universal**

FDA conform

Product description:

Black screw cap made of PPS with GL 45 thread, movable reduction body made of PTFE with O-Ring made of FKM for transition to GL threads. The body can be moved independently from the screw cap so that the completely assembled reduction can be removed and fixed on another vessel without the risk of disarranging the tubing or cable. The product is only exposed to PTFE.

Cap GL	Reducing thread GL	For tubing-Ø mm	Cat. No.:
18	14	0,8 - 8,0	D 784-01
25	14	0,8 - 8,0	D 784-03
25	18	1,6 - 10,0	D 784-04
32	18	1,6 - 10,0	D 784-06
45	14	0,8 - 8,0	D 784-08
45	18	1,6 - 10,0	D 784-16
45	25	1,6 - 14,0	D 784-24



Material: **PP, PBTP** Temperature resistance: **from -20 °C to +110 °C** Chemical resistance: **++ very good**

FDA conform

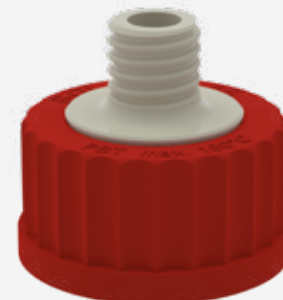
Product description:

Red screw cap made of PBTP, movable reduction body made of PP with O-Ring made of FPM for transition to GL threads. The body can be moved independently from the screw cap so that the completely assembled reduction can be removed and fixed on another vessel without the risk of disarranging the tubing or cable.

Cap GL	Reducing thread GL	For tubing-Ø mm	Cat. No.:
45	14	0,8 - 8,0	D 782-08
45	18	1,6 - 10,0	D 782-16
45	25	1,6 - 14,0	D 782-24

Applications:

For connecting or inserting tubing, tubes or probes.





BOLA Distributors for Canisters – what you should know about.

These distributors are ideal for drawing liquids from canisters and for distributing these liquids to several vessels.

They consist of a screw cap for canister threads (see page 367) and a movable body with three GL-threaded necks. The threaded necks allow the connection of tubing or tubes made of glass, metal, or plastic by means of BOLA Laboratory Screw Joints (see page 90). The distributor can also be integrated into a pressure or vacuum system.

A possible unevenness of the canister thread is adjusted by an o-ring behind an elastic sealing lip, and the canister is closed tightly. The product is only exposed to the body of the distributor.

The special clou: the body of the distributor can be turned independently from the screw cap. This means, that the completely assembled distributor can be removed and fixed on another canister without the risk of disarranging the tubing.



+ No disarrangements thanks to 360° clearance of distributor body

+ Universal connecting options thanks to GL thread

+ High temperature resistance up to 200°C

+ Integrated seal ensures perfect sealing

+ Handy cap geometry ensures good grip



BOLA Distributors for Canisters

Material: PTFE Temperature resistance: from -20°C to +200°C Chemical resistance: +++ universal autoclave: 121°

FDA conform

Product description:
Distributors for canisters with movable body and GL-threaded necks.

» Type with screw cap made of glass-fibre reinforced PTFE and body made of PTFE.

Canister thread GLS	Necks GL		Cat. No.:
55	2x 14 / 1x 18		D 760-16
60	3x 18		D 760-24



Material: PP, PTFE Temperature resistance: from -50°C to +80°C Chemical resistance: ++ very good autoclave: 121°

FDA conform

Product description:
» Type with screw cap made of PP and body made of PTFE.

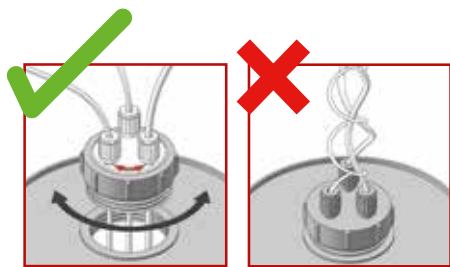
	Canister thread S	Necks GL		Cat. No.:
A	55	2x 14 / 1x 18		D 762-08
B	60	2x 18		D 762-14
C	60	3x 18		D 762-20
D	65	3x 18		D 762-32
E	71	2x 18 / 1x 25		D 762-38
F	90	3x 18 / 1x 25		D 762-44
G	Nalgene B53	2x 14		D 766-16
H	Nalgene B83	3x 18 / 1x 25		D 766-22



#SUITABLE PAGE 90
Laboratory screw joints



BOLA Multiple Distributors for Barrels – what you should know about.



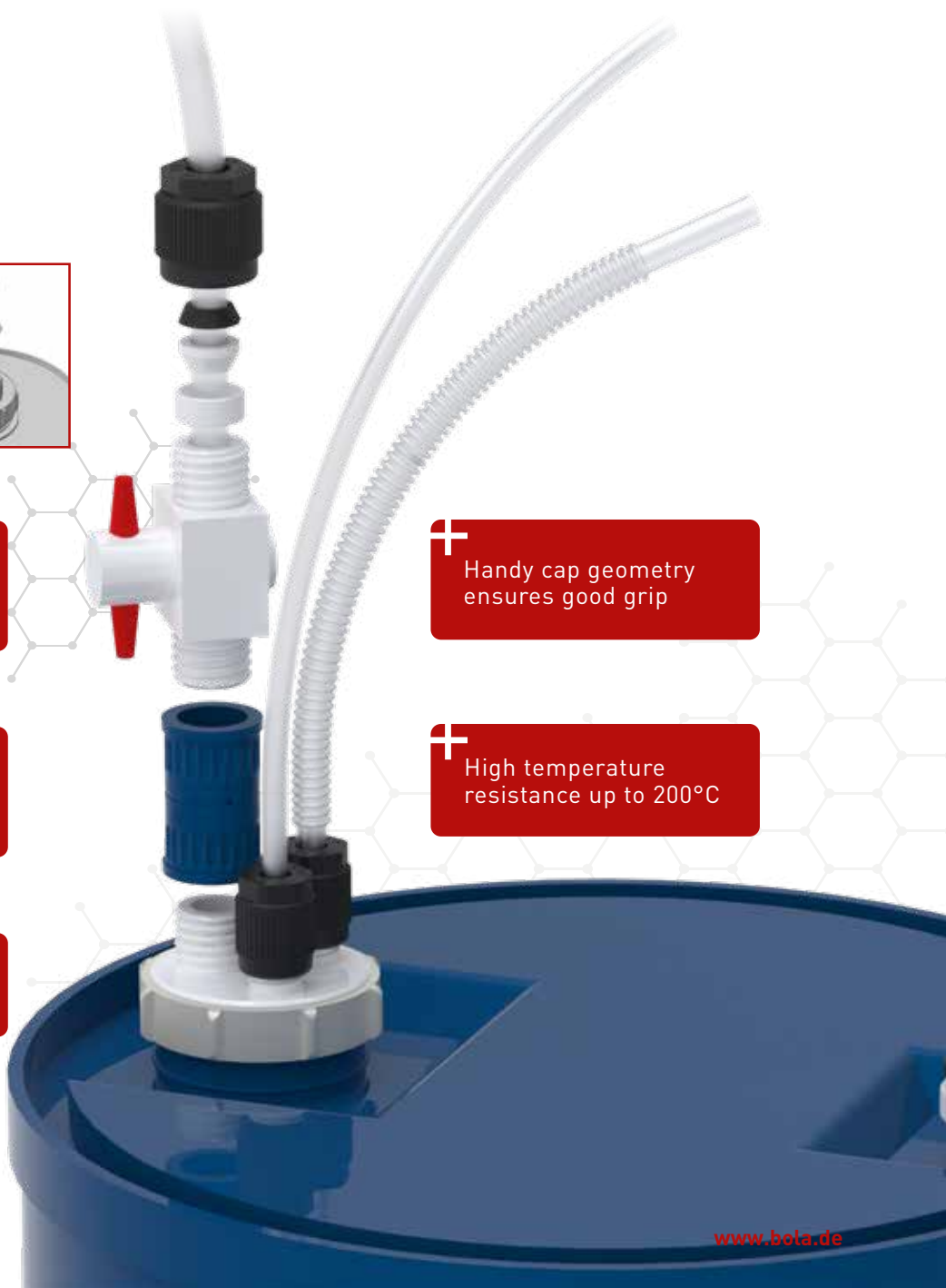
+ No disarrangements thanks to 360° clearance of distributor body

+ Universal connecting options thanks to GL thread

+ Integrated seal ensures perfect sealing

+ Handy cap geometry ensures good grip

+ High temperature resistance up to 200°C





BOLA Multiple Distributors for Barrels

Material: **PTFE** Temperature resistance: **from -20°C to +200°C** Chemical resistance: **+++ universal**

FDA conform

Product description:

Screw cap made of glass-fibre reinforced PTFE for barrels with female thread, body with GL-threaded necks made of PTFE. Very good chemical resistance, for working temperatures up to max. + 200°C. The product is only exposed to PTFE.

For female barrel thread	Necks GL	For tubing O.D. max. mm	Cat. No.:
G2" / G2" / BSP 2"	3x 14	8	D 696-06
G2" / G2" / BSP 2"	4x 18	10	D 696-08
G2" / G2" / BSP 2"	2x 18 / 1x 25	2x 10 / 1x 14	D 696-14
Mauser 2"	4x 18	10	D 697-08
Mauser 2"	2x 18 / 1x 25	2x 10 / 1x 14	D 697-14
Tri-Sure 2"	3x 14	8	D 698-06
Tri-Sure 2"	4x 18	10	D 698-08
Tri-Sure 2"	2x 18 / 1x 25	2x 10 / 1x 14	D 698-14

Applications:

Drawing or inserting aggressive or pure liquids. Inserting tubing, tubes and probes into barrels.



#SUITABLE PAGE 90
Laboratory screw joints

BOLA Ring Wrench

Material: **PP** Temperature resistance: **from 0°C to +110°C** Chemical resistance: **++ very good**

Product description:

Ring wrench made of PP.

I.D. mm	Total length mm	Cat. No.:
78	200	D 701-24

Applications:

For opening and closing BOLA Multiple Distributors for Barrels.



BOLA **Barrel Aeration**

Material: PTFE Temperature resistance: from -20°C to +230°C Chemical resistance: +++ universal Vacuum: suitable autoclave: 121°

FDA conform

Product description:

Consisting of a body made of PTFE for female thread R 3/4" with a GL 32 thread, a PTFE/silicone gasket, an exchangeable filtering membrane (2,5µm) made of PTFE and a screw cap made of PPS. Very good chemical resistance, the product is only exposed to PTFE.

Pressure compensation at 0,1 bar differential pressure.

Max. flow rate:

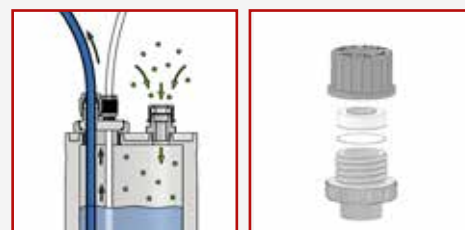
» at 0,5 bar differential pressure: 80 l/h

» at 1,0 bar differential pressure: 320 l/h

For female barrel thread	O.D. of membrane mm	Thickness of membrane mm	Thread of screw cap GL	Cat. No.:
R 3/4"	29	0,2	32	N 1696-32

Applications:

For pressure compensation during filling or drawing of liquids. Integrated membrane prevents contamination of the product. Membranes are available separately (see Cat. No. N 1699-32 on page 114).

BOLA **Sets for Pressure Compensation**

Material: PTFE Temperature resistance: from -20°C to +230°C Chemical resistance: +++ universal Vacuum: suitable autoclave: 121°

FDA conform

Product description:

Consisting of screw cap made of PPS for GL thread, PTFE/silicone gasket and exchangeable filtering membrane made of PTFE (pore size 2,5 µm). High chemical resistance, the product is only exposed to PTFE. Pressure compensation already at 0,01 bar differential pressure.

For thread GL	Dia. of mem-brane mm	Flow rate at 0,5 bar l/h	Flow rate at 1 bar l/h	Cat. No.:
14	12	14	31	N 1698-14
18	16	39	89	N 1698-18
25	23	55	127	N 1698-25
32	29	127	290	N 1698-32
45	42	401	918	N 1698-45

Applications:

For pressure compensation during filling or drawing of liquids. Prevention of unintentional over-pressure or vacuum in the vessel. Integrated membrane prevents contamination of the product. Membranes are available separately (see Cat. No. N 1699-.. on page 114).

**Spare parts** for Pressure Compensation-kit

Description	Material	Packing Unit	for Thread	suitable for Cat.No.:	Cat. No.:	
Replacement Membranes for Pressure Compensation	PTFE	A Pack size: 10 pieces	GL 14	N 1698-14	N 1699-14	
			GL 18	N 1698-18	N 1699-18	
			GL 25	N 1698-25	N 1699-25	
			GL 32	N 1698-32	N 1699-32	
			GL 45	N 1698-45	N 1699-45	
		B Pack size: 10 pieces				



BOLA Barrel-GL-Adaptors

Material: PTFE Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal Vacuum: suitable autoclave: 121°

FDA conform

Product description:

Adaptors made of PTFE/PP, for transition from female barrel thread R2" or Tri-Sure 2" to a GL 45 thread. See page 368 for dimensions of the barrel threads.

» Made of PTFE, very good chemical resistance, working temperatures up to max. +250°C

	Material	For barrel thread GL	Thread of head GL	Bore dia. max. mm	Dia. of grip ca. mm	Cat. No.:
A	PTFE	R2" / G2" / BSP2"	45	32	78	D 736-12
	PTFE	Tri-Sure 2"	45	32	67	D 736-24



Material: PTFE Temperature resistance: from 0°C to +110°C Chemical resistance: ++ very good Vacuum: suitable autoclave: 121°

Product description:

» Made of PP, restricted chemical resistance, working temperatures up to max. +110°C

	Material	For barrel thread GL	Thread of head GL	Bore dia. max. mm	Dia. of grip ca. mm	Cat. No.:
B	PP	R2" / G2" / BSP2"	45	32	78	D 737-12
	PP	Tri-Sure 2"	45	32	67	D 737-24

Applications:

For the connection of e. g. BOLA Multiple Distributors for Bottles with a GL 45 thread for inserting tubing, tubes or probes.



BOLA GL-Aeration

Material: PTFE, PPS Temperature resistance: from 0°C to +70°C Chemical resistance: ++ very good autoclave: 121°

Product description:

Filter with PTFE membrane and flexible tubing, screw cap made of PPS for GL threads.

For thread GL	Filter material	Pore size µm	Filter O.D. mm	Cat. No.:
14	PTFE	0,20	33	N 1697-14
18	PTFE	0,20	33	N 1697-18

Applications:

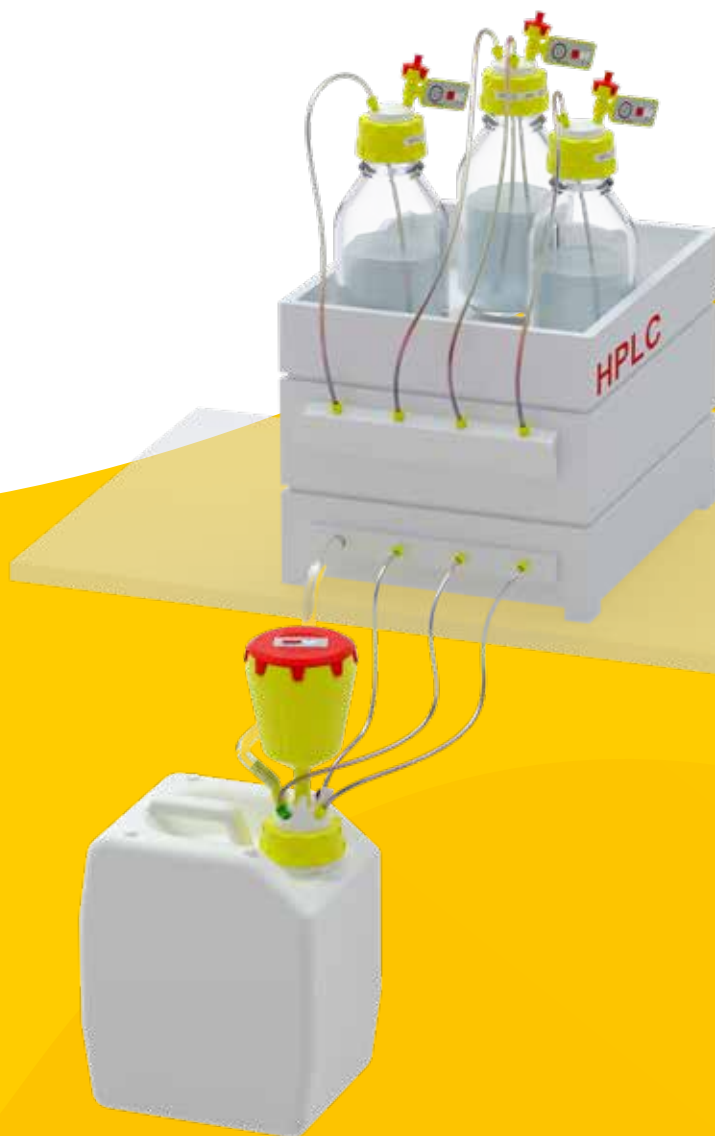
For sterile pressure compensation on multiple distributors for bottles. Overpressure or vacuum in the vessel are prevented. A contamination of the product with dust or any other particles is avoided. It is recommended to exchange the filter every 6 months



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BOLA Screw Caps

BOLA Screw Caps are available as closed caps for closing bottles and vessels with GL thread or as caps with aperture which can for example hold tubes or – in connection with a gasket - be used as septum for sampling. All caps have a handy knurl for easy opening and closing.

They are available for bottle threads GL 14 to GL 45 and are either made of glass-fibre reinforced PTFE, PPS or PBTP. The closed caps are either supplied with an integrated PTFE/silicone gasket or with an integrated PTFE membrane.

The caps which are made of glass-fibre reinforced **PTFE** have a high chemical resistance and can be used with aggressive products.

PPS offers a high mechanical strength; even caps with small diameters can be closed safely. At the same time, these caps can be used at high temperatures due to a good chemical and thermal resistance.

PBTP caps are an ideal and cheap choice for all applications which do not need high chemical and thermal resistance.

BOLA Screw Caps „PPS“

Material:
PPS

Temperature resistance:
from -200°C to +250°C

Chemical resistance:
+++ universal



Product description:

Screw cap with handy knurl, suitable for GL threads, made of PPS.

» Screw Caps with Aperture

	For thread	Dia. of aperture mm	Cat. No.:
A	GL 14	9,2	H 995-14
	GL 18	11,0	H 995-18
	GL 25	15,0	H 995-25
	GL 32	20,0	H 995-32
	GL 45	34,0	H 995-45
	S 40	28,0	H 989-40

» Screw caps with integrated PTFE/silicone gasket for compensation of unevenness on the sealing surface

	For thread	Cat. No.:
B	GL 14	H 993-14
	GL 18	H 993-18
	GL 25	H 993-25
	GL 32	H 993-32
	GL 45	H 993-45
	S 40	H 988-40

A



B



#SUITABLE PAGE 123

Gaskets for screw caps are available separately



BOLA Screw Caps HT (High Temp)

Material: **PPS** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Vacuum: **suitable**

FDA conform

Product description:

Screw cap with handy knurl made of PPS with elastic and highly chemical resistant integrated PTFE-membrane gasket. After assembly, the product is only exposed to PTFE. The cap provides a high mechanical and thermal resistance (up to max. +250°C).

For thread			Cat. No.:
GL 14			H 994-14
GL 18			H 994-18
GL 25			H 994-25
GL 32			H 994-32
GL 45			H 994-45



BOLA Screw Caps „PTFE“

Material: **PTFE, PTFE-GF** Temperature resistance: **from -20°C to +250°C** Chemical resistance: **+++ universal**

FDA conform

Product description:

Screw cap with handy knurl, suitable for GL threads, made of PTFE, glass-fibre reinforced PTFE.

» Screw Caps with Aperture

	For thread	Dia. of aperture mm	Material	Cat. No.:
A	GL 14	9,2	PTFE-GF	H 983-01
	GL 18	11,0	PTFE-GF	H 983-02
	GL 25	15,0	PTFE-GF	H 983-03
	GL 32	20,0	PTFE-GF	H 983-04
	GL 45	34,0	PTFE-GF	H 983-05

» Screw Caps

	For thread		Material	Cat. No.:
B	GL 14		PTFE	H 986-01
	GL 18		PTFE	H 986-02
	GL 25		PTFE	H 986-03
	GL 32		PTFE	H 986-04
	GL 45		PTFE	H 986-05

A



B



BOLA Screw Caps „PBTP“

Material:
PBTPTemperature resistance:
from -50°C to +120°CChemical resistance:
+ good

Product description:

Screw cap with handy knurl, suitable for GL threads, made of PBTP.

» Screw Caps with Aperture

	For thread	Dia. of aperture mm	Cat. No.:
A	GL 14	9,2	H 984-01
	GL 18	11,0	H 984-02
	GL 25	15,0	H 984-03
	GL 32	20,0	H 984-04
	GL 45	34,0	H 984-05

FDA conform

» Screw caps with integrated PTFE/silicone gasket for compensation of unevenness on the sealing surface

	For thread	Cat. No.:
B	GL 14	H 987-01
	GL 18	H 987-02
	GL 25	H 987-03
	GL 32	H 987-04
	GL 45	H 987-05

A**B**

BOLA Screw Caps with Aperture

Material:
PPTemperature resistance:
from -20°C to +110°CChemical resistance:
+ good

Product description:

Screw cap made of PP with handy knurl. The cap provides a good chemical and thermal resistance (up to max +110°C).

	For thread	Bore dia. mm	Cat. No.:
	GL 45	34,0	H 999-45



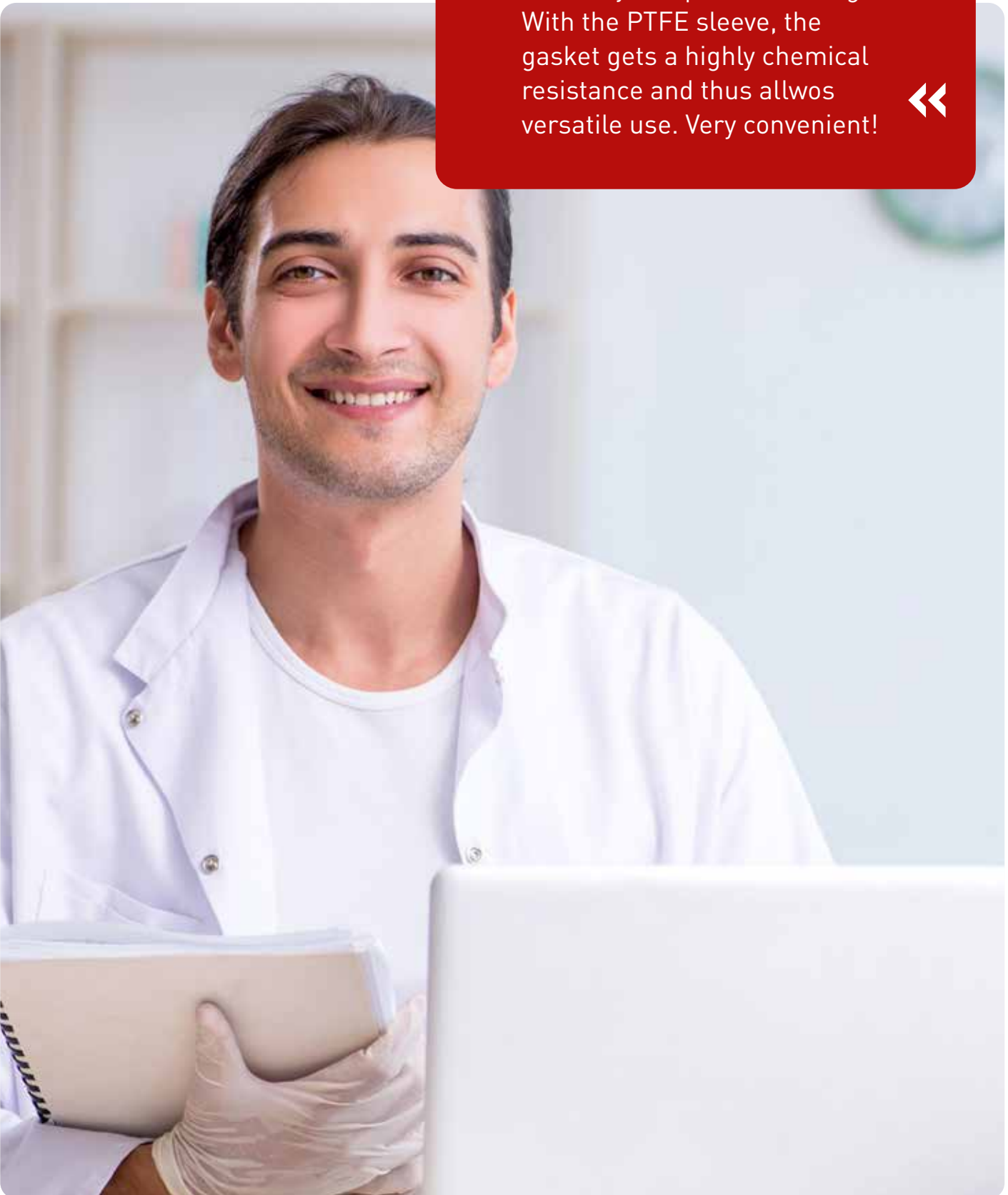
You have a special request?
Call us on: **+49 (0) 93 46-92 86-0**

Or just send us a drawing (a rough sketch is sufficient) and some information to **info@bola.de**. We will then contact you to discuss further details and establish an offer for you free of charge.



BOLA **One-Sided Gaskets**

The soft silicone core provides flexibility and perfect sealing. With the PTFE sleeve, the gasket gets a highly chemical resistance and thus allows versatile use. Very convenient!



BOLA **One-Sided Gaskets**Material:
PTFETemperature resistance:
from -60°C to +230°CChemical resistance:
+++ universal

FDA conform

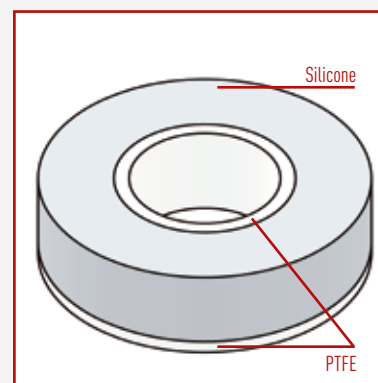
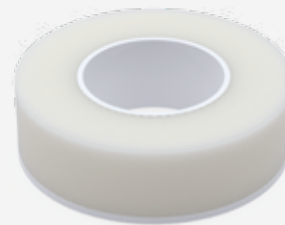
Product description:

Silicone ring with PTFE washer. After assembly, the product is only exposed to PTFE. Packing unit: 10 pieces, differing ordering quantities are rounded up to factor 10.

For thread GL	O.D. x I.D. x Height mm	For tube dia. mm	Cat. No.:
14	12x 6,0 x 3,5	5,5 - 6,5	H 975-02
18	16x 6,0 x 4,5	5,5 - 6,5	H 975-04
18	16x 8,0 x 4,5	7,5 - 9,0	H 975-06
18	16x 10,0 x 4,5	9,0 - 11,0	H 975-10
25	22x 8,0 x 6,5	7,5 - 9,0	H 975-12
25	22x 10,0 x 6,5	9,0 - 11,0	H 975-14
25	22x 12,0 x 6,5	11,0 - 13,0	H 975-18
32	29x 10,0 x 9,0	9,0 - 11,0	H 975-20
32	29x 12,0 x 9,0	11,0 - 13,0	H 975-22
32	29x 14,0 x 9,0	13,0 - 15,0	H 975-26
32	29x 16,0 x 9,0	15,0 - 17,0	H 975-28
32	29x 18,0 x 9,0	17,0 - 19,0	H 975-30
45	42x 26,0 x 9,0	25,0 - 27,0	H 975-34
45	42x 32,0 x 9,0	31,0 - 33,0	H 975-36

Applications:

As gasket for BOLA Screw Caps with Aperture (Cat. No. H 983/ H 984/ H 995 from page 118). Also suitable for GL caps of DWK Life Science (formerly Duran Group).

BOLA **Double-Sided Gaskets**Material:
PTFETemperature resistance:
from -60°C to +230°CChemical resistance:
+++ universal

FDA conform

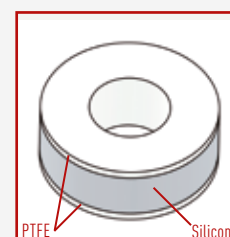
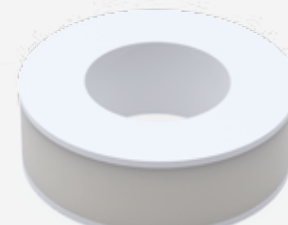
Product description:

Silicone ring with double-sided PTFE washer. After assembly, the product is only exposed to PTFE.

For thread GL	O.D. x I.D. x Height mm	For tube dia. mm	Cat. No.:
14	12x 6,0 x 3,6	5,5 - 6,5	H 977-08
18	16x 6,0 x 4,6	5,5 - 6,5	H 977-16
18	16x 8,0 x 4,6	7,5 - 9,0	H 977-18
18	16x 10,0 x 4,6	9,0 - 11,0	H 977-20
25	22x 8,0 x 6,6	7,5 - 9,0	H 977-28
25	22x 10,0 x 6,6	9,0 - 11,0	H 977-32
25	22x 12,0 x 6,6	11,0 - 13,0	H 977-36

Applications:

As gasket for BOLA Screw Caps with Aperture (Cat. No. H 983/ H 984/ H 995 from page 118). Also suitable for GL caps of DWK Life Science (formerly Duran Group).





BOLA Gaskets for Screw Caps

Material: PTFE
 Temperature resistance: from -60°C to +230°C
 Chemical resistance: +++ universal

FDA conform

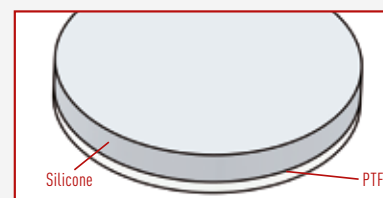
Product description:

Upper side made of PTFE, lower side made of silicone-elastomer for balancing unevennesses on sealing surfaces. After assembly, the product is only exposed to PTFE.

For thread	Dia. of gasket mm	Thickness of gasket mm	Cat. No.:
GL 14	13	3,3	H 973-14
GL 18	16,8	3,3	H 973-18
GL 25	23,5	3,3	H 973-25
GL 32	30,2	3,3	H 973-32
S 40	38,0	3,3	H 973-41
GL 45	43,2	3,3	H 973-45

Applications:

As septum in combination with BOLA-Screw-Caps with Aperture (Cat. No. H 983/ H 984/ H 995/ H 989/ H 999 from page 118). As gasket for BOLA Screw Caps with Aperture (Cat. No. H 986/ H 987/ H 988/ H 993 from page 118).



BOLA SVL Gaskets

Material: PTFE
 Temperature resistance: from -60°C to +230°C
 Chemical resistance: +++ universal

FDA conform

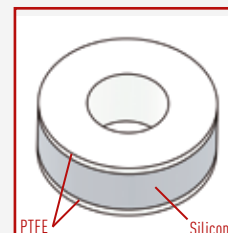
Product description:

Silicone ring with double-sided washer made of PTFE. Suitable for Torion-/SVL threads. Universal chemical resistance, the product is only exposed to PTFE.

For SVL thread I.D. mm	O.D. of gasket mm	For tube dia. mm	Height mm	Cat. No.:
15	15	5,6 x 6,4	5	H 979-12
15	15	7,6 x 8,4	5	H 979-24
22	22	13,6 x 14,4	5	H 979-32

Applications:

As gasket for tubing, tubes or probes inserted through Torion threads.



BOLA GL Dispensers

Material: PTFE
Temperature resistance: from -20°C to +110°C
Chemical resistance: +++ universal

FDA conform

Product description:
Black screw cap made of PPS, movable dispenser with stopcock made of PTFE, integrated ventilation. With PTFE cap for sealing the discharge tube.

Thread GL	Stopcock bore dia. mm	Dia. of discharge tube mm	Cat. No.:
45	4	4	H 918-10

Applications:
For controlled and safe pouring of liquids. A bottle with mounted dispenser can be headfirst fixed in a holder.





BOLA GL Funnels

Material: PTFE, PPS
 Temperature resistance: from -20°C to +200°C
 Chemical resistance: +++ universal

FDA conform

Product description:

Funnels with a capacity of approx. 100 ml made of borosilicate glass. Inlet tube made of PTFE, connection with GL screw caps made of PPS or with ground joint. The outlet tube has a length of approx. 64 mm on the lower side. The glass funnel can be fixed in each position.

» Insertion for reaction vessels with GL-threaded necks.

	Thread of funnel GL	Connecting thread on lower side GL	Inlet tube (O.D. x I.D.) mm	Cat. No.:
A	25	25	15 - 12	D 738-12
	32	32	20 - 17	D 738-22
	25	32	20 - 17	D 738-42
	32	25	15 - 12	D 738-52

» Insertion for reaction vessels with ground joint sockets.

	Thread of funnel GL	Ground joint NS	Inlet tube (O.D. x I.D.) mm	Cat. No.:
B	32	29/32	20 - 17	D 739-22

Applications:

Positionable insertion for reaction vessels. Adhering or agglutinating of powders is prevented. Liquids can be inserted directly without cooling or adhering at the wall of the vessel. Instead of the glass funnel, a condenser can be mounted at the upper screw cap and provide a direct return into the vessel.



BOLA INNOVATION



#1 GL-Funnel

Helps to insert products into reaction vessels. Available in two versions: **A)** for GL threads, **B)** for ground joints. Liquids are inserted directly into the reactor and do not adhere and cool down at the wall.

BOLA Swivelling Screw Fittings with Ground Joint

Material:
PTFE, PPSTemperature resistance:
from -20°C to +200°CChemical resistance:
+++ universalVacuum:
suitable

FDA conform

Product description:

Ground joint body made of PTFE, screw cap made of PPS. Probes, tubes or tubing are firstly inserted through the fitting, then the fitting is put into the ground joint and the inserted element can be fixed in the requested position.

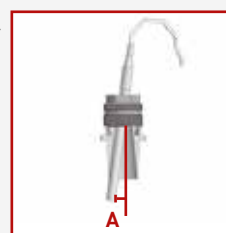
Ground joint size NS	For probe/tube O.D mm	Max. angle A mm	Thread of screw cap GL	Cat. No.:
19/26	6	4°	18	D 692-24
29/32	6	8°	25	D 692-34
29/32	8	7°	25	D 692-44
29/32	10	6°	25	D 692-54
29/32	12	5°	25	D 692-64

Product advantages:

- » suitable for all kinds of probes, tubes or hard-walled tubing
- » can be used with GL threads or ground joints
- » angle and height can be fixed tightly
- » a damage of tube or probe due to collision with the stirrer shaft can be avoided

Applications:

Insertion of probes, tubes or tubing into vessels with ground joints for avoiding collision with the stirrer shaft.



BOLA INNOVATION



#1 Swivelling Screw Fittings

Many products only allow to fix for example a thermometer in straight direction. BOLA Swivelling Screw Fittings with spherical inner parts allow a deflection of up to 12°.



BOLA Swivelling Screw Fittings

Material: PTFE, PPS Temperature resistance: from -20°C to +200°C Chemical resistance: +++ universal Pressure: 5 bar Vacuum: suitable

FDA conform

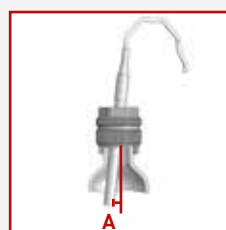
Product description:

Screw cap made of PPS with inner parts made of PTFE. Probes, tubes or tubing are firstly inserted through the fitting, then the fitting is screwed on the GL neck and the inserted element can be fixed in the requested position.

For probe/tube O.D. mm	For thread GL	Max. angle A mm	Cat. No.:
2,0	18	10°	D 690-14
(1/8") 3,2	18	9°	D 690-18
6,0	18	5°	D 690-24
6,0	25	12°	D 690-34
8,0	25	10°	D 690-38
(3/8") 9,52	25	9°	D 690-42
10,0	25	8°	D 690-46
12,0	25	6°	D 690-50
19,0	32	3°	D 690-68

Applications:

Insertion of probes, tubes or tubing into vessels with GL necks for avoiding collision with the stirrer shaft.



BOLA Threaded Couplings

Material: PTFE Temperature resistance: from -20°C to +200°C Chemical resistance: +++ universal

FDA conform

Product description:

Screw caps made of PPS (up to +200°C) or PBTP (up to +180°C) with GL thread and a PTFE/FPM gasket. Connection piece made of PTFE. The product is only exposed to PTFE. For connecting two GL threads of the same size.

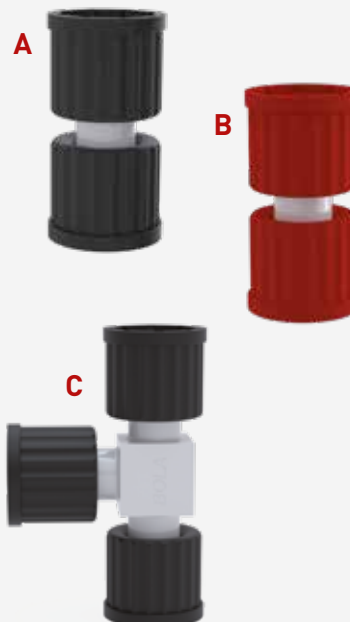
Typ: BOLA Threaded Couplings

For thread GL	Length from sealing lip to sealing lip mm	A	Cat. No.: PPS Cap	B	Cat. No.: PBTP Cap
14	15		H 900-01		H 901-01
18	17		H 900-02		H 901-02
25	22		H 900-03		H 901-03
32	22		H 900-04		H 901-04
45	23		H 900-05		H 901-05

Typ: BOLA T-Threaded Couplings

NEW

For thread GL	Length from sealing lip to sealing lip mm	C	Cat. No.: PPS Cap
14	33		H 908-14
18	38		H 908-18
25	55		H 908-25



BOLA **Rigid Threaded Couplings**Material:
PTFE, PPSTemperature resistance:
from -20 °C to +200 °CChemical resistance:
+++ universal**NEW****FDA conform**

Product description:

Sturdy coupling with female GL threads made of PPS and internal connecting tube made of PTFE. Its special design allows to turn the two halves of the coupling independently from each other and to adjust connected components. Furthermore this design provides high stability. A sealing lip on the connecting tube with integrated FKM-o-ring provides good sealing on the GL thread. Universal chemical resistance, the flowing product is only exposed to PTFE.

For thread GL	Length from sealing lip to sealing lip mm	Total length mm	Cat. No.:
14	28	49	H 903-14
18	24	49	H 903-18
25	24	51	H 903-25

Applications:

For connecting two GL threads of the same size.

BOLA **Reducing Screw Thread Adaptor Couplings**Material:
PTFETemperature resistance:
from -20°C to +200°CChemical resistance:
+++ universal**FDA conform**

Product description:

Two screw caps made of PPS with GL thread and a PTFE/FKM gasket. Connection piece made of PTFE. The product is only exposed to PTFE. For connecting two GL threads of different sizes.

From thread GL	To thread GL	Length from sealing lip to sealing lip mm	Cat. No.:
18	14	20,0	H 904-02
25	14	27,5	H 904-03
25	18	28,3	H 904-04
32	18	32,5	H 904-05
32	25	28,0	H 904-06
45	25	38,0	H 904-07
45	32	33,0	H 904-08





BOLA GL Bellows

Material: PTFE Temperature resistance: from -20°C to +200°C Chemical resistance: +++ universal Vacuum: suitable

FDA conform

Product description:

Two screw caps made of PPS with GL thread and a PTFE/FKM gasket. Bellow with sharp folds made of PTFE. Bellow can be bent up to an angle of 120°, flexible and strainless connection.

For thread GL	Min. length of bellow mm	Max. length of bellow mm	Cat. No.:
14	28	40	H 902-03
18	42	90	H 902-04
25	58	104	H 902-05
32	58	90	H 902-10
45	67	115	H 902-15



BOLA Dirt Traps

Material: PTFE Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal Pressure: 10 bar Vacuum: suitable

FDA conform

Product description:

With two GL 18 threads for connecting hard-walled tubing (PTFE, PFA, FEP) or tubes with BOLA Laboratory Screw Joints. Lateral connection with plug for easy exchange of filtering membrane (thickness 0,2-3,0 mm) and for cleaning. The flow direction is marked with an arrow. Completely made of PTFE, the flowing product is only exposed to PTFE.

Connecting thread GL	Dia. of filtering membrane mm	Bore dia. mm	Total height mm	Cat. No.:
18	25	8	88	N 1674-08

Applications:

Protection of aggregates (pumps, valves, stopcocks, nozzles etc.) against particle contamination and damage. Metal-free, can be used under clean-room conditions. BOLA Filtering Membranes separately available (Cat. No. N 1690-28, page 332).



BOLA Adaptors for Prominent®-Pumps

Material: PTFE-GF Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal Pressure: 10 bar

FDA conform

Product description:

Adaptor made of glass-fibre reinforced PTFE, transition from pump thread M20x1,5 to GL thread. Pressure resistant connection (max. 10 bar) of hard-walled tubing with Prominent® pumps by using BOLA Laboratory Screw Joints. Universal chemical resistance, the product is only exposed to PTFE.

Connecting thread GL	Bore dia. mm	Cat. No.:
14	3,0	D 730-12
18	10,5	D 730-24





BOLA GL Tube Fittings – what you should know about

A distribution system consists of tubes or tubing and connection pieces, so-called tube fittings. The BOLA GL-Fitting-System is a modular system which consists of tube fittings, screw-in fittings, different stopcocks and valves.

All fittings have GL threads so that they can be connected to hard-walled tubing (PTFE, PFA, FEP) or tubes (e.g. glass, metal, plastic) by means of BOLA Laboratory Screw Joints.

Together with these BOLA Laboratory Screw Joints (from page 88), the connection is absolutely tight and even suitable for vacuum; the screw joints for GL 14, GL 18 and GL 25 even resist pressures up to max. 10 bar at room temperature.

The system is completed by accessories like quick connectors, dirt traps and GL hose connectors.

BOLA GL Tube Fittings

Material: PTFE
 Temperature resistance: from -200°C to +250°C
 Chemical resistance: +++ universal
 Pressure: 10 bar
 Vacuum: suitable

FDA conform

Product description:

Straight tube fitting made of PTFE, two connections with GL thread.
 Universal chemical resistance, the product is only exposed to PTFE.

Thread GL	Bore dia. mm	Length without screw joint mm	Wrench size hexagon mm	Cat. No.:
14	6,5	50	15	D 538-14
18	10,5	50	19	D 538-18
25	14,5	56	27	D 538-25
32	21,0	75	32	D 538-32
45	32,5	75	46	D 538-45



#SUITABLE PAGE 146
 Fittings and laboratory screw joints made of static dissipative PTFE-EX.

BOLA PRACTICAL-TIP

Don't fear blocked passage bores:

The special construction of our fittings does not allow tubing to be pushed in too far.



BOLA GL Tube Fittings T

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Pressure: **10 bar** Vacuum: **suitable**

FDA conform

Product description:

Tube fitting T-shaped made of PTFE, three connections with GL thread. Universal chemical resistance, the product is only exposed to PTFE.

Thread GL	Bore dia. mm	Length without screw joint mm	Wrench size square mm	Cat. No.:
14	6,5	54	20	D 540-14
18	10,5	56	20	D 540-18
25	14,5	70	27	D 540-25
32	21,0	83	33	D 540-32
45	32,5	98	48	D 540-45



Application:

For distributing liquids or gases. As reduction for connecting different diameters of tubes or tubing.



#SUITABLE PAGE 90
Laboratory screw joints

BOLA PRACTICAL-TIP Protection from buckling

If you want to avoid buckling of your tubing, simply cut it and add an elbow fitting for connection.

BOLA GL Tube Fittings Elbow

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Pressure: **10 bar** Vacuum: **suitable**

FDA conform

Product description:

Tube fitting elbow-shaped made of PTFE, two connections with GL thread. Universal chemical resistance, the product is only exposed to PTFE.

Thread GL	Bore dia. mm	Length without screw joint mm	Wrench size square mm	Cat. No.:
14	6,5	37	20	D 539-14
18	10,5	39	20	D 539-18
25	14,5	51	27	D 539-25
32	21,0	58	32	D 539-32
45	32,5	73	48	D 539-45



Application:

For distributing liquids or gases. As reduction for connecting different diameters of tubes or tubing.

BOLA GL Tube Fittings Cross

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Pressure: **10 bar** Vacuum: **suitable**

FDA conform

Product description:

Tube fitting cross-shaped made of PTFE, four connections with GL thread. Universal chemical resistance, the product is only exposed to PTFE.

Thread GL	Bore dia. mm	Length without screw joint mm	Wrench size square mm	Cat. No.:
14	6,5	54	20	D 541-14
18	10,5	56	20	D 541-18
25	14,5	70	27	D 541-25

Application:

For distributing liquids or gases. As reduction for connecting different diameters of tubes or tubing.



BOLA INNOVATION



#1 GL-Fittings

They are mainly used to fix the same diameters on both sides. Together with BOLA Laboratory Screw Joints, they can also be used as reductions.

BOLA GL Quick Connectors

Material: **PFA** Temperature resistance: **from -50°C to +200°C** Chemical resistance: **+++ universal** Pressure: **6 bar** Vacuum: **suitable**



FDA conform

Two-part quick connector completely made of PFA, with two GL threads for connecting tubing or tubes with BOLA Laboratory Screw Joints. Quick and easy disconnection of flow. When disconnected, the flow is interrupted by means of built-in non-return valves and only continues after a safe locking. Suitable for pressure up to max. 6 bar, for vacuum of 700 mm Hg and working temperatures up to max. +200°C. Universal chemical resistance, the product is only exposed to PFA.

Connecting thread GL	Length without screw joint	Flow at 4 bar (water) l/min.	Cat. No.:
14	75	3,2	D 625-20
18	75	4,0	D 625-40
25	79	10,5	D 625-60

Applications:

Ideal for conducting highly pure or aggressive products.





BOLA Thread Adaptors GL

Material: PTFE Temperature resistance: from -200 °C to +250 °C Chemical resistance: +++ universal Pressure: 10 bar Vacuum: suitable

FDA conform

Product description:

Straight transition fitting made of PTFE, two GL-threaded connections. Universal chemical resistance, the medium is only exposed to PTFE.

From male thread GL	to male thread GL	Bore dia. mm	Cat. No.:
14	18	8,5	D 537-04
14	25	8,5	D 537-08
18	25	10,5	D 537-12
25	45	14,5	D 537-16

Applications:

Reduction to connect different tube and tubing diameters with BOLA Laboratory Screw Joints.



BOLA GL-Screw-in Tube Fittings

Material: PTFE Temperature resistance: from -200 °C to +250 °C Chemical resistance: +++ universal Pressure: 10 bar Vacuum: suitable

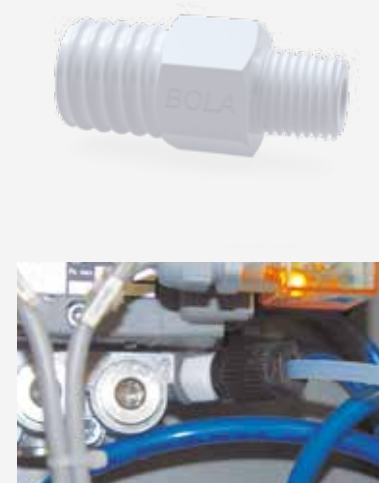
FDA conform

Product description:

Straight tube fitting made of PTFE, with one screw-in thread (either NPT or G thread). Universal chemical resistance, the product is only exposed to PTFE.

Screw-in thread NPT	Thread GL	Bore dia. mm	Wrench size hexagon mm	Cat. No.:
1/8"	14	4,0	15	D 516-08
1/4"	14	5,0	15	D 516-14
3/8"	14	6,5	19	D 516-20
1/8"	18	4,0	19	D 516-26
1/4"	18	6,5	19	D 516-32
3/8"	18	8,0	19	D 516-38
3/8"	25	8,0	27	D 516-44
1/2"	25	12,0	27	D 516-50

Screw-in thread G	Thread GL	Bore dia. mm	Wrench size hexagon mm	Cat. No.:
1/8"	14	4,0	15	D 517-08
1/4"	14	5,0	15	D 517-14
3/8"	14	6,5	19	D 517-20
1/8"	18	4,0	19	D 517-26
1/4"	18	6,5	19	D 517-32
3/8"	18	8,0	19	D 517-38
1/2"	25	12,0	27	D 517-50
1"	32	18,0	34	D 517-74



#SUITABLE PAGE 90
Laboratory screw joints

BOLA GL Stopcocks

Material: PTFE Temperature resistance: from 0°C to +110°C Chemical resistance: +++ universal Pressure: 6 bar Vacuum: suitable



FDA conform

Product description:

Two-way stopcock with straight bore and two connections with GL thread or three-way stopcock with L-shaped or T-shaped bore and three connections with GL thread. Cylindrical stopcock plug for good tightness, stop valve with mark of flow direction. Suitable for pressure up to max. 6 bar, or for vacuum. Universal chemical resistance, the flowing product is only exposed to PTFE.

» Two-way stopcock with straight bore

	Type	Bore shape Stopcock	Bore dia. mm	Connecting thread GL	External dimensi- ons L / D / H mm	Cat. No.:
A	2-Way		4	14	54 x 20 x 38	E 684-14
	2-Way		6	18	64 x 30 x 45	E 684-18
	2-Way		8	25	78 x 40 x 57	E 684-25

» Three-way stopcock with L-shaped bore

	Type	Bore shape Stopcock	Bore dia. mm	Connecting thread GL	External dimensi- ons L / D / H mm	Cat. No.:
B	3-Way		4	14	64 x 47 x 43	E 686-14
	3-Way		6	18	74 x 57 x 57	E 686-18
	3-Way		6	25	78 x 59 x 57	E 686-25

» Three-way stopcock with T-shaped bore

	Type	Bore shape Stopcock	Bore dia. mm	Connecting thread GL	External dimensi- ons L / D / H mm	Cat. No.:
C	3-Way		4	14	74 x 57 x 57	E 688-14
	3-Way		4	18	74 x 57 x 57	E 688-18
	3-Way		6	25	88 x 69 x 57	E 688-25

Applications:

For distributing liquids or gases. Quick and easy disconnection of flow. Connection of tubing or tubes by means of BOLA Laboratory Screw Joints.



#SUITABLE PAGE 90
Laboratory screw joints



BOLA PRACTICAL-TIP

You don't know which thread type and size you have in your hands?

Our scale thread illustrations help to make an optical comparison.

see page 366

»» **GL Stopcocks** allow to work with pressure of up to max. 6 bar. Assembled with BOLA Laboratory Screw Joints, they are absolutely tight and therefore also appropriate for aggressive products. ««



BOLA Ground Joint GL 2-Way Stopcocks


Material: PTFE Temperature resistance: from 0°C to +110°C Chemical resistance: +++ universal Pressure: 6 bar Vacuum: suitable

FDA conform


Product description:

Ground joint 2-way-stopcock with straight bore and one connection with GL thread or ground joint 3-way-stopcock with L-shaped bore and two connections with GL thread. Cylindrical stopcock plug for good tightness, stop valve with mark of flow direction. Suitable for pressures up to max. 6 bar, or for vacuum. Universal chemical resistance, the flowing product is only exposed to PTFE.

» Two-way stopcock with straight bore

	Type	Bore shape Stopcock	Bore dia. mm	Connecting thread GL	For ground joint NS	External dimensions L / D / H mm	Cat. No.:
A	2-Way		6	18	29/32	100 x 40 x 57	E 689-18

» Three-way stopcock with L-shaped bore

	Type	Bore shape Stopcock	Bore dia. mm	Connecting thread GL	For ground joint NS	External dimensions L / D / H mm	Cat. No.:
B	3-Way		6	18	29/32	116 x 57 x 57	E 690-18

Applications:

For evacuation of ground joint flasks or distributing liquids or gases. Quick and easy disconnection of flow. Connection of tubing or tubes by means of BOLA Laboratory Screw Joints.



BOLA GL Distributors with Stopcock


Material: PTFE, PP Temperature resistance: from 0 °C to +110 °C Chemical resistance: +++ universal Pressure: 6 bar

FDA conform

Product description:

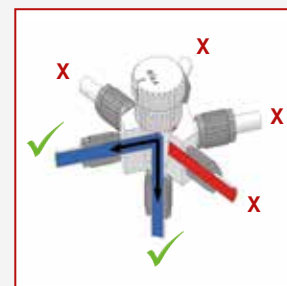
Distributor body made of PTFE with six lateral, GL-threaded connectors and one on the bottom. Conical stopcock made of PTFE with L-Bore for good sealing and knurled grip made of PP for marking and regulation of flow direction. Universal chemical resistance, the flowing product is only exposed to PTFE.

» GL-Distributor with L-shaped bore

	Bore shape Stopcock	Bore dia. mm	Supply / Drain GL-neck	For tubing O.D. mm	Outer dimensions Dia. x H mm	Cat. No.
		4	6x 14 / 1x 14	7x 8,0	84 x 80	E 661-14

Applications:

For distribution of liquids and gases. Quick and easy disconnection of flow. For dosage from one source to six recipients. Also usable as a drain valve to collect liquids from several sources in one recipient. Connection of tubing or tubes by means of BOLA Laboratory Screw Joints.





BOLA GL Stopcocks

Material: PTFE, PPS Temperature resistance: from -20°C to +200°C Chemical resistance: +++ universal Pressure: 12 bar Vacuum: suitable

FDA conform

Product description:

Two-way valve with straight bore and two connections with GL thread or three-way valve with L-shaped bore and three connections with GL thread. Ball-shaped stopcock plug for excellent tightness, free-moving stop valve. Suitable for pressure up to max. 12 bar, or for vacuum. Universal chemical resistance, the flowing product is only exposed to PTFE.

» Two-way stopcock with straight bore

	Type	Bore shape Stopcock	Bore dia. mm	Connecting thread GL	External dimensions L / D / H mm	Cat. No.:
A	2-Way		3	14	50 x 20 x 36	E 664-10
	2-Way		4	18	80 x 44 x 65	E 664-20
	2-Way		8	25	90 x 50 x 68	E 664-30
	2-Way		12	32	100 x 50 x 74	E 664-40

» Three-way stopcock with L-shaped bore

	Type	Bore shape Stopcock	Bore dia. mm	Connecting thread GL	External dimensions L / D / H mm	Cat. No.:
B	3-Way		3	14	50 x 20 x 52	E 667-10
	3-Way		4	18	80 x 40 x 90	E 667-20
	3-Way		8	25	90 x 50 x 98	E 667-30
	3-Way		12	32	100 x 50 x 106	E 667-40

Applications:

For distributing liquids or gases. Quick and easy disconnection of flow. Connection of tubing or tubes by means of BOLA Laboratory Screw Joints.

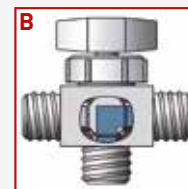
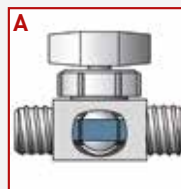


#SUITABLE PAGE 90
Laboratory screw joints

A



B



BOLA Pressure-Relief Valves with Manual Ventilation

Material: PTFE, PPS Temperature resistance: from -20°C to +250°C Chemical resistance: +++ universal Pressure: 10 bar

FDA conform

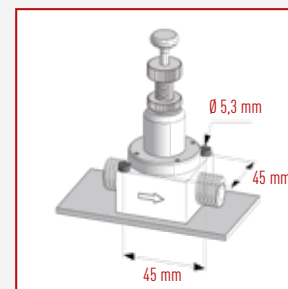
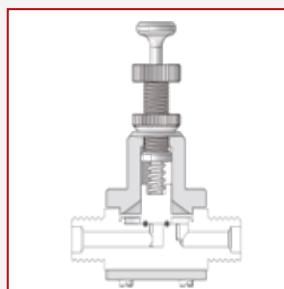
Product description:

Body made of PTFE with two connections with GL 18 thread, valve made of PPS with toggle for manual ventilation by pulling and adjusting screw with counternut for adjusting and fixing of requested pressure in a range between 0,1 and 10 bar (factory setting 1,5 bar). Universal chemical resistance, the flowing product is only exposed to PTFE.

Connecting thread GL	Bore dia. mm	External dimensions L x D x H mm	Cat. No.:
18	6	88 x 54 x 116	E 683-18

Applications:

Pressure control valve with adjustable opening pressure. For preventing pressure drop during filling.



BOLA GL Control Valves

Material: PTFE, PPS Temperature resistance: from -20°C to +250°C Chemical resistance: +++ universal Pressure: 6 bar

FDA conform

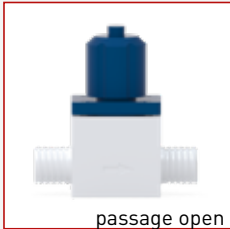
Product description:

Two-way valve with straight bore and two connections with GL thread completely made of PTFE. Motionless sealing without wearing parts due to integrated bellow. For best possible tightness even with considerable thermal fluctuations, the conical nipple of the bellow is prestressed by means of a spring. The valve can be opened and closed by turning the adjusting nut; a nipple on the top indicates the angle of opening. Suitable for pressure up to max. 6 bar, suitable for vacuum. Universal chemical resistance, the flowing product is only exposed to PTFE.

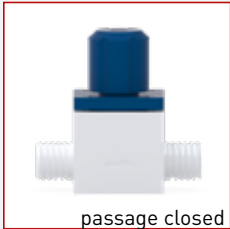
Connecting thread GL	Bore dia. mm	External dimensions L x D x H mm	Cat. No.:
14	4	62 x 30 x 73	E 694-14
18	6	80 x 44 x 83	E 694-18

Applications:

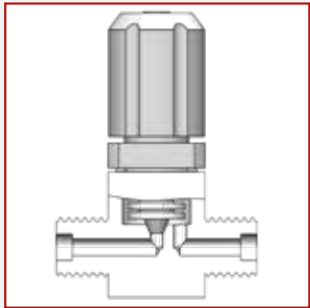
For distributing liquids or gases. Manual regulation for constant flow. Connection of tubing or tubes by means of BOLA Laboratory Screw Joints.



passage open



passage closed



#SUITABLE PAGE 90
Laboratory screw joints



BOLA Hose Connectors (with Nut)

Material: **PFA, PPS** Temperature resistance: **from -20°C to +200°C** Chemical resistance: **+++ universal** Vacuum: **suitable**



FDA conform

Product description:

GL 14 and GL 18 hose connectors made of PFA, GL 25 and GL 32 hose connectors made of PTFE. With elastic sealing lip, FKM o-ring and nut made of PPS. Available as straight or bent type. Universal chemical resistance, for working temperatures up to max. +200°C. The flowing product is only exposed to PFA or PTFE.

» Straight type

	Thread GL	O.D. of hose connector mm	I.D. of hose connector mm	Length with nut mm	Cat. No.:
A	14	8,7	6,0	45	D 581-02
	18	10,4	7,0	51	D 581-04
	25	16,0	10,0	68	D 581-06
	32	21,0	16,0	80	D 581-08

» Bent type

	Thread GL	O.D. of hose connector mm	I.D. of hose connector mm	Length with nut mm	Cat. No.:
B	14	8,7	6,0	49	D 582-02
	18	10,4	7,0	65	D 582-04

Applications:

For connecting elastic tubing to GL-threaded equipment.

A



B



BOLA INNOVATION



#1 Hose Connectors with Sealing Lip

BOLA Hose Connectors are provided with an O-ring which is protected by a sealing lip. This O-ring can compensate unevenness on the top of the thread. The liquid is only in contact with the sealing lip.



Spare Parts for Hose Connectors (PFA)

Description	Material	Packing Unit	for Thread	suitable for Cat.No.:	Cat. No.:	
Replacement Hose Connectors Straight type	PFA	1 piece	GL 14	D 581-02	D 568-14	
			GL 18	D 581-04	D 568-18	
			GL 25	D 581-06	D 568-25	
			GL 32	D 581-08	D 568-32	
Replacement Hose Connectors Bent type	PFA	1 piece	GL 14	D 582-02	D 569-14	
			GL 18	D 582-04	D 569-18	
Replacement Screw Caps	PPS	1 piece	GL 14	D 581-02 / D 582-02	H 995-14	
			GL 18	D 581-04 / D 582-04	H 995-18	
			GL 25	D 581-06	C 425-90	
			GL 32	D 581-08	C 425-92	

BOLA Hose Connectors (with Nut)

Material: **PP** Temperature resistance: **from 0°C to +110°C** Chemical resistance: **++ very good** Vacuum: **suitable**

FDA conform

Product description:

Hose connectors made of PP, with elastic sealing lip, FKM o-ring and nut made of PBTP. Available as straight or bent type. Restricted chemical resistance, for working temperatures up to max. +110°C. The flowing product is only exposed to PP.

» Straight type

	Thread GL	O.D. of hose connector mm	I.D. of hose connector mm	Length with nut mm	Cat. No.:
A	14	8,8	6,0	46	D 585-14
	18	10,8	7,0	52	D 585-18
	25	16,0	10,0	68	D 585-25

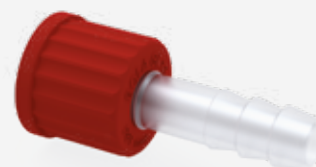
» Bent type

	Thread GL	O.D. of hose connector mm	I.D. of hose connector mm	Length with nut mm	Cat. No.:
B	14	8,8	6,0	51	D 586-14
	18	10,8	7,0	66	D 586-18

Applications:

For connecting elastic tubing to GL-threaded equipment.

A



B



Spare Parts for Hose Connectors (PP)

Description	Material	Packing Unit	for Thread	suitable for Cat.No.:	Cat. No.:	
Replacement Hose Connectors Straight type	PP	1 piece	GL 14	D 585-14	D 583-14	
			GL 18	D 585-18	D 583-18	
			GL 25	D 585-25	D 583-25	
Replacement Hose Connectors Bent type	PP	1 piece	GL 14	D 586-14	D 584-14	
			GL 18	D 586-18	D 584-18	
Replacement Screw Caps	PBTP	1 piece	GL 14	D 585-14 / D 586-14	H 984-01	
			GL 18	D 585-18 / D 586-18	H 984-18	



SPECIAL REQUIREMENTS? CUSTOMIZED!



You are looking for something very special? Something that even our huge portfolio of sophisticated lab solutions does not cover?

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For this, we just need a drawing (a rough sketch is sufficient) and some information.

Checklist for your customised product:

- » What is the article name?
- » In which application should the article be used?
- » What dimensions should the article have?
- » Are there any specific material specifications?
- » In which temperature range should the article be used?
- » What chemical stresses is the article exposed to?
- » In which quantities is the article required?
- » What cost per piece should the article not exceed?

You have a special request?
Call us on: **+49 (0) 93 46-92 86-0**

Or just send us a drawing (a rough sketch is sufficient) and some information to **info@bola.de**. We will then contact you to discuss further details and establish an offer for you free of charge.

Static charging and handling of highly inflammable liquids and gases in combination carry a significant risk potential. BOLA offers an extensive assortment of components made of static dissipative plastics with a high thermal and chemical resistance to prevent static charging.





COMPONENTS FOR EX-PROTECTION

146 GL Screw Joints Ex

Laboratory Screw Joints EX	146
Replacement Inner Parts EX	146
Replacement Caps EX	147
GL Tube Fittings EX	147
GL Tube Fittings T EX	147
GL Tube Fittings Elbow EX	149
GL Tube Fittings Cross EX	149
GL Stopcocks EX	150
Multiple Distributors for Bottles EX	151
Multiple Distributors for Barrels EX	151
Distributors for Canisters EX	152
Screw Caps with Aperture EX	152
GL Reductions EX	153
Hose Connectors EX (with nut)	153

154 Tubing EX

Flexible Tubing EX	154
Antistatic Explosion-Proof Tubing	155
Zebra Explosion-Proof Tubing	156
PTFE Explosion-Proof Tube Reels	157

158 Propeller Stirrer Shafts EX

Propeller Stirrer Shafts EX	158
Moon-Shaped Stirrer Shafts EX	158

159 Temperature Probes EX

Double Temperature Probes Lemo® Kompakt EX	159
Temperature Probes PT 100 Lemo® Compact EX	159

163 Reactor Lids EX

Reactor Lids DN 60 EX	163
Reactor Lids DN 100 EX	163
Screw-in Connectors EX with Ground Joint	164
Screw-in Connectors GL EX	164
Screw-in Stoppers EX	164
Stirrer Bearings EX	165



BOLA Screw Joints / Components for Ex-Protection – what you should know about.

+ No twirls thanks to 360°C clearance of distributor bodies

+ Universal connecting possibilities thanks to GL connectors

+ Integrated seal ensures perfect sealing

+ All components electrically conductive up to 10^6 Ohm

+ Practical cap geometry for a good grip

+ High temperature resistance up to 260°C





Screw Joints / Components for Ex-Protection

A safe protection against electrostatic charging



How does electrostatic charging occur?

Electrostatic charging occurs if the charge particles from surfaces made of insulating materials interchange with the charge particles of surfaces made of conductive materials. If the two surfaces are quickly separated after such a charge exchange the transferred charging cannot flow back to its original source especially with insulating materials. On the one side this leads to an excess charge whereas on the other side it leads to a lack of electrostatic charging. This generates an electrical voltage.

Once the voltage is high enough it will discharge when it gets in contact with a conductive surface. This generates a spark which can ignite solvent vapours or highly combustible liquids.

A separation as described above can happen during decanting of large packages as well as during transportation of products in hose pipes or operation of a stirrer shaft in a stirrer bearing.

How can electrostatic charging be prevented?

Electrostatic charging and the related hazards can be dissipated by means of a connection with earth. Therefore the pipes, components and packages have to be made of static dissipative materials to prevent an electrostatic charging.

What is the advantage of BOLA Ex-Protection Components?

All Ex-Protection Components of BOLA are made of static dissipative PTFE-EX, PFA-EX or PPS-EX. Due to the addition of conductive pigments, e.g. carbon black or electrographitised carbon the technically insulating plastics become conductive as well. At the same time the good chemical and thermal resistance of PTFE are conserved.

In the delivery state all products from BOLA made of PTFE-EX, PFA-EX or PPS-EX have a surface resistance of 10^6 Ohm or better.

In individual cases the added conductive pigments can be damaged by strongly oxidizing products (H_2O_2 , ozone, acids such as azotic acid, lyes, halogens). Thus the conductive pigments can be dissolved and the components lose their discharge capability. An indication is also the bleaching of the black colour of the EX-Protection components. In extreme cases of a complete oxidation, PTFE e.g. can superficially take the colour grey or white again. In these cases we recommend the renewal of the component to guarantee a safe operation.

PTFE-EX, PFA-EX as well as PPS-EX are inherently flame-retardant and self-extinguishing. The oxygen index (LOI-value) stands for the oxygen content in the ambient atmosphere in which material continues burning after ignition without additional energy source. The oxygen index of PTFE-EX and PFA-EX is approx. 95 %, the oxygen index of PPS-EX is approx. 50 %. This means all materials do not burn under normal conditions since the oxygen content of the air is approx. 21 %.

The materials are dyed black and therefore UV-resistant. Consequently they can be used for products which react to UV rays.

How is earthing made?

Connection to earth is made by connecting a cable clamp or a ground clip to a provided earthing bore. The earthing of the complete system has to be executed professionally and in compliance to the according instructions.

How can I identify BOLA Ex-Protection Components?

All BOLA EX-Protection Components made of PTFE-EX can be identified by their black colour. Screw Caps made of PPS-EX are inscribed accordingly. In case of ambiguities, an attrition test can help. The component is rubbed slightly on a white piece of paper. A colouration indicates that the component has conductive particles. Only the measuring of the surface resistance respectively of the specific contact resistance absolutely proves whether the items are made of static dissipative material.

BOLA **Laboratory Screw Joints EX**

Material:	Temperature resistance:	Chemical resistance:	Pressure:	Vacuum:	Conductivity:
PTFE-, PPS-EX	from -200°C to +250°C	++ very good	10 bar	suitable	10 ⁶ Ohm

Product description:

Screw cap made of conductive black PPS-EX reinforced with glass fibres, inner parts made of conductive PTFE-EX

For tubing O.D. mm	Thread GL		Cat. No.:
4	14		D 840-66
6	14		D 840-74
4	18		D 841-46
6	18		D 841-54
8	18		D 841-62
10	18		D 841-74
8	25		D 842-62
10	25		D 842-74
12	25		D 842-80
14	25		D 842-90

Applications:

Connecting equipment and fittings with GL threads with hard-walled tubing or tubes made of glass, plastic or metal. Fixing probes, thermometers, dip tubes or cables in reaction vessels.



#HELPFUL PAGE 85

Detailed information on the assembly and function of BOLA Laboratory Screw Joints.

BOLA **Replacement Inner Parts EX**

Material:	Temperature resistance:	Chemical resistance:	Pressure:	Vacuum:	Conductivity:
PTFE-EX	from -200°C to +250°C	++ very good	10 bar	suitable	10 ⁶ Ohm

Product description:

Made of conductive PTFE-EX.

For tubing O.D. mm	Thread GL		Cat. No.:
4	14		D 848-66
6	14		D 848-74
4	18		D 849-46
6	18		D 849-54
8	18		D 849-62
10	18		D 849-74
8	25		D 850-62
10	25		D 850-74
12	25		D 850-80
14	25		D 850-90





BOLA Replacement Caps EX

Material: PPS-EX	Temperature resistance: from -20°C to +250°C	Chemical resistance: ++ very good	Conductivity: 10⁶ Ohm
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Product description:

Black screw cap made of glass-fibre PPS-EX, with handy knurl and hexagon.

Thread GL	From tubing O.D. to tubing O.D. mm		Cat. No.:
14	0,8 - 6,0		D 846-10
18	0,8 - 10,0		D 846-20
25	0,8 - 10,0		D 846-30
25	0,8 - 14,0		D 846-34



BOLA GL Tube Fittings EX

Material: PTFE-EX	Temperature resistance: from -200°C to +250°C	Chemical resistance: ++ very good	Pressure: 10 bar	Vacuum: suitable	Conductivity: 10⁶ Ohm
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Product description:

Straight tube fitting made of PTFE-EX, two connections with GL thread. Connection of tubing or tube with BOLA Laboratory Screw Joints EX.

Thread GL	Bore dia. mm	Length without screw joint mm	Wrench size hexagon mm	Cat. No.:
14	6,5	50	15	D 856-14
18	10,5	50	19	D 856-18
25	14,5	56	27	D 856-25

Applications:

For distributing liquids or gases. As reduction for connecting different diameters of tubes or tubing.



BOLA GL Tube Fittings T EX

Material: PTFE-EX	Temperature resistance: from -200°C to +250°C	Chemical resistance: ++ very good	Pressure: 10 bar	Vacuum: suitable	Conductivity: 10⁶ Ohm
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Product description:

Tube fitting T-shaped made of PTFE-EX, three connections with GL thread. Connection of tubing or tube with BOLA Laboratory Screw Joints EX.

Thread GL	Bore dia. mm	Length without screw joint mm	Wrench size square mm	Cat. No.:
14	6,5	50	20	D 857-14
18	10,5	56	20	D 857-18
25	14,5	70	27	D 857-25

Applications:

For distributing liquids or gases. As reduction for connecting different diameters of tubes or tubing.



➤➤ **BOLA Tube Fittings EX**
are electro conductive and
chemically inert at the
same time. They can be
used with inflammable
liquids or gas in explosive
areas.





BOLA GL Tube Fittings Elbow EX

Material: PTFE-EX	Temperature resistance: from -200°C to +250°C	Chemical resistance: ++ very good	Pressure: 10 bar	Vacuum: suitable	Conductivity: 10⁶ Ohm
-----------------------------	---	---	----------------------------	----------------------------	--

Product description:

Tube fitting elbow-shaped made of PTFE-EX, two connections with GL thread. Connection of tubing or tube with BOLA Laboratory Screw Joints EX.

Thread GL	Bore dia. mm	Length without screw joint mm	Wrench size square mm	Cat. No.:
14	6,5	37	20	D 858-14
18	10,5	39	20	D 858-18
25	14,5	51	27	D 858-25

Applications:

For distributing liquids or gases. As reduction for connecting different diameters of tubes or tubing.



BOLA GL Tube Fittings Cross EX

Material: PTFE-EX	Temperature resistance: from -200°C to +250°C	Chemical resistance: ++ very good	Pressure: 10 bar	Vacuum: suitable	Conductivity: 10⁶ Ohm
-----------------------------	---	---	----------------------------	----------------------------	--

Product description:

Tube fitting cross-shaped made of PTFE-EX, four connections with GL thread. Connection of tubing or tube with BOLA Laboratory Screw Joints EX.

Thread GL	Bore dia. mm	Length without screw joint mm	Wrench size square mm	Cat. No.:
14	6,5	54	20	D 859-14
18	10,5	56	20	D 859-18
25	14,5	70	27	D 859-25

Applications:

For distributing liquids or gases. As reduction for connecting different diameters of tubes or tubing.






BOLA **GL Stopcocks EX**

Material:	Temperature resistance:	Chemical resistance:	Pressure:	Vacuum:	Conductivity:
PTFE-EX, PP	from 0°C to +110°C	++ very good	6 bar	suitable	10 ⁶ Ohm




Product description:

Two-way stopcock made of conductive PTFE-EX with straight bore and two connections with GL thread or three-way stopcock with L-shaped or T-shaped bore and three connections with GL thread. Cylindrical stopcock plug made of conductive PTFE-EX for good tightness, stop valve with mark of flow direction. Grip made of red PP. Suitable for pressure up to max. 6 bar, suitable for vacuum. Connection of tubing or tube with BOLA Laboratory Screw Joints EX..




» GL thread with straight bore

A	Type	Bore shape	Bore dia. mm	Connecting thread GL	External dimensions L / D / H mm	Cat. No.:
	2-Way		4	14	54 x 20 x 38	E 712-14
	2-Way		6	18	64 x 30 x 45	E 712-18
	2-Way		8	25	78 x 40 x 57	E 712-25

» GL thread with L-shaped

B	Type	Bore shape	Bore dia. mm	Connecting thread GL	External dimensions L / D / H mm	Cat. No.:
	3-Way		4	14	64 x 47 x 43	E 714-14
	3-Way		6	18	74 x 57 x 57	E 714-18
	3-Way		6	25	78 x 59 x 57	E 714-25

» GL thread with T-shaped bore

C	Type	Bore shape	Bore dia. mm	Connecting thread GL	External dimensions L / D / H mm	Cat. No.:
	3-Way		4	14	74 x 57 x 57	E 716-14
	3-Way		4	18	74 x 57 x 57	E 716-18
	3-Way		6	25	88 x 69 x 57	E 716-25

Applications:

For distributing liquids or gases. Quick and easy disconnection of flow.





BOLA Multiple Distributors for Bottles EX

Material: PTFE-, PPS-EX Temperature resistance: from -20°C to +200°C Chemical resistance: ++ very good Vacuum: suitable Conductivity: 10⁶ Ohm

Product description:

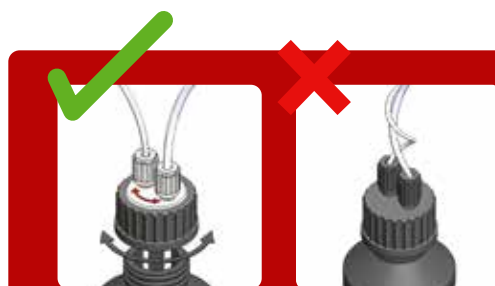
Screw cap black for thread GL 45 made of conductive PPS-EX. Distributor body made of conductive PTFE-EX with GL-threaded necks. Tubes can be inserted through the necks. Connection of tubes and tubing by means of BOLA Laboratory Screw Joints EX.

Detailed information in the product description of the identical Multiple Distributors for Bottles on page 95.

	Necks GL	For tubing O. D. mm	Cat. No.:
A	2 x 14	2 x 8,0	D 864-08
B	3 x 14	3 x 8,0	D 865-08
C	3 x 25	3 x 14,0	D 866-08

Applications:

Drawing or inserting aggressive or pure liquids. Inserting tubing, tubes and probes into jars.



The special feature: The body of the distributor can be turned independently from the screw cap. This means, that the completely assembled distributor can be removed and fixed on another bottle without the risk of disarranging the tubing.

BOLA Multiple Distributors for Barrels EX

Material: PTFE-EX Temperature resistance: from -20 °C to +200 °C Chemical resistance: ++ very good Vacuum: suitable Conductivity: 10⁶ Ohm

Product description:

Screw cap for barrels with female thread and body with GL-threaded necks made of conductive PTFE-EX. Bore with female thread M5x6 for connecting a grounding cable. GL-threaded necks for inserting tubing with a max. O.D. of 14 mm. Connection of tubing or tubes by means of BOLA Laboratory Screw Joints EX.

Detailed information in the product description of the identical Multiple Distributors for Barrels on page 113.

For female barrel thread	Necks GL	For tubing O.D. max. mm	Cat.No.
G2" / BSP2"	2x 18 / 1x 25	2x 10 / 1x 14	D 693-14
Tri-Sure 2"	2x 18 / 1x 25	2x 10 / 1x 14	D 695-14

Applications:

Drawing or inserting aggressive or pure liquids. Inserting tubing, tubes and probes into barrels. Quick and easy discharging of electrostatic charging by means of a grounding cable which can be connected to the body.



BOLA Distributors for Canisters EX

Material: PTFE-EX	Temperature resistance: from -20 °C to +200 °C	Chemical resistance: ++ very good	autoclave: 121 °C	Conductivity: 10⁶ Ohm
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Product description:

Screw cap and movable body with GL-threaded necks made of conductive PTFE EX. Without earthing connection. Earthing is made via a conductive canister. Connection of tubing made by BOLA Laboratory Screw Joints EX.

Detailed information in the product description of the identical Multiple Distributors for Barrels on page 111.

Canister Thread	Necks GL	For tubing O.D. max. mm	Cat. No.
55	2x 14 / 1x 18	2x 8 / 1x 10	D 772-08
60	3 x 18	3x 10	D 772-20
65	3 x 18	3x 10	D 772-32

Applications:

Drawing or inserting aggressive or pure liquids. Inserting tubing, tubes and probes into canisters.



BOLA Screw Caps with Aperture EX

Material: PPS-EX	Temperature resistance: from -20 °C to +250 °C	Chemical resistance: ++ very good	Conductivity: 10⁶ Ohm
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Product description:

Screw cap with handy knurl, suitable for GL threads, with aperture, made of conductive PPS-EX.

For thread GL	Bore dia. mm	Cat. No.:
14	9,2	D 898-14
18	11,0	D 898-18
25	15,0	D 898-25
45	34,0	D 898-45





BOLA GL Reductions EX

Material: **PTFE-, PPS-EX** Temperature resistance: **from -20 °C to +250 °C** Chemical resistance: **++ very good** Conductivity: **10⁶ Ohm**

Product description:

Black screw cap made of PPS-EX, movable reduction body made of PTFE-EX with o-ring made of FKM for transition to GL threads. The body can be moved independently from the screw cap so that the completely assembled reduction can be removed and fixed on another vessel without the risk of disarranging the tubing or cable. The product is only exposed to PTFE-EX.

From screw cap GL	to thread GL	max. tubing O.D. mm	Cat. No.:
25	14	0,8 - 10,0	D 872-10
25	18	1,6 - 10,0	D 872-15
45	14	0,8 - 8,0	D 872-20
45	18	1,6 - 10,0	D 872-25

Applications:

For connecting or inserting tubing, tubes or probes. Static charges can be dissipated through earthing the connected components.



BOLA Hose Connectors EX (with Nut)

Material: **PTFE-, PPS-EX** Temperature resistance: **from -20 °C to +200 °C** Chemical resistance: **++ very good** Conductivity: **10⁶ Ohm**

Product description:

Hose connectors made of PTFE-EX. With elastic sealing lip, FKM o-ring, and nut made of PPS-EX with GL thread. Available as straight type. The medium is only exposed to PTFE-EX.

Thread GL	O. D. of Hose Connector mm	I. D. of Hose Connector mm	Length with nut mm	Cat. No.
14	8,7	6,0	45	D 874-02
18	10,4	7,0	51	D 874-04
25	16,0	10,0	68	D 874-06

Applications:

For connecting elastic tubing to GL-threaded equipment. Static charges can be dissipated through earthing the connected components.



BOLA Flexible Tubing EX

Material:	Temperature resistance:	Chemical resistance:	Conductivity:
PFA-EX	from -200°C to +260°C	+++ universal	10 ⁶ Ohm

Product description:

Static dissipative, corrugated tubing with nominal width 10 and with circular corrugations around the longitudinal axis. Cylindrical tubing ends with a length of 40 mm can for example be connected directly to fittings, stopcocks or hose connectors. Together with BOLA Laboratory Screw Joints EX, the connection is static dissipative, absolutely tight and suitable for vacuum.

I.D.	Tubing end O.D.	Bending radius ¹ mm	Burst pressure ² bar	Cat.No.: Length 0,5 m	Cat.No.: Length 1,0 m	Cat.No.: Length 2,5 m
4	6	18	11	S 1824-24	S 1824-54	S 1824-74
6	8	18	11	S 1824-27	S 1824-57	S 1824-77
8	10	18	11	S 1824-30	S 1824-60	S 1824-80
10	12	18	11	S 1824-33	S 1824-63	S 1824-83
12	14	18	11	S 1824-35	S 1824-65	S 1824-85

- Product advantages:
- » flexible to highly flexible
 - » tight bending radius only causes little cross-section reduction
 - » non-porous

- Applications:
- » antistatic applications
 - » in explosive ambiance (explosion protection)
 - » for easy handling of liquids and gases
 - » for transport of solvents or alcohols
 - » ideal for connections under vibrations
 - » usable with a small bending radius
 - » for compensation of thermal expansions



#SUITABLE PAGE 146
Conductive fittings and stopcocks
made of PTFE-EX

BOLA PRACTICAL TIP
Easy tubing assembly

Before assembling the tubing on a hose connector, heat it in an oven or with a hot air gun to approx. 60°C. All BOLA products can be heated for easier assembly or disassembly.



¹ Bending radius: minimum bending radius in mm at a room temperature of 23°C

² Burst pressure: computed value in bar at a room temperature of 23°C. It is recommended to restrict the maximum working pressure to 25% of the burst pressure. For higher temperatures, this value has to be multiplied by the reduction factor shown on page 359. It is the user's responsibility to check if the used tubing fulfils the respective requirements.



BOLA Antistatic Explosion-Proof Tubing EX

Material:
PTFE-EX

Temperature resistance:
from -200°C to +250°C

Chemical resistance:
+++ universal

Conductivity:
10⁶ Ohm



FDA conform

Product description:

Very good electric conductivity due to a special "antistatic compound" made of pure PTFE and finest, highly pure carbon dust (less than 2,5%). Colour: black

I.D. mm	O.D. mm	Wall thickness mm	Bending radius ¹ mm	Burst pressure ² bar	Cat. No.:
(1/32") 0,8	(1/16") 1,6	0,4	7	140	S 1827-10
(1/16") 1,6	(1/8") 3,2	0,8	13	140	S 1827-26
2,0	3,0	0,5	18	70	S 1827-30
2,0	4,0	1,0	16	140	S 1827-32
3,0	4,0	0,5	32	46	S 1827-34
4,0	6,0	1,0	36	70	S 1827-40
(11/64") 4,35	(1/4") 6,35	1,0	40	64	S 1827-42
6,0	8,0	1,0	64	46	S 1827-50
8,0	10,0	1,0	100	35	S 1827-60
10,0	12,0	1,0	144	28	S 1827-64
12,0	14,0	1,0	196	23	S 1827-68
14,0	16,0	1,0	256	20	S 1827-74

Product advantages:

- » extensive chemical resistance due to PTFE parts
- » resistance of less than 10⁶ Ohm according to EN 12115 directive
- » ideal for light-sensitive substances

Applications:

- » antistatic applications
- » in explosive ambience (explosion protection)
- » for transport of solvents or alcohols



BOLA INFORMATIVE



#1 Antistatic Explosion-Proof Tubing made of PTFE-EX are matching the sizes of the BOLA Screw Joint System.

Nominal outer diameter:

from Ø 1,6 mm to Ø 3,2 mm

from Ø 3,3 mm to Ø 6,35mm

from Ø 8,0 mm to Ø 14,0 mm

at Ø 16,0 mm

» tolerance outer diameter: +/-0,10 mm

» tolerance outer diameter: +/-0,25 mm

» tolerance outer diameter: +/-0,30 mm

» tolerance outer diameter: +/-0,40 mm

¹ Bending radius: minimum bending radius in mm at a room temperature of 23°C

² Burst pressure: computed value in bar at a room temperature of 23°C. It is recommended to restrict the maximum working pressure to 25% of the burst pressure. For higher temperatures, this value has to be multiplied by the reduction factor shown on page 359. It is the user's responsibility to check if the used tubing fulfils the respective requirements.

BOLA **Zebra Explosion-Proof Tubing EX**Material:
PFA-EXTemperature resistance:
from -200°C to +260°CChemical resistance:
+++ universalConductivity:
10⁶ Ohm**FDA conform****Product description:**

Transparent PFA tubing with black longitudinal conductive stripes on the outer surface.
The tubing is absolutely round and can be connected to all common fittings.

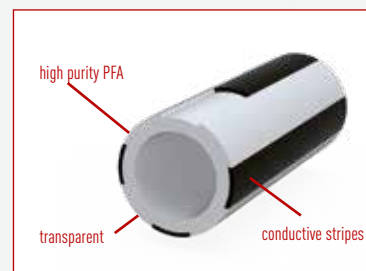
I.D. mm	O.D. mm	Wall thickness mm	Bending radius ¹ mm	Burst pressure ² bar	Cat. No.:
2,0	3,0	0,5	15	57	S 1855-30
4,0	6,0	1,0	25	57	S 1855-40
6,0	8,0	1,0	50	41	S 1855-50
8,0	10,0	1,0	80	32	S 1855-60
10,0	12,0	1,0	130	27	S 1855-64

Product advantages:

- » the flowing product is only exposed to PFA
- » no chemical restrictions due to the outer conducting stripes
- » resistance less than 10⁶ Ohm
- » smooth, non-porous interior surface
- » clear visibility of the flowing product
- » no corrosion unlike metal lines or metal meshes
- » almost universal chemical resistance

Applications:

- » antistatic applications
- » in explosive ambience (explosion protection)
- » for transport of highly flammable solvents or alcohols
- » for transport of highly pure chemicals and gases

**BOLA INNOVATION****#1 Zebra Tubing**

Especially made for antistatic applications: Transparent tubing made of PFA with black longitudinal conductive stripes on the outer surface.
Provides high chemical resistance and can be used in explosive ambience.

¹ Bending radius: minimum bending radius in mm at a room temperature of 23°C

² Burst pressure: computed value in bar at a room temperature of 23°C. It is recommended to restrict the maximum working pressure to 25% of the burst pressure. For higher temperatures, this value has to be multiplied by the reduction factor shown on page 359. It is the user's responsibility to check if the used tubing fulfils the respective requirements.



BOLA PTFE Explosion-Proof Tube Reels EX

Material: PTFE-EX Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal Conductivity: 10⁶ Ohm


NEW
FDA conform

Product description:

Very good electric conductivity due to a special "antistatic compound" made of pure PTFE and finest, highly pure carbon dust (less than 2,5%). Colour: black

Reel length mm	I.D. mm	O.D. mm	Wall thickness mm	Bending radius ¹ mm	Burst pressure ² bar	Cat. No.:
5	2,0	4,0	1,00	16	140	\$ 2040-32
5	4,0	6,0	1,00	36	70	\$ 2040-40
5	6,0	8,0	1,00	64	46	\$ 2040-50
5	8,0	10,0	1,00	100	35	\$ 2040-60
5	10,0	12,0	1,00	144	28	\$ 2040-64



#SUITABLE PAGE 155

You need BOLA tubing in longer length in one piece?
No problem! You can also get our fluoroplastic tubes
by the metre.

BOLA INFORMATIVE



#1 Antistatic Explosion-Proof Tubing made of PTFE-EX are matching the sizes of the BOLA Screw Joint System.

Nominal outer diameter:

from Ø 1,6 mm to Ø 3,2 mm

from Ø 3,3 mm to Ø 6,35mm

from Ø 8,0 mm to Ø 14,0 mm

at Ø 16,0 mm

» tolerance outer diameter: +/-0,10 mm

» tolerance outer diameter: +/-0,25 mm

» tolerance outer diameter: +/-0,30 mm

» tolerance outer diameter: +/-0,40 mm

¹ Bending radius: minimum bending radius in mm at a room temperature of 23°C

² Burst pressure: computed value in bar at a room temperature of 23°C. It is recommended to restrict the maximum working pressure to 25% of the burst pressure. For higher temperatures, this value has to be multiplied by the reduction factor shown on page 359. It is the user's responsibility to check if the used tubing fulfils the respective requirements.

BOLA **Propeller Stirrer Shafts EX**

Material:	Temperature resistance:	Chemical resistance:	Conductivity:
PTFE-EX	from -200 °C to +250 °C	++ very good	10 ⁶ Ohm

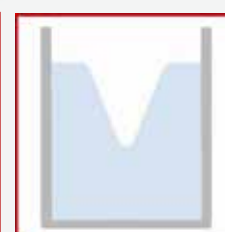
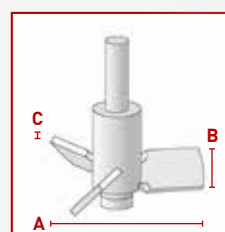
Product description:

PTFE-EX jacketed stainless steel shaft, propeller completely made of static dissipative PTFE-EX with three 45° angled angular blades. Good chemical resistance, the product is only exposed to PTFE-EX.

Length mm	Shaft dia. mm	Chucking dia. mm	Dimensions according to drawing			Cat. No.:
			A	B	C	
350	8	6,5	75	18	3,0	C 278-12

Applications:

The product is sucked bottom-up, good axial flow with low shear force. Earthing is made for example via a stirrer bearing made of PTFE-EX (Cat. No. C 423-08 on page 165).

BOLA **Moon-Shaped Stirrer Shafts EX**

Material:	Temperature resistance:	Chemical resistance:	Conductivity:
PTFE-EX	from -200 °C to +250 °C	++ very good	10 ⁶ Ohm

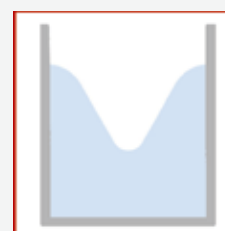
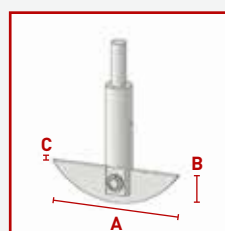
Product description:

PTFE-EX jacketed stainless steel shaft, tilting half-moon stirrer blade with double-sided groove and access for stirrer shaft completely made of static dissipative PTFE-EX. Good chemical resistance, the product is only exposed to PTFE-EX

Length mm	Shaft dia. mm	Chucking dia. mm	For ground joint NS	Dimensions acc. to drawing			Cat.No.:
				A	B	C	
450	10	8,0	29/32	90	24	3,0	C 276-14

Applications:

Tangential flow with little turbulence. The tilting half-moon blade is ideal for stirring in round-bottom flasks with ground-joint necks. Earthing is made for example via a stirrer bearing made of PTFE-EX (Cat. No. C 423-.. on page 165).





BOLA Double Temperature Probes PT 100 Lemo® Compact EX

Material: PTFE-EX	Temperature resistance: from -200°C to +250°C	Temperature range from -50°C to +250°C	Chemical resistance: ++ very good	Conductivity: 10 ⁶ Ohm
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Product description:

Two independent sensors PT 100 in a stainless steel tube (1.4571) encapsulated with static dissipative PTFE-EX. Collar ring Ø 12mm, bore dia. 5 mm for earthing connection. The electric circuits are locally separated complying with European Standard EN 61010-2-010:2013. Connection by two couplings (type Lemo®, socket size 1, 4-wire-system) fixed directly at the end of the probe.

Typical response times:

- » T 50: 20 - 24 s
- » T 90: 30 s

See page 352 for detailed explanation.

Usable length mm	Probe dia. mm	Total length mm	Number of sensors	Width of coupling mm approx.	Cat. No.:
300	8	400	2 x PT 100	27	P 1744-20
400	8	400	2 x PT 100	27	P 1744-23
500	8	400	2 x PT 100	27	P 1744-30

Applications:

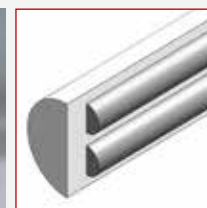
- » avoiding of electric charging
- » parallel temperature measurement in aggressive liquids
- » double safety due to redundant systems
- » control function due to two independent sensors
- » Suitable for simultaneous temperature measurement and safety circuit as per the specifications of the standard DIN EN 61010-2-010 but only one NS/GL socket will be occupied, separately switched sensors.
- » ideal for built-in measurement cables



probe tip



socket



BOLA Temperature Probes PT 100 Lemo® Compact EX

Material: PTFE-EX	Temperature resistance: from -200 °C to +250 °C	Temperature range from -50 °C to +250 °C	Chemical resistance: ++ very good	Conductivity 10 ⁶ Ohm
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Product description:

One measuring sensor PT 100 in a stainless steel tube (1.4571) encapsulated with static dissipative PTFE-EX. Temperature probe Ø 8 mm, tip Ø 6 mm, collar ring Ø 12 mm. Electrostatic charges can be discharged by a grounding clamp (not included in the scope of delivery). Connection by a coupling (type Lemo®, socket size 1, 4-wire-system) fixed directly at the end of the probe.

Typical response times:

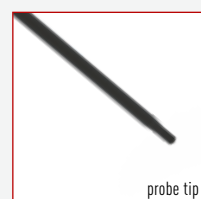
- » T 50: 20 - 24 s
- » T 90: 30 s

See page 352 for detailed explanation.

Usable length mm	Total length mm	Connector	Cat. No.:
200	270	socket, 4-wire-system	P 1734-10
300	370	socket, 4-wire-system	P 1734-15
400	470	socket, 4-wire-system	P 1734-20
500	570	socket, 4-wire-system	P 1734-25

Applications:

- » Avoiding electrostatic charging
- » temperature measurement in aggressive liquids
- » ideal for built-in measurement cables



probe tip



socket

BOLA Modular System for Reactor Lids EX – what you should know about



For a short-term realisation of projects in Mini plant installations or in the production of small quantities in chemical and pharmaceutical industry and research, special components are required that help to start up existing reactors flexibly. The components should have a very good chemical resistance, a permanent durability and should be easily cleanable at the same time.

All these requirements are met by the BOLA Modular System for Reactor Lids EX adapted for standard glass reactors with flat flange from SCHOTT® for sizes DN 60 and DN 100.

The Modular System consists of Reactor Lids with different screw-in threads as well as different connections for transition to ground joint components, as stirrer bearings, for connection of probes or tubes and tubing, and stoppers, all with NPT screw-in thread.

By means of the screw-in connections, the Reactor Lid can be arranged to the requirements of your application and project. Thus, a lid can be used most versatile and economic.

All components are made of static dissipative PTFE-EX. This allows to ground the complete system by connecting an earthing cable to the bore M 5x6 on the Reactor Lid EX.

All Reactor Lids EX dispose of a centric screw-in thread NPT for connection of a stirrer bearing. The lateral necks, that even dispose of NPT screw-in threads, are arranged round the centric connector. The special clou is that the angles of lateral necks are made for an insertion of probes and tubes aside the centre in order to avoid collisions with the stirrer shaft and further inserted components.

The large choice of different inserts allows to connect existing equipment with ground joint such as Liebig condensers and dropping funnels as well as GL thread such as lead-in for sensors. The already existing equipment can be further used.





All features at a glance:

- » Easy assembly
- » Flexibly expandable
- » Compatible with glass reactors with SCHOTT®-flat flange
- » Completely made of static dissipative PTFE-EX, universal chemical resistance
- » With connectors for the use of existing equipment with ground joint or GL thread
- » Also available in virgin PTFE (see page 267)



Selection and Assembly:

- » Choose a lid that fits onto the flange of your glass reactor, as well as the number of connectors needed.
- » Choose the necessary transition fittings according to NPT threads in the chosen lid.
- » Mount the transition fittings into the connectors of the reactor lid. The lid is now ready for service.
- » All fittings can be acquired separately and can be exchanged amongst each other depending on the NPT thread.
- » Ground the assembled lid by connecting an earthing cable to the bore M5x6 on the reactor lid.

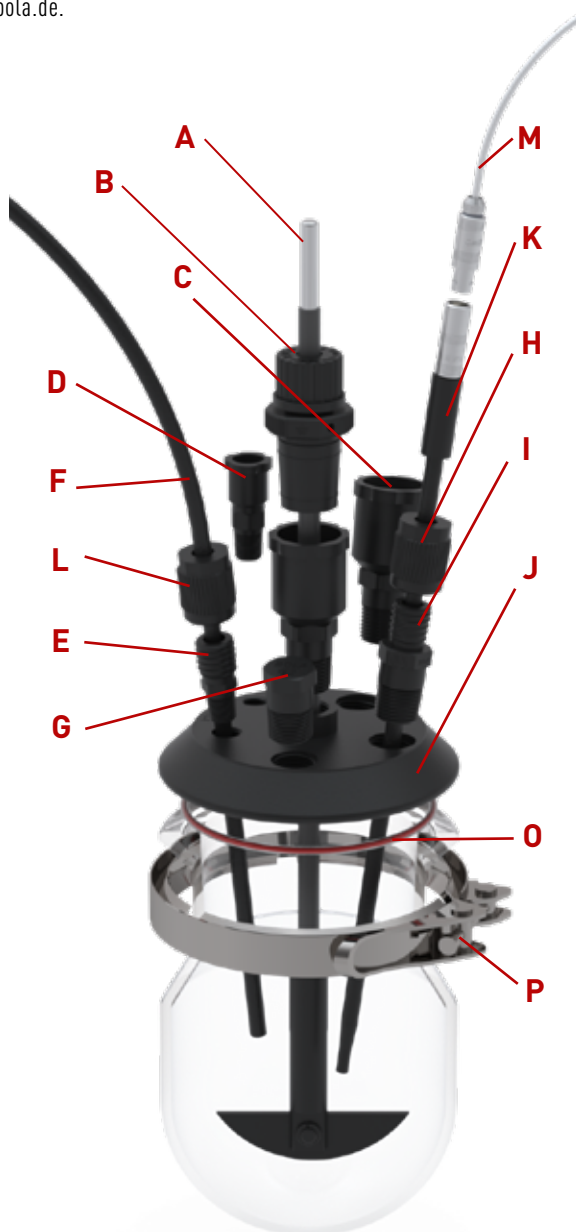


Custom Manufacture – Lid and Fitting

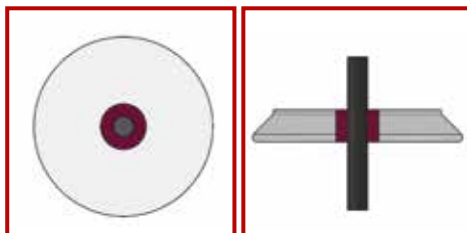
If we do not even have the correct reactor lid in our wide range, we are pleased to offer you a modified reactor lid or modified components accordingly. Just give us a call: +49 (0) 9346 9286-0 or send us a little sketch with the requested component by e-mail to info@bola.de.

Example: Reactor Lid DN 100 EX

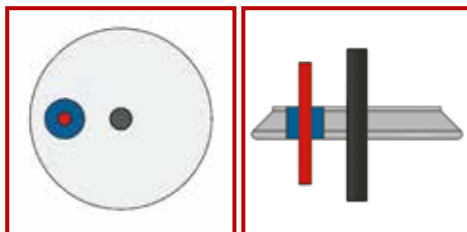
- A** Moon-shaped Stirrer Shaft EX
Cat. No.: C 276-14
see page 158
- B** Stirrer Bearing EX
Cat. No.: C 423-10
see page 165
- C** Screw-in Connector with Ground Joint EX
Cat. No.: B 174-06
see page 164
- D** Screw-in Connector with Ground Joint EX
Cat. No.: B 174-02
see page 164
- E** Screw-in Connector GL EX
Cat. No.: B 172-32
see page 164
- F** Antistatic Tubing
Cat. No.: S 1827-50
see page 130



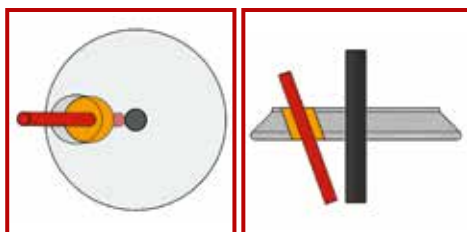
- G** Screw-in Stopper EX
Cat. No.: B 173-04
see page 164
- H** Laboratory Screw Joints EX
Cat. No.: D 841-62
see page 146
- I** Screw-in Connector EX
Cat. No.: B 172-18
see page 164
- J** Reactor Lid DN100 EX
Cat. No.: B 170-16
see page 163
- K** Temperature Probe Lemo Compact EX
Cat. No.: P 1734-20
see page 159
- L** Laboratory Screw Joint EX
Cat. No.: D 841-62
see page 146
- M** Extension Cable
Cat. No.: P 1724-38
see page 241
- O** O-Ring
Cat. No.: H 969-25
see page 270
- P** Quick Release Clamps
Cat. No.: B 277-03
see page 270

Thread connections in detail:**Centric thread connection (purple):**

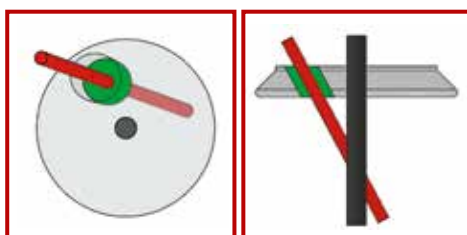
For insertion of the stirrer bearing (see page 160).

**Vertical thread connection with parallel alignment to the stirrer shaft (blue):**

Components such as probes can be led into the reactor parallel to the stirrer shaft.

**Inclined thread connection with direction straight to the stirrer shaft (yellow):**

Components such as tubes and tubing can be led directly to the stirrer shaft to achieve an optimal mixing of the medium.

**Inclined thread connection with direction aside the shaft (green):**

Collisions of long components such as temperature probes are avoided as they are led aside the stirrer shaft by means of this thread connection.



BOLA Reactor Lids DN 60 EX

Material: PTFE-EX Temperature resistance: from -200 °C to +250 °C Chemical resistance: ++ very good Conductivity: 10⁶ Ohm

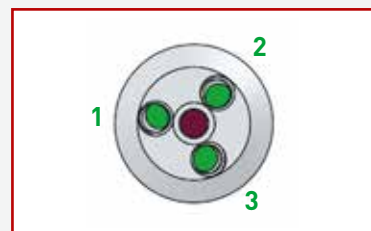
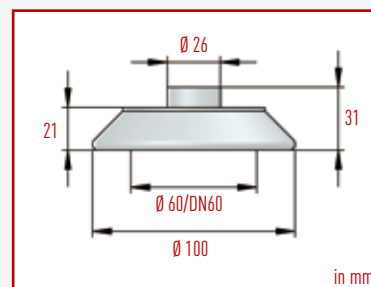
Product description:

Made of static dissipative PTFE-EX. Suitable for glass reactors DN 60 with SCHOTT flat flange. With screw-in threads for connection of transition fittings. Bore with female thread M5x6 for earthing connection on the upper side of the lid.

Connection 1	Connection 2	Connection 3	Cat. No.:
NPT 1/2"	NPT 1/2"	NPT 1/2"	B 170-04
Connection aside the shaft	Connection aside the shaft	Connection aside the shaft	

Applications:

For assembly of reactor lids using transition fittings made of static dissipative PTFE-EX from page 164 to 165.



BOLA Reactor Lids DN 100 EX

Material: PTFE-EX Temperature resistance: from -200 °C to +250 °C Chemical resistance: ++ very good Conductivity: 10⁶ Ohm

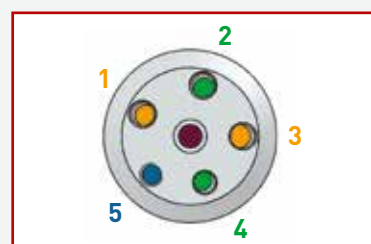
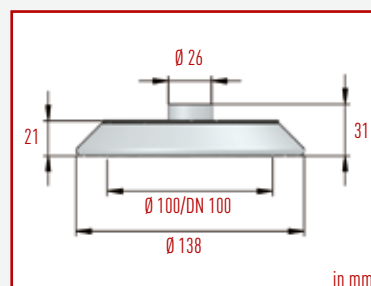
Product description:

Made of static dissipative PTFE-EX. Suitable for glass reactors DN 100 with SCHOTT flat flange. With screw-in threads for connection of transition fittings. Bore with female thread M5x6 for earthing connection on the upper side of the lid.

Connection 1	Connection 2	Connection 3	Connection 4	Connection 5	Cat. No.:
NPT 1/2"	NPT 1/2"	NPT 1/2"	NPT 1/4"	NPT 1/4"	B 170-16
Connection directly to the shaft	Connection aside the shaft	Connection directly to the shaft	Connection aside the shaft	vertical connection	

Applications:

For assembly of reactor lids using transition fittings made of static dissipative PTFE-EX from page 164 to 165.



BOLA Screw-In Connectors EX with Ground Joint

Material: PTFE-EX	Temperature resistance: from -200 °C to +250 °C	Chemical resistance: ++ very good	Conductivity: 10⁶ Ohm
-----------------------------	---	---	--

Product description:

Made of static dissipative PTFE-EX. For connection to BOLA Reactor Lids. Connection with ground socket. With hexagonal gripping surface in standard wrench size. Earthing is made via a connection on the reactor lid.

Screw-In Thread NPT (male)	Ground socket NS	Wrench Size SW	Cat. No.:
1/4"	14/23	15	B 174-02
1/2"	29/32	24	B 174-06

Applications:

For assembly on BOLA Reactor Lids made of PTFE-EX. Cat.No.: B 170-.. from page 163. For connection to BOLA Reactor Lids Cat.No. C 423-.. Connection with ground socket. With hexagonal gripping surface in standard wrench size. Earthing is made via a connection on the reactor lid.



BOLA Screw-In Connectors GL EX

Material: PTFE-EX	Temperature resistance: from -200 °C to +250 °C	Chemical resistance: ++ very good	Conductivity: 10⁶ Ohm
-----------------------------	---	---	--

Product description:

Made of PTFE-EX. For connection to BOLA Reactor Lids as GL necks. With hexagonal gripping surface in standard wrench size. Earthing is made via a connection on the reactor lid.

Screw-In Thread NPT (male)	Neck GL (male)	Wrench size SW	Cat. No.:
1/4"	18	15	B 172-16
1/2"	18	22	B 172-18
1/2"	25	22	B 172-20

Applications:

For assembly on BOLA Reactor Lids made of PTFE-EX, Cat. No. B 170-... on page 163. As adapter for Stirrer Bearings EX, Cat. No. C 423-... for centric insertion of stirrer shafts. For connection to existing components with ground joint such as Liebig Condensers, dropping funnels etc.



BOLA Screw-In Stoppers EX

Material: PTFE-EX	Temperature resistance: from -200 °C to +250 °C	Chemical resistance: ++ very good	Conductivity: 10⁶ Ohm
-----------------------------	---	---	--

Product description:

Made of PTFE-EX. For connection to BOLA Reactor Lids. For closure of non-used connectors. With hexagonal gripping surface in standard wrench size. Earthing is made via a connection on the Reactor Lid.

Screw-In Thread NPT (male)	Wrench Size SW	Cat. No.:
1/4"	15	B 173-02
1/2"	22	B 173-04
3/4"	32	B 173-06

Applications:

For assembly on BOLA Reactor Lids made of PTFE-EX, Cat. No. B 170-... on page 136.





BOLA Stirrer Bearings EX

Material: PTFE-EX	Temperature resistance: from -15 °C to +200 °C	Chemical resistance: ++ very good	Conductivity: 10⁶ Ohm
-----------------------------	--	---	--

Product description:

Ground joint cone made of static dissipative PTFE-EX with sealing rings on the outside to prevent sticking of the connection and to reduce the danger of breaking glass. A special gasket made of PTFE-EX and an FKM o-ring which is compressed by GL screw cap provide a good sealing of the stirrer shaft. Bore with female thread M5 on the knurl for earth connection.



Cone NS European standard	For stirrer shaft dia. mm	Total length mm ca.	Thread of screw cap GL	Cat. No.:
29/32	8	71	18	C 423-08
29/32	10	72	25	C 423-10

Applications:

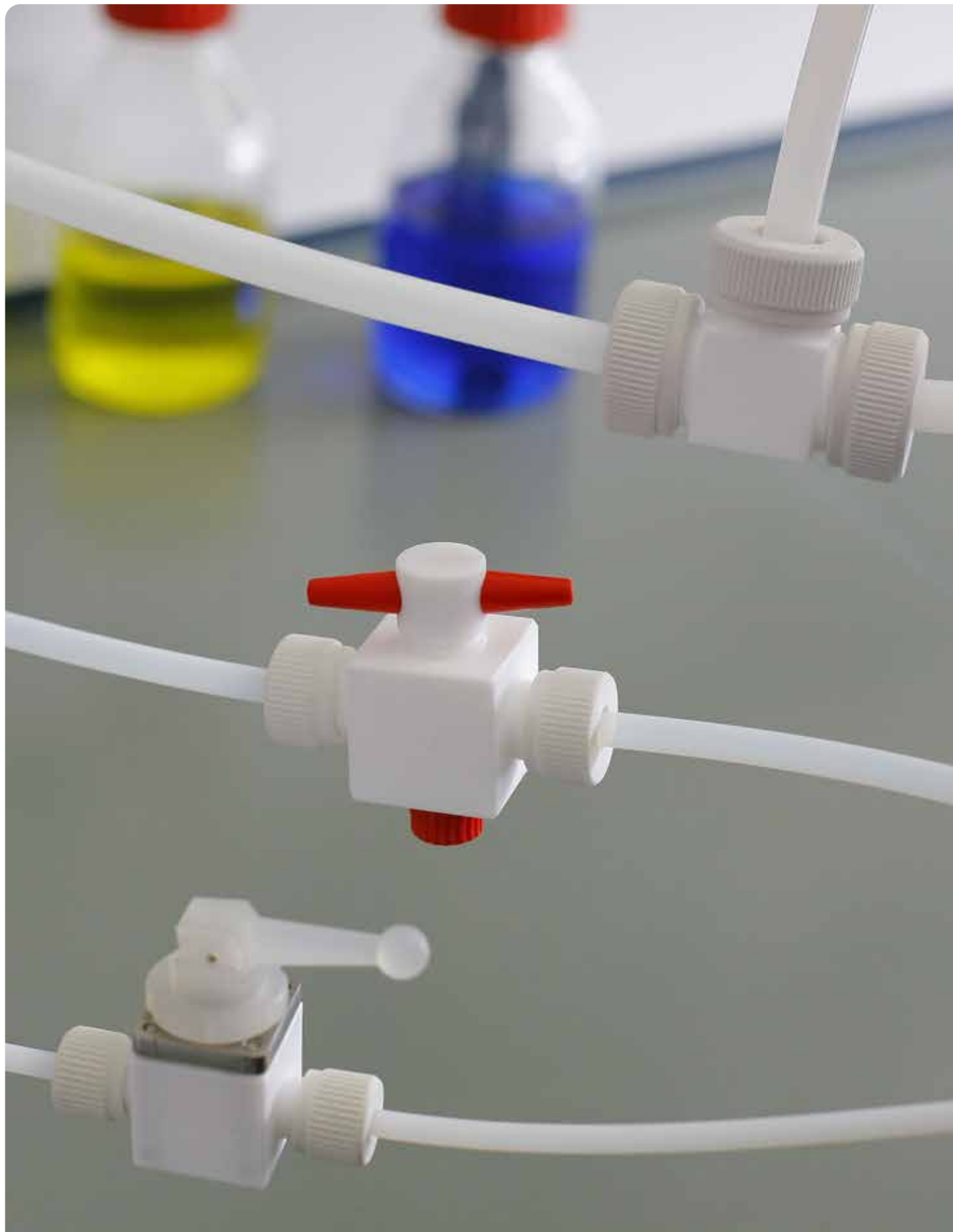
Perfect bearing for stainless steel, glass and BOLA stirrer shafts EX.

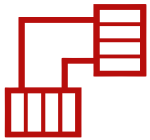


Spare Parts for : Sirrer Bearings EX

Description	Material	Packing Unit		Packing Unit	Cat. No.:	
Replacement Special Gaskets EX	PTFE-EX	1 piece		C 423-08 C 423-10	C 432-08 C 432-10	
Replacement Screw Caps EX	PTFE-EX	1 piece		C 423-08 C 423-10	C 433-08 C 433-10	

So that what belongs together stays together: we keep ready the right screw fitting and connection for nearly every installation and any application.





SCREW JOINTS FOR PRESSURES UP TO 5 BARS



168 Fittings

Fittings	168
Tube Fittings Elbow	169
Tube Fittings T	169
Reducing Unions	170
Distributors	170
Screw-in Tube Fittings	171
Ground-Joint Tube Fittings	177
Plugs	178

178 Tubing Connectors

Tubing Connectors	178
Tubing Connectors T	178
Tubing Connectors Elbow	179
Tubing Connectors Cross	179
Tubing Connectors Y	179
Reducing Tubing Connectors	180
Screw-in Tubing Connectors	180

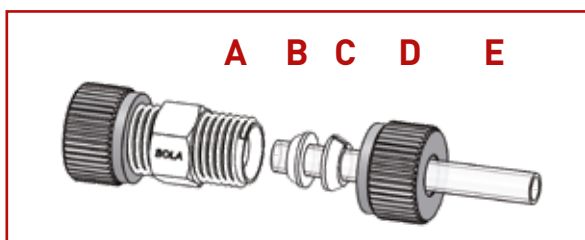
172 Valves and stopcocks

Snap Valves	172
Control Valves	172
2-way/3-way Stopcocks	173
Stopcocks with Hose	
Connectors	176
Non-return Valves	176

BOLA Screw Joints for Pressures up to 5 Bar

Assembly made easy –how to reach your goal quickly.

- A** Threaded neck of fitting
- B** Tapered ring
- C** V-ring
- D** Nut
- E** Tubing or tube



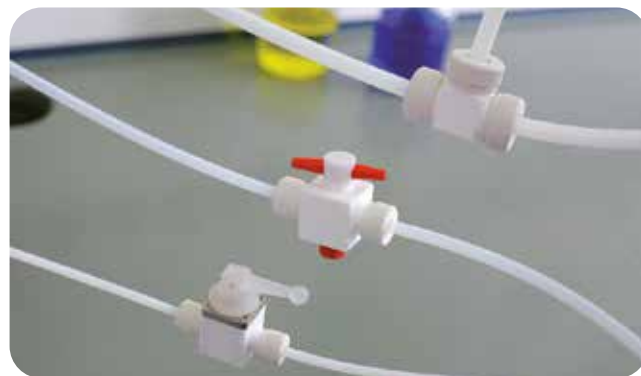
Assembly:

1. Push the nut on the tubing/tube
2. Push V-ring and then the tapered ring on the tubing/tube
3. Tighten the nut on the threaded neck – ready

The screw joint system up to 5 bar –
what you should know about.

This economic screw joint system was developed especially for tubing made of PTFE, PFA or FEP, but it can also be used with tubes made of glass or steel. Its function is based on compression rings which provide a pressure resistance of up to 5 bar at room temperature. All parts which are exposed to the medium are made of PTFE. Only the nut which is not in contact with the medium is made of glass-fibre reinforced PTFE for better stability. The fittings and nuts have metric threads.

All components of this system have a universal chemical resistance, since the product is only exposed to PTFE.



BOLA Tube Fittings

Material: PTFE Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal Pressure: 5 bar Vacuum: suitable



FDA conform

Product description:

Straight tube fitting made of PTFE with nuts made of glass-fibre reinforced PTFE. Universal chemical resistance, the product is only exposed to PTFE.

Thread of fitting M	Bore dia. mm	Total length mm	For tubing O.D. mm	Cat. No.:
14 x 2	6	49	4	D 503-02
14 x 2	6	49	6	D 503-04
14 x 2	6	49	(1/4")6,35	D 503-06
18 x 2	8	54	8	D 503-08
18 x 2	8	54	10	D 503-12
28 x 2	14	58	12	D 503-14
28 x 2	14	58	14	D 503-16
28 x 2	14	58	16	D 503-18





BOLA Tube Fittings Elbow

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Pressure: **5 bar** Vacuum: **suitable**

FDA conform

Product description:

Tube fitting elbow-shaped made of PTFE, two connections with nuts made of glass-fibre reinforced PTFE. Universal chemical resistance, the product is only exposed to PTFE.

Thread of fitting M	Bore dia. mm	Dimensions (L x H) mm	For tubing O.D. mm	Cat. No.:
14 x 2	4	39 x 39	4	D 504-02
14 x 2	4	39 x 39	6	D 504-04
18 x 2	8	43 x 43	8	D 504-08
18 x 2	8	43 x 43	10	D 504-12
28 x 2	14	54 x 54	12	D 504-14
28 x 2	14	54 x 54	14	D 504-16
28 x 2	14	54 x 54	16	D 504-18



BOLA PRACTICAL TIP Protection from buckling

If you want to avoid buckling of your tubing, simply cut it and add an elbow fitting for connection.

BOLA Tube Fittings T

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Pressure: **5 bar** Vacuum: **suitable**

FDA conform

Product description:

Tube fitting T-shaped made of PTFE, three connections with nuts made of glass-fibre reinforced PTFE. Universal chemical resistance, the product is only exposed to PTFE.

Thread of fitting M	Bore dia. mm	Dimensions (L x H) mm	For tubing O.D. mm	Cat. No.:
14 x 2	4	56 x 39	4	D 505-02
14 x 2	4	56 x 39	6	D 505-04
14 x 2	4	56 x 39	(1/4") 6,35	D 505-06
18 x 2	8	60 x 43	8	D 505-08
18 x 2	8	60 x 43	10	D 505-12
28 x 2	14	71 x 54	12	D 505-14
28 x 2	14	71 x 54	14	D 505-16
28 x 2	14	71 x 54	16	D 505-18



#SUITABLE page 189
Tubing for all fittings

BOLA Reducing Unions

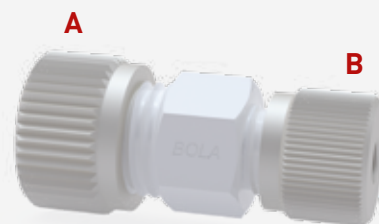
Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Pressure: **5 bar** Vacuum: **suitable**

FDA conform

Product description:

Straight tube fitting made of PTFE with nuts made of glass-fibre reinforced PTFE. For connecting tubing or tube with different outer diameters. Universal chemical resistance, the product is only exposed to PTFE.

A Thread of fitting M	For tubing O.D. mm	Bore dia. mm	B Thread of fitting M	For tubing O.D. mm	Cat. No.:
14 x 2	6	6	14 x 2	4	D 526-02
18 x 2	8	6	14 x 2	4	D 526-04
18 x 2	8	6	14 x 2	6	D 526-10
18 x 2	10	6	14 x 2	4	D 526-06
18 x 2	10	6	14 x 2	6	D 526-12
18 x 2	10	8	18 x 2	8	D 526-14
28 x 2	12	6	14 x 2	4	D 526-26
28 x 2	12	6	14 x 2	6	D 526-32
28 x 2	12	10	18 x 2	8	D 526-38
28 x 2	12	10	18 x 2	10	D 526-18
28 x 2	14	6	14 x 2	4	D 526-28
28 x 2	14	6	14 x 2	6	D 526-34
28 x 2	14	10	18 x 2	10	D 526-20
28 x 2	16	6	14 x 2	4	D 526-30
28 x 2	16	6	14 x 2	6	D 526-36
28 x 2	16	10	18 x 2	10	D 526-22



BOLA Distributors

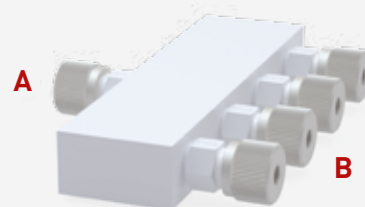
Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Pressure: **5 bar** Vacuum: **suitable**

FDA conform

Product description:

Body made of PTFE with nuts made of glass-fibre reinforced PTFE. One inlet and three or four outlets, bore diameter 6 mm. Universal chemical resistance, the product is only exposed to PTFE.

Thread of fitting M	Inlets A	For tubing O.D. mm	Outlets B	For tubing O.D. mm	Dimensions L x W x H mm	Cat. No.:
14 x 2	1	4	3	4	100 x 22 x 96	D 512-01
14 x 2	1	6	3	6	100 x 22 x 96	D 512-02
14 x 2	1	4	4	4	140 x 22 x 96	D 512-08
14 x 2	1	6	4	6	140 x 22 x 96	D 512-09





BOLA Screw-in Tube Fittings

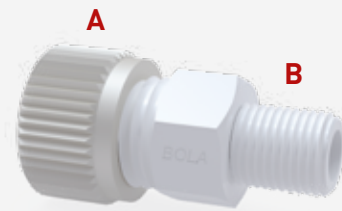
Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Pressure: **5 bar** Vacuum: **suitable**

FDA konform

Product description:

Straight tube fitting made of PTFE with nuts made of glass-fibre reinforced PTFE and a screw-in thread (either NPT or G). Universal chemical resistance, the product is only exposed to PTFE.

A Thread of fitting M	For tubing O.D. mm	Bore dia. mm	B Screw-in thread	Total length mm	Cat. No.:
14 x 2	4	4	NPT 1/8"	38	D 518-02
14 x 2	4	4	G 1/8"	38	D 518-04
14 x 2	4	4	NPT 1/4"	40	D 518-06
14 x 2	4	4	G 1/4"	38	D 518-08
14 x 2	6	4	NPT 1/4"	40	D 518-12
14 x 2	6	4	G 1/4"	38	D 518-14
14 x 2	6	4	NPT 3/8"	46	D 518-16
14 x 2	6	4	G 3/8"	46	D 518-18
18 x 2	8	8	NPT 1/4"	46	D 518-24
18 x 2	8	8	G 1/4"	46	D 518-26
18 x 2	8	8	NPT 3/8"	46	D 518-28
18 x 2	8	8	G 3/8"	46	D 518-30
18 x 2	10	8	NPT 1/4"	46	D 518-36
18 x 2	10	8	G 1/4"	46	D 518-38
18 x 2	10	8	NPT 3/8"	46	D 518-40
18 x 2	10	8	G 3/8"	46	D 518-42
28 x 2	12	12	G 3/8"	56	D 518-50
28 x 2	12	12	NPT 1/2"	56	D 518-52
28 x 2	12	12	G 1/2"	56	D 518-54
28 x 2	14	12	G 1/2"	56	D 518-62
28 x 2	16	12	NPT 1/2"	56	D 518-68
28 x 2	16	12	G 1/2"	56	D 518-70



#SUITABLE page 189
Tubing for all fittings

BOLA PRACTICAL TIP
You don't know which thread type and size you have in your hands?

Our scale thread illustrations help to make an optical comparison.

see page 366

BOLA Snap Valves

Material: PTFE, PPS Temperature resistance: from -20°C to +250°C Chemical resistance: +++ universal Pressure: 6 bar Vacuum: suitable

FDA conform

Product description:

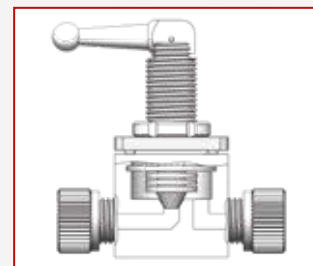
Valve body made of PTFE with bore dia. 6 mm. Holding plate with bulkhead thread, lever and bulkhead ring made of PPS. Two connectors for tubing and tubes including compression rings (PTFE) and screw nut (PTFE with glass fibres). Gastight closing of the passage by means of a PTFE-bellow with flat cone point, lever locks into place in open position. An engraved arrow on the valve body marks the flow direction which has to be taken into account during installation. Universal chemical resistance, the flowing product is only exposed to PTFE.

Thread of fitting M	For tubing O.D. mm	Outer dimensions L x D x H mm	Cat. No.:
18 x 2	8	85 x 44 x 93	E 674-54
18 x 2	10	85 x 44 x 93	E 674-56



Applications:

Fast opening/closing of the passage. Lever with integrated bulkhead union for panel mounting.



BOLA Control Valves

Material: PTFE, PPS Temperature resistance: from -20°C to +250°C Chemical resistance: +++ universal Pressure: 6 bar Vacuum: suitable

FDA conform

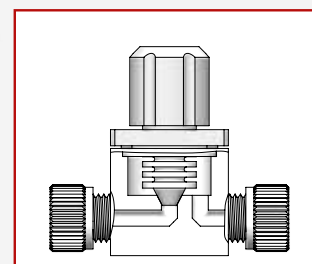
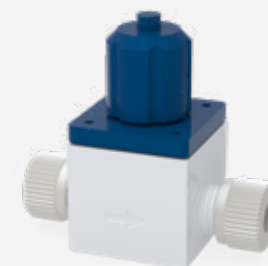
Product description:

Valve body made of PTFE with bore dia. 6 mm. Holding plate and adjusting screw made of PPS. Two connectors for tubing and tubes including compression rings (PTFE) and screw nut (PTFE with glass fibres). By turning the adjusting screw the passage is closed and thus the volume flow can be manually regulated (without regulation scale), the opening degree of the passage is indicated by a protruding pin in the center of the adjusting screw. An engraved arrow on the valve body marks the flow direction which has to be taken into account during installation. Universal chemical resistance, the flowing product is only exposed to PTFE.

Thread of fitting M	For tubing O. D. mm	Outer dimensions L x D x H mm	Cat. No.:
18 x 2	8	89 x 44 x 83	E 672-54
18 x 2	10	89 x 44 x 83	E 672-56

Applications:

For distributing liquids or gases. Manual regulation of the flow rate by turning the adjusting screw.





BOLA (2-Way/3-Way) Stopcocks

Material: PTFE, PP Temperature resistance: from 0°C to +110°C Chemical resistance: +++ universal Pressure: 2 bar

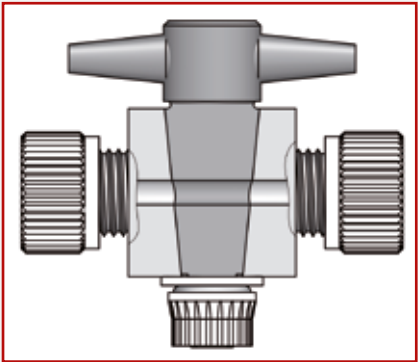
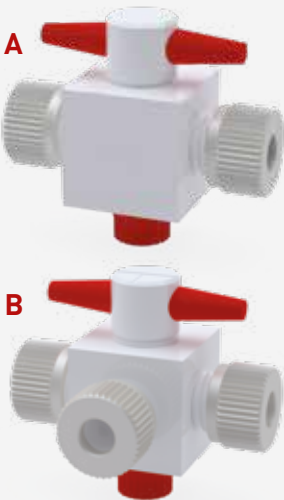


FDA conform

Product description:
2-way stopcock with straight bore and two connections or 3-way stopcock with T-shaped bore and three connections, with nuts made of glass-fibre reinforced PTFE for connecting tubing or tube. Conical stopcock plug, tightness is increased by turning the nut on the lower side. 3-way stopcock plug with T-shaped mark of flow direction. Universal chemical resistance, the flowing product is only exposed to PTFE.

	Typ	Bore shape stopcock	Bore dia. mm	For tubing O. D. mm	Thread M	Outer dimensions L x D x H mm	Cat. No.:
A	2-Way		2	4	14 x 2	59 x 22 x 53	E 652-02
	2-Way		2	6	14 x 2	59 x 22 x 53	E 652-04
	2-Way		5	8	18 x 2	74 x 35 x 69	E 652-06
	2-Way		5	10	18 x 2	74 x 35 x 69	E 652-08
B	3-Way		1,5	4	14 x 2	59 x 41 x 53	E 654-02
	3-Way		1,5	6	14 x 2	59 x 41 x 53	E 654-04
	3-Way		3,5	8	18 x 2	74 x 54 x 69	E 654-06
	3-Way		3,5	10	18 x 2	74 x 54 x 69	E 654-08

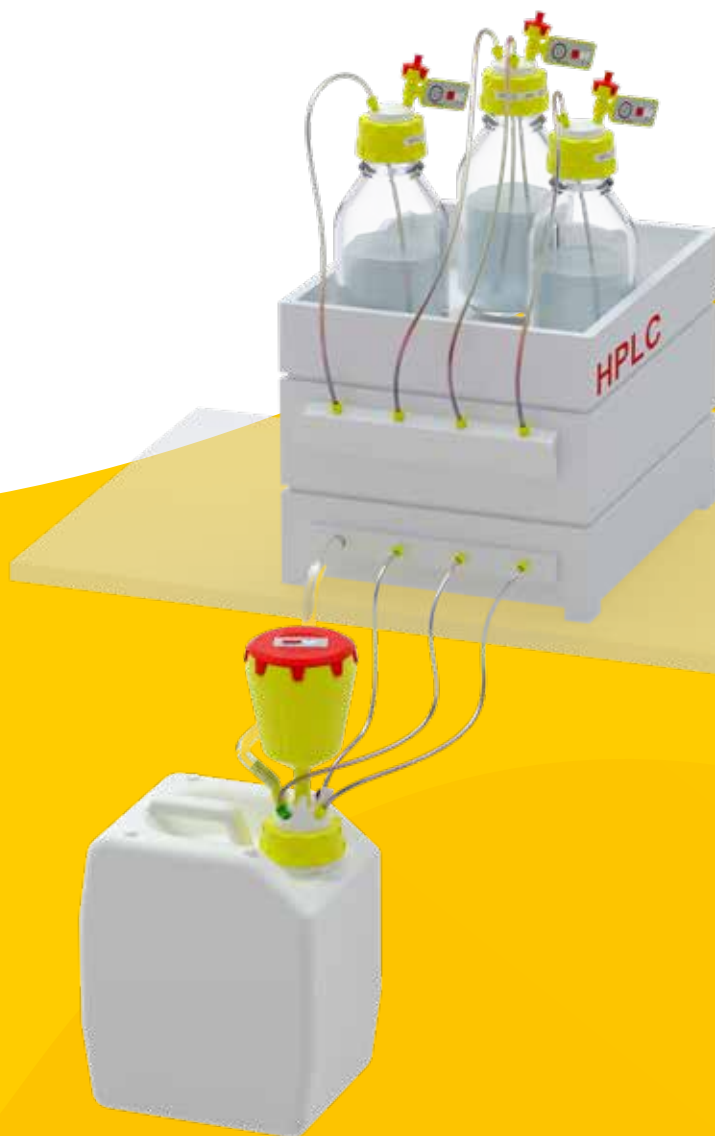
Applications:
For distributing liquids or gases. Quick and easy disconnection of flow.



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BOLA **Stopcocks with Hose Connectors**Material:
PTFE, PPTemperature resistance:
from 0°C to +110°CChemical resistance:
+++ universalPressure:
2 bar

FDA conform

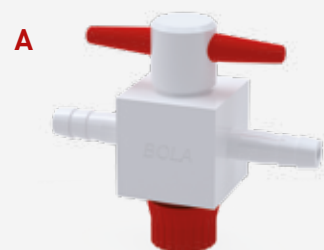
Product description:

2-way stopcock with straight bore and two hose connectors or 3-way stopcock with T-shaped bore and three hose connectors for connecting elastic tubing (e.g. Viton[®], Tygon[®], silicone). Conical stopcock plug, tightness is increased by turning the nut on the lower side. 3-way stopcock plug with T-shaped mark of flow direction. Universal chemical resistance, the flowing product is only exposed to PTFE.

	Type	Bore shape stopcock	Bore dia. mm	For tubing I. D. mm	O.D. of hose connectors mm	Outer dimensions L x D x H mm	Cat. No.:
A	2-Way		1,5	4	4,5	60 x 22 x 53	E 650-03
	2-Way		3,0	6	6,8	60 x 22 x 53	E 650-06
	2-Way		4,0	8	9,0	60 x 22 x 53	E 650-09
	2-Way		6,0	10	11,0	85 x 35 x 69	E 650-12
B	3-Way		1,0	4	4,5	60 x 41 x 53	E 650-50
	3-Way		2,0	6	6,8	60 x 41 x 53	E 650-53
	3-Way		3,0	8	9,0	60 x 41 x 53	E 650-56
	3-Way		4,0	10	11,0	85 x 60 x 69	E 650-59

Applications:

For distributing liquids or gases. Quick and easy disconnection of flow.

BOLA **Non-Return Valves**Material:
PTFETemperature resistance:
from -200°C to +250°CChemical resistance:
+++ universal

FDA conform

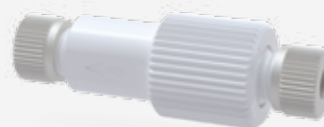
Product description:

Made of PTFE, with nuts made of glass-fibre reinforced PTFE for connecting tubing or tube. Opening pressure adjustable between 0,1 bar and 2 bar (factory setting 0,1 bar). The built-in lock function only allows flow in one direction, the flow direction is marked by an arrow, any fitting position is possible. All parts are easy to disassemble by hand for cleaning. Universal chemical resistance, the flowing product is only exposed to PTFE or PFA.

Thread of fitting M	For tubing O.D. mm	Total length mm	O.D. mm	Cat. No.:
14 x 2	4	110	38	E 680-21
14 x 2	6	110	38	E 680-23
18 x 2	8	110	38	E 680-27
18 x 2	10	110	38	E 680-31



#SUITABLE page 189
Tubing for all fittings





BOLA Ground Joint Tube Fittings

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Vacuum: **suitable**

FDA conform

Product description:

Fitting made of PTFE for transition from ground joints to metric threads for connecting hard-walled tubing (e.g. PTFE, PFA or FEP). With nuts made of glass-fibre reinforced PTFE, body with rings and knurled grip for opening. The product is only exposed to PTFE.



Ground Joint NS	For tubing O.D. mm	Thread of fitting M	Bore dia. mm	Cat. No.:
14/23	6	14 x 2	5,0	H 1001-04
19/26	6	14 x 2	5,0	H 1001-06
29/32	6	14 x 2	5,0	H 1001-10
29/32	8	18 x 2	8,5	H 1001-12
29/32	10	18 x 2	8,5	H 1001-14

Applications:

For connecting tubes or tubing to vessels with ground joint. For inserting and fixing probes, thermometers, dip tubes or cables.



Spare Parts for: Components with metric thread

Description	Material	Packing Unit	For tubing O.D. mm	suitable for	Cat. No.:	
Replacement Nuts	PTFE-GF	1 piece	4 - 6,35 8 - 10,0 12 - 16,0	all components with thread M 14 x 2 all components with thread M 18 x 2 all components with thread M 28 x 2	D 501-01 D 501-04 D 501-07	
Replacement Compression Rings	PTFE	1 piece	4 6 6,35 8 9,52 10 12 12,7 14 16	all components with thread M 14 x 2 all components with thread M 14 x 2 all components with thread M 14 x 2 all components with thread M 18 x 2 all components with thread M 18 x 2 all components with thread M 18 x 2 all components with thread M 18 x 2 all components with thread M 28 x 2 all components with thread M 28 x 2 all components with thread M 28 x 2 all components with thread M 28 x 2	D 502-01 D 502-02 D 502-03 D 502-04 D 502-05 D 502-06 D 502-07 D 502-51 D 502-08 D 502-09	

BOLA **Plugs**

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Pressure: **5 bar** Vacuum: **suitable**

FDA conform

Product description:

Made of PTFE, for closing unused fitting connections (a suitable glass-fibre reinforced PTFE nut has to be ordered separately (Cat. No. D 501-.. see page 177).

Connection for O.D. mm			Cat. No.:
4 / 6 / (1/4") 6,35			D 648-02
8 / (3/8") 9,52 / 10			D 648-08
12 / (1/2") 12,7 / 14 / 16			D 648-14

BOLA **Tubing Connectors**

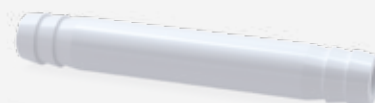
Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Vacuum: **suitable**

FDA conform

Product description:

Straight fitting made of PTFE with two connectors for elastic tubing (e.g. Viton®, Tygon®, silicone). Universal chemical resistance, the product is only exposed to PTFE.

Total length mm	Bore dia. mm	O.D. of connectors mm	Cat. No.:
45	2	4,5	D 575-02
53	3	6,8	D 575-04
61	5	9,0	D 575-06
69	6	11,0	D 575-08

BOLA **Tubing Connectors T**

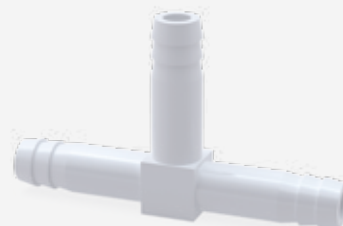
Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Vacuum: **suitable**

FDA conform

Product description:

T-shaped fitting made of PTFE with three connectors for elastic tubing (e.g. Viton®, Tygon®, silicone). Universal chemical resistance, the product is only exposed to PTFE.

Total length mm	Bore dia. mm	O.D. of connectors mm	Cat. No.:
19,5	2	4,5	D 577-02
22,5	3	6,8	D 577-04
25,5	5	9,0	D 577-06
28,5	6	11,0	D 577-08





BOLA Tubing Connectors Elbow

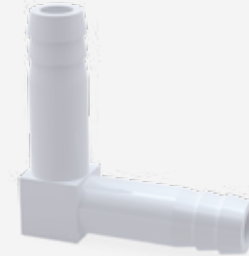
Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Vacuum: **suitable**

FDA conform

Product description:

Elbow-shaped fitting made of PTFE with two connectors for elastic tubing (e.g. Viton®, Tygon®, silicone). Universal chemical resistance, the product is only exposed to PTFE.

Total length mm	Bore dia. mm	O.D. of connectors mm	Cat. No.:
19,5	2	4,5	D 574-02
22,5	3	6,8	D 574-04
25,5	5	9,0	D 574-06
28,5	6	11,0	D 574-08



BOLA Tubing Connectors Cross

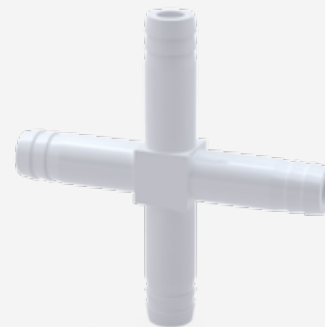
Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Vacuum: **suitable**

FDA conform

Product description:

Cross-shaped fitting made of PTFE with four connectors for elastic tubing (e.g. Viton®, Tygon®, silicone). Universal chemical resistance, the product is only exposed to PTFE.

Total length mm	Bore dia. mm	O.D. of connectors mm	Cat. No.:
28,5	6	11,0	D 573-08



BOLA Tubing Connectors Y

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Vacuum: **suitable**

FDA conform

Product description:

Y-shaped fitting made of PTFE with three connectors for elastic tubing (e.g. Viton®, Tygon®, silicone). Universal chemical resistance, the product is only exposed to PTFE.

Total length mm	Bore dia. mm	O.D. of connectors mm	Cat. No.:
40	2	4,5	D 576-02
47	3	6,8	D 576-04
53	5	9,0	D 576-06
60	6	11,0	D 576-08



BOLA **Reducing Tubing Connectors**

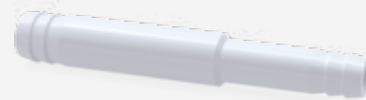
Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Vacuum: **suitable**

FDA conform

Product description:

Straight fitting made of PTFE with two connectors for elastic tubing (e.g. Viton®, Tygon®, silicone) with different inner diameters. Universal chemical resistance, the product is only exposed to PTFE.

Total length mm	Bore dia. mm	From O.D. of connector mm	To O.D. of connector mm	Cat. No.:
45	2	6,8	4,5	D 572-02
55	3	9,0	6,8	D 572-04
75	5	11,0	9,0	D 572-06

BOLA **Screw-In Tubing Connectors**

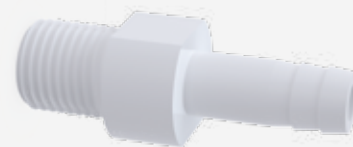
Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Vacuum: **suitable**

FDA conform

Product description:

Straight fitting made of PTFE with one connector for elastic tubing (e.g. Viton®, Tygon®, silicone) and one screw-in thread (either NPT or G). Universal chemical resistance, the product is only exposed to PTFE.

Total length mm	Bore dia. mm	O.D. of connector mm	Thread NPT	Thread G	Wrench size mm	Cat. No.:
20	2,5	4,5	1/8"		14	D 579-02
22	5,0	6,8	1/4"		15	D 579-04
22	5,8	9,0	1/4"		15	D 579-06
22	4,0	6,8		1/4"	15	D 579-22
22	5,0	9,0		1/4"	15	D 579-24
25	8,0	11,0		3/8"	18	D 579-26





SPECIAL REQUIREMENTS? CUSTOMIZED!



You are looking for something very special? Something that even our huge portfolio of sophisticated lab solutions does not cover?

No problem:

As developer and producer, we offer the possibility to produce individually according to your requirement. This is faster, simpler and often more economic than you can imagine. Just talk to our experts about your ideas – we advise you and support you already during the construction and produce suitable for the material exactly according to your specification. And this already from quantity 1.

For this, we just need a drawing (a rough sketch is sufficient) and some information.

Checklist for your customised product:

- » What is the article name?
- » In which application should the article be used?
- » What dimensions should the article have?
- » Are there any specific material specifications?
- » In which temperature range should the article be used?
- » What chemical stresses is the article exposed to?
- » In which quantities is the article required?
- » What cost per piece should the article not exceed?

You have a special request?
Call us on: **+49 (0) 93 46-92 86-0**

Or just send us a drawing (a rough sketch is sufficient) and some information to **info@bola.de**. We will then contact you to discuss further details and establish an offer for you free of charge.

Totally practice-oriented: BOLA Tubing, Films and Tiles meet highest demands and are used in more and more laboratories.





TUBING, FILMS, TILES



189 Tubing

PTFE Tubing	189
FEP Tubing	190
PFA Tubing	192
PTFE Tubing Reels	193
FEP Tubing Reels	194
PFA Tubing Reels	194
PFA Corrugated Tubing	195
Flexible Corrugated Tubing	196
Flanged Corrugated Tubing	197
Heat Shrinkable Tubing	197
Colour Tubing	198
Spiral Tubing	198
PEEK Capillary Tubing	199
Tubing Cutter	199

202 Sealing Material

Sealing Tape	202
Flat Sealing Tapes	202
Fluoroplastic Spray	203
Fluorslide Paste	203
Fluoroplastic Grease Tubes	203

204 Screws, Balls and Boiling Stones

Screws with Countersunk Head	204
Screws with Cylindrical Head	204
Hexagon Nuts	204
Washers	205
Boiling Stones	205
Balls	205

200 Rods, Tiles and Sheets

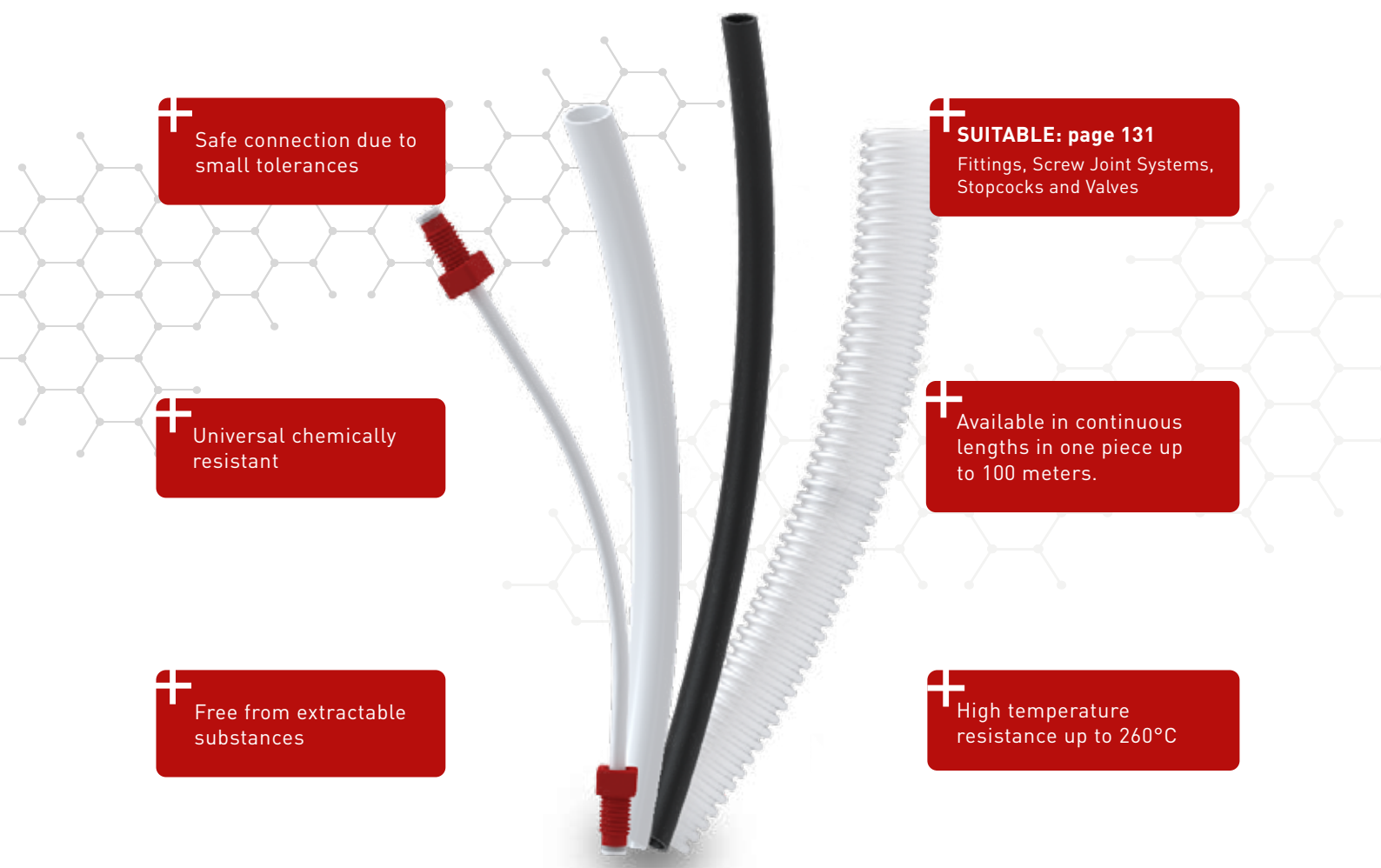
Rods	200
Tiles	200
Sheets	201



BOLA Tubing – what you should know about.

BOLA Tubing is dimensionally perfectly suited for the use with all BOLA Screw Joint Systems. You can be sure that all fittings and screw joints fit together with the tubing. The production of tubing always involves certain tolerances in outer diameter and wall thickness. We always supply the ordered quantity in full metres in one piece, as far as this is not

longer than the maximum production length of 100 m. A confection of several rolls of the same length is possible on demand. We check our tubing multiple times on the basis of our strict BOLA internal standards. These are by far stricter than the tolerances customary in the market.



Safe connection due to small tolerances



Universal chemically resistant



Free from extractable substances



SUITABLE: page 131

Fittings, Screw Joint Systems, Stopcocks and Valves



Available in continuous lengths in one piece up to 100 meters.



High temperature resistance up to 260°C



BOLA Tubing

BOLA Tubing offers many advantages:

» Short minimum lengths

Depending on the tubing dimensions – for details please look at our price-list. Minimum lengths are unfortunately necessary for granting a low price per metre.

» No specification of fixed rolls – available per metre

Free choice of requested length between minimum length and maximum production length.

» Longer lengths in one piece possible

For tubing up to O.D. 10 mm, quantities of up to 100 metres in one length are possible without extra charge; quantities of more than 100 metres in one length are only available in particular cases – please ask us.

» Whenever possible, your ordered quantity is supplied in one length

If our inventory or the ordered quantity does not allow another possibility, the tubing is supplied in partial lengths without consultation. Example: 90 m = 60 m + 30 m

» Good to handle

Tubing up to an O.D. of 3 mm and with a minimum length of 30 m is supplied on reels. This prevents bends and twists and makes storage and rolling up easier.

» Tailored rolls/reels are available

Several rolls with the same lengths are available at low extra charges, e.g. 5 rolls of 40 metres or 11 rolls of 22 metres.

» Excellent quality at fair prices

Stricter tolerances than the general industrial standard GKV – perfect interaction with our BOLA Fittings and BOLA Stopcocks.

Tolerances of BOLA Tubing – You can count on them.

BOLA Tubing is perfectly suitable for the use with all BOLA Screw Joint Systems. You can be sure that all fittings and screw joints fit together with the tubing. The production of tubing always involves certain tolerances in outer diameter and wall thickness.

We always check our tubing repeatedly on the basis of strict BOLA-internal standards. These standards are stricter than the standards which are currently in the market.

Nominal O.D.

from 0,4 mm to 3,2 mm

» tolerance of O.D. +/- 0,05 mm

over 3,3 mm to 10,0 mm

» tolerance of O.D. +/- 0,10 mm

over 10,1 mm to 16,0 mm

» tolerance of O.D. +/- 0,15 mm

over 16,1 mm to 22,0 mm

» tolerance of O.D. +/- 0,20 mm

over 22,1 mm

» tolerance of O.D. +/- 0,25 mm



HELPFUL: page 358

Detailed information about tubing tolerances



What you should know about the choice of tubing

Incorrectly chosen tubing can endanger the user. Here you can find the most important features in tabular form. The number of “+”-signs stands for the degree of performance of the feature.

Tubing material	PTFE	PFA	FEP
Maximum temperature <small>(at moderate charge)</small>	+260°C	+260°C	+205°C
Minimum temperature <small>(at moderate charge)</small>	-200°C	-270°C	-270°C
Chemical resistance	+++	+++	++(+)
Transparency	+	++(+)	+++
Surface quality	++	+++	+++
Gas proofness <small>(in limit range)</small>	++	+++	+++
Recovery	+	++	++
Costs	+	+++	++

Our tip: PTFE tubing is ideal for the “normal” work in laboratories.

If you need tubing which is absolutely gastight even in limit range of pressure and temperature, you should choose PFA or FEP. PFA only has advantages at temperatures of more than +205°C, but is more expensive than FEP tubing.

We shape and bend ... according to your needs.

FEP and PFA tubing is most suitable for shaping or bending. A special thermal procedure is applied to shape the tubing to the requested form. Please contact us for a free and non-binding quotation.

We connect and assemble ... according to your needs.

We can offer you our “know how” for cutting tubing, assembling fittings (either from our standard range or suitable for your specific system) from single pieces to complete series manufacturing. Please contact us for a free quotation.

Typical range of applications for tubing made of fluoroplastics (PTFE, PFA, FEP)

- » For transport of aggressive products such as acids, lyes, gases and solvents
- » For analysis- or measuring devices of chromatography and laboratory
- » As product lines in miniplant systems
- » As dosing lines for reaction vessels
- » In liquid chromatography; high-purity tubing without additives (e.g. softeners) which could destroy analysis
- » As covering of mechanically operated parts, e.g. bowden wires (due to the low coefficient of friction)
- » As covering of sensors in chemical plants
- » For transport of lacquers, oils, resins and food products
- » As covering of heating elements in galvanic stations and microelectronics
- » Antistatic tubing in explosive applications



BOLA Tubing



Frequently asked questions about customized tubing

» **Which tubing dimensions are available?**

We can supply tubing with outer diameters between 0,4 mm and 40 mm and wall thicknesses between 0,1 mm and 4 mm.

» **What if I only need a small quantity of customized tubing?**

Small quantities can be supplied but only at higher cost as a minimum order quantity has to be purchased. Unfortunately it is not possible to indicate exact minimum lengths. In general: the smaller the outer diameter, the bigger the minimum quantity and the smaller the price per metre. Please send us your actual requirement. We will then provide you with the corresponding minimum quantity and price.

» **Which tubing materials do you offer?**

We offer tubing made of fluoroplastics such as PTFE, PTFE-EX, FEP and PFA. Additionally, we supply tubing made of PEEK.

» **What shall I do if I am not sure if the requested tubing is producible?**

Normally we know this and can inform you quickly.

» **Do you have screw joint systems for every diameter of tubing?**

We offer a wide range of screw joints. A screw joint system to your requirements might already exist. If not, custom screw joints can be offered and supplied. Please contact us.

» **How do close tolerances affect the price of tubing?**

In general, close tolerances increase the price for production because expenses for checking the tubing are higher and there can be more waste of tubing which does not fulfil these close tolerances. It can even occur that a production is not possible if the tolerances are too close – in this case we will contact you to find a solution.

» **What is the lead time for tubing?**

The lead time depends on many factors such as dimension, quantity, material, tolerances and running length. The typical lead time for customized tubing is between 3 and 6 weeks.

» **How do I get a quotation?**

Send us your enquiry by fax or e-mail stating all relevant dimensions such as diameter, length, etc. We will do our utmost to get our offer to you as soon as possible. Please do not forget to indicate the required quantity. It is also important to include in your enquiry whether the requested tubing is a one-time or a repeating need.



Cleaning and reuse of tubing

In general, cleaned fluoroplastic tubing should only be reused if the transported product is known and rated with “+” in the chemical resistance chart (page 347).

It is not recommended to reuse the tubing with unknown products and mixtures of chemicals. For all water-soluble substances (e.g. salts, acids, bases etc) you can use water as cleaning agent.

Volatile solvents such as alcohols, esters, ketones, low-boiling hydrocarbons, chlorinated hydrocarbons are given off reversibly by storing under aeration (only if they have not been absorbed by the interior surface of the tubing).

If you are using substances which can only be eliminated by organic solvents or if you are using toxic and dangerous products, the tubing should be disposed appropriately after use. A visual inspection or, in case of unclarity an inspection according to EN 12115, has to be made before reusing cleaned tubing.

You haven't found anything suitable? – No problem

We would be glad to send you a quotation. For quick processing, we need some information:

- » Outer diameter in mm (e.g. 16 mm)
- » Inner diameter in mm (e.g. 12 mm)
- » Which quantity in one length do you need?
- » Which total quantity do you need?
- » Which material shall be used?

Further information – not obligatory, but often making sense.

- » Do you need special tolerances for outer or inner diameter (e.g. \varnothing 10 mm \pm 0,1 mm; this means tubing can vary between 9,9 mm and 10,1 mm)?
- » Shall the tubing be deformable, for example for making flanges?
- » Up to which temperature will the tubing be used?
- » Which pressure shall the tubing resist?
- » Shall the tubing be electroconductive?
- » Shall the tubing be transparent?
- » Shall the tubing have a special surface quality?
- » Do you need certificates? (e.g. test certificates, certificates of compliance or FDA certificates)
- » To which pressure or vacuum at which temperatures is the tubing exposed?
- » Do you need special packaging?
- » Shall the tubing be dyed with a colour? Which colour do you request?
- » Do you need an exceptionally tight bending radius?
- » Does the tubing have to be absolutely gastight?



BOLA PTFE Tubing

Material:
PTFE

Temperature resistance:
from -200°C to +250°C

Chemical resistance:
+++ universal



FDA conform



Product description:

Translucent to milky-white appearance

Product advantages:

- » almost universal chemical resistance
- » free from extractable agents
- » physiologically safe
- » non-adhesive surface
- » very good sliding characteristics
- » very good dielectric characteristics
- » flame retardant according to UL94V0
- » oxygen value more than 95
- » resistant to irradiation and weather
- » can be sterilized in autoclaves



I.D. mm	O.D. mm	Wall thick- ness mm	Bending radius ¹ mm	Burst pressure ² bar	Cat. No.:
0,2	1,6	0,70	6	960	S 1810-01
0,2	0,4	0,10	2	960	S 1810-02
0,3	0,6	0,15	3	140	S 1810-04
0,3	1,6	0,65	4	606	S 1810-05
0,4	0,9	0,25	3	175	S 1810-06
0,5	1,0	0,25	4	140	S 1810-08
0,5	1,6	0,55	5	308	S 1810-09
0,8	1,6	0,40	7	140	S 1810-10
1,0	1,6	0,30	8	84	S 1810-12
1,0	2,0	0,50	8	140	S 1810-14
1,0	3,0	1,00	9	280	S 1810-16
1,2	1,8	0,30	8	70	S 1810-18
1,4	2,2	0,40	12	80	S 1810-19
1,5	2,1	0,30	14	56	S 1810-20
1,5	2,5	0,50	13	93	S 1810-22
1,5	3,0	0,75	12	140	S 1810-23
1,5	3,5	1,00	12	186	S 1810-21
1,6	3,2	0,80	13	140	S 1810-26
1,6	2,4	0,40	14	70	S 1810-24
1,9	2,5	0,30	20	44	S 1810-28
2,0	3,0	0,50	18	70	S 1810-30
2,0	4,0	1,00	16	140	S 1810-32
2,4	3,2	0,40	25	46	S 1810-33
3,0	4,0	0,50	32	46	S 1810-34
3,0	5,0	1,00	25	93	S 1810-36
3,0	6,0	1,50	24	140	S 1810-37
4,0	5,0	0,50	50	35	S 1810-38

You will find further tubing diameters in the adjoining chart

Applications:

- » Perfect tubing for aggressive and pure liquids or gases

I.D. mm	O.D. mm	Wall thick- ness mm	Bending radius ¹ mm	Burst pressure ² bar	Cat. No.:
3,175	6,35	1,58	26	140	S 1810-39
4,0	6,0	1,00	36	70	S 1810-40
3,96	6,35	1,19	34	84	S 1810-41
4,35	6,35	1,00	40	64	S 1810-42
4,78	6,35	0,79	51	46	S 1810-43
5,0	6,0	0,5	72	28	S 1810-44
5,0	7,0	1,00	49	56	S 1810-46
6,0	7,0	0,5	98	23	S 1810-48
6,0	8,0	1,00	64	46	S 1810-50
7,0	8,0	0,50	128	20	S 1810-52
7,0	9,0	1,00	81	40	S 1810-54
7,5	10,0	1,25	80	46	S 1810-56
8,0	9,52	0,75	120	26	S 1810-58
8,0	10,0	1,00	100	35	S 1810-60
8,0	11,0	1,50	80	52	S 1810-61
8,0	12,0	2,00	72	70	S 1810-62
9,0	11,0	1,00	121	31	S 1810-63
10,0	12,0	1,00	144	28	S 1810-64
9,52	12,7	1,59	102	46	S 1810-65
10,0	14,0	2,00	98	56	S 1810-66
12,0	14,0	1,00	196	23	S 1810-68
12,0	16,0	2,00	128	46	S 1810-70
13,0	16,0	1,50	170	32	S 1810-72
14,0	16,0	1,00	256	20	S 1810-74
16,0	18,0	1,00	324	17	S 1810-78
18,0	20,0	1,00	400	16	S 1810-84
20,0	22,0	1,00	490	14	S 1810-88



#HELPFUL page 155

Tubing made of static dissipative
PTFE-EX

¹ Bending radius: minimum bending radius in mm at a room temperature of 23°C

² Burst pressure: computed value in bar at a room temperature of 23°C. It is recommended to restrict the maximum working pressure to 25% of the burst pressure. For higher temperatures, this value has to be multiplied by the reduction factor shown on page 359. It is the user's responsibility to check if the used tubing fulfils the respective requirements.

BOLA **FEP** TubingMaterial:
FEPTemperature resistance:
from -200°C to +205°CChemical resistance:
+++ universalTransparency:
transparent

FDA conform



Product description:

Transparent, gastight tubing

Product advantages:

- » non-porous
- » almost universal chemical resistance
- » free from extractable agents
- » physiologically safe
- » non-adhesive surface
- » very good sliding characteristics
- » very good dielectric characteristics
- » flame retardant according to UL94V0
- » oxygen value more than 95
- » resistant to irradiation and weather
- » can be sterilized in autoclaves



I.D. mm	O.D. mm	Wall thickness mm	Bending radius ¹ mm	Burst pressure ² bar	Cat. No.:
0,8	1,6	0,40	7	112	S 1815-04
1,5	3,0	0,75	12	112	S 1815-05
1,6	3,2	0,80	13	112	S 1815-08
2,0	3,0	0,50	18	56	S 1815-07
2,0	4,0	1,00	16	112	S 1815-12
3,175	6,35	1,58	26	112	S 1815-14
3,6	6,0	1,20	30	75	S 1815-16
3,96	6,35	1,20	34	67	S 1815-24
4,0	6,0	1,00	36	56	S 1815-20
4,35	6,35	1,00	52	51	S 1815-28
4,78	6,35	0,79	51	37	S 1815-30
5,6	8,0	1,20	53	48	S 1815-32
6,0	8,0	1,00	64	37	S 1815-36
6,35	9,52	1,59	58	56	S 1815-40
6,8	10,0	1,60	63	53	S 1815-44
8,0	10,0	1,00	100	28	S 1815-48
9,52	12,7	1,59	101	37	S 1815-56
10,0	12,0	1,00	144	22	S 1815-60
12,0	14,0	1,00	196	19	S 1815-68

Applications:

Perfect tubing for aggressive and pure liquids or gases

BOLA PRACTICAL-TIP
How can you calculate the maximum bending radius?

Very easy: Squared outer diameter of tubing divided by wall thickness.

page 362

¹ Bending radius: minimum bending radius in mm at a room temperature of 23°C

² Burst pressure: computed value in bar at a room temperature of 23°C. It is recommended to restrict the maximum working pressure to 25% of the burst pressure. For higher temperatures, this value has to be multiplied by the reduction factor shown on page 359. It is the user's responsibility to check if the used tubing fulfils the respective requirements.



BOLA PTFE and PFA Tubing

All BOLA Tubings have small tolerance on the outer diameter and the wall thickness. This assures that fittings and screw joints always match.



BOLA **PFA Tubing**Material:
PFATemperature resistance:
from -200°C to +260°CChemical resistance:
+++ universalTransparency:
transparent

FDA conform



Product description:

Transparent, gastight tubing

Product advantages:

- » non-porous
- » almost universal chemical resistance
- » free from extractable agents
- » physiologically safe
- » non-adhesive surface
- » very good sliding characteristics
- » very good dielectric characteristics
- » flame retardant according to UL94V0
- » oxygen value more than 95
- » resistant to irradiation and weather
- » can be sterilized in autoclaves
- » mechanical strength even at high temperatures



I.D. mm	O.D. mm	Wall thickness mm	Bending radius ¹ mm	Burst pressure ² bar	Cat. No.:
0,8	1,6	0,40	7	140	S 1811-02
1,5	3,0	0,75	12	140	S 1811-03
1,6	3,2	0,80	13	140	S 1811-04
2,0	3,0	0,50	18	70	S 1811-05
2,0	4,0	1,00	16	140	S 1811-06
3,175	6,35	1,58	26	140	S 1811-07
3,6	6,0	1,20	30	96	S 1811-08
3,96	6,35	1,20	34	84	S 1811-12
4,0	6,0	1,00	36	70	S 1811-10
4,35	6,35	1,00	52	64	S 1811-14
4,78	6,35	0,79	51	46	S 1811-15
5,6	8,0	1,20	53	60	S 1811-16
6,0	8,0	1,00	64	46	S 1811-18
6,35	9,52	1,59	58	70	S 1811-20
6,8	10,0	1,60	63	66	S 1811-22
8,0	10,0	1,00	100	35	S 1811-24
8,8	12,0	1,60	90	51	S 1811-26
9,52	12,7	1,59	101	47	S 1811-28
10,0	12,0	1,00	144	28	S 1811-30
12,0	14,0	1,00	196	23	S 1811-40
14,0	16,0	1,00	256	20	S 1811-50

Applications:

Perfect tubing for aggressive and pure liquids or gases

¹ Bending radius: minimum bending radius in mm at a room temperature of 23°C² Burst pressure: computed value in bar at a room temperature of 23°C. It is recommended to restrict the maximum working pressure to 25% of the burst pressure. For higher temperatures, this value has to be multiplied by the reduction factor shown on page 359. It is the user's responsibility to check if the used tubing fulfils the respective requirements.



BOLA INNOVATION



#1 Perfect connection

Tubings with industrial standards have a very big range of tolerance. This can lead to problems regarding connection. BOLA Tubing is exactly suited to the strict BOLA standard.

page 131

BOLA PTFE Tubing Reels

Material: PTFE
 Temperature resistance: from -200°C to +260°C
 Chemical resistance: +++ universal

NEW

FDA conform

Product description:

Transparent to milky white

Roll length m	I.D. mm	O.D. mm	Wall thick- ness mm	Bending radius ¹ mm	Burst pressure ² bar	Cat. No.:
5	3,96	6,35	1,19	34	56	S 2010-41
5	4,35	6,35	1,00	40	64	S 2010-42
5	6,0	8,0	1,00	64	46	S 2010-50
5	8,0	10,0	1,00	100	35	S 2010-60
5	9,52	12,7	1,59	102	32	S 2010-65
5	10,0	12,0	1,00	144	28	S 2010-64

Roll length m	I.D. mm	O.D. mm	Wall thick- ness mm	Bending radius ¹ mm	Burst pressure ² mm	Cat. No.:
10	0,8	1,6	0,40	7	140	S 2012-10
10	1,6	3,2	0,80	13	140	S 2012-26
10	2,0	3,0	0,50	18	70	S 2012-30
10	2,0	4,0	1,00	16	140	S 2012-32
10	4,0	6,0	1,00	36	70	S 2012-40

Applications:

Please find further tube diameters under Cat. No. S 1810-... on page 189 by the metre.



#HELPFUL page 157
 Tubing made of static dissipative PFA-EX

¹ Bending radius: minimum bending radius in mm at a room temperature of 23°C

² Burst pressure: computed value in bar at a room temperature of 23°C. It is recommended to restrict the maximum working pressure to 25% of the burst pressure. For higher temperatures, this value has to be multiplied by the reduction factor shown on page 359. It is the user's responsibility to check if the used tubing fulfils the respective requirements.

BOLA **FEP** Tubing ReelsMaterial:
FEPTemperature resistance:
from -200 °C to +205 °CChemical resistance:
+++ universal**NEW****FDA conform**

Product description:

Transparent, gas-tight tubes.

Roll length m	I.D. mm	O.D. mm	Wall thick- ness mm	Bending radius ¹ mm	Burst pressure ² bar	Cat. No.:
5	3,96	6,35	1,19	34	56	S 2020-24
5	4,35	6,35	1,00	52	51	S 2020-28
5	6,0	8,0	1,00	64	37	S 2020-36
5	8,0	10,0	1,00	100	28	S 2020-48
5	9,52	12,7	1,59	101	37	S 2020-56
5	10,0	12,0	1,00	144	22	S 2020-60

Roll length m	I.D. mm	O.D. mm	Wall thick- ness mm	Bending radius ¹ mm	Burst pressure ² bar	Cat. No.:
10	0,8	1,6	0,40	7	112	S 2022-04
10	1,6	3,2	0,80	13	112	S 2022-08
10	2,0	3,0	0,50	18	56	S 2022-07
10	2,0	4,0	1,00	16	112	S 2022-12
10	4,0	6,0	1,00	36	56	S 2022-20

Applications:

Please find further tube diameters under Cat. No. S 1815-... on page 190 by the metre.

BOLA **PFA** Tubing ReelsMaterial:
PFATemperature resistance:
from -200 °C to +260 °CChemical resistance:
+++ universal**NEW****FDA conform**

Product description:

Transparent, gas-tight tubes.

Roll length m	I.D. mm	O.D. mm	Wall thick- ness mm	Bending radius ¹ mm	Burst pressure ² bar	Cat. No.:
5	3,96	6,35	1,19	34	84	S 2030-12
5	4,35	6,35	1,00	52	64	S 2030-14
5	6,0	8,0	1,00	64	46	S 2030-18
5	8,0	10,0	1,00	100	35	S 2030-24
5	9,52	12,7	1,59	101	47	S 2030-28
5	10,0	12,0	1,00	144	28	S 2030-30

Roll length m	I.D. mm	O.D. mm	Wall thick- ness mm	Bending radius ¹ mm	Burst pressure ² bar	Cat. No.:
10	0,8	1,6	0,40	7	140	S 2032-02
10	1,6	3,2	0,80	13	140	S 2032-04
10	2,0	3,0	0,50	18	70	S 2032-05
10	2,0	4,0	1,00	16	140	S 2032-06
10	4,0	6,0	1,00	36	70	S 2032-10

Applications:

Please find further tube diameters under Cat. No. S 1811-... on page 192 by the metre.

¹ Bending radius: minimum bending radius in mm at a room temperature of 23°C² Burst pressure: computed value in bar at a room temperature of 23°C. It is recommended to restrict the maximum working pressure to 25% of the burst pressure. For higher temperatures, this value has to be multiplied by the reduction factor shown on page 359. It is the user's responsibility to check if the used tubing fulfils the respective requirements.



BOLA PFA Corrugated Tubing

Material: **PFA** Temperature resistance: **from -200°C to +260°C** Chemical resistance: **+++ universal** Transparency: **transparent** Vacuum: **suitable**

FDA conform

Product description:

Circular corrugations around the longitudinal axis. Can be shortened easily by means of a tubing cutter (see page 199).

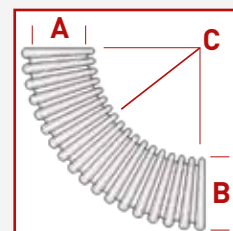
Product advantages:

- » flexible to highly flexible
- » tight bending radius only causes little cross-section reduction
- » non-porous
- » translucent
- » resistant to irradiation and weather
- » almost universal chemical resistance

Nominal width NW	I.D. A mm	O.D. B mm	Bending radius ¹ C mm	Pressure load max. bar	Cat. No.:
4,5	4,3	6,8	5	1,7	S 1820-01
8	7,7	10,7	15	3,4	S 1820-02
10	9,7	13,0	18	2,8	S 1820-04
13	12,4	16,1	23	2,6	S 1820-06
14	13,7	17,8	25	2,3	S 1820-08
16	15,4	19,7	28	2,3	S 1820-10
19	18,4	23,2	32	2,2	S 1820-14
21	19,8	24,8	35	2,1	S 1820-16
23	23,8	28,8	40	1,2	S 1820-23

Applications:

Perfect tubing for aggressive and pure liquids or gases



#HELPFUL page 154

Flexible tubing made of static dissipative PFA-EX

¹ Bending radius: minimum bending radius in mm at a room temperature of 23°C

² Burst pressure: computed value in bar at a room temperature of 23°C. It is recommended to restrict the maximum working pressure to 25% of the burst pressure. For higher temperatures, this value has to be multiplied by the reduction factor shown on page 359. It is the user's responsibility to check if the used tubing fulfils the respective requirements.

BOLA Flexible Corrugated Tubing

Material:
PFA

Temperature resistance:
from -200°C to +260°C

Chemical resistance:
+++ universal

Transparency:
transparent

Vacuum:
suitable



FDA conform



Product description:

Corrugated tubing with circular corrugations around the longitudinal axis and cylindrical tubing ends with a length of 40 mm which can for example be connected directly to fittings, stopcocks or hose connectors. Together with BOLA Laboratory Screw Joints, the connection is absolutely tight and suitable for vacuum.

Product advantages:

- » flexible to highly flexible
- » tight bending radius only causes little cross-section reduction
- » non-porous
- » translucent



Nominal width NW	Connecting Pieces		Bending radius ¹ mm	Burst pressure bar	Cat. No.: Length 0,25 m	Cat. No.: Length 0,50 m	Cat. No.: Length 1,00 m	Cat. No.: Length 2,50 m
Innen-Ø mm	Außen-Ø mm							
4,5	2	4	5	1,7		S 1822-01	S 1822-19	S 1822-52
8	6	8	15	2,0	S 1822-92	S 1822-02	S 1822-20	S 1822-56
10	8	10	18	2,0	S 1822-93	S 1822-04	S 1822-22	S 1822-60
13	10	12	23	2,0	S 1822-94	S 1822-06	S 1822-24	S 1822-64
14	12	14	25	2,0		S 1822-08	S 1822-26	S 1822-68
16	14	16	28	2,0		S 1822-10	S 1822-28	S 1822-72
19	16	18	32	2,0	S 1822-98	S 1822-14	S 1822-32	S 1822-76
21	17,5	20	35	2,0		S 1822-16	S 1822-34	S 1822-80
23	20,9	25,4	40	1,2		S 1822-18	S 1822-36	S 1822-84

Applications:

- » ideal for connections under vibrations
- » usable with a small bending radius
- » for compensation of thermal expansions
- » for easy handling of liquids



#SUITABLE page 90
Laboratory screw joints



#HELPFUL page 154
Flexible tubing made of static dissipative PFA-EX

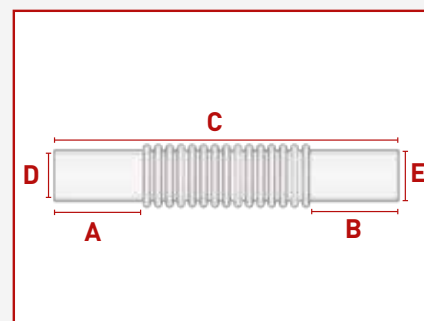
BOLA Customized Flexible Tubing

BOLA Flexible Tubing

Flexible tubing made of PFA can be manufactured individually according to your specifications. We would be glad to send you a quotation.

Please complete the list below and send us a copy by fax to +49 (0)9346-928651. Thank you.

Quantity:	
Tubing size NW:	
A Tubing end length:	
B Tubing end length:	
C Total length:	
D Tubing end I. D.:	
E Tubing end O.D.:	



¹ Bending radius: minimum bending radius in mm at a room temperature of 23°C



BOLA Flanged Corrugated Tubing

Material: **PFA, PBTP** Temperature resistance: **from -50 °C to +140 °C** Chemical resistance: **+++ universal** Transparency: **transparent** Vacuum: **suitable**

FDA conform

Product description:

Corrugated tubing with circular corrugations around the longitudinal axis and flanged end pieces made of PFA, with two preassembled screw caps with GL thread made of PBTP and washers made of silicone for direct connection to components and devices with GL screw neck. The connection is absolutely tight and suitable for vacuum.

Applications:

Ideal for connections under vibrations or thermal expansions. Small bending radius allow connections in a tight space. More lengths on demand.



Tubing size NW	I.D. mm	O.D. mm	For thread GL	Bending radius ¹ mm	Pressure load max. bar	Cat. No.: Lenght 0,50 m	Cat. No.: Lenght 1,00 m
4,5	4,3	6,8	14	5	1,7	S 1880-05	S 1880-35
8	7,7	10,7	18	15	3,4	S 1880-10	S 1880-40
10	9,7	13,0	18	18	2,8	S 1880-15	S 1880-45
13	12,4	16,1	25	23	2,6	S 1880-20	S 1880-50



BOLA Heat Shrinkable Tubing

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Transparency: **transparent** Shrink rate: **4:1**

FDA konform

Product description:

For protection of probes, cables, electric components etc. against chemical disturbance. The shrink rate of 4:1 means that the inner diameter of the tubing shrinks to approx. ¼ of the original inner diameter and that the length shrinks to approx. 15%. Good heat transmission due to low wall thickness.

Expanded I.D. mm	Min. shrunk O.D. mm	Wall thickness after shrinkage mm	Cat. No.:
2,0	0,7	0,22	S 1828-08
3,2	1,0	0,25	S 1828-16
4,7	1,3	0,30	S 1828-24
6,3	1,6	0,30	S 1828-32
9,5	2,5	0,30	S 1828-40
12,7	3,7	0,38	S 1828-48
19,0	5,7	0,38	S 1828-56
25,4	7,0	0,38	S 1828-64

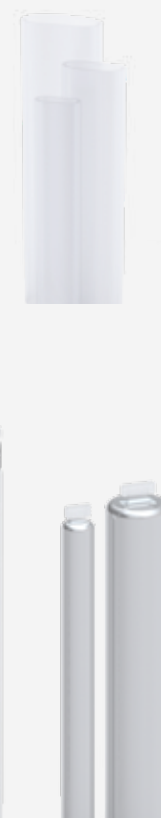
Product advantages:

- » transparent
- » incombustible (ASTM D876)
- » insulation resistance $10^{18} \Omega/\text{cm}$ (ASTM D 876)
- » good dielectric strength
- » flame retardant



#HELPFUL page 361

Detailed instructions for processing



¹ Bending radius: minimum bending radius in mm at a room temperature of 23°C

BOLA Colour Tubing

Material:
PTFE

Temperature resistance:
from -200°C to +250°C

Chemical resistance:
+++ universal

Product description:

The completely coloured tubes are lightfast and assure a high security against possible mix-ups. The colour pigments may possibly influence the chemical resistance.

	I.D. mm	O.D. mm	Bending radius ¹ mm	Colour	Cat. No.:
	4	6	36	red	S 1861-40
	6	8	64	red	S 1861-50
	4	6	36	blue	S 1862-40
	6	8	64	blue	S 1862-50
	4	6	36	green	S 1863-40
	6	8	64	green	S 1863-50
	4	6	36	yellow	S 1864-40
	6	8	64	yellow	S 1864-50



BOLA Spiral Tubing

Material:
PFA

Temperature resistance:
from -200°C to +260°C

Chemical resistance:
+++ universal

Transparency:
transparent

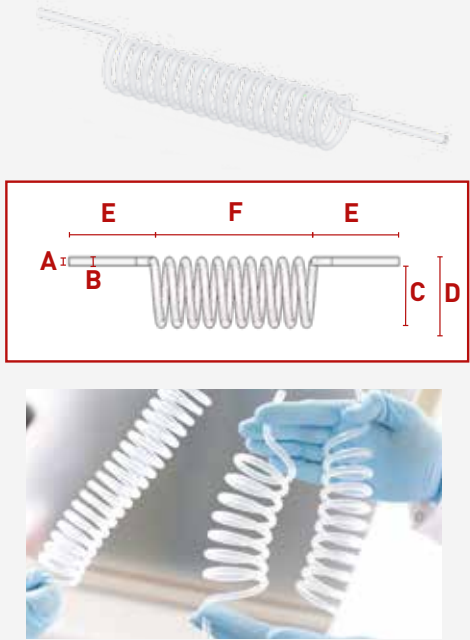
FDA conform

Product description:

Spiral tubing made of PFA is manufactured individually according to your specifications. Please take the possible tubing dimensions from the list on page 192. We would be glad to send you a quotation.

Please complete the list below and send us a copy by fax to +49 (0)9346-928651. Thank you.

Quantity:	
A Tubing I.D.:	
B Tubing O.D.:	
C Spiral I.D.:	
D Spiral O.D.:	
E Length of tubing ends:	
F Length of spiral:	





BOLA PEEK Capillary Tubing

Material:
PEEK

Temperature resistance:
from -50°C to +250°C

Chemical resistance:
+++ universal

FDA conform

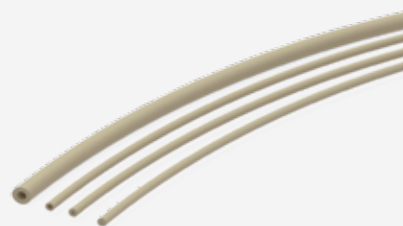
Product description:

Flexible, brown high-pressure tubing for almost all organic or inorganic liquids.

I.D. mm	O.D. mm	Bending radius ¹ mm	Pressure resistant up to bar	Cat. No.:
0,25	1,6	4	350	S 1817-08
0,50	1,6	4	350	S 1817-12
0,80	1,6	4	280	S 1817-16
1,60	3,2	7	280	S 1817-20

Product advantages:

- » metal-free
- » corrosion-proof
- » high pressure resistance
- » biocompatible
- » high temperature resistance (melting point +334°C)
- » alternative for capillary tubes made of titan or stainless steel



BOLA Tubing Cutter

Product description:

Ideal for cutting plastic and rubber tubing with and without textile reinforcement up to a diameter of 28 mm. The blade is exchangeable. Not suitable for steel reinforced tubing.

Up to tubing O.D. mm	Cat. No.:
28	S 1852-28



Spare Parts for Replacement Blades

Description	Packing Unit	suitable for	Cat. No.:	
Replacement Blades	1 Stück	S 1852-28	S 1853-28	

¹ Bending radius: minimum bending radius in mm at a room temperature of 23°C

BOLA **Rods**

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal**

FDA conform

Product description:
Virginal rods for further treatment and processing in lengths of up to 2 m. Diameter and length are nominal dimensions and can contain a machining allowance.

O.D. mm			Cat. No.:
6			S 1800-06
8			S 1800-08
10			S 1800-10
12			S 1800-12
15			S 1800-15
16			S 1800-16
20			S 1800-20
25			S 1800-25
30			S 1800-30
40			S 1800-40



BOLA **Tiles**

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal**

FDA conform

Product description:
Standard sizes with different thicknesses.

Length x width x height mm			Cat. No.:
300 x 300 x 2			S 1805-02
300 x 300 x 3			S 1805-04
300 x 300 x 4			S 1805-06
300 x 300 x 5			S 1805-08
300 x 300 x 6			S 1805-10
300 x 300 x 8			S 1805-12
300 x 300 x 10			S 1805-14
300 x 300 x 15			S 1805-16

Applications:
Ideal for using as table pad. Also suitable for using as slideway or for insulation.





BOLA **Sheets**

Material:
PTFE

Temperature resistance:
from -200°C to +250°C

Chemical resistance:
+++ universal



FDA conform

Product description:

Delivered in rolls with a length of 1000 mm. Colour: white

Thickness mm			Cat. No.: width 300 mm	Cat. No.: width 600 mm
0,05			S 1803-02	S 1803-21
0,12			S 1803-04	S 1803-23
0,25			S 1803-06	S 1803-25
0,50			S 1803-08	S 1803-27
0,75			S 1803-10	S 1803-29
1,00			S 1803-12	S 1803-31
1,50			S 1803-14	S 1803-33

Applications:

Ideal for using as table pad or for lining drawers. Also suitable for using as slideway or for insulation.



BOLA **FEP Sheets**

Material:
FEP

Temperature resistance:
from -200°C to +205°C

Chemical resistance:
+++ universal

Product description:

Transparent, gastight and non-porous rolls with a length of 1000 mm.

Thickness mm	Width mm	Length mm	Cat. No.:
0,025	150	1000	S 1833-04
0,05	150	1000	S 1833-08
0,25	150	1000	S 1833-16
0,025	300	1000	S 1833-34
0,05	300	1000	S 1833-38
0,25	300	1000	S 1833-46

Applications:

Ideal for using as table pad or for lining drawers. Also suitable for using as slideway or for insulation.



BOLA Sealing Tape

Material:
PTFE

Temperature resistance:
from -200°C to +250°C

Chemical resistance:
+++ universal

Product description:

For sealing threads, checked according to DIN / DVGW and KTW.

Width mm	Thickness mm	Length m	Cat. No.:
12	0,1	12	H 960-01

Product advantages:

- » does not embrittle, swell and agglutinate
- » does not contain oil or grease
- » prevents rusting and sticking
- » easy removal even after years



BOLA Flat Sealing Tapes

Material:
PTFE

Temperature resistance:
from -200°C to +250°C

Chemical resistance:
+++ universal

FDA conform

Product description:

Deformable, virginal PTFE flat tape with expanded fibre structure.

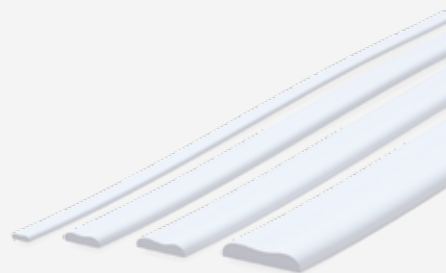
Thickness mm	Width mm	Length m	Cat. No.:
2	5	25	H 959-16
3	10	25	H 959-22
4	14	10	H 959-28
7	22	5	H 959-34

Product advantages:

- » tasteless
- » odourless up to +270°C
- » self-adhesive
- » physiologically safe
- » not ageing
- » good sealing also on uneven surfaces
- » almost universal chemical resistance
- » quick and easy assembly

Applications:

For making customized gaskets "on-site".





BOLA Fluoroplastic Spray

Material:

PTFE

Product description:

Release and anti-blocking agent as well as lubricant for laboratory.

Capacity ml			Cat. No.:
400			H 958-04

Product advantages:

- » dry and greaseless
- » CFC and silicone-free
- » heat resistant up to +260°C
- » non-adhesive and dirt-repellent
- » physiologically safe
- » excellent gliding and separating effects



BOLA Fluorslide Paste

Material:

PTFE

Temperature resistance:

from -36°C to +260°C

Chemical resistance:

+++ universal

FDA conform

Product description:

Extremely stable, synthetic high-temperature paste in resealable tube.

Capacity g			Cat. No.:
56			S 1870-16

Product advantages:

- » exceptionally low friction coefficient
- » extremely long-lasting
- » for temperatures between -36°C and over +260°C
- » resists high mechanical loads
- » not soluble in most solvents
- » non-flammable
- » oxygen-resistant
- » compatible with all common elastomers and plastics
- » chemical resistance against aggressive chemicals or solvents



BOLA Fluoroplastic Grease Tubes

Material:

PTFE

Temperature resistance:

from -20 °C to +260 °C

Chemical resistance:

+++ universal

Product description:

High-performance grease for all kinds of greasing points, fine PTFE particles lower the friction between the surfaces, a special additive system provides extremely high pressure and temperature resistance, also suitable as anticorrosive, does not contain any heavy metals.

Capacity g			Cat. No.:
100			S 1872-16

Product advantages:

- » very low friction coefficient
- » extremely high pressure and temperature resistance



BOLA Screws with Countersunk Head

Material:
PTFE

Temperature resistance:
from -200°C to +250°C

Chemical resistance:
+++ universal

FDA conform

Product description:

Similar to DIN 963/DIN EN ISO 2009

Thread M	Pitch mm	Usable length mm	Dia. of head mm	Cat. No.:
4	0,7	30	8,4	H 1124-14
5	0,8	30	9,3	H 1124-18
6	1,0	30	11,3	H 1124-22
8	1,25	40	15,8	H 1124-26



BOLA Screws with Cylindrical Head

Material:
PTFE

Temperature resistance:
from -200°C to +250°C

Chemical resistance:
+++ universal

FDA conform

Product description:

Similar to DIN 84/DIN EN ISO 1207

Thread M	Pitch mm	Usable length mm	Dia. of head mm	Cat. No.:
4	0,7	30	7,0 x 4,0	H 1128-14
5	0,8	30	8,5 x 4,5	H 1128-18
6	1,0	30	10,0 x 5,0	H 1128-22
8	1,25	40	13,0 x 6,0	H 1128-26



BOLA Hexagon Nuts

Material:
PTFE

Temperature resistance:
from -200°C to +250°C

Chemical resistance:
+++ universal

FDA conform

Product description:

Similar to DIN 934 / DIN EN ISO 4032

Thread M	Pitch mm	Usable length mm	Dia. of head mm	Cat. No.:
4	0,7	7	5,0	H 1132-14
5	0,8	8	6,0	H 1132-18
6	1,0	10	7,5	H 1132-22
8	1,25	13	9,0	H 1132-26





BOLA Washers

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal**

FDA conform

Product description:

Similar to DIN 125-1, packing unit: 10 pieces

Thread M	O.D. mm	I.D. mm	Height mm	Cat. No.:
4	9,0	4,3	0,9	H 1126-14
5	10,0	5,3	1,1	H 1126-18
6	12,0	6,4	1,8	H 1126-22
8	16,0	8,4	1,8	H 1126-26



BOLA Boiling Stones

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal**

FDA conform

Product description:

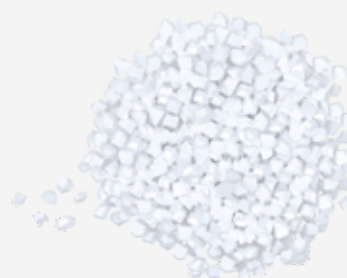
Prevent splashes and production of bubbles during boiling.

Packed in resealable bag.

Grain size mm	Packing unit g			Cat. No.:
4	500			H 972-02
6	500			H 972-04

Product advantages:

- » durable
- » almost universal chemical resistance



BOLA Balls

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal**

FDA conform

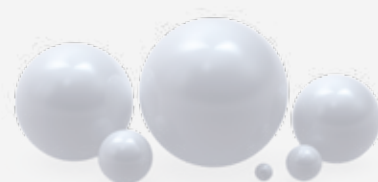
Product description:

Made of solid PTFE, with smooth surface. Different packing units.

Dia. of ball mm	Packing unit		Cat. No.:
3	1 pack of 100 pieces		H 964-03
6	1 pack of 100 pieces		H 964-06
9	1 pack of 100 pieces		H 964-09
15	1 pack of 50 pieces		H 964-15
20	1 pack of 50 pieces		H 964-18
25	1 pack of 25 pieces		H 964-21

Applications:

For extension of surfaces of e. g. distillation apparatus; as splash guard



No matter if you use sleeves with gripping ring, with ribs or sleeves for spherical ground joints – with BOLA you give your laboratory installation the required finishing touches: made of PTFE with excellent sealing and easy loosening of the connections.





GROUND JOINT COMPONENTS



209 Ground Joint Components

Sleeves with Ribs	209
Sleeves with Gripping Ring	210
Spherical Ground Joint Sleeves	210
Joint Clamps	211

212 Connectors, plugs and adapters

Bellows	212/213
Stoppers	213
Ground Joint Adaptors	214
Ground Joint GL Tube Fittings	214
Socket-GL Tube Fittings	215
Spherical Ground Joint GL Tube Fittings	215
Multiple Distributors with Ground Joint	216
Ground Joint-GL Adaptor	217
Ground Joint Reduction Set	218
Glass Flange Metal Adaptors	218

219 O-Rings

O-Rings	219
O-Rings for Laboratory Flat Flanges	219

223 Tri-Clamp Fittings

Tri-Clamp GL-Adaptor	223
Tri-Clamp Multiple Distributor	223
Tri-Clamp GL Stopcocks	224
Tri-Clamp Gaskets	224
Adaptor Tri-Clamp Hose Connector	225



BOLA Sleeves – what you should know about.

+ BOLA sleeves with gripping ring are available for all current ground joint sizes from NS 10 to NS 100

+ Sleeves can be cleaned easily and reused

+ BOLA sleeves make grinding grease superfluous. Grease residues and contamination in the medium are avoided.



+ The solid and robust design in PTFE allows permanent use at high temperatures and aggressive media.

+ Sealing rings take care for selective sealing and improve solvability at the same time.

+ The small contact surface minimizes the risk of sticking in the ground joint sleeve and thus glass breakage while maintaining the same level of tightness.



BOLA Sleeves

BOLA Sleeves – helpful accessories for many applications.

All BOLA sleeves are sealing without any grease and the product will not be contaminated by any greasy residues. They are made for creating gastight, liquid-tight and vacuum tight ground joint connections.

Sealing rings on the outside of the sleeves and a low friction coefficient of PTFE prevent sticking of the ground joints. This reduces the danger of breaking and injury.

The sleeves have an excellent chemical resistance and can be used at working temperatures between -200°C and + 250°C.

Their solid construction (partly with gripping ring) makes them suitable for continued use.

All common joint clamps can still be used.

The sleeves are available for European and American ground joint sizes.

BOLA Sleeves – with sealing rings.

Punctiform sealing on the rings improves both sealing and releasing.



BOLA Sleeves with Ribs

Material: PTFE Temperature resistance: from -200 °C to +250°C Chemical resistance: +++ universal Vacuum: suitable Feature: reusable



FDA conform



Product description:

Made of PTFE, with sealing rings („ribs“) on the outside. Without gripping ring and therefore usable with joint clamps. For vacuum up to 0,1 mbar; solid construction for continued use; sealing rings are easy accessible and therefore easy to clean.

European standard Size NS	Cat. No.:	US standard Size	Cat. No.:
7/16	H 930-01	14/20	H 932-03
10/19	H 930-02	19/38	H 932-05
12/21	H 930-03	24/40	H 932-06
14/23	H 930-04	29/42	H 932-07
19/26	H 930-05	45/50	H 932-10
24/29	H 930-06		
29/32	H 930-07		
34/35	H 930-08		
40/38	H 930-09		
45/40	H 930-10		
50/42	H 930-11		
60/46	H 930-13		
71/51	H 930-14		
85/55	H 930-15		

Applications:

For example for rotary evaporators.



BOLA **Sleeves with Gripping Ring**

Material: **PTFE** Temperature resistance: **from -200 °C to +250 °C** Chemical resistance: **+++ universal** Vacuum: **suitable** Feature: **reusable**



FDA conform



Product description:

Made of PTFE, with gripping ring and sealing rings on the outside, high-vacuum tight sealing; low leak rate: $<1 \times 10^{-4}$ mbar x l x s⁻¹; solid construction for continued use; sealing rings are easy accessible and therefore easy to clean.

European standard Size NS	Cat. No.:	US standard Size	Cat. No.:
10/19	H 933-01	14/20	H 935-01
12/21	H 933-02	19/22	H 935-03
14/23	H 933-03	24/40	H 935-05
19/26	H 933-04	29/42	H 935-06
24/29	H 933-05	45/50	H 935-09
29/32	H 933-06		
34/35	H 933-07		
45/40	H 933-09		
50/42	H 933-10		
55/44	H 933-11		
60/46	H 933-12		
71/51	H 933-13		
85/55	H 933-14		
100/60	H 933-15		

BOLA **Spherical Ground Joint Sleeves**

Material: **PTFE** Temperature resistance: **from -200 °C to +250 °C** Chemical resistance: **+++ universal** Vacuum: **suitable** Feature: **reusable**

FDA conform

Product description:

Made of PTFE, with gripping ring and sealing rings on the outside, high-vacuum tight sealing; low leak rate: $<1 \times 10^{-1}$ mbar x l x s⁻¹; solid construction for continued use.

European standard Size S	Cat. No.:	US standard KS	Cat. No.:
13	H 934-02	18	H 931-01
19	H 934-04	28	H 931-06
29	H 934-06	35	H 931-10
35	H 934-08		
40	H 934-12		
51	H 934-16		
64	H 934-18		





BOLA Joint Clamps

Material: **PTFE** Temperature resistance: **from -50 °C to +250°C** Chemical resistance: **+++ universal** Feature: **reusable**

FDA conform

Product description:

PTFE-encapsulated steel spring core. Universal chemical resistance since the product is only exposed to PTFE.

Size NS			Cat. No.:
14/23			H 942-14
19/26			H 942-19
29/32			H 942-32
45/40			H 942-45

Applications:

For connecting ground joint parts, especially if highly aggressive liquids are involved; high recovery even at high temperatures.



BOLA INNOVATION



#1 Sleeves

BOLA Sleeves for gastight, liquid-tight connections have sealing rings on the outside which provide a punctal sealing. This prevents sticking and allows easy removal.

BOLA **Bellows**

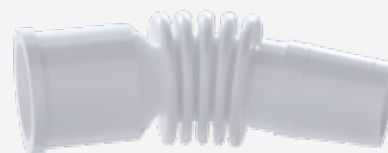
Material: **PTFE** Temperature resistance: **from -200 °C to +250°C** Chemical resistance: **+++ universal** Vacuum: **suitable**

FDA conform

Product description:

Made of PTFE, with round folds and sealing rings on the outside; maximum deflection: 40°.

Socket NS	Cone NS	Total minimum length min. mm	Total maximum length max. mm	Cat. No.:
29/32	29/32	106	114	H 907-10
45/40	45/40	128	144	H 907-15



Applications:

Strainless connection of ground joint equipment; for compensating vibrations from vacuum pumps; for length compensation of heated columns; angular misalignment.

BOLA **Ground Joint Connector**

Material: **PTFE** Temperature resistance: **from -200 °C to +250°C** Chemical resistance: **+++ universal**

NEW

FDA conform

Product description:

Adaptor made of PTFE to connect two components with ground joint socket. With knurled grip. The product is only exposed to PTFE.

Cone size NS	Bore dia. mm	Length mm	Cat.No.:
2x NS 29/32	22	92	B 306-03



Applications:

For loss- and contamination-free transfer from e. g. a round bottom flask via a ground joint neck into a reactor.



BOLA Bellows

Material: **PTFE** Temperature resistance: **from -200 °C to +250 °C** Chemical resistance: **+++ universal** Vacuum: **suitable**

FDA conform

Product description:

Made of PTFE, with sharp folds and sealing rings on the outside; maximum deflection: 120°.

European Standard Socket NS	Cone NS	Total minimum length min. mm	Total maximum length max. mm	Cat. No.:
14/23	14/23	82	90	H 906-02
19/26	19/26	93	105	H 906-04
24/29	24/29	110	124	H 906-06
29/32	29/32	100	120	H 906-12
45/40	45/40	130	170	H 906-14

Applications:

Stainless connection of ground joint equipment; for compensating vibrations from vacuum pumps; for length compensation of heated columns; angular misalignment.



BOLA Stoppers

Material: **PTFE** Temperature resistance: **from -200 °C to +250 °C** Chemical resistance: **+++ universal**

FDA conform

Product description:

Made of PTFE, with ground joint and sealing rings on the outside; knurled or hexagonal grip. Compared with glass stoppers, they are easily removable and can be used without grease. The stoppers can expand under heat which might lead to a breaking of the ground joint sockets.

A	Size NS	Knurled grip Cat. No.:	B	Size NS	Wrench size (SW) mm	Hexagonal Cat. No.:
	10/19	H 936-02		14/23	19	H 937-04
	12/21	H 936-03		19/26	26	H 937-05
	14/23	H 936-04		29/32	35	H 937-07
	19/26	H 936-05		45/40	52	H 937-10
	24/29	H 936-06				
	29/32	H 936-07				
	34/35	H 936-08				
	45/40	H 936-10				

Applications:

For closing ground joint parts.



BOLA Ground Joint Adaptors

Material: **PTFE** Temperature resistance: **from -200 °C to +250 °C** Chemical resistance: **+++ universal**

FDA conform

Product description:

Made of PTFE, socket in cone, with sealing rings on the outside and knurled grip.

Socket NS	Cone NS	Knurled grip dia. mm	Cat. No.:
14/23	19/26	30	H 980-03
14/23	29/32	40	H 980-06
19/26	29/32	40	H 980-09
29/32	45/40	55	H 980-12

Applications:

For connecting different ground joint sizes.



BOLA Ground Joint GL Tube Fittings

Material: **PTFE** Temperature resistance: **from -200 °C to +250 °C** Chemical resistance: **+++ universal** Vacuum: **suitable**

FDA conform

Product description:

Fitting made of PTFE, for transition from ground joints to GL threads. For connection of hard-walled tubing (e.g. PTFE, PFA, FEP) with BOLA Laboratory Screw Joints (see page 75). Ground joint body with turned rings and knurled grip for opening. The product is only exposed to PTFE.

Cone size NS	Bore dia. mm	Thread GL	Cat. No.:
14/23	6,5	14	D 570-08
19/26	10,5	18	D 570-16
29/32	14,5	25	D 570-32
29/32	20,0	45	D 570-45

Applications:

For connecting tubes or tubing to vessels with ground joint. For inserting and fixing probes, thermometers, dip tubes or cables.





BOLA Socket GL Tube Fittings

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Vacuum: **suitable**

FDA conform

Product description:

Fitting made of PTFE, with socket for tubes with ground joint and GL thread for connection of hard-walled tubing (e.g. PTFE, PFA, FEP) with BOLA Laboratory Screw Joints (see page 90). The product is only exposed to PTFE.

Socket size NS	Bore dia. mm	Thread GL	Cat. No.:
14/23	6,5	14	D 571-08
19/26	10,5	18	D 571-16
29/32	12,5	25	D 571-32



BOLA Spherical Ground Joint GL Tube Fittings

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Vacuum: **suitable**

FDA conform

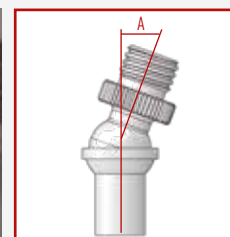
Product description:

Fitting made of PTFE, for transition from spherical ground joints to GL threads. For connection of hard-walled tubing (e.g. PTFE, PFA, FEP) with BOLA Laboratory Screw Joints (see page 90). The product is only exposed to PTFE.

Spherical ground joint size S	Bore dia. mm	Thread GL	Angle A	Cat. No.:
19	10,5	18	25°	D 790-24
29	14,5	25	20°	D 790-36
35	14,5	25	10°	D 790-48

Applications:

For connecting tubes or tubing to vessels with ground joint. For inserting and fixing probes, thermometers, dip tubes or cables.



BOLA Multiple Distributors with Ground Joint

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Vacuum: **suitable** autoclave: **121°**

FDA conform

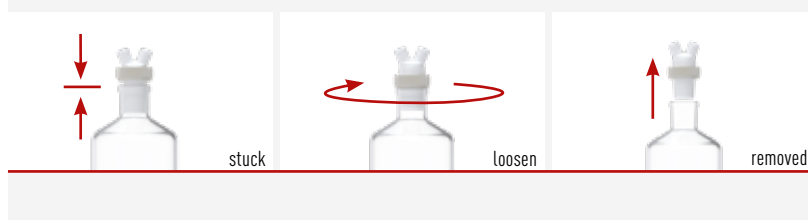
Product description:

Completely made of PTFE. With ground joint size 29/32 and two GL-threaded necks. Integrated special nut for easy unlocking of the ground joint. For the connection of tubing or tube made of glass, plastic or metal by means of laboratory screw joints.

For ground joint NS	For tubing O.D. mm	Necks GL	Cat. No.:
29/32	2 x 8	2 x 14	D 620-08

Applications:

For bottles or reaction vessels with ground joint. For transferring liquids without contamination. For connection to a liquid source or a pressure or vacuum system.



BOLA Reactor Multiple Distributor with Ground Joint

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Vacuum: **suitable** autoclave: **121°**

NEW

FDA conform

Product description:

Completely made of PTFE. Cone with elevated sealing rings on the outside and knurled grip for easy removal and three GL-threaded necks for connection of hard-walled tubing and tubes made of glass, plastic or metal by means of BOLA Laboratory Screw Joints. Universal chemical resistance. The product is only exposed to PTFE.

For ground joint NS	For tubing O. D. max. mm	Necks GL	Cat. No.:
14/23	3 x 8	3 x 14	D 623-14
19/26	3 x 8	3 x 14	D 623-19
29/32	3 x 10	3 x 18	D 623-29
45/40	3 x 10	3 x 18	D 623-45

Applications:

Easy extension of connections on glass lids with ground joint. For leading in and removal of liquids in glass reactors without contamination of the media through the ambient air.





BOLA Ground Joint GL Adaptors

Material: **PTFE, PPS** Temperature resistance: **from -20°C to +200°C** Chemical resistance: **+++ universal** Vacuum: **suitable**

FDA conform

Product description:

Black screw cap made of PPS with GL 45 thread or blue screw cap made of PP with GLS 80 thread, movable insert with ground joint made of PTFE. Transition from a ground joint to a glass thread. The body can be turned independently from the screw cap. The completely assembled adaptor can be removed and fixed on another bottle without the risk of disarranging the tubing. Very good chemical resistance.

A	For bottle thread GL	Socket NS	Cat. No.:
	45	29/32	D 734-40
	45	45/40	D 734-44
B	For bottle thread GL	Cone NS	Cat. No.:
	45	29/32	D 740-40



Material: **PTFE, PP** Temperature resistance: **from 0°C to +110°C** Chemical resistance: **+++ universal** Vacuum: **suitable**

C	For bottle thread GLS	Socket NS	Cat. No.:
	80	29/32	D 734-50
	80	45/40	D 734-54

Applications:

Assembly of components with ground joint (condensers, stirrer bearings etc.) on glass bottles or GL-threaded necks.



BOLA PRACTICAL TIP

You have a ground joint, but you don't know exactly its size?

Take our ground joint reducing set which allows bridging different cone and socket sizes.

see page 218

BOLA **Ground Joint Reduction Set**

Material: **PTFE** Temperature resistance: **from -200 °C to +250°C** Chemical resistance: **+++ universal** Vacuum: **suitable**



FDA conform

Product description:

Made of PTFE, consisting of reducing rings graduated as follows:
NS 14 – NS 19 – NS 24 – NS 29 – NS 34 – NS 45 and NS 60.

Dimensions NS	Height/length of ground joint mm	Cat. No.:
14-20	20	H 981-14

Applications:

For bridging different cone and socket sizes e. g. a NS 14 cone can functionally be placed into a NS 45 socket.

BOLA **Glass Flange Metal Adaptors**

Material: **PTFE, Silicone** Temperature resistance: **from -60°C to +230°C** Chemical resistance: **+++ universal** Pressure: **low** Vacuum: **suitable**

FDA conform

Product description:

Made of PTFE and silicone, circular PTFE collar facilitates assembly and assures exact placement of the gasket. The elasticity for expansions and contractions is given by a special kind of silicone which is placed behind PTFE sealing lips. Universal chemical resistance since the product is only exposed to PTFE.

Nominal width	O.D. mm	Bore dia. mm	Sealing height mm	Cat. No.:
10	25	14	2	D 720-10
15	32	16	3	D 720-15
25	47	27	3	D 720-25

Applications:

For HWS® "Adaptor, metal, for flexible metallic hose" for a reliable sealing between glass flange and metal adaptor. Ideal for sealing temper connections, e.g. on double walled vessels.





BOLA O-Rings

Material: **PTFE** Temperature resistance: **from -200 °C to +250°C** Chemical resistance: **+++ universal**

FDA conform

Product description:

Made of PTFE. Due to the nearly inexhaustible possibilities of dimensions we only manufacture PTFE-O-Rings to your specifications. We would be glad to send you a quotation.

Please complete the list below and send us a copy by fax to +49 (0)9346-928651. Thank you.

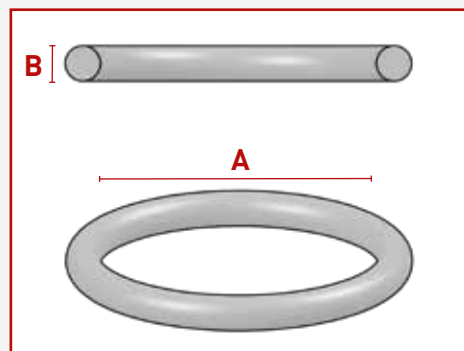
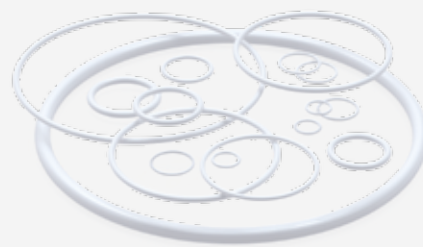
Quantity:

A O-Ring I.D.:

B Thickness:

Applications:

As sealing.



BOLA O-Rings for Laboratory Flat Flanges

Material: **FEPPTFE** Temperature resistance: **from -60°C to +205°C** Chemical resistance: **++ very good**

FDA conform

Product description:

Silicone core with seamless FEP coating; manufactured according to DIN 12214:1996-12; flexible, almost universal chemical resistance.

For flat flange NW	Dimensions mm		Cat. No.:
60	75 x 4		H 969-18
100	110 x 4		H 969-25
120	132 x 4		H 969-45
150	155 x 4		H 969-55
200	214 x 4		H 969-75

Applications:

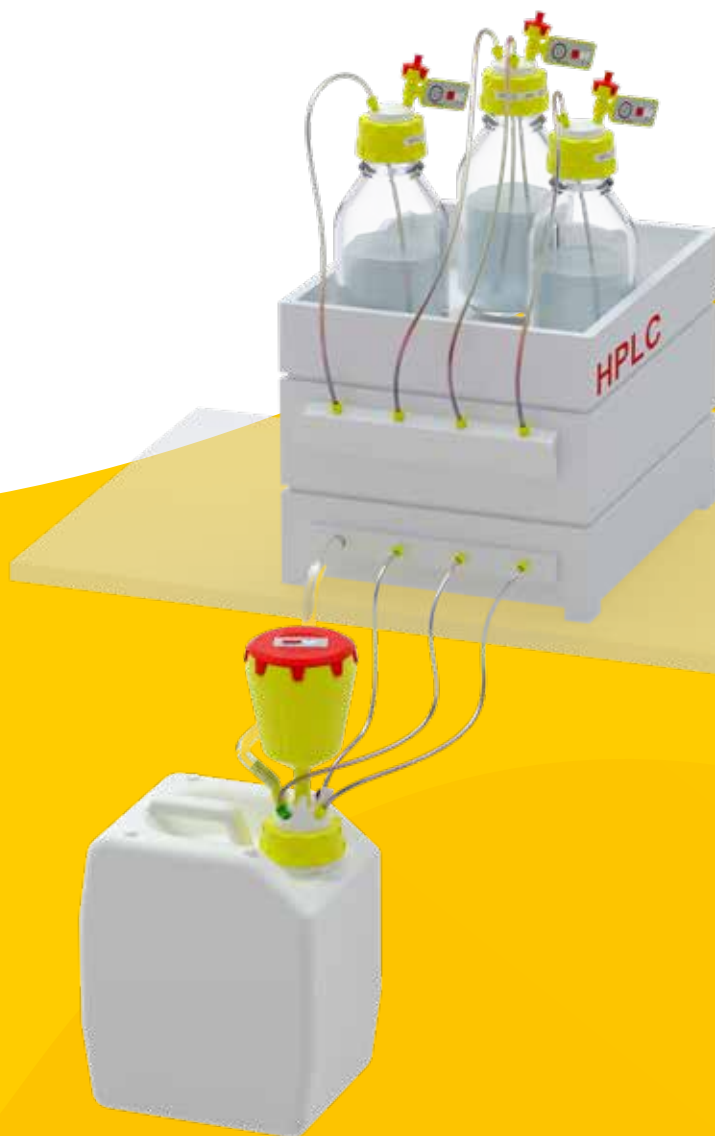
As sealing for flat flange with groove.



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BOLA Tri-Clamp Fittings – what you should know about.

Tri-Clamp is a standardized screwing system which is used in chemical, pharmaceutical and food industry everywhere where great importance on cleanliness and reliability is attached and thus components that can be cleaned easily and assembled safely are required.

All BOLA components with Tri-Clamp are produced in accordance with the relevant standard DIN 32 676. Other dimensions and further adaptors for the transition to other threads are always available on demand.

+ All Tri-Clamp Fittings are produced in accordance with DIN 32 676 and thus are compatible to all components of the same standard.

+ The flange-like fittings are pressed together and connected by means of a locking clamp in suitable size.

+ The seal is made on the flat flange and, in addition, the inside diameter of the pipe is the same throughout, so that the dead volume is reduced.

+ With BOLA Tri-Clamp Fittings and Laboratory Screw Joints, PTFE tubes can be connected directly to the GL socket and thus with the existing Tri-Clamp tubing, for example, you can extract or fill in medium.

+ BOLA Tri-Clamp fittings can be manufactured to any known standard and the number and design of the connections can be adapted to your requirements.

+ BOLA Tri-Clamp Fittings produced of PTFE are chemically and thermally high resistant. At the same time the surfaces are non-adhesive and thus can be cleaned easily.



BOLA Tri-Clamp GL-Adaptor

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

FDA conform

Product description:

Fitting made of PTFE for transition of Tri-Clamp as per DIN 32 676 to a GL-threaded neck. Universal chemical resistance, the flowing product is only exposed to PTFE.

Plate-Ø	Nominal size as per DIN	For tube I.D. mm	Threaded Neck GL	Cat. No.:
25,5	DN 08	8,0	14	D 901-02
25,5	DN 10	10,0	18	D 901-04
25,5	DN 10	10,0	25	D 901-06
34,0	DN 10	10,0	14	D 901-22
34,0	DN 15	16,0	18	D 901-24
34,0	DN 20	20,0	25	D 901-26
50,5	DN 25	26,0	14	D 901-42
50,5	DN 25	26,0	18	D 901-44
50,5	DN 32	32,0	25	D 901-46
50,5	DN 40	38,0	45	D 901-48

Applications:

For connection of hard-walled tubing (such as glass, stainless steel) or fluoroplastic tubes (such as PTFE, PFA, FEP) with BOLA Laboratory Screw Joints to Tri-Clamp components as per DIN 32 676.



#SUITABLE page 90
Laboratory screw joints



BOLA Tri-Clamp Multiple Distributor

Material:
PTFE

Temperature resistance:
from -200 °C to +250 °C

Chemical resistance:
+++ universal

FDA conform

Product description:

Fitting made of PTFE for transition of Tri-Clamp as per DIN 32 676 to two or three GL-threaded necks. Universal chemical resistance, the flowing product is only exposed to PTFE.

Plate-Ø	Nominal size as per DIN	For tube I.D. mm	Threaded Neck GL	Bore diam. mm	Cat. No.:
34,0	DN 20	20,0	2 x 14	2 x 8,5	D 911-22
50,5	DN 40	38,0	3 x 14	3 x 8,5	D 911-42
50,5	DN 40	38,0	3 x 18	3 x 10,5	D 911-44

Applications:

For connection of hard-walled tubing (such as glass, stainless steel) or fluoroplastic tubes (such as PTFE, PFA, FEP) with BOLA Laboratory Screw Joints to Tri-Clamp components as per DIN 32 676.



BOLA **Tri-Clamp GL-Stopcocks**Material:
PTFE, PPTemperature resistance:
from 0 °C to +110 °CChemical resistance:
+++ universal**FDA conform**

Product description:

2-Way stopcock made of PTFE with straight bore, one Tri-Clamp neck as per DIN 32 676 and one GL-threaded neck. Cylindrical stopcock made of PTFE for reliable tightness and grip made of PP for marking the flow direction. Universal chemical resistance, the flowing product is only exposed to PTFE.

Plate-Ø	Nominal size as per DIN	For tube I.D. mm	connecting thread GL	bore dia. mm	Cat. No.:
25,0	DN 08	8,0	18	6	D 917-02
34,0	DN 15	16,0	25	8	D 917-24
50,5	DN 25	26,0	25	8	D 917-42

Applications:

Quick and easy disconnection of flow. For connection of hard-walled tubing (such as glass, stainless steel) or fluoroplastic tubes (such as PTFE, PFA and FEP) with BOLA Laboratory Screw Joints to Tri-Clamp components as per DIN 32 676.

BOLA **Tri-Clamp Gaskets**Material:
PTFE, SilikonTemperature resistance:
from -60 °C to +230 °CChemical resistance:
+++ universal**FDA conform**

Product description:

Silicone ring with double-sided, elastic washer made of PTFE. Suitable for Tri-Clamp connections as per DIN 32 676. Universal chemical resistance, the flowing product is only exposed to PTFE.

Plate-Ø	Nominal size as per DIN	For tube I.D. mm	Cat. No.:
25,5	DN 08	8,0	D 930-02
25,5	DN 10	10,0	D 930-04
34,0	DN 10	10,0	D 930-22
34,0	DN 15	16,0	D 930-24
34,0	DN 20	20,0	D 930-26
50,5	DN 25	26,0	D 930-42
50,5	DN 32	32,0	D 930-44
50,5	DN 40	38,0	D 930-46
64,0	DN 50	50,0	D 930-62
91,0	DN 65	66,0	D 930-72

Applications:

Chemical inert, reusable gasket for Tri-Clamp connections as per DIN 32 676.





BOLA **Adaptor Tri-Clamp Hose Connector**

Material:
PTFE

Temperature resistance:
from -200 °C to + 250 °C

Chemical resistance:

+++ universal

FDA conform

Product description:

Fitting made of PTFE for transition of Tri-Clamp as per DIN 32 676 to a hose connector.
Universal chemical resistance, the flowing product is only exposed to PTFE.

Plate-Ø mm	Nominal size as per DIN	For tube I.D. mm	Hose Connector O.D. mm	Cat. No.:
25,0	DN 08	8,0	10,4	D 915-02
34,0	DN 10	10,0	10,4	D 915-22
50,5	DN 25	26,0	16,0	D 915-42

Applications:

For connection of elastic tubing (such as silicone, Viton®, Tygon®) to Tri-Clamp components as per DIN 32 676.



Precise and reliable measurements even in aggressive liquids – all probes are encapsulated with PTFE for maximum chemical resistance.





TEMPERATURE MEASUREMENT



232 Temperature Probes PT100

Double Temperature Probes	
PT 100 Lemo® Compact	232
Temperature Probes PT 100	233
Temperature Probes PT 100 Lemo®	233
Temperature Probes PT 100 Lemo® Compact	234
Temperature Probes PT 100 Lemo®	235
Total Immersion Probes PT 100	236
Total Immersion Probes PT 100 Lemo®	237
Total Immersion Probes PT 100 Lemo®	237

242 Temperature Probes K

Temperature Probes K	242
Temperature Probes K with SMP plug	242

241 Adaptors / Accessories

Extension Cable for Temperature Probe Lemo®	241
Adaptors for Temperature Probes	241
Probe Insertion	243

238 Temperature Probes PT1000

Temperature Probes PT1000	238
Temperature Probes PT1000 Lemo®	238
Total Immersion Probes PT1000	239
Total Immersion Probes PT1000 Lemo®	239

BOLA Temperature Measurement – what you should know about.

Precise and reliable measurements even in aggressive liquids – all probes are encapsulated with PTFE for maximum chemical resistance.

+ Universal chemical resistance; metal-free

+ Unbreakable

+ Fall protection ring for safe handling

+ Available from stock in different versions and lengths

+ Tapered probe tip provides reduction in response times

+ High measuring accuracy



BOLA Temperature Probes and Total Immersion Probes



Build-up and function of BOLA Temperature Probes

Two different sensors are used for BOLA Temperature Probes.

BOLA Temperature Probes PT 100 and PT 1000 are resistance thermometers which measure temperature correlated to platinum's changing electrical resistance under temperature influence with a deposited table of values.

BOLA Temperature Probes Type K are thermocouples which measure temperature with the help of changing voltage inside the sensor under temperature influence.

The sensors of all BOLA Temperature Probes, PT 100, PT 1000 and Type K are located at the end of a PTFE-encapsulated stainless steel tube (material code: 1.4571).

The stainless steel tube provides certain rigidity, but can be bent to the requested form by hand, so that the sensor can be oriented to the optimum measuring point.

For BOLA Temperatures Probes PT 100 and PT 1000, connection to the measuring device is made either with a socket or plug type Lemo® size 1 or by connecting directly the strands of the cable to the device.

For BOLA Temperature Probes Type K, connection to the measuring device is either made by using the SMP-connector or by connecting directly the strands to the device.

The cable itself is also encapsulated with PFA and connected tightly to the temperature probe

Advantages of BOLA Temperature Probes

Reduction of response time

Temperature Probes PT 100 and PT 1000 have tapered tips which reduce the response time considerably.

Chemical resistance and metal-free

The PTFE encapsulation provides an almost universal chemical resistance. All parts which are exposed to the medium do not contain any metals.

Safe to handle

Due to the collar ring at its end, the probe cannot fall into the medium.

High accuracy of measurement

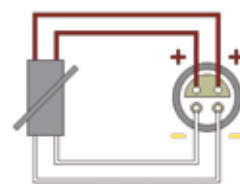
The four-wire system of the PT 100 probes eliminates nearly completely the influence of the resistivity and the transition resistance (failure: approx. 0,002-0,004 % / Ohm). Normally, a calibration is not necessary. Long connecting cables can be used with the four-wire system.

PT 1000 probes use the two-wire system. At 0 °C, PT 100 probes have a resistance of 100 Ohm whereas PT 1000 probes have a resistance of 1000 Ohm. Due to the high inherent resistance of PT 1000 probes, the measuring result is insignificantly influenced by the resistivity of the measuring line. Thus the measured temperature deviates minimally from the actual temperature even when long connecting cables are used.

Performance Data of BOLA Temperature Probes

4-wire-system - PT 100

Pin configuration of the LEMO® socket/plug



Temperature probe / PT 100

Temperature range:

-50°C to +250°C

Specification:

DIN EN 60751

Type:

Platinum temperature sensor

Class:

A

Tolerance:

0,15 + (0,002 x (t))

Typical aberrations:

at 0°C: +/- 0,15°C

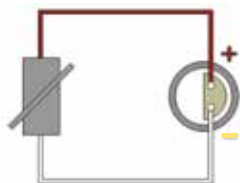
at 100°C: +/- 0,35°C



Performance Data of BOLA Temperature Probes

2-wire-system- PT 1000

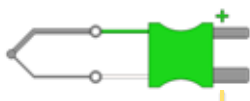
Pin configuration of the LEMO® socket plug



Temperature probe / PT 1000

Temperature range:	-50°C to +250°C
Specification:	DIN EN 60751
Type:	Platinum temperature sensor
Class:	A
Tolerance:	0,15 + (0,002 x (t))
Typical aberrations:	at 0°C: +/- 0,15°C at 100°C: +/- 0,35°C

Pin configuration of the Temperature Probe K



Temperature Probe K

Temperature range:	from 0°C to + 300°C
Specification:	IEC60584.3:2007
Type:	Type K Thermoelement
Tolerance:	+/- 0,15°C
Dimension of panel:	38 x 38 x 2,5 mm

Difference between PT 100 and PT 1000

Both, PT 100 and PT 1000 probes are resistance thermometers but have a different coefficient of temperature. Depending on the platinum used, PT 1000 probes have a coefficient of temperature of 3,85 Ohm/°C and PT 100 probes of 0,385 Ohm/°C. This means, at 0 °C the platinum of the PT 1000 sensor has a resistance of 1000 Ohm, at 1 °C of 1003,85 Ohm and so on. A PT 1000 probe has a higher gradient and thus offers a higher resolution. The inherent resistance of the connecting cable does not influence the measuring results of PT 1000 probes. For PT 100 probes, the measuring device compensates the inherent resistance of the connecting cable. Therefore not all devices can handle both probe types.

We produce temperature probes according to your indications

Do you need a different temperature probe?
No problem - we can quote for your special requirements.

Coating custom temperature probes and thermometers

We can coat your temperature probes or thermometers with a PTFE heat-shrinkable tubing so that they have the chemical resistance of PTFE. Even if the probes or thermometers break, there is no risk of contamination due to the PTFE coating.

Because of the thin coating, the probe or thermometer has slower response behavior.

For coating, your probe/thermometer has to resist a short-time temperature of minimum +250°C.

Please contact us!



BOLA Temperature Probes and Total Immersion Probes

Response times of BOLA Temperature Probes

Due to the properties of PTFE, the response times of PTFE-encapsulated temperature probes are longer than the response times of glass or metal probes. We have indicated all corresponding T 50 and T 90 values of our temperature probes.



INFORMATIVE: page 352
Determination of response times of temperature probes

BOLA Temperature Probes made of static dissipative PTFE-EX

Besides Compact Probes with a PTFE-encapsulation, also identical Temperature Probes Compact EX encapsulated with black, static dissipative PTFE-EX are available at BOLA. By adding conductive pigments like soot and electrographitised carbon, the electrically isolating PTFE becomes static dissipative.

The construction and performance data are identical with the known BOLA Temperature Probes.

You will find BOLA Temperatures Probes Compact EX on page 159. Please see also page 145 for additional information on BOLA products in static dissipative materials.

Plugs and sockets

Our temperature probes are normally supplied with plugs or sockets type LEMO® size 1. Should you need a different LEMO® size, we can offer corresponding adaptors (see page 241).

We can also supply temperature probes with your specific plug or socket. You can find below the most important dimensions for determination of LEMO® plugs and sockets.

Easy identification of plug and socket size!

You can find out your plug or socket size as follows:



Plug Lemo Size 0
O.D. 7 mm



Plug Lemo Size 1
O.D. 9 mm



Socket Lemo Size 0
O.D. 9 mm



Socket Lemo Size 1
O.D. 12 mm

BOLA Double Temperature Probes PT 100 Lemo® Compact

Material: PTFE Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal Temperature range: from -50°C to +250°C



FDA conform



Product description:

Two independent measuring sensors PT 100 in one PTFE-encapsulated stainless steel tube (1.4571). Collar ring Ø 12 mm. Connection by two couplings (type Lemo®, socket size 1, 4-wire system) fixed directly at the end of the probe.

Typical response times:

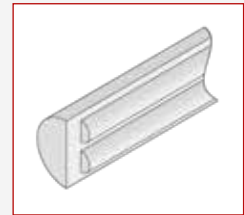
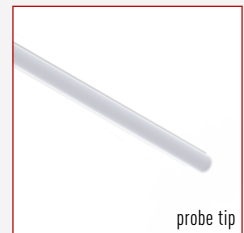
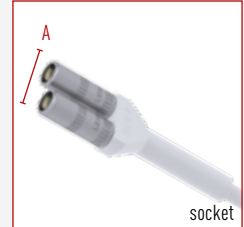
- » T 50: 20 - 24 s
- » T 90: 30 s

See page 352 for detailed explanation.

Usable length mm	Probe dia. mm	Total length mm	Number of sensors	Width of coupling A mm ca.	Cat. No.:
300	8	400	2x PT 100	27	P 1740-20
400	8	500	2x PT 100	27	P 1740-23
500	8	600	2x PT 100	27	P 1740-30
300	6	400	2x PT 100	27	P 1740-40

Applications:

- » parallel temperature measurement in aggressive liquids
- » double safety due to redundant systems
- » control function due to two independent measuring sensors
- » suitable for simultaneous temperature measurement and safety circuit as per the specifications of the standard DIN EN 61010-2-010 but only one NS/GL socket will be occupied, separately switched sensors.
- » ideal for built-in measurement cables
- » identical versions also available in static dissipative PTFE-EX (see page 159)



#SUITABLE page 126
Swivelling screw fittings

BOLA INNOVATION



#1 Double Temperature Probes Lemo® Compact

Two PT 100 elements in one PTFE-encapsulated stainless steel tube combine several functions: for example measuring temperature in aggressive liquids or making measurements in safety circuit.



BOLA Temperature Probes PT 100

Material: PTFE Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal Temperature range: from -50°C to +250°C

FDA conform



Product description:

One measuring sensor PT 100 in a PTFE-encapsulated stainless steel tube (1.471).
Temperature probe Ø 8mm, tip Ø 6mm, collar ring Ø 12mm. With white PFA-coated cable
(length: 1,5m, 4 strands).

Typical response times:

» T 50: 7 - 12 s

» T 90: 14 - 16 s

See page 352 for detailed explanation.

Usable length mm	Total length mm	Connector	Cat. No.:
100	135	strands, 4-wire-system	P 1750-10
200	240	strands, 4-wire-system	P 1750-15
300	340	strands, 4-wire-system	P 1750-20
500	560	strands, 4-wire-system	P 1750-25
600	660	strands, 4-wire-system	P 1750-30

Applications:

- » temperature measurement in aggressive liqu
- » cable provides flexible connection from measuring device to medium



#SUITABLE page 34
Slip-on Baffles to transform
temperature probes to baffles.



probe tip

connecting cable

BOLA Temperature Probes PT 100 Lemo®

Material: PTFE Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal Temperature range: from -50°C to +250°C

FDA conform



Product description:

One measuring sensor PT 100 in a PTFE-encapsulated stainless steel tube (1.471).
Temperature probe Ø 8mm, tip Ø 6mm, collar ring Ø 12mm. With white PFA-coated cable
(length: 1,5m) and coupling (type Lemo® socket size 1, 4-wire-system).

Typical response times:

» T 50: 7 - 12 s

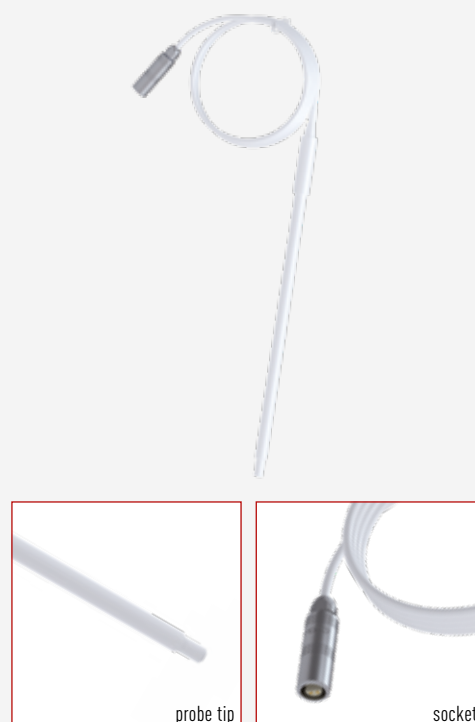
» T 90: 14 - 16 s

See page 352 for detailed explanation.

Usable length mm	Total length mm	Connector	Cat. No.:
100	135	socket, 4-wire-system	P 1760-10
200	240	socket, 4-wire-system	P 1760-15
300	340	socket, 4-wire-system	P 1760-20
500	560	socket, 4-wire-system	P 1760-25
600	660	socket, 4-wire-system	P 1760-30

Applications:

- » temperature measurement in aggressive liquids
- » cable provides flexible connection from measuring device to medium



probe tip

socket

BOLA Temperature Probes PT 100 Lemo® Compact

Material: PTFE Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal Temperature range: from -50°C to +250°C

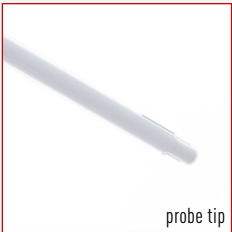


Product description:
One measuring sensor PT 100 in a PTFE-encapsulated stainless steel tube (1.4571). Temperature probe Ø 8 mm, tip Ø 6 mm, collar ring Ø 12 mm. Connection by a coupling (type Lemo®, socket size 1, 4-wire system) fixed directly at the end of the probe.

Typical response times:
» T 50: 7 - 12 s
» T 90: 14 - 16 s
See page 352 for detailed explanation.

Usable length mm	Total length mm	Connector	Cat. No.:
100	170	socket, 4-wire-system	P 1730-10
300	370	socket, 4-wire-system	P 1730-20
400	470	socket, 4-wire-system	P 1730-23
500	570	socket, 4-wire-system	P 1730-25

Applications:
» temperature measurement in aggressive liquids
» ideal for built-in measurement cables
» identical versions also available in static dissipative PTFE-EX (see page 159)



#SUITABLE page 126
Swivelling screw fittings

BOLA INNOVATION



#1 Temperature Probes Lemo® Compact

Many measuring sensors are connected directly to the cable. The Lemo® connector of BOLA Temperature Probes Compact is connected to the sensor so that the temperature probe can be exchanged easily.



BOLA **Temperature Probes PT 100 Lemo®**

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Temperature range: **from -50°C to +250°C**



FDA conform



Product description:
One measuring sensor PT 100 in a PTFE encapsulated stainless steel tube (1.4571).
Temperature probe Ø 8 mm, tip Ø 6 mm, collar ring Ø 12 mm. With white PFA-coated cable
(length: 1,5 m) and mounted Lemo® plug size 1, 4-wire system.

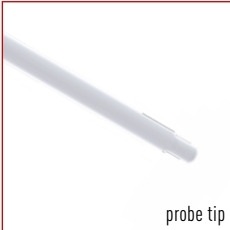
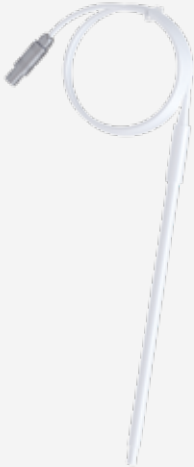
Typical response times:

- » T 50: 7 - 12 s
 - » T 90: 14 - 16 s
- See page 352 for detailed explanation.

Usable length mm	Total length mm	Connector	Cat. No.:
100	135	plug, 4-wire-system	P 1762-10
200	240	plug, 4-wire-system	P 1762-15
300	340	plug, 4-wire-system	P 1762-20
500	560	plug, 4-wire-system	P 1762-25
600	660	plug, 4-wire-system	P 1762-30

Applications:

- » temperature measurement in aggressive liquids
- » cable provides flexible connection from measuring device to medium



BOLA **Total Immersion Probes PT 100**

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Temperature range: **from -50°C to +250°C**

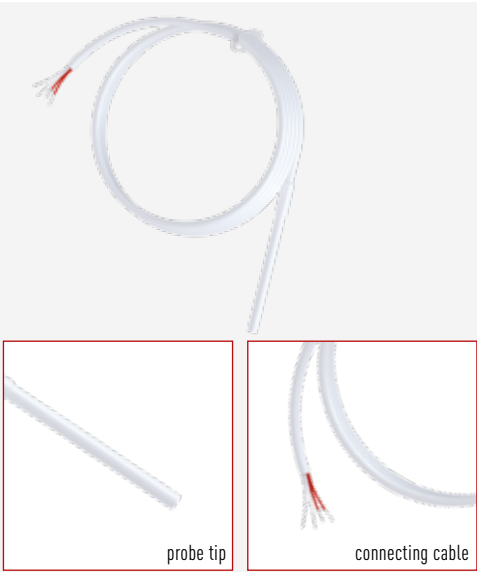


Product description:
Total immersion probe (class A, PT 100), with white PFA-coated cable length: 4 m, (4-wire) and collar ring Ø 5 mm.

Typical response times:
» T 50: 4 - 6 s
» T 90: 6 - 8 s
See page 352 for detailed explanation.

Usable length mm	Probe dia. mm	Connector	Cat. No.:
50	4	strands, 4-wire-system	P 1780-20

Applications:
» e.g. for measuring temperatures in autoclaves
» can be immersed totally into the liquid



#SUITABLE page 90
Laboratory screw joints



BOLA **Total Immersion Probes PT 100 Lemo®**

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Temperature range: **from -50°C to +250°C**



Product description:
Total immersion probe (class A, PT 100), with white PFA-coated cable (length: 4 m), coupling (type Lemo®, socket size 1, 4-wire) and collar ring Ø 5 mm.

Typical response times:
» T 50: 4 - 6 s
» T 90: 6 - 8 s
See page 352 for detailed explanation.

Usable length mm	Probe dia. mm	Connector	Cat. No.:
50	4	socket, 4-wire-system	P 1790-20

Applications:
» e.g. for measuring temperatures in autoclaves
» can be immersed totally into the liquid



BOLA **Total Immersion Probes PT 100 Lemo®**

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Temperature range: **from -50°C to +250°C**



Product description:
Total immersion probe (class A, PT 100), with white PFA-coated cable (length: 4 m), coupling (type Lemo®, plug size 1, 4-wire) and collar ring Ø 5 mm.

Typical response times:
» T 50: 4 - 6 s
» T 90: 6 - 8 s
See page 352 for detailed explanation.

Usable length mm	Probe dia. mm	Connector	Cat. No.:
50	4	plug, 4-wire-system	P 1792-20

Applications:
» e.g. for measuring temperatures in autoclaves
» can be immersed totally into the liquid



BOLA **Temperature Probes PT 1000**

Material: PTFE	Temperature resistance: from -200°C to +250°C	Chemical resistance: +++ universal	Temperature range: from -50°C to +250°C
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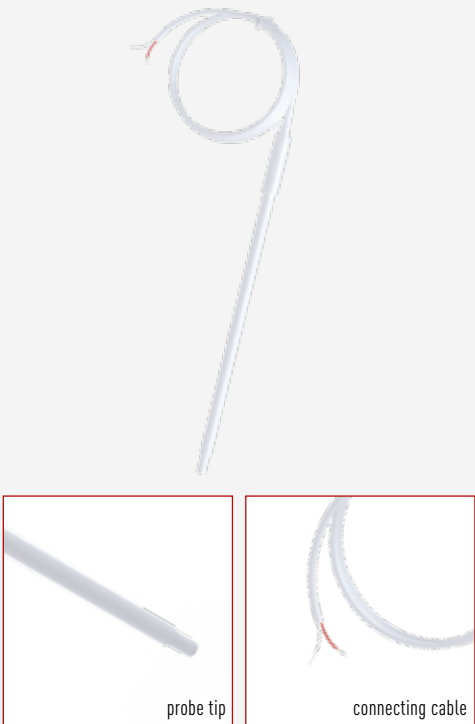
Product description:
One measuring sensor PT 1000 in a PTFE encapsulated stainless steel tube (1.4571).
Temperature probe Ø 8 mm, tip Ø 6 mm, collar ring Ø 12 mm. With white PFA-coated cable (length: 1,5 m, 2-wire system).

Typical response times:
» T 50: 16 - 18 s
» T 90: 47 - 50 s
See page 352 for detailed explanation.

Usable length mm	Total length mm ca.	Connector	Cat. No.
200	260	strands, 2-wire system	P 1950-15
300	360	strands, 2-wire system	P 1950-20
500	560	strands, 2-wire system	P 1950-25
600	660	strands, 2-wire system	P 1950-30



#SUITABLE page 34
Slip-on Baffles to transform
temperature probes to baffles



BOLA **Temperature Probes PT 1000 Lemo®**

Material: PTFE	Temperature resistance: from -200°C to +250°C	Chemical resistance: +++ universal	Temperature range: from -50°C to +250°C
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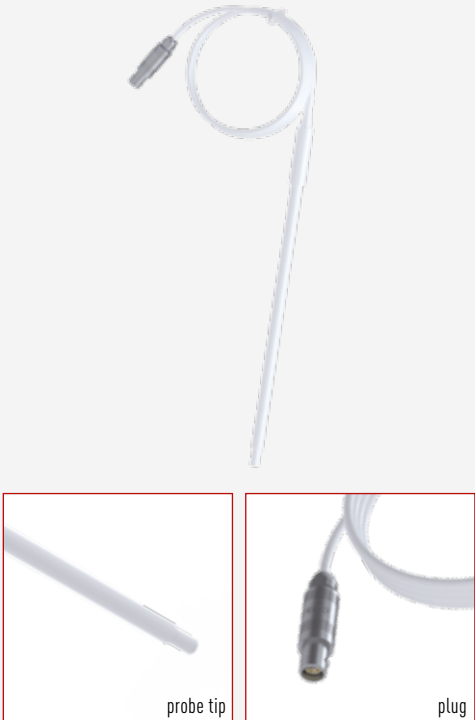


Product description:
One measuring sensor PT 1000 in a PTFE encapsulated stainless steel tube (1.4571).
Temperature probe Ø 8 mm, tip Ø 6 mm, collar ring Ø 12 mm. With white PFA-coated cable (length: 1,5 m) and mounted Lemo® plug size 1, 2-wire system.

Typical response times:
» T 50: 16 - 18 s
» T 90: 47 - 50 s
See page 352 for detailed explanation.

Usable length mm	Total length mm ca.	Connector	Cat. No.:
200	260	plug, 2-wire system	P 1962-15
300	360	plug, 2-wire system	P 1962-20
500	560	plug, 2-wire system	P 1962-25
600	660	plug, 2-wire system	P 1962-30

Applications:
» temperature measurement in aggressive liquids
» cable provides flexible connection from measuring device to medium





BOLA **Total Immersion Probes PT 1000**

Material: **PTFE, PFA** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Temperature range: **from -50°C to +250°C**



Product description:
Total immersion probe PT 1000, collar ring Ø 5mm. With white PFA-coated cable (length: 4 m, 2-wire system).

Typical response times:

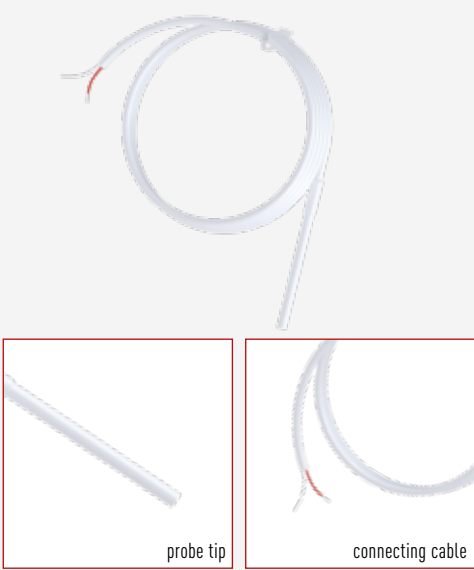
- » T 50: 16 - 18 s
- » T 90: 47 - 50 s

See page 352 for detailed explanation.

Usable length mm	Probe dia. mm	Connector	Cat. No.:
50	4	strands, 2-wire system	P 1980-20

Applications:

- » e.g. for measuring temperatures in autoclaves
- » vollständig ins Medium eintauchbar



BOLA **Total Immersion Probes PT 1000 Lemo®**

Material: **PTFE, PFA** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Temperature range: **from -50°C to +250°C**



Product description:
Total immersion probe PT 1000, collar ring Ø 5 mm. With white PFA-coated cable (length: 4 m), mounted Lemo® plug size 1, 2-wire system.

Typical response times:

- » T 50: 16 - 18 s
- » T 90: 47 - 50 s

See page 352 for detailed explanation.

Usable length mm	Probe dia. mm	Connector	Cat. No.:
50	4	plug, 2-wire system	P 1992-20

Applications:

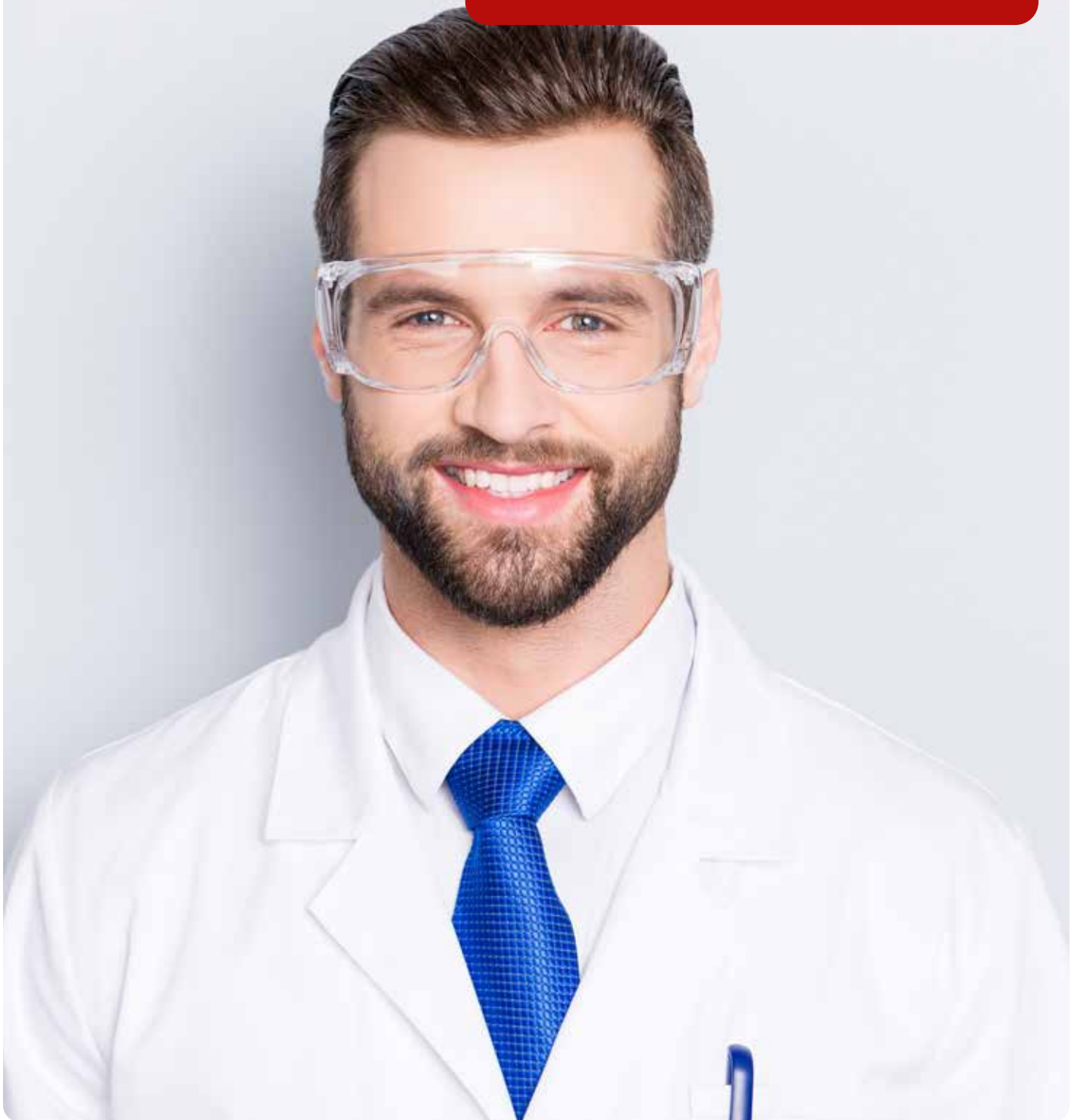
- » e.g. for measuring temperatures in autoclaves
- » can be immersed totally into the liquid





BOLA Temperature Probes

Compared to stainless steel probes, BOLA Temperature Probes offer best chemical resistance. And unlike glass, they are unbreakable.





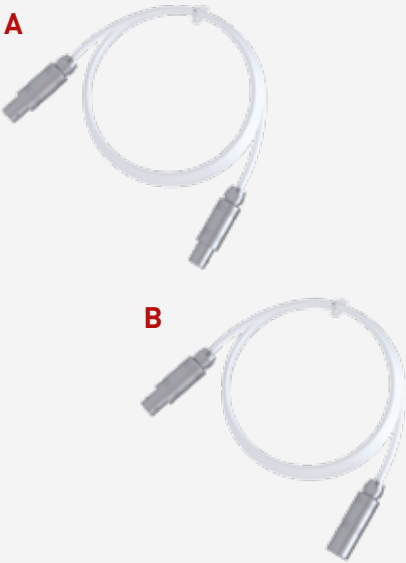
BOLA **Extension Cable for Temperature Probe Lemo®**

FDA conform

Product description:
PTFE-coated, 4-wire measuring cable with coupling (type Lemo®). Due to the 4-wire system there is no need to compare with a measuring apparatus. Suitable for all BOLA Temperature Probes with coupling type Lemo®.

	Cable length mm	Size first side	Size second side	Transition from Size	Cat. No.
A	1.500	Plug 1	Plug 1	Socket size 1 to socket size 1	P 1724-08
	3.000	Plug 1	Plug 1	Socket size 1 to socket size 1	P 1724-16
	Cable length mm	Size first side	Size second side	Transition from Size	Cat. No.
B	1.500	Plug 1	Socket 1	Socket size 1 to plug size 1	P 1724-38
	3.000	Plug 1	Socket 1	Socket size 1 to plug size 1	P 1724-46

Applications:
» for the extension of existing measuring cables
» for fix installation e.g. in extractor hoods

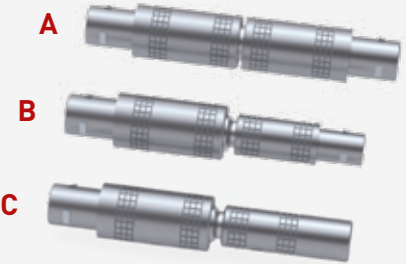


BOLA **Adaptors for Temperature Probes**

Product description:
4-wire adaptors.

	Size first side	Size second side	Length mm	Transition from size	Cat. No.:
A	Plug 1	Plug 1	72	Socket size 1 to Socket size 1	P 1720-16
B	Plug 1	Plug 0	65	Socket size 1 to Socket size 0	P 1720-32
C	Plug 1	Socket 0	65	Socket size 1 to Plug size 0	P 1720-24

Applications:
» for the connection of different sizes of plugs and sockets
» for the connection of existing ports to temperature probes
» for the connection of existing measurement cables with plugs or sockets of company Lemo®



BOLA Temperature Probes K

Material: PTFE Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal Temperature range: from -50°C to +250°C

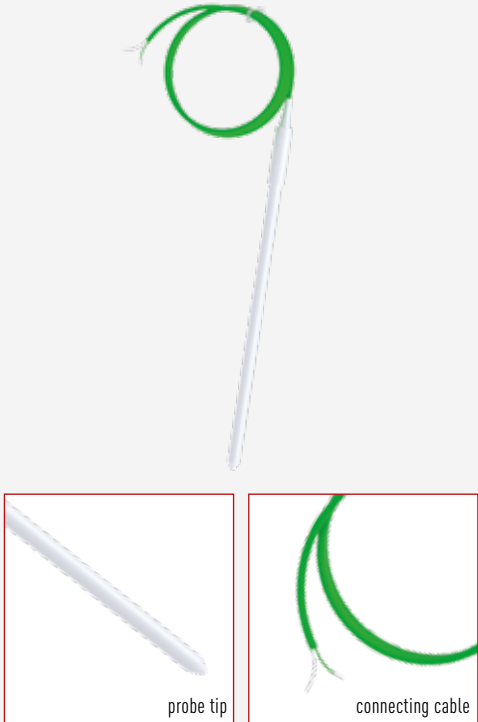
FDA conform

Product description:
Thermocouple K (Ni Cr + Ni) in a PTFE-encapsulated stainless steel tube (1.4571).
Temperature probe Ø 8 mm, pointed tip, collar ring Ø 12 mm. With green PFA-coated cable (length: 1,5m, 2-wire-system)

Typical response times:
» T 50: 25 s
» T 90: 59 s
See page 352 for detailed explanation.

Usable length mm	Total length mm	Connector	Cat. No.:
200	240	strands, 2-wire-system	P 1850-15
300	340	strands, 2-wire-system	P 1850-20
500	560	strands, 2-wire-system	P 1850-25

Applications:
» temperature measurement in aggressive liquids
» cable provides flexible connection from measuring device to medium



BOLA Temperature Probes K with SMP-Connector

Material: PTFE Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal Temperature range: from -50°C to +250°C

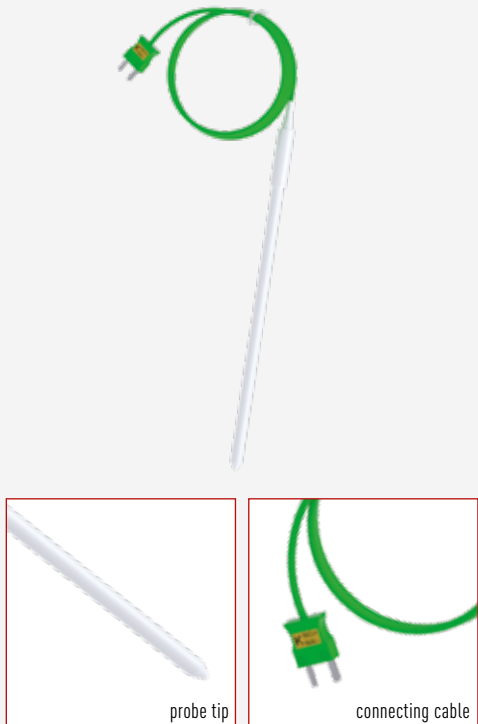
FDA conform

Product description:
Thermocouple K (Ni Cr + Ni) in a PTFE-encapsulated stainless steel tube (1.4571).
Temperature probe Ø 8 mm, pointed tip, collar ring Ø 12 mm. With green PFA-coated cable (length: 1,5m) and SMP-plug.

Typical response times:
» T 50: 25 s
» T 90: 59 s
See page 352 for detailed explanation.

Usable length mm	Total length mm	Connector	Cat. No.:
200	240	SMP plug, 2-wire-system	P 1860-15
300	340	SMP plug, 2-wire-system	P 1860-20
500	560	SMP plug, 2-wire-system	P 1860-25

Applications:
» temperature measurement in aggressive liquids
» cable provides flexible connection from measuring device to medium



#SUITEBLE page 34
Slip-on Baffles to transform
temperature probes to baffles.



BOLA **Probe Insertion**

Material: PTFE, PPS Temperature resistance: from 0°C to +110°C Chemical resistance: +++ universal

FDA conform

Product description:
Black screw cap made of PPS with GL 45 thread, movable body made of PTFE with adjusting screw for fixing and sealing sensors. The product is only exposed to PTFE.

For thread GL	For sensor dia. mm		Cat. No.:
45	12 (+/- 0,5)		D 780-14

Applications:
For contamination-free insertion of sensors into bottles with GL 45 thread.



A suitable solution for practically every application in well-known BOLA quality and optimally adapted to your needs.





VESSELS AND DISTILLATION EQUIPMENT



246 Scrubber Bottles

Scrubber Columns	246
Scrubber Bottles	247
Micro Scrubber Bottles	248

254 Reaction and Digestion Vessels

Micro Reaction Vessel	254
Hydrolysing and Digestion Vessel	263

248 Bottles, Flasks, Beakers, and Jars

Wide Mouth Bottles	248/249
Wide Mouth Bottles with Conical Neck	249
Wash Bottles	250
Round Bottom Flasks	250-252
Jars	253
Micro Reaction Vessels	254
Beakers	255/256
Lids	255
Measuring Cylinders	256
Erlenmeyer Flasks	259
Thermo Beakers	259

267 Reactor lids and Distillation units

Flat Flange Reactor Lids and Accessories	267-291
Flat Flange Distillation Apparatus	283

257 Dishes, Test Tubes, and Funnels

Watch Dishes	257
Evaporating Dishes	257/258
Test Tubes	260
Sampling Bags	260
Funnels	261
Dipper Vessels	261
Dipping Sieves	262

BOLA **Scrubber Columns**Material:
FEP, PTFETemperature resistance:
from -200°C to +205°CChemical resistance:
+++ universalPressure:
no pressureTransparency:
transparent**FDA** conform

Product description:

Tall, slim scrubber column made of FEP. Inlet and outlet tube as well as riser tube are made of FEP (5,6 x 8 mm), bottom and top are made of pure PTFE. The standard PTFE frit has a pore size of approx. 3 µm and is screwed on the riser tube with an M8x1 thread. It can be exchanged with the PTFE gas distributor with fine bores (Cat. No. N 1501-16 – page 327) which needs a lower primary pressure.

Capacity ml	Total height mm	Connection for tubing O.D. mm	O.D. of column mm	Cat. No.:
500	400	2 x 8	54	A 117-04
1.000	700	2 x 8	54	A 117-08

Product advantages:

- » transparent
- » unbreakable
- » intense mixing of gas due to tall riser tube
- » frit easily exchangeable

Flow rate:

Using the standard gas distributor and at the stated system pressure.

Cat. No.:	System pressure		
	0,1 bar	0,3 bar	0,6 bar
A 117-04	15,0 l/h	62,5 l/h	130,0 l/h
A 117-08	5,0 l/h	50,0 l/h	117,5 l/h



#SUITABLE page 328
**Scrubber Adaptor for Bottles with
 GL 45 and GLS 80**



BOLA **Scrubber Bottles**

Material: **PFA, PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Pressure: **no pressure** Transparency: **transparent**



Product description:

Bottle made of PFA. PTFE top with two threaded connections. The standard PTFE frit has a pore size of approx. 3 µm and is screwed on the riser tube with an M8x1 thread. It can be exchanged with the PTFE gas distributor with fine bores (Cat. No. N 1501-16 – page 327) which needs a lower primary pressure.

Capacity ml	Total height mm	Connection for tubing O.D. mm	Cat. No.:
250	175	2 x 6	A 118-01
500	200	2 x 6	A 118-02
1.000	240	2 x 8	A 118-03

Product advantages:

- » transparent
- » unbreakable
- » frit easily exchangeable

Flow rate:

Using the standard gas distributor and at the stated system pressure.

Cat. No.:	System pressure		
	0,1 bar	0,3 bar	0,6 bar
A 118-01	12,5 l/h	67,5 l/h	140,0 l/h
A 118-02	7,5 l/h	30,0 l/h	80,0 l/h
A 118-03	7,5 l/h	37,5 l/h	80,0 l/h



BOLA **Micro Scrubber Bottles**

Material: **PFA** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Pressure: **no pressure** Transparency: **transparent**

FDA conform

Product description:

For use with volumes up to 50 ml. The gas inlet tube (not included, please choose a hard-walled tubing) is inserted through the fitting on the top and can be fixed safely. The side fitting is used as gas outlet.

Capacity ml	Total height mm	Connection for tubing O.D. mm	O.D. of bottle mm	Cat. No.:
50	180	6	31	A 119-24

Product advantages:

- » transparent
- » unbreakable
- » non-porous

Applications:

Can also be used as cold trap.

BOLA **Wide Mouth Bottles**

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Pressure: **no pressure**

FDA conform

Product description:

Thick-walled, smooth interior surface, screw cap.

Capacity ml	Total height mm	I.D. mm	O.D. mm	Thread of screw cap	Cat. No.:
1	22	9	12	M12 x 1,0	A 100-01
5	35	15	20	M20 x 1,0	A 100-03
10	44	18	28	GL25 x 3,5	A 100-04
25	53	25	34	GL32 x 4,0	A 100-05
50	78	31	45	GL40 x 4,0	A 100-06
100	86	34	50	GL45 x 4,0	A 100-07
250	120	34	63	GL45 x 4,0	A 100-08
500	170	46	75	GL56 x 4,0	A 100-09
1.000	192	58	100	GL70 x 4,0	A 100-10





BOLA Wide Mouth Bottles with Conical Neck

Material: **PFA** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Pressure: **no pressure** Transparency: **transparent**

Product description:

Transparent, non-porous, conical neck, screw cap.

Capacity ml	Total height mm	I.D. mm	O.D. mm	Buttress thread S	Cat. No.:
50	94	20	38	28	A 103-03
100	117	20	45	28	A 103-06
250	153	32	61	40	A 103-09
500	181	32	76	40	A 103-12
1.000	221	32	94	40	A 103-15



#SUITABLE page 95

Distributors for different bottle threads and tubing diameters



#SUITABLE page 99

Threaded adaptors for connecting multiple distributors GL45

BOLA Wide-Mouth Bottles with Conical Neck

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Pressure: **no pressure**

FDA conform

Product description:

Thick-walled, smooth interior surface, ergonomic grips on bottle and screw cap.

Capacity ml	Total height mm	I.D. of neck mm	O.D. mm	Thread M	Cat. No.:
25	62	19	33	25 x 2,0	A 111-16
50	77	25	43	30 x 2,0	A 111-24
100	87	33	52	42 x 2,5	A 111-32
250	112	41	67	48 x 2,5	A 111-40



BOLA **Wash Bottles**

Material: **PFA** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Transparency: **transparent**

FDA conform

Product description:

Transparent, non-porous, graduated, screw cap.

Capacity ml	Total height mm	O.D. mm	Cat. No.:
250	200	60	A 114-02
500	280	72	A 114-03
1.000	320	92	A 114-04

BOLA **Round Bottom Flasks**

Material: **PFA** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Transparency: **transparent**

Product description:

Transparent, non-porous, with ground joint neck size 29.

Capacity ml	Total height mm	O.D. of ball mm	Cat. No.:
100	117	67	A 158-06
250	149	88	A 158-08
500	177	107	A 158-09

Applications:

For rotary evaporators.



#SUITABLE page 213
Different types of stoppers



BOLA **Round Bottom Flasks with Two or Three Ground Joint Necks**

Material: **PFA** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Transparency: **transparent**

Product description:
Transparent, non-porous, central ground joint neck size 29 and lateral ground joint necks.

A

Capacity ml	Total height mm	O.D. of ball mm	Lateral necks NS	Cat. No.:
100	117	67	1 x 14/23	A 155-12
250	149	88	1 x 29/32	A 155-20
500	177	107	1 x 29/32	A 155-36

B

Capacity ml	Total height mm	O.D. of ball mm	Lateral necks NS	Cat. No.:
100	117	67	2 x 14/23	A 156-12
250	149	88	2 x 29/32	A 156-20
500	177	107	2 x 29/32	A 156-36



BOLA Round Bottom Flasks with Threaded GL Necks

Material:
PFA

Temperature resistance:
from -200°C to +250°C

Chemical resistance:
+++ universal

Transparency:
transparent

Product description:

Transparent, non-porous, central ground joint neck size 29 and 2 lateral GL 18 threaded necks (suitable laboratory screw joints with Cat. No. D 629-.. can be found on page 90).

Capacity ml	Total height mm	O.D. of ball mm	Cat. No.:
250	149	88	A 149-20
500	177	107	A 149-36



BOLA INNOVATION



#1 Round Bottom Flasks with Lateral Necks

A standard product in glassware but not a given made of PFA: round-bottom flasks with lateral necks. BOLA offers two versions: Central ground joint with either lateral ground joint sockets or lateral necks with GL18.



BOLA Jars

Material: **PFA** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Pressure: **no pressure** Transparency: **transparent**

FDA conform

Product description:

Translucent, non-porous, sturdy design, screw cap.

Capacity ml	Total height mm	O.D. mm	I.D. mm	Thread S	Depth mm	Cat. No.:
7	37	18,5	22	24	32	A 130-01
60	47	45,5	50	52	40	A 130-05
90	67	45,5	50	52	58	A 130-06
120	53	60,0	66	69	45	A 130-07
240	95	60,0	66	69	86	A 130-09
500	120	80,0	85	88	109	A 130-11
1.000	151	100,0	107	110	139	A 130-12



BOLA Jars

Material: **PFA** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Pressure: **no pressure** Transparency: **transparent**

FDA conform

Product description:

Translucent, non-porous, sturdy design, screw cap with 2 connections for tubing O.D. 6,35 mm (1/4"). Suitable PTFE, PFA and FEP tubing can be found on page 189.

Capacity ml	Total height mm	O.D. mm	I.D. mm	Cat. No.:
120	74	66	60	A 131-12
240	116	66	60	A 131-14



Security Advice

Beakers and vessels made of fluoroplastics cannot be heated on a hotplate. Due to overheating, harmful gases can be released. See also page 353 for further advice on the heating of fluoroplastics.



BOLA PRACTICAL TIP
BOLA products can be cleaned in dishwasher.

Stubbornly dirty? Put in alcohol or wipe with a soft cloth soaked with ethyl alcohol, window cleaner or a detergent solution.

BOLA **Micro Reaction Vessels**

Material: **PFA, PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Pressure: **no pressure** Transparency: **transparent** Transparenz: **transparent**

FDA conform

Product description:

Vessel made of translucent, non-porous PFA, screw cap made of PTFE with threaded necks for connection of e. g. thermometers, probes or sensors.

Capacity ml	Total height mm	O.D. mm	I.D.	Threaded necks	Cat. No.:
90	96	50	45,5	2x GL14 / 1x GL18	B 318-40
240	130	66	60,0	2x GL18 / 1x GL25	B 318-64
500	158	85	80,0	3x GL25	B 318-80



#SUITABLE page 90
Laboratory Screw Joints

BOLA **Vials**

Material: **PFA** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Pressure: **no pressure** Transparency: **transparent**

FDA conform

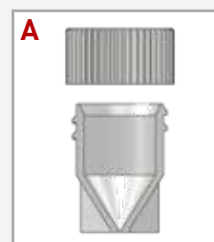
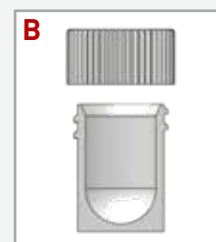
Product description:

Translucent, non-porous, with round or conical bottom, screw cap.

A	Capacity ml	Total height mm	O.D. mm	Bottom shape	Thread S	Cat. No.:
	5	36	22	conical	25	A 194-04
B	Capacity ml	Total height mm	O.D. mm	Bottom shape	Thread S	Cat. No.:
	7	36	22	round	25	A 195-04

Applications:

For centrifugal or evaporation work.

**A****B****A****B**



BOLA Beakers

Material: PTFE
 Temperature resistance: from -200°C to +250°C
 Chemical resistance: +++ universal

FDA conform

Product description:

Thick-walled, smooth interior surface, reinforced upper rim, with spout. Optional PTFE lid with centering shoulder is available.

Capacity ml	Height O.D. mm	Height I.D. mm	O.D. mm	I.D. mm	Cat. No.:
3	22	20	17	15	A 136-02
5	24	22	21	19	A 136-03
10	36	32	26	23	A 136-04
25	47	45	31	28	A 136-05
50	57	52,5	41	35	A 136-06
100	78,5	71	51	44	A 136-07
150	90,5	82	56	48	A 136-08
250	97,5	90	65	58	A 136-09
500	119	114	81	76	A 136-11
1.000	152,5	147,5	105	97	A 136-13
2.000	197	192	142	136	A 136-14
3.000	232	226	156	148	A 136-15



BOLA Lids

Material: PTFE
 Temperature resistance: from -200°C to +250°C
 Chemical resistance: +++ universal

FDA conform

Product description:

Lid with centering shoulder.

O.D. mm	Suitable for Cat. No.:	Cat. No.:	O.D. mm	Suitable for Cat. No.:	Cat. No.:
27	A 136-03	H 927-03	82	A 136-09	H 927-09
35	A 136-04	H 927-04	94	A 136-11	H 927-11
40	A 136-05	H 927-05	125	A 136-13	H 927-13
50	A 136-06	H 927-06	166	A 136-14	H 927-14
60	A 136-07	H 927-07	185	A 136-15	H 927-15
66	A 136-08	H 927-08			



#SUITABLE page 259
 Thermo Beakers for hot-plates



BOLA **Beakers**

Material: **PFA** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Transparency: **transparent**

Product description:

Translucent, non-porous, graduated, with spout.

Capacity ml	Total height O.D. mm	Total height I.D. mm	O.D. mm	Cat. No.:
25	50	48	36	A 137-01
50	59	57	44	A 137-02
100	71	69	56	A 137-03
250	96	93	76	A 137-05
500	121	118	83	A 137-07
1.000	142	138	105	A 137-09

BOLA **Measuring Cylinders**

Material: **TFM, PTFE** Temperature resistance: **from -200 °C to +250 °C** Chemical resistance: **+++ universal**

FDA conform

Product description:

Translucent and non-porous. Design based on ISO 4788. With graduation (uncalibrated), spout and reinforcing ring. Universal chemical resistance, the product is only exposed to PTFE.

Capacity ml	Graduation divisions ml	Total height mm	I. D. mm	Cat. No.
25	1	172	24	A 164-12
50	2	202	30	A 164-16
100	2,5	268	40	A 164-20

Product advantages:

- » hexagonal base prevents the cylinder from rolling
- » permanent, recessed graduation

Application:

Volume measurement of aggressive or pure liquids





BOLA Watch Dishes

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal**

FDA conform

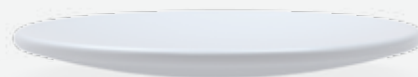
Product description:

Convex shape

	O.D. mm	Height mm		Cat. No.:
50	8			A 200-01
75	8			A 200-02
100	11			A 200-03
125	12			A 200-04

Applications:

For blends or for covering vessels



BOLA Evaporating Dishes

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal**

FDA conform

Product description:

Cylindrical shape, without spout.

Capacity ml	Height O.D. mm	Height I.D. mm	O.D. mm	I.D. mm	Cat. No.:
25	27	25	43	40	A 170-01
50	25	22	66	62	A 170-02
100	29	27	80	75	A 170-03
250	56	53	100	94	A 170-04



Security Advice

Beakers and vessels made of fluoroplastics cannot be heated on a hotplate. Due to overheating, harmful gases can be released. See also page 353 for further advice on the heating of fluoroplastics.

BOLA Evaporating Dishes, Conical Shape

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal**

FDA conform

Product description:

Conical shape, with spout.

Capacity ml	Height O.D. mm	Height I.D. mm	O.D. top mm	O.D. bottom mm	Cat. No.:
25	36	33	38	34	A 169-01
50	40	38	49	46	A 169-02
100	54	51	64	60	A 169-03
250	47	44	97	90	A 169-04



BOLA **Evaporating Dishes**Material:
PTFETemperature resistance:
from -200°C to +250°CChemical resistance:
+++ universal**FDA conform**

Product description:

Cylindrical shape, with spout.

Capacity ml	Height O.D. mm	Height I.D. mm	O.D. mm	I.D. mm	Cat. No.:
100	18	15,50	105	100	A 176-02
250	36	33	130	125	A 176-03

**#SUITABLE** page 80
Spatula and tweezersBOLA **Evaporating Dishes**Material:
PFATemperature resistance:
from -200°C to +250°CChemical resistance:
+++ universal**FDA conform**

Product description:

Cylindrical shape, without spout, transparent, non-porous, stackable.

Capacity ml	Height O.D. mm	Height I.D. mm	O.D. mm	I.D. mm	Cat. No.:
25	13,5	10	56	50	A 177-01
100	19,5	14,5	105	99	A 177-03

BOLA **Evaporating Dishes**Material:
PFATemperature resistance:
from -200°C to +250°CChemical resistance:
+++ universal**FDA conform**

Product description:

Conical shape, with spout, transparent, non-porous.

Capacity ml	Height O.D. mm	Height I.D. mm	O.D. top mm	O.D. bottom mm	Cat. No.:
100	30	27	90	60	A 171-01





BOLA Erlenmeyer Flasks

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Vacuum: **suitable**

FDA conform

Product description:

Thick-walled, with ground joint.

Capacity ml	Height O.D. mm	Height I.D. mm	O.D. bottom mm	Ground Joint NS	Cat. No.:
50	86	81	54	19/26	A 151-01
100	128	121,7	63	19/26	A 151-02
250	144	139	85	29/32	A 151-03
500	190	181	107	29/32	A 151-04



#SUITABLE page 213
ideally coordinated stoppers

BOLA Thermo Beakers

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal**

FDA conform

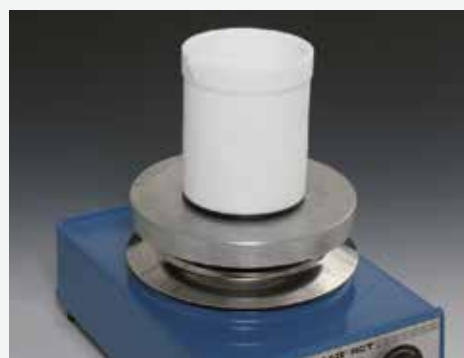
Product description:

Thick-walled beaker made of PTFE, reinforced upper rim with spout. The base is made of heat resistant PTFE-carbon, thus the beaker can be heated on a hot plate up to max. +270 °C. The inside of the beaker is made of pure PTFE and provides universal chemical resistance.

Capacity ml	Height O.D. mm	Height I.D. mm	O. D. mm	I. D. mm	Cat. No.
100	74	69,5	56	50	A 135-02
250	93	88,5	75	67	A 135-04
500	110	104,5	85	77	A 135-06

Applications:

Direct heating of products in a chemical inert beaker made of PTFE. The reinforced base made of PTFE-carbon at once prevents distortions and provides a good heat transfer.



BOLA **Test Tubes**

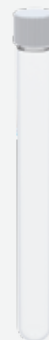
Material: **PFA** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Transparency: **transparent**

FDA conform

Product description:

Round bottom, transparent, non-porous, wall thickness 1 mm, with PTFE screw cap.

Capacity ml	Height mm	O.D. mm	Cat. No.:
10	140	12	A 185-01
15	110	16	A 185-02
20	160	16	A 185-03
50	220	22	A 185-05

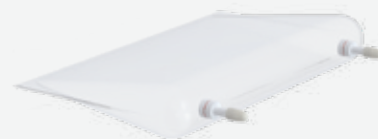
BOLA **Sampling Bags**

Material: **PVF** Temperature resistance: **from -30°C to +150°C** Chemical resistance: **+ good** Transparency: **transparent**

Product description:

Transparent, non-porous, without plasticisers, with two exchangeable ports made of PTFE.

Capacity l	Length mm	Width mm	Cat. No.:
1,0	150	250	A 223-58
2,0	200	250	A 223-62
5,0	250	350	A 223-70
10,0	350	500	A 223-74



Applications:

For the storage of gases or liquids.



Spare Parts for: Sampling Bags

Description	Material	Packing Unit	suitable for Cat. No.	Cat. No.:	
Replacement Connector with tube	PTFE	1 piece	A 223-58 / A 223-62 A 223-70 / A 223-74	A 226-06	
Replacement Stopcock with tube	PTFE	1 piece	A 223-58 / A 223-62 A 223-70 / A 223-74	A 226-12	



BOLA Funnels

Material:
PTFE

Temperature resistance:
from -200°C to +250°C

Chemical resistance:
+++ universal



FDA conform

Product description:

Conical opening with long outlet.

I.D. inlet mm	O.D. inlet mm	I.D. outlet mm	O.D. outlet mm	Total height mm	Cat. No.:
30	33	4	7	50	H 920-02
50	52	6	10	84	H 920-04
74	78	6	11	116	H 920-06
99	104	10	15	150	H 920-08
152	158	11	18	200	H 920-10



BOLA Dipper Vessels

Material:
PVF

Temperature resistance:
from -200°C to +250°C

Chemical resistance:
+++ universal

autoclave:
121°

FDA conform

Product description:

With handle and holes in wall and bottom.

I.D. of vessel mm	O.D. of vessel mm	Depth of vessel mm	Dia. of bores mm	Total height mm	Cat. No.:
35	38	60	6	100	H 1138-08
57	60	100	8	175	H 1138-16
95	100	140	12	230	H 1138-24

Applications:

For washing, rinsing or dipping solids in aggressive or pure substances.



BOLA Dipper Baskets

Material:
PTFE

Temperature resistance:
from -200°C to +250°C

Chemical resistance:
+++ universal

FDA conform

Product description:

Non-porous basket with a mesh size of approx. 1,0 x 1,0 mm in the bottom, with fixed stem.

I.D. of vessel mm	O.D. of vessel mm	Depth of vessel mm	Total height mm	Cat. No.:
62	75	19	176	H 997-03

Applications:

For washing, rinsing or dipping solids in aggressive or pure substances.



BOLA Dipping Sieves

Material:
PTFE

Temperature resistance:
-200 °C to +250 °C

Chemical resistance:
+++ universal

NEW

FDA conform

Product description:

Stable sieve bottom with evenly distributed bores with dia. 8 mm, fixed handle in the middle.

Basket I.D. mm	Basket O.D. mm	Depth of basket mm	Height incl. handle mm	Cat. No.:
144	150	22	250	H 1140-08

Applications:

For washing, rinsing or dipping solids in aggressive or pure substances.





BOLA Hydrolysing and Digestion Vessels for Microwave Ovens

Microwave ovens are often used for making quick and easy digestions. The energy of a microwave oven penetrates the material of the vessel almost without any loss. It only heats the liquid within a few seconds over the boiling point.

BOLA Digestion Vessels are made of TFM, a modified PTFE with thermoplastic parts for a homogenous, non-porous surface which avoids contamination and memory effects.

As soon as the pressure exceeds the maximum limit, the rupture membrane bursts and the released liquid will be drained through an optional tubing (O.D. 6,35 mm / 1/4") into a separately available collecting vessel (Cat. No. A 131-..., see page 253).



BOLA Digestion Vessels

Material: PTFE, TFM Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal

FDA conform



Product description:

Dimensionally stable basic vessel and screw cover made of TFM, homogenous, non-porous surface. One set of sealing and rupture membranes already mounted, 10 sets of replacement membranes included in delivery. For samples of up to max. 0,5 g.

Capacity ml	Internal dimensions Ø x Height mm	O.D. of body mm	O.D. of cover mm	Pressure max.bar	Temperature max.C°	Cat. No.:
5	15 x 32	30	40	25	160	A 240-02
20	22 x 60	50	60	20	150	A 240-06
50	33 x 62	69	95	20	150	A 240-08
100	35 x 110	70	95	15	140	A 240-10



Spare Parts for: Hydrolysing and Digestion Vessels

Description	Material	Packing Unit	Capacity	suitable for Cat. No.	Cat. No.:	
Replacement Sealing and Rupture Membranes	PFA / PTFE	pack size 10 pieces	5 ml 20 ml 50 and 100 ml	A 240-02 A 240-06 A 240-08 / A 240-10	A 244-02 A 244-04 A 244-06	
Replacement Jars for tubing O.D. 6,35 mm	PFA	1 piece	120 ml 240 ml	all Hydrolysing and Digestion Vessels all Hydrolysing and Digestion Vessels	A 131-12 A 131-14	



BOLA PTFE Flat Flange Reactor Lids with NPT threads – what you should know about.

+ Non-adhesive surface, therefore no accumulation of material and easy cleaning

+ Great freedom of design, universal connecting possibilities

+ High thermal and universal chemical resistance

+ Connections with different inclined orientations to avoid collisions with the stirrer shaft.

+ Compatible with standard glass reactors

+ Large selection of compatible components

+ Note: Please find suitable accessories on page 284





For a short-term realisation of projects in Mini plant installations or in the production of small quantities in chemical and pharmaceutical industry and research, special components are required that help to start up existing reactors flexibly. The components should have a very good chemical resistance, a permanent durability and should be easily cleanable at the same time.

All these requirements are met by the BOLA Modular System for Reactor Lids adapted for standard glass reactors with flat flange from SCHOTT® for sizes DN 60, DN 100 and DN 150.

The Modular System consists of Reactor Lids with different screw-in threads as well as different connections for transition to ground joint components, as stirrer bearings, for connection of probes or tubes and tubing, and stoppers, all with NPT screw-in thread.

By means of the screw-in connections, the Reactor Lid can be arranged to the requirements of your application and project. Thus, a lid can be used most versatile and economic.

All Reactor Lids dispose of a centric screw-in thread NPT for connection of a stirrer bearing. The lateral necks, that even dispose of NPT screw-in threads, are arranged round the centric connector. The special clou is that the angles of lateral necks are made for an insertion of probes and tubes aside the centre in order to avoid collisions with the stirrer shaft and further inserted components.

The large choice of different inserts allows to connect existing equipment with ground joint such as Liebig condensers and dropping funnels as well as GL thread such as lead-in for sensors. The already existing equipment can be further used.



Selection and Assembly:

- » Choose a lid that fits onto the flange of your glass reactor, as well as the number of connectors needed.
- » Choose the necessary transition fittings according to NPT threads in the chosen lid.
- » Mount the transition fittings into the connectors of the reactor lid. The lid is now ready for service.
- » All fittings can be acquired separately and can be exchanged amongst each other depending on the NPT thread.

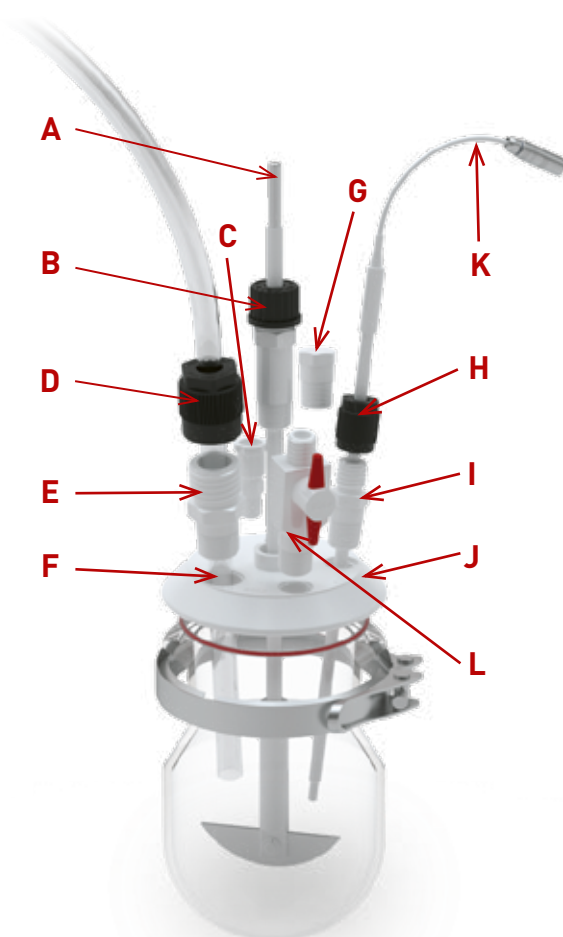
Custom Manufacture – Lid and Fitting

If we do not even have the correct reactor lid in our wide range, we are pleased to offer you a modified reactor lid or modified components accordingly.

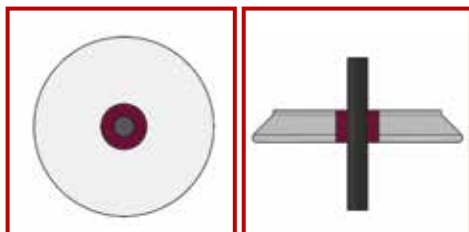
Just give us a call: +49 (0) 9346 9286-0 or send us a little sketch with the requested component by e-mail to info@bola.de.

Example: **Reactor Lid DN 100**

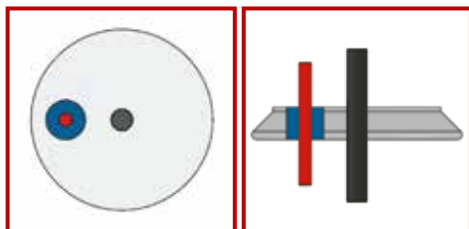
- A** Moon-Shaped Stirrer Shaft
Cat. No.: C 376-14
see page 24
- B** Screw-in Stirrer Bearing
Cat. No.: B 155-08
see page 271
- C** Screw-in Connector with Ground Joint
Cat. No.: B 154-02
see page 271
- D** Laboratory Screw Joint
Cat. No.: D 631-46
see page 90
- E** Screw-in Fitting GL
Cat. No.: B 152-32
see page 273
- F** PTFE Tubing
Cat. No.: S 1810-74
see page 189



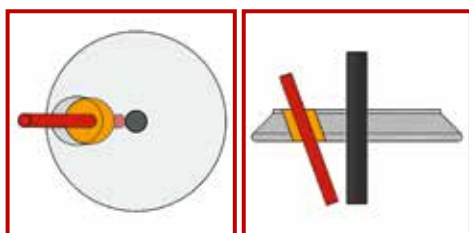
- G** Screw-in Stopper
Cat. No.: B 153-04
see page 273
- H** Laboratory Screw Joint
Cat. No.: D 629-62
see page 90
- I** Screw-in Fitting GL
Cat. No.: B 152-18
see page 273
- J** Reactor Lid DN100
Cat. No.: B 150-14
see page 268
- K** Temperature Probe Lemo
Cat. No.: P 1760-20
see page 233
- L** Screw-in Stopcock
Cat. No.: B 156-02
see page 272

Thread connections in detail:**Centric thread connection (purple):**

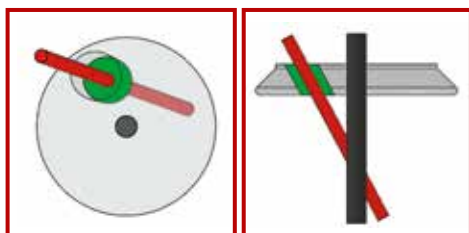
For insertion of the stirrer bearing (see page 271)

**Vertical thread connection with parallel alignment to the stirrer shaft (blue):**

Components such as probes can be led into the reactor parallel to the stirrer shaft.

**Inclined thread connection with direction straight to the stirrer shaft (yellow):**

Components such as tubes and tubing can be led directly to the stirrer shaft to achieve an optimal mixing of the medium.

**Inclined thread connection with direction aside the shaft (green):**

Collisions of long components such as temperature probes are avoided as they are led aside the stirrer shaft by means of this thread connection.



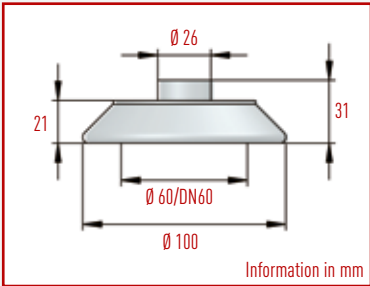
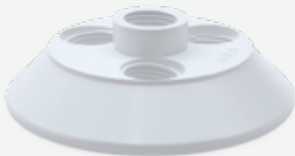
BOLA **Reactor Lid DN 60**

Material: PTFE Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal

FDA conform

Product description:
Suitable for current glass reactors DN 60 with flat flange according to DIN 12214 with screw-in threads for the connection of adaptor fittings and a centre neck NPT 1/2".

	1 Connection	2 Connection	3 Connection	Cat. No.:
A	NPT 1/4" connection directly to the shaft	NPT 1/2" connection aside the shaft	NPT 1/2" connection aside the shaft	B 150-02
B	NPT 1/2" connection aside the shaft	NPT 1/2" connection aside the shaft	NPT 1/2" connection aside the shaft	B 150-04



Material: PTFE Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal

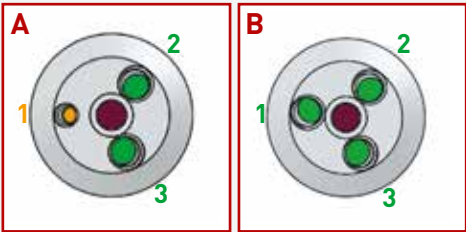
NEW

FDA conform

BOLA Reactor Lid DN 60 with Center Ground Joint Neck

Product description:
Suitable for current reactors with flat flange DN 60 according to DIN 12214 with centre neck sleeve NS 29/32 and lateral internal thread NPT for the connection of screw-in connectors. .

	1 Connection	2 Connection	3 Connection	Cat. No.:
B	NPT 1/2" connection aside the shaft	NPT 1/2" connection aside the shaft	NPT 1/2" connection aside the shaft	B 120-04



#INFORMATIVE page 266
Threads and connectors in details.

BOLA **Reactor Lid DN 100**

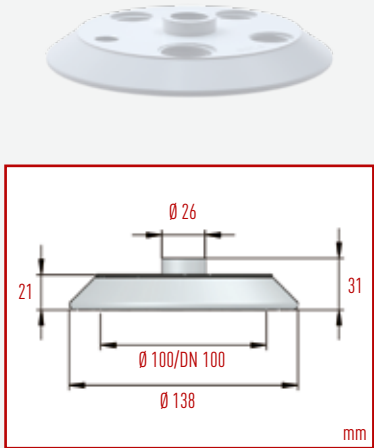
Material: PTFE Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal

FDA conform

Product description:

Suitable for current glass reactors DN 100, with flat flange according to DIN 12224. With screw-in thread for the connection of transition fittings and a centre neck NPT 1/2".

	1 Connection	2 Connection	3 Connection	4 Connection	5 Connection	Cat. No.:
A	NPT 1/2" connection aside the shaft	NPT 1/2" connection directly to the shaft	NPT 1/2" connection directly to the shaft			B 150-12
B	NPT 1/2" connection directly to the shaft	NPT 1/2"	NPT 1/2" connection directly to the shaft	NPT 3/4" connection aside the shaft	NPT 1/4" vertical connection	B 150-14
C	NPT 1/2" connection directly to the shaft	NPT 1/2" connection aside the shaft	NPT 1/2" connection directly to the shaft	NPT 1/4" connection aside the shaft	NPT 1/4" vertical connection	B 150-16



Material: PTFE Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal

NEW

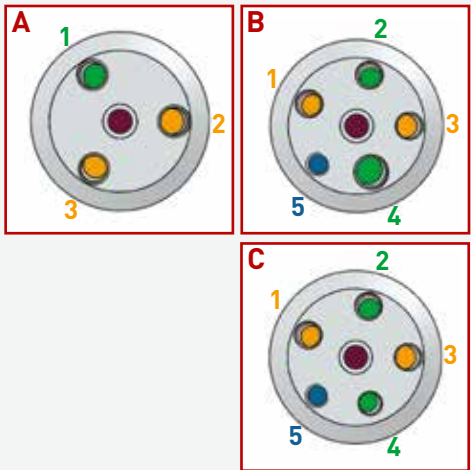
FDA conform

BOLA Reactor Lid DN 100 with Center Ground Joint Neck

Product description:

Suitable for current reactors with flat flange DN 100 according to DIN 12214, with centre neck sleeve NS 29/32 and lateral internal thread NPT for the connection of screw-in connectors.

	1 Connection	2 Connection	3 Connection	4 Connection	5 Connection	Cat. No.:
C	NPT 1/2" connection directly to the shaft	NPT 1/2" connection aside the shaft	NPT 1/2" connection directly to the shaft	NPT 1/4" connection aside the shaft	NPT 1/4" vertical connection	B 120-14



#INFORMATIVE page 266
Threads and connectors in detail.



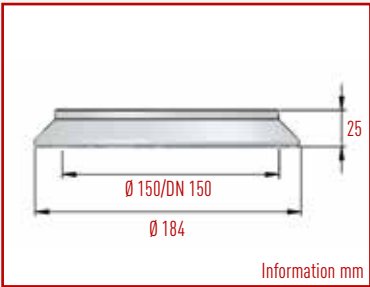
BOLA Reactor Lid DN 150

Material: PTFE
Temperature resistance: from -200°C to +250°C
Chemical resistance: +++ universal

FDA conform

Product description:
Suitable for current glass reactors DN 150 with flat flange according to DIN 12214. With screw-in threads for the connection of transition fittings and a centre neck NPT 1/2".

	1 Connection	2 Connection	3 Connection	4 Connection	5 Connection	Cat. No.:
A	NPT 1/2" connection directly to the shaft	NPT 1/2" connection aside the shaft	NPT 1/2" connection directly to the shaft	NPT 1/4" connection aside the shaft	NPT 1/4" vertical connection	B 150-22
B	NPT 1/2" connection directly to the shaft	NPT 1/2" connection aside the shaft	NPT 1/2" connection directly to the shaft	NPT 3/4" connection aside the shaft	NPT 1/4" vertical connection	B 150-24



Material: PTFE
Temperature resistance: from -200°C to +250°C
Chemical resistance: +++ universal

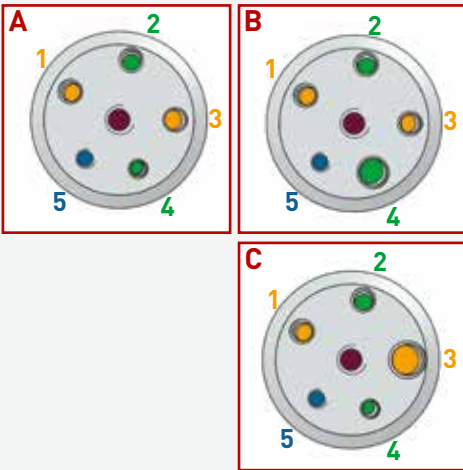
NEW

FDA conform

BOLA Reactor Lid DN 150 with NS Centre Neck

Product description:
Suitable for current reactor vessels with flat flange DN 150 according to DIN 12214, with centre neck sleeve NS 29/32 and lateral screw-in thread NPT for the connection of screw-in connectors.

	1 Connection	2 Connection	3 Connection	4 Connection	5 Connection	Cat. No.:
B	NPT 1/2" connection directly to the shaft	NPT 1/2" connection aside the shaft	NPT 1/2" connection directly to the shaft	NPT 3/4" connection aside the shaft	NPT 1/4" vertical connection	B 120-22



#INFORMATIVE page 266
Threads and connectors in detail.

BOLA Flat Flange Reaction Vessel

Material: PTFE Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal Vacuum: suitable

NEW

FDA conform

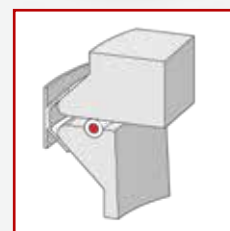
Product description:

Made of PTFE, thick wall with round bottom and smooth interior surface. flat flange with circular groove as per DIN 12 214. Can be heated by a thermostat or an electrical heating mantle.

Flat flange DN	Capacity mm	O.D. of vessel mm	Total height mm	Cat. No.:
60	250	100	125	B 271-01
100	500	110	120	B 271-03
100	1000	110	205	B 271-06
100	2000	140	270	B 271-09
150	4000	200	290	B 271-12
150	6000	215	320	B 271-15

Applications:

Suitable O-ring seal with silicone core and seamless FEP-coating is separately available, Cat. No. H 969-...



Material: FEP Temperature resistance: from -60°C to +205°C Chemical resistance: ++ very good

FDA conform

BOLA O-Rings for Laboratory Flat Flanges

Product description:

Silicone core with seamless FEP coating; manufactured according to DIN 12214:1996-12; flexible, almost universal chemical resistance.

For flat flange NW	Dimensions mm	Cat. No.:
60	75 x 4	H 969-18
100	110 x 4	H 969-25
150	155 x 5	H 969-55

Applications:

As sealing for flat flange with groove.



Material:
Stainless steel

NEW

BOLA Quick Release Clamps for Flat Flange Vessels

Product description:

Made of stainless steel, readjustable clamp with three retaining segments.

Flat Flange NW	Cat. No.:
60	B 277-01
100	B 277-03
150	B 277-05

Applications:

For safe connection of vessel and lid with flat flange.





BOLA Screw-in Stirrer Bearings

Material: **PTFE** Temperature resistance: **from -15°C to +200°C** Chemical resistance: **+++ universal**

FDA conform

Product description:

For centric guidance of stirrer shafts in the center screw-in thread of BOLA Reactor Lids. A special gasket made of PTFE and a FKM o-ring which is compressed by a GL screw cap made of PPS provide a good sealing of the stirrer shaft. With hexagonal gripping surface in standard wrench size. Universal chemical resistance, the medium is only exposed to PTFE.

Screw-in thread NPT (male)	For stirrer shaft mm	Thread of screw cap GL	O.D. mm	Wrench size SW	Cat. No.:
1/2"	6	25	33	25	B 155-06
1/2"	8	25	33	25	B 155-08
1/2"	10	25	33	25	B 155-10

Applications:

For assembly on BOLA Reactor Lids, Cat. No. B 150-... from page 268. Perfect bearing for entric guidance of glass, stainless steel and PTFE-coated stirrer shafts. Suitable spare parts for the stirrer bearing see BOLA Special Gaskets and BOLA Replacement Screw Caps on page 47.



HELPFUL: page 143
Complete Modular System for Reactor Lids in PTFE-EX.

BOLA Screw-in Connector with Ground Joint

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal**

FDA conform

Product description:

For connection to BOLA Reactor Lids. Connector with ground socket. With hexagonal gripping surface in standard wrench size.

Screw-in Thread NPT (male)	Ground Socket GL (male)	O.D. mm	Wrench Size SW	Cat. No.:
1/4"	14/23	22	15	B 154-02
1/2"	19/26	25	22	B 154-04
1/2"	29/32	37	24	B 154-06
3/4"	29/32	37	30	B 154-08
1"	29/32	38	34	B 154-10

Applications:

For assembly on BOLA Reactor Lids, Cat. No. B 150-... from page 268. For connection to existing components with ground joint such as Liebig Condensers, Dropping Funnels etc.





BOLA **Screw-in Stopcocks**Material:
PTFETemperature resistance:
from 0°C to +110°CChemical resistance:
+++ universal

FDA conform

Product description:

For connection to screw-in threads on BOLA Reactor Lids to interrupt the flow of connected tubes. Available as two-way stopcock with straight bore and one GL-threaded connection or as three-way stopcock with L-bore and two GL-threaded connections. Cylindrical stopcock plug with grip made of PP for good tightness, stop valve with mark of flow direction. Universal chemical resistance, the flowing product is only exposed to PTFE.

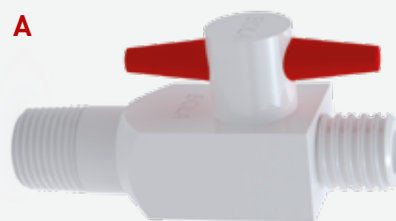
	Screw-in Thread NPT (male)	Typ	Bore shape stopcock	Connecting thread GL	Bore dia. mm	Cat. No.:
A	1/2"	2-Way		18	6	B 156-02
B	1/2"	3-Way		18	6	B 156-08

Applications:

For assembly on BOLA Reactor Lids, Cat. No. B 150-... from page 268. For inserting liquids and gases. Quick and easy disconnection of flow. Connection of tubing or tubes by means of BOLA Laboratory Screw Joints.



#SUITABLE page 90
Laboratory Screw Joints

BOLA **Screw-In Fittings PG**Material:
PTFETemperature resistance:
from -200 °C to +250 °C +++ universal

Chemical resistance:

NEW

FDA conform

Product description:

For connection of sensors with male thread PG to BOLA reactor lids. With hexagonal gripping surface in standard wrench size.

Screw-in thread NPT (male)	PG thread (female)	Bore dia. mm	O.D. mm	Wrench Size SW	Cat. No.:
1/2"	13,5	Ø 12,5	24	24	B 151-03

Application:

For tight and safe insertion of sensors with male thread PG.





BOLA Screw-in Fittings GL

Material:
PTFE

Temperature resistance:
from -200°C to +250°C

Chemical resistance:
+++ universal

FDA conform

Product description:

For connection to BOLA Reactor Lids as GL necks. With hexagonal gripping surface in standard wrench size.

Screw-in thread NPT (male)	Neck GL (male)	Wrench Size SW	Cat. No.:
1/4"	14	15	B 152-14
1/4"	18	15	B 152-16
1/2"	18	22	B 152-18
1/2"	25	22	B 152-20
3/4"	32	32	B 152-32
1"	45	45	B 152-45

Applications:

For assembly on BOLA Reactor Lids, Cat. No. B 150-... from page 268. For connection of hard-walled tubes, tubing and probes by means of BOLA Laboratory Screw Joints.



BOLA Screw-in Stopper

Material:
PTFE

Temperature resistance:
from -200°C to +250°C

Chemical resistance:
+++ universal

FDA conform

Product description:

For connection to BOLA Reactor Lids. For closure of non-used connectors. With hexagonal gripping surface in standard wrench size.

Screw-in thread NPT (male)	Wrench size SW	Cat. No.:
1/4"	15	B 153-02
1/2"	22	B 153-04
3/4"	32	B 153-06
1"	45	B 153-08

Applications:

For assembly on BOLA Reactor Lids, Cat. No. B 150-... from page 268.



SPECIAL REQUIREMENTS? CUSTOMIZED!



You are looking for something very special? Something that even our huge portfolio of sophisticated lab solutions does not cover?

No problem:

As developer and producer, we offer the possibility to produce individually according to your requirement. This is faster, simpler and often more economic than you can imagine. Just talk to our experts about your ideas – we advise you and support you already during the construction and produce suitable for the material exactly according to your specification. And this already from quantity 1.

For this, we just need a drawing (a rough sketch is sufficient) and some information.

Checklist for your customised product:

- » What is the article name?
- » In which application should the article be used?
- » What dimensions should the article have?
- » Are there any specific material specifications?
- » In which temperature range should the article be used?
- » What chemical stresses is the article exposed to?
- » In which quantities is the article required?
- » What cost per piece should the article not exceed?

You have a special request?
Call us on: **+49 (0) 93 46-92 86-0**

Or just send us a drawing (a rough sketch is sufficient) and some information to **info@bola.de**. We will then contact you to discuss further details and establish an offer for you free of charge.



BOLA PFA Flat Flange Reactor Vessels – what you should know about.

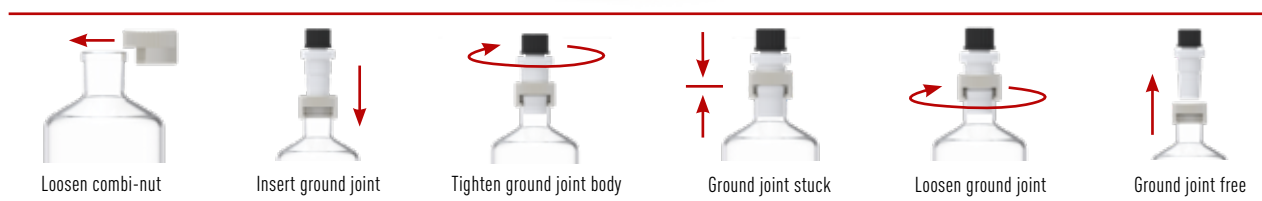
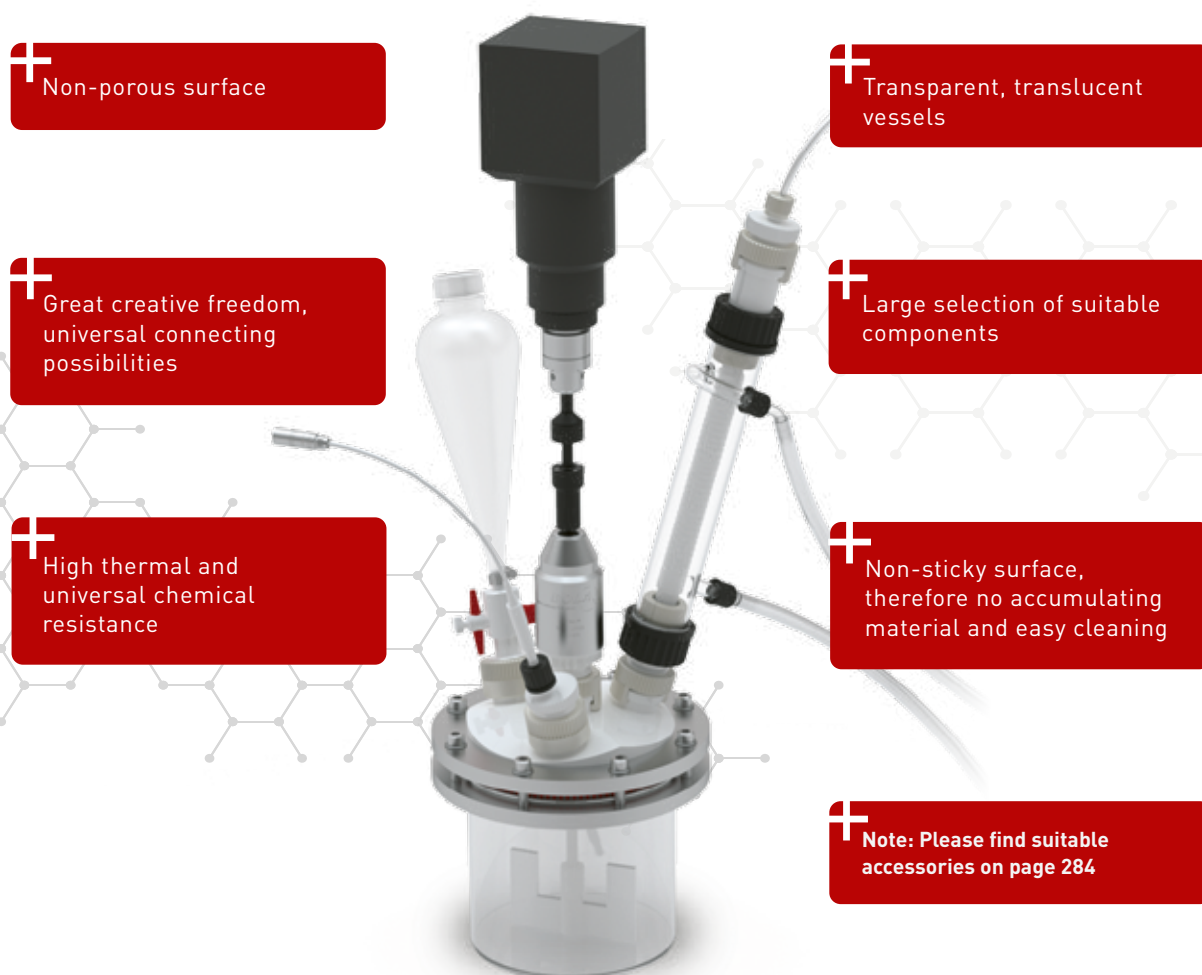
Perfectly suited for the distillation of strong alkaline or acid products as well as very aggressive solvents when the resistance of other materials, such as glass, is not sufficient. All parts exposed to the medium are either made completely of PTFE/PFA or are coated with PTFE, such as the thermometers. The distillate in the Liebig Condenser is conducted to the collection vessel through a PFA pipe.

For heating we recommend either a thermostat or an electric heating mantle. However, a temperature of +200°C should not be exceeded.

The PFA reaction vessel with flat bottom is an alternative to the PTFE reaction vessel with round bottom. It is translucent, non-porous and can be used for mixing the material with a hotplate magnetic stirrer and a PTFE coated magnetic stirring bar.

The Special Clou – the Safe-Lab Principle

For safety reasons, our distillation apparatus is equipped with the Safe-Lab Principle. This system allows a tight and safe connection as well as an easy disconnection of the cone and socket. This can be realised by a combi-nut which is held on an external thread above the cone and holds the socket. For disconnection this special nut has to be turned clockwise. The power of the fingers is enforced by the thread pitch, transferred axially to the socket. The ground joint is released.



Selection and assembly:

- » Choose a vessel with flat flange in the required size
- » Choose lid and joint suitable to the vessel and the required connectors
- » If required you will find further accessories in our catalogue: stirring shafts, magnetic stirrer heads, laboratory fittings, swivel fittings; bellows and ground joint fittings.

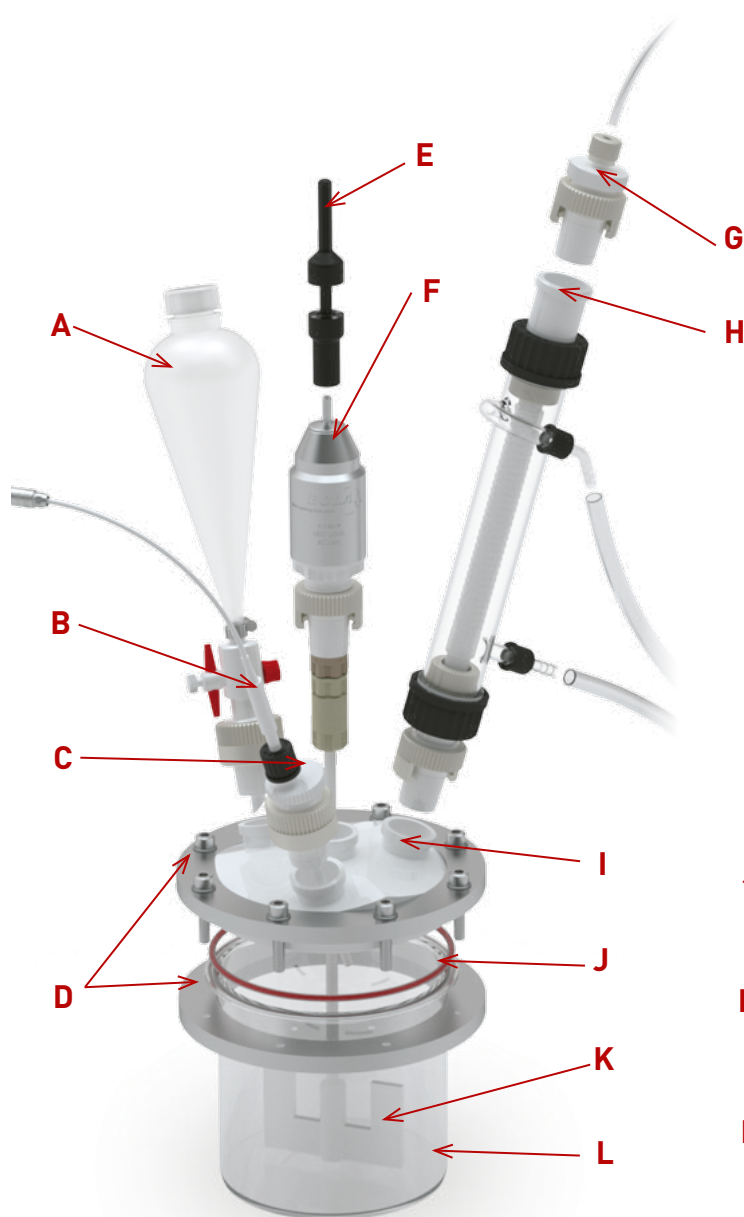
Customised Manufacturing – Lid and Fitting Made to Measure

Your flat-flange reactor vessel needs a bottom outlet? You are in need of further or differently designed connectors on the lid? We produce modified lids and vessels made to measure according to your requirements.

Just call us. +49 (0) 9346 9286-0 or send us a sketch of the required component by email to: info@bola.de.

e.g. **Reactor Lid NW 170/146**

- A** Dropping Funnel
Cat. No. B 285-02
see page 290
- B** Thermal Sensor PT 100
Cat. No. P 1760-15
see page 286
- C** Thermometer Holder
Cat. No. B 286-03
see page 286
- D** Flat-flange Connector
Cat. No. B 323-01
see page 277
- E** Globus-Stirrer-Coupling
Cat. No. C 399-12
see page 28
- F** P-MRK
Cat. No. C 520-24
see page 53



- G** Ground-Joint Fitting Connection
Cat. No. B 304-20
see page 289
- H** Liebig Condenser "Vertical"
Cat. No. B 301-02
see page 284
- I** Flat-Flange Lid DN 170/146
Cat. No. B 326-01
see page 277
- J** O-Ring
Cat. No. H 969-55
see page 277
- K** Anchor Stirrer Shaft
Cat. No. C 384-10
see page 27
- L** PFA Vessel NW 170/146
Cat. No. B 325-01
see page 277



BOLA Flat Flange Vessels

Material: **PFA** Temperature resistance: **from -200 °C to +250 °C** Chemical resistance: **+++ universal** Transparencz: **transparent**

NEW

FDA conform

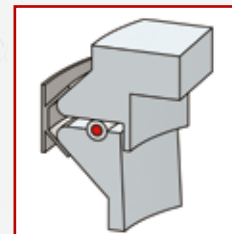
Product description:

Made of transparent PFA; model with flat bottom and pore-free surface. Flange with circular groove. Heatable with thermostats or in a heating hood.

Flange NW	Volume ml	Vessel O.D. mm	Total height mm	Cat. No.:
170/146	2400	150	150	B 325-01

Applications:

Suitable FEP-coated silicone o-ring see Cat. No. H 969-55.



Material: **PTFE** Temperature resistance: **from -200 °C to +250 °C** Chemical resistance: **+++ universal**

NEW

FDA conform

BOLA Flat Flange Lids

Product description:

Suitable for reactor made of PFA (Cat. No. B 325-01), with socket center neck NS 29/32 and three lateral necks with ground joint sockets. Bottom side with centring collar for non-slipping alignment on the reactor. All lateral connectors are made for an insertion of tubes and probes aside the centre in order to avoid collisions.

Flange NW	Lateral Necks NS	Cat. No.:
170/146	3x 29/32 aside the shaft	B 326-01



Material: **FEP** Temperature resistance: **from -60 °C to +205 °C** Chemical resistance: **++ very good**

FDA conform

BOLA O-Rings for Laboratory Flat Flanges

Product description:

Silicone core with seamless FEP coating; manufactured according to DIN 12214:1996-12; flexible, almost universal chemical resistance.

For flat flange NW	Dimensions mm	Cat. No.:
170/146 and 150	155 x 5	H 969-55

Applications:

As sealing for flat flange with groove.



Material:
Aluminium

BOLA Flat Flange Joining Pieces

Product description:

Made of aluminium, connection between reaction vessel and lid. Locked by zinc-plated steel screws.

For flange NW	Number of screws	Cat. No.:
170/146	8	B 323-01



BOLA PTFE Flat Flange Reactor Vessels – what you should know about.

Perfectly suited for the distillation of strong alkaline or acid products as well as very aggressive solvents when the resistance of other materials, such as glass, is not sufficient. All parts exposed to the medium are either made completely of PTFE/PFA or are coated with PTFE, such as the thermometers. The distillate in the Liebig Condenser is conducted to the collection vessel through a PFA pipe.

For heating we recommend either a thermostat or an electric heating mantle. However, a temperature of +200°C should not be exceeded.

The Special Clou – the Safe-Lab Principle

For safety reasons, our distillations apparatus is equipped with the Safe-Lab Principle. This system allows a tight and safe connection as well as an easy disconnection of the cone and socket. This can be realised by a combi-nut which is held on an external thread above the cone and holds and locks the socket. For disconnection this special nut has to be turned clockwise. The power of the fingers is enforced by the thread pitch, transferred axially to the socket. The ground joint is released.



Large selection of compatible components



Great freedom of design, universal connecting possibilities



High thermal and universal chemical resistance



Robust, reliable execution



Non-sticky surface, therefore no accumulating material and easy cleaning





Selection and assembly:

- » Choose a vessel with flat flange in the required size
- » Choose lid and joint suitable to the vessel and the required connectors
- » If required you will find further accessories in our catalogue: stirring shafts, magnetic stirrer heads, laboratory fittings, swivel fittings; bellows and ground joint fittings.



Customised Manufacturing – Lid and Fitting Made to Measure

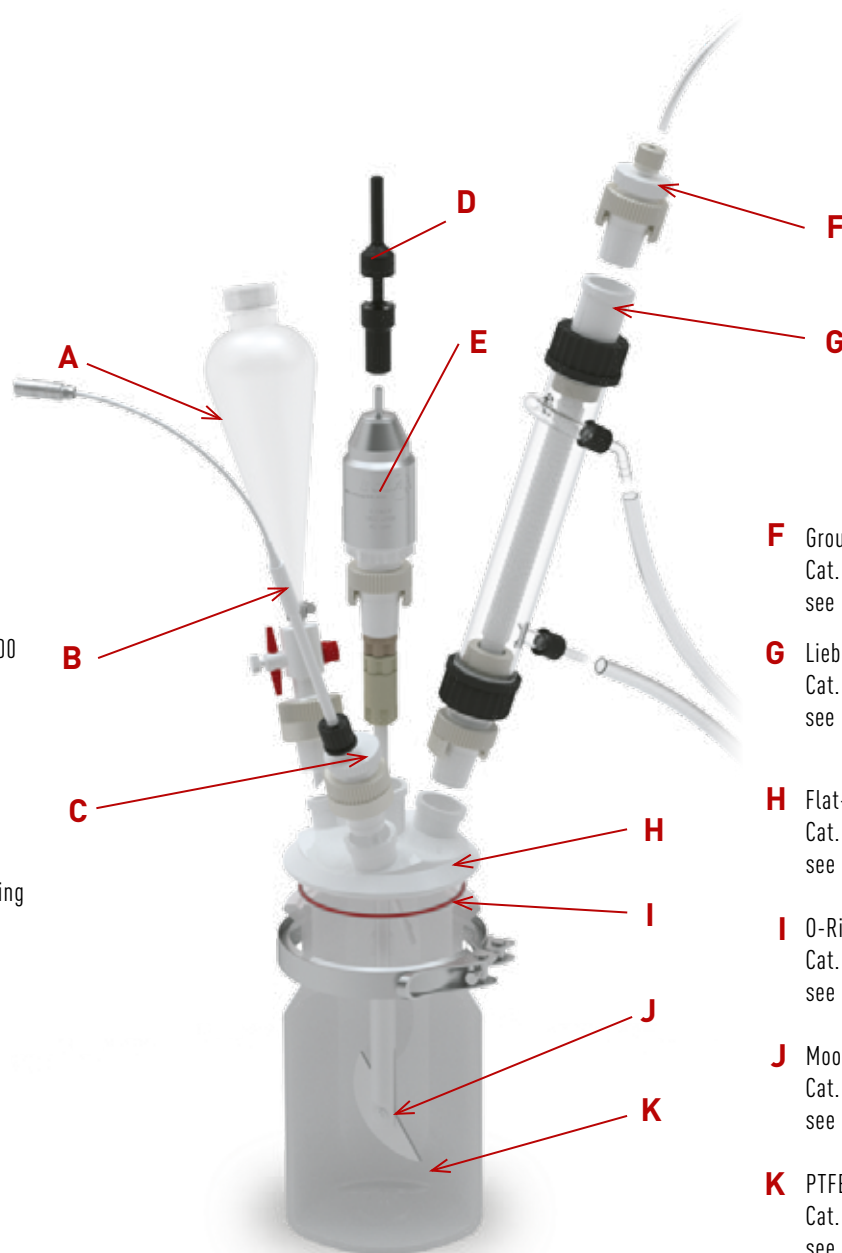
Your flat-flange reactor vessel needs a bottom outlet? You are in need of further or differently designed connectors on the lid? We produce modified lids and vessels made to measure according to your requirements.

Just call us. +49 (0) 9346 9286-0 or send us a sketch of the required component by email to: info@bola.de.



e.g. **Reactor Lid DN 100**

- A** Dropping Funnel
Cat. No.: B 285-02
see page 290
- B** Thermal Sensor PT 100
Cat. No.: P 1760-20
see page 286
- C** Thermometer Holder
Cat. No.: B 286-03
see page 286
- D** Globus-Stirrer-Coupling
Cat. No.: C 399-12
see page 28
- E** P-MRK
Cat. No.: C 520-28
see page 53



- F** Ground-Joint Fitting Connection
Cat. No.: B 304-20
see page 289
- G** Liebig Condenser "Vertical"
Cat. No.: B 301-02
see page 284
- H** Flat-Flange Lid
Cat. No.: B 210-14
see page 280
- I** O-Ring
Cat. No.: H 969-25
see page 281
- J** Moon-Shaped Stirrer Shaft
Cat. No.: C 376-12
see page 24
- K** PTFE Vessel (with nut)
Cat. No.: B 271-09
see page 280

BOLA **Flat Flange Reaction Vessel**

Material: PTFE Temperature resistance: from -200 °C to +200 °C Chemical resistance: +++ universal Vacuum: suitable

NEW

FDA conform

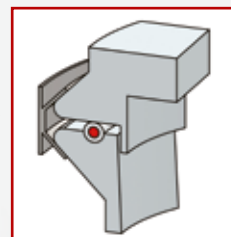
Product description:

Made of PTFE, thick wall with round bottom and smooth interior surface. flat flange with circular groove as per DIN 12 214. Can be heated by a thermostat or an electrical heating mantle.

Flat flange NW	Capacity ml	O.D. of vessel mm	Total height mm	Cat. No.:
60	250	100	125	B 271-01
100	500	110	120	B 271-03
100	1000	110	205	B 271-06
100	2000	140	270	B 271-09
150	4000	200	290	B 271-12
150	6000	215	320	B 271-15

Applications:

Suitable O-ring seal with silicone core and seamless FEP-coating is separately available, Cat. No. H 969-... see page 281.

BOLA **Flat Flange Lids**

Material: PTFE Temperature resistance: from -200 °C to +200 °C Chemical resistance: +++ universal

NEU

FDA conform

Product description:

Suitable for current reactor vessels with flat flange according to DIN 12214, with centre neck sleeve NS 29/22 and lateral necks with ground joint sleeves or GL threads. Bottom side with centring collar for non-slip alignment on the vessel. All lateral connections are aligned that tubes, pipes or probes can be introduced collision-free diagonally past the centre or vertically (parallel to the stirrer shaft).

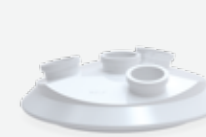
	Flat Flange DN	Side Necks NS	Side Necks GL	Cat. No.:
A	60	2x 14/23 connection aside the shaft	2x 18 connection aside the shaft	B 210-02
B	100	2x 29/32 connection aside the shaft 1x 19/26 vertical connection	3x 25 vertical connection	B 210-12
C	100	3x 29/32 connection aside the shaft		B 210-14
D	150	2x 29/32 vertical connection 1x 19/26 vertical connection	4x 25 vertical connection	B 210-22
E	150	3x 29/32 connection aside the shaft		B 210-24

Applications:

Extension of the distillation apparatus with suitable accessories. By means of laboratory fittings tubes, pipes or probes can be fixed at the required position with the GL threaded sockets.

A**B****C****D**

bottom view

E



BOLA **O-Rings for Laboratory Flat Flanges**

Material: **FEP/PTFE** Temperature resistance: **from -60°C to +205°C** Chemical resistance: **++ very good**

FDA conform

BOLA O-Rings for Laboratory Flat Flanges

Product description:
Silicone core with seamless FEP coating; manufactured according to DIN 12214:1996-12; flexible, almost universal chemical resistance.



For flat flange NW	Dimensions mm	Cat. No.:
60	75 x 4	H 969-18
100	110 x 4	H 969-25
120	132 x 4	H 969-45
150	155 x 4	H 969-55
200	214 x 4	H 969-75

Applications:
As sealing for flat flange with groove.

Material:
Stainless steel

BOLA Quick Release Clamps for Flat Flange Vessels

Product description:
Made of stainless steel, readjustable clamp with three retaining segments.



Flat Flange DN	Cat. No.:
60	B 277-01
100	B 277-03
150	B 277-05

Applications:
For safe connection of vessel and lid with flat flange.



BOLA Flat Flange Distillation Apparatus – what you should know about.

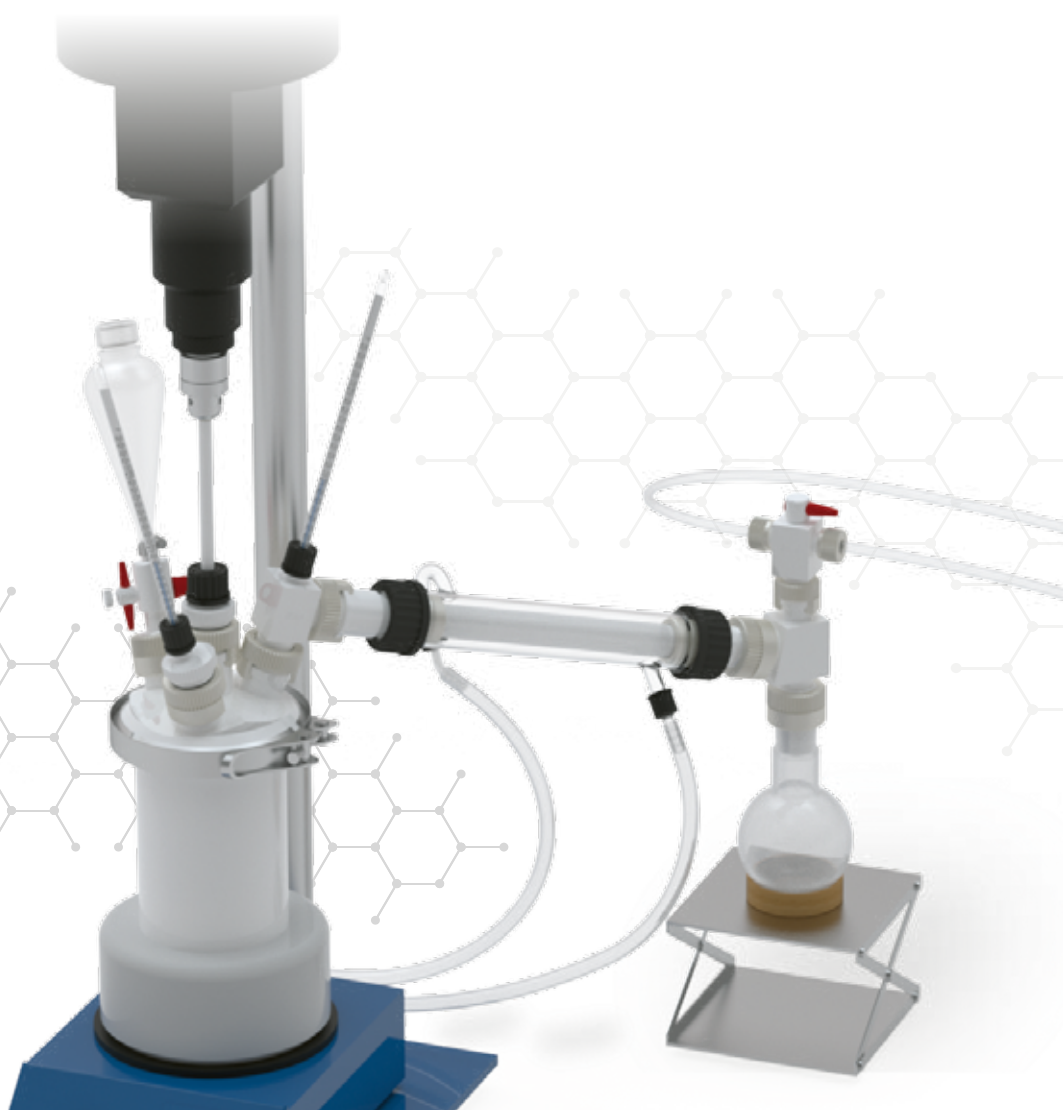
Suitable for the distillation of strong alkaline or acid products as well as very aggressive solvents when the resistance of other materials, e.g. glass, is not sufficient. All parts exposed to the medium are either made completely of PTFE/PFA or, like the thermometers, jacketed with PTFE. The distillate in the Liebig Condenser is conducted to the collecting vessel through a PFA pipe.

For heating, we recommend to either use a thermostat or an electric heating mantle. A temperature of $+200^{\circ}\text{C}$ should not be exceeded.

As alternative to the reaction vessel made of PTFE with round bottom, you can also use the reaction vessel made of PFA with flat bottom. It is translucent, non-porous and can be used with a hotplate magnetic stirrer and a PTFE-encapsulated magnetic stirring bar for stirring.

The Safe-Lab principle:

For security reasons, our distillation apparatus are equipped with the Safe-Lab system. This system allows a tight and safe connection as well as an easy disconnection of cone and socket. A special nut which is held on an external thread above the cone holds and locks the socket. For disconnection, this special nut has to be turned clockwise. The power is enforced by the thread pitch and is transferred axially to the socket. The ground joint is released.



Loosen combi-nut



Insert ground joint



Tighten ground joint body



Ground joint stuck



Loosen ground joint



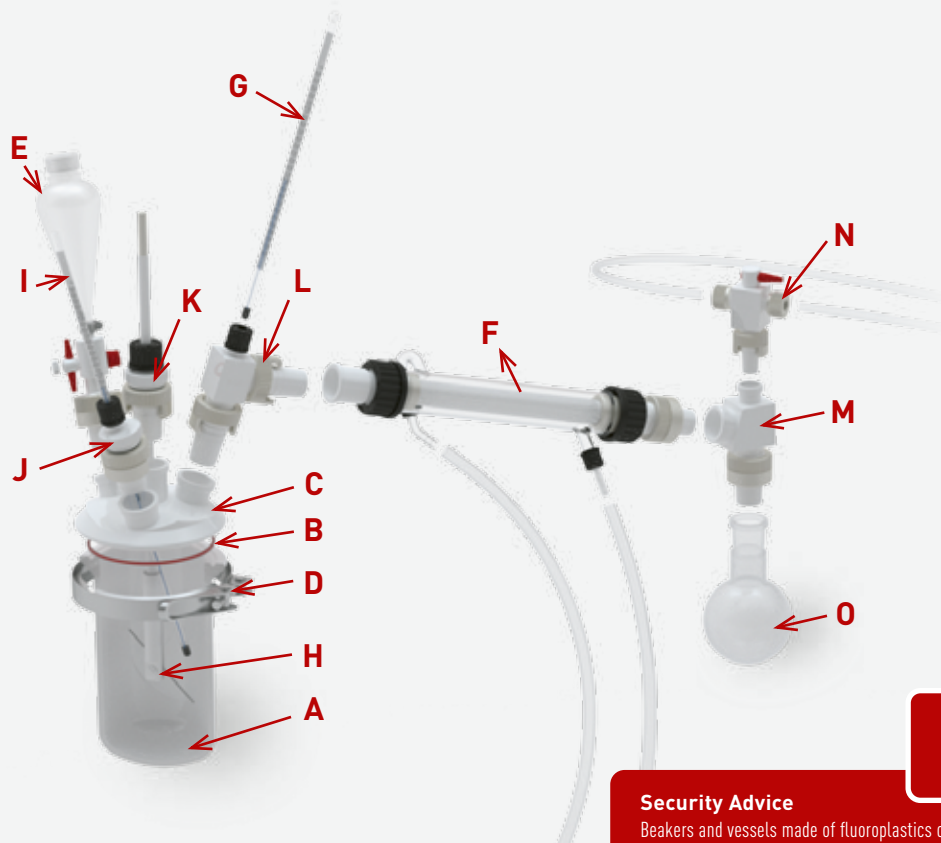
Ground joint free



BOLA Flat Flange Distillation Apparatus

Material: PTFE, PFA Temperature resistance: from -200°C to +200°C Chemical resistance: +++ universal Vacuum: suitable

	Capacity Cat. No.:	500 ml B 280-03	1.000 ml B 280-06	2.000 ml B 280-09	4.000 ml B 280-12	6.000 ml B 280-15
	Total dimensions H x L mm	450 x 600	550 x 700	700 x 750	750 x 980	790 x 1000
A	Flat Flange Reaction Vessels	NW 100 B 271-03	NW 100 B 271-06	NW 100 B 271-09	NW 150 B 271-12	NW 150 B 271-15
B	O-Rings for Laboratory Flat Flanges	NW 100 H 969-25	NW 100 H 969-25	NW 100 H 969-25	NW 150 H 969-55	NW 150 H 969-55
C	Flat Flange Lids	NW 100 B 210-14	NW 100 B 210-14	NW 100 B 210-14	NW 150 B 210-24	NW 150 B 210-24
D	Quick Release Clamps for Flat Flange Vessels	NW 100 B 277-03	NW 100 B 277-03	NW 100 B 277-03	NW 150 B 277-05	NW 150 B 277-05
E	Dropping Funnels with Cone NS 29/32	125 ml B 285-01	125 ml B 285-01	250 ml B 285-02	500 ml B 285-03	500 ml B 285-03
F	Liebig Condensers	300 mm B 291-02	450 mm B 291-04	450 mm B 291-04	600 mm B 291-06	600 mm B 291-06
G	Distillation Thermometers 0/+250:1°C°	B 290-03	B 290-03	B 290-03	B 290-03	B 290-03
H	Moon-Shaped Stirrer Shafts	Ø 10 x 350 mm C 376-12	Ø 10 x 450 mm C 376-14	Ø 10 x 510 mm C 376-16	Ø 10 x 600 mm C 376-18	Ø 10 x 600 mm C 376-18
I	Thermometers for Flask 0/+250:1°C°	Ø 7 x 450 mm B 287-03	Ø 7 x 450 mm B 287-03	Ø 7 x 530 mm B 287-06	Ø 7 x 600 mm B 287-09	Ø 7 x 600 mm B 287-09
J	Thermometer Holders	B 286-03	B 286-03	B 286-03	B 286-03	B 286-03
K	Stirrer Bearings NS 29/32	B 288-02	B 288-02	B 288-02	B 288-02	B 288-02
L	Distillation Heads 2x NS 29/32	B 289-03	B 289-03	B 289-03	B 289-03	B 289-03
M	Receiver Adaptors	B 292-02	B 292-02	B 292-02	B 292-02	B 292-02
N	Vacuum Stopcocks	B 293-02	B 293-02	B 293-02	B 293-02	B 293-02
O	Round Bottom Flasks with Ground Joint NS 29/32	100 ml A 158-06	250 ml A 158-08	500 ml A 158-09	500 ml A 158-09	500 ml A 158-09



Security Advice

Beakers and vessels made of fluoroplastics cannot be heated on a hotplate. Due to overheating, harmful gases can be released. See also page 353 for further advice on the heating of fluoroplastics.



BOLA Flat Flange Reaction Vessels

ACCESSORIES



BOLA Liebig Condensers "Vacuum"

Material: **PTFE** Temperature resistance: **from -20°C to +250°C** Chemical resistance: **+++ universal** Vacuum: **suitable**

FDA conform

Product description:

One-piece cooling tube with ground joint socket and cone size 29 made of PTFE, cooling jacket made of borosilicate glass with hose connectors made of PP and nuts for connection of cooling water. The distillate is only exposed to PFA/PTFE. Integrated special nut (Safe-Lab) for easy locking and unlocking of the ground joint.

Length mm	Cat. No.:
300	B 295-02
450	B 295-04



BOLA Liebig Condensers "Vertical"

Material: **PFA** Temperature resistance: **from -20°C to +110°C** Chemical resistance: **+++ universal** Transparency: **transparent**

FDA conform

Product description:

Thin-walled cooling tube made of translucent and gastight PFA, cooling jacket made of borosilicate glass with hose connectors made of PP and nuts for connection of cooling water, ground joint cone and socket size 29 made of PTFE. The distillate is only exposed to PFA/PTFE. Integrated special nut (Safe-Lab) for easy locking and unlocking of the ground joint.

Length mm	Cat. No.:
300	B 301-02
450	B 301-04





BOLA Distillation Thermometers

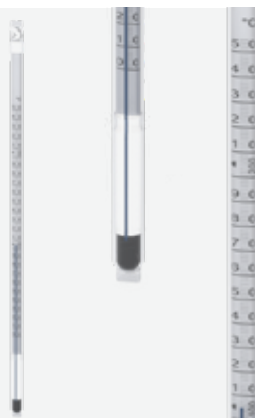
Material: **PTFE** Temperature resistance: **from 0°C to +250°C** Chemical resistance: **+++ universal**

FDA conform

Product description:

PTFE-jacketed glass thermometer, justified to an immersion depth of 50 mm. Length 300 mm, measuring range 0/+250: 1°C.

For reaction vessel ml	O.D. mm	Cat. No.:
500-6.000	7,5	B 290-03



BOLA Thermometers for Flasks

Material: **PTFE** Temperature resistance: **from 0°C to +250°C** Chemical resistance: **+++ universal**

FDA conform

Product description:

PTFE-jacketed glass thermometer, measuring range 0/+250: 1°C

For reaction vessel ml	Measuring range °C	O.D. mm	Length mm	Cat. No.:
500	0/+250:1	7	450	B 287-03
1.000	0/+250:1	7	530	B 287-06
2.000-6.000	0/+250:1	7	600	B 287-09



BOLA **Temperature Probes**

Material: PTFE Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal Temperature range: from -50°C to +250°C

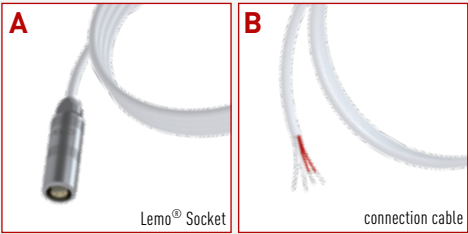
FDA conform

Product description:
One measuring sensor PT 100 in a PTFE-encapsulated stainless steel tube (1.4571). Temperature probe Ø 8mm, tip Ø 6mm, collar ring Ø 12mm.
Connection is made either directly to the white PFA-coated cable (length: 1,5m, 4 strands) or alternatively to a coupling type Lemo® socket size 1, 4-wire-system.

Typical response times:
» T 50: 7 - 12 s
» T 90: 14 - 16 s
See page 352 for detailed explanation.

	Usable length ml	Total length mm	Connection type mm	Cat. No.:
A	200	260	Lemo® socket, 4-wire-system	P 1760-15
	300	360	Lemo® socket, 4-wire-system	P 1760-20
	500	560	Lemo® socket, 4-wire-system	P 1760-25
	600	660	Lemo® socket, 4-wire-system	P 1760-30
B	200	260	strands, 4-wire-system	P 1760-15
	300	360	strands, 4-wire-system	P 1760-20
	500	560	strands, 4-wire-system	P 1760-25
	600	660	strands, 4-wire-system	P 1760-30

Applications:
» temperature measurement in aggressive liquids
» cable provides flexible connection from measuring device to medium



#OTHER SIZES page 227
PT 100 temperature probes in different versions and sizes.

BOLA **Thermometer Holders**

Material: PTFE Temperature resistance: from -20°C to +230°C Chemical resistance: +++ universal

FDA conform

Product description:
A flexible gasket made of PTFE/silicone holds all thermometers with an O.D. of 7-8 mm. Integrated special nut (Safe-Lab) for easy locking and unlocking of the ground joint. The product is only exposed to PTFE.

Ground joint NS	For diameter mm	Angle	Cat. No.:
29/32	7-8	7°	B 286-03





BOLA Stirrer Bearings

Material: **PTFE** Temperature resistance: **from -20°C to +250°C** Chemical resistance: **+++ universal**

FDA conform

Product description:

Guiding the stirrer shaft. With adjustable special gasket. Integrated special nut (Safe-Lab) for easy locking and unlocking of the ground joint.

Cone NS	For stirrer shaft dia. mm	Cat. No.:
29/32	10	B 288-02



BOLA Moon-Shaped Stirrer Shafts

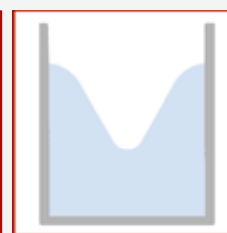
Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal**

FDA conform

Product description:

PTFE-jacketed stainless steel shaft, stirrer blade and access for the stirrer shaft completely made of PTFE. Stirrer blade tilts and fits through a ground joint. Further stirrer shafts can be found on page 24.

For reaction vessel mL	For ground joint NS	Dia. of stirrer shaft mm	Length mm	Cat. No.:
500	29/32	10	350	C 376-12
1.000	29/32	10	450	C 376-14
2.000	29/32	10	510	C 376-16
4.000-6.000	29/32	10	600	C 376-18
4.000/6.000	45/40	10	600	C 376-20



BOLA Distillation Heads

Material: **PTFE** Temperature resistance: **from -20°C to +230°C** Chemical resistance: **+++ universal**

FDA conform

Product description:

Two ground joint cones size 29 and one vertical connection with flexible PTFE/Silicone sealing and PPS screw cap to insert and fix thermometers of an O.D. of 7-8 mm. Integrated special nut (Safe-Lab) for easy locking and unlocking of the ground joint.

Cone NS	For dia. mm	Angle of vertical cone	Cat. No.:
29/32	7-8	90°	B 289-03



BOLA **Receiver Adaptors**

Material: **PTFE** Temperature resistance: **from -20°C to +230°C** Chemical resistance: **+++ universal**

FDA conform

Product description:

Ground joint cone and socket size 29, as well as socket size 19 for example for vacuum stopcock (Cat. No. B 293-02 see page 288). Integrated special nut (Safe-Lab) for easy locking and unlocking of the ground joint.

Cone NS	Socket mm	Lateral socket NS	Lateral angle	Cat. No.:
29/32	19/26	29/32	15°	B 292-02

BOLA **Vacuum Stopcocks**

Material: **PTFE** Temperature resistance: **from 0°C to +110°C** Chemical resistance: **+++ universal**

FDA conform

Product description:

Ground joint cone size 19, bore diameter 2 mm, connections for tubing O.D. 8 mm. Integrated special nut (Safe-Lab) for easy locking and unlocking of the ground joint.

Cone NS	Bore shape Stopcock	Bore dia. of stopcock mm	Cat. No.:
19/26		2	B 293-02

BOLA **Links**

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal**

FDA conform

Product description:

Auxiliary to keep a BOLA Liebig Condenser "Vertical" with diagonal past the reactor lid connection in vertical position. Integrated special nut (Safe-Lab) for easy locking and unlocking of the ground joint.

Cone NS	Socket mm	Angle	Cat. No.:
29/32	29/32	15°	B 303-02





BOLA Ground Joint Tube Fittings

Material: **PTFE** Temperature resistance: **from -200°C to +205°C** Chemical resistance: **+++ universal**

FDA conform

Product description:

For connecting tubes, hard-walled tubing, thermometers. The sealing rings on the outside of the cone prevent sticking of the ground joints and improve the sealing. Integrated special nut (Safe-Lab) for easy locking and unlocking of the ground joint.

Cone NS	For tubing I.D. x O.D. mm	Bore dia. mm	Cat. No.:
19/26	4,0 x 6,0	5	B 304-10
29/32	1,6 x 3,2	2	B 304-16
29/32	4,0 x 6,0	8	B 304-20
29/32	6,0 x 8,0	8	B 304-22
29/32	8,0 x 10,0	8	B 304-24



BOLA Ground Joint Distributors

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal**

FDA conform

Product description:

With ground joint cone and socket size 29. All ground joints are connected with a bore dia. of 10 mm. The bore dia. of the cone is 16 mm. Integrated special nut (Safe-Lab) for easy locking and unlocking of the ground joint.

Socket NS	Cone NS	Length x Width x Total height mm	Cat. No.:
2 x 29/32	29/32	113 x 40 x 105	B 302-02



BOLA "SAFE LAB" Nuts

Material:
PTFE-GFTemperature resistance:
from -200°C to +250°CChemical resistance:
+++ universal

FDA conform

Product description:

Allows a tight and safe connection as well as an easy disconnection of cone and socket. The special nut which is held on an external thread above the cone holds and locks the socket. For disconnection, this special nut has to be turned clockwise. The power is enforced by the thread pitch and is transferred axially to the socket. The ground joint is released.

Suitable for ground joint NS				Cat. No.:
19/26				K 1349-06
29/32				K 1349-10
45/40				K 1349-16



Loosen combi-nut



Insert ground joint



Tighten ground joint body



Ground joint stuck



Loosen ground joint



Ground joint free

BOLA Dropping Funnels

Material:
PTFE, FEPTemperature resistance:
from 0°C to +110°CChemical resistance:
+++ universalTransparency:
transparent

FDA konform

Product description:

Dropping funnel made of transparent FEP, fine adjustment stopcock with cone size 29 made of PTFE. Integrated special nut (Safe-Lab) for easy locking and unlocking of the ground joint.

Capacity ml				Cat. No.:
125				B 285-01
250				B 285-02
500				B 285-03





BOLA Liebig Condensers "Transparent"

Material: PTFE, PFA Temperature resistance: from -20°C to +110°C Chemical resistance: +++ universal Transparency: transparent

Product description:

Thin-walled cooling tube made of translucent and gastight PFA, cooling jacket made of borosilicate glass with hose connectors made of PP and nuts for connection of cooling water, ground joint cone and socket size 29 made of PTFE. The distillate is only exposed to PFA/PTFE. Integrated special nut (Safe-Lab) for easy locking and unlocking of the ground joint.

Length mm			Cat. No.:
300			B 291-02
450			B 291-04
600			B 291-06



BOLA Cold Traps

Material: PTFE Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal Vacuum: suitable Transparency: transparent

FDA conform

Product description:

Transparent, connecting nut made of PTFE reinforced with glassfibres, head made of PTFE with two threaded necks GL 14 for connection of hard-walled tubing by means of separately available laboratory screw joints (page 90). For soft, flexible tubing we recommend to use GL hose connectors (see page 139).

Collecting capacity ml	O.D. of column mm	Total height mm	Cat. No.:
320	60	400	B 317-60



BOLA Threaded Adaptors

Material: PTFE Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal

FDA conform

Product description:

Allow the use of BOLA Multiple Distributors for Bottles with female thread GL 45 also on bottles with GL 32, GL 40 and S 40 threads.

Example 1 for Cat. No. H 978-30:

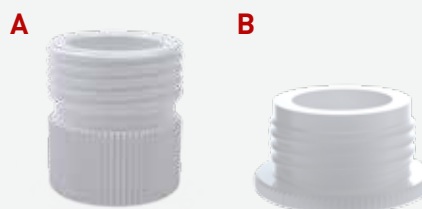
Transition from GL 40 / S 40 to GL 45

Suitable for Merck® bottles with GL 40 thread or for all PFA-, PTFE bottles and jars with thread GL 40 and S 40

Example 2 for Cat. No. H 978-40:

Transition from GL 32 to GL 45

Suitable for bottles with GL 32 thread, e.g. from DWK Life Science (vormals Duran Group)

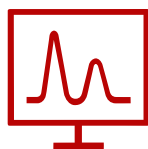


	Bottle thread GL / S	Top thread GL	Cat. No.:
A	GL 32	45	H 978-30
B	GL/S 40	45	H 978-40



Easy handling, sturdy design and pressure resistance up to 30 bar: also in HPLC applications BOLA Screw Joints are your first choice.





SCREW JOINTS FOR HPLC



295 Distributors for Bottles

HPLC Distributors for Bottles	295
HPLC Distributors for Bottles with Stopcocks	296
Distributors for Bottles	298
Distributors for Bottles with Stopcocks	298
Chromatography Adaptors	299

299 Fitting Complete Hoses

Flanged Tubing	299
----------------	-----

302 Couplings, stopcocks and valves

Extender with Adaptor for Syringe Filters	295
Miniature-Couplings	302
Miniature-Distributors	302
Miniature 2-Way Stopcocks	303
Miniature 3-Way-Stopcocks	303
Miniature Manifold Blocks	304
Miniature Pressure Relief Valves	304
Universal Couplings	305
Miniature Screw-in Adaptors	305
Miniature Luer Connectors	306
Miniature Luer Lock Connectors	306

306 Tube End Fittings

Double Tube End Fittings	306
Tube End Fittings	307
Plugs	308
Washers	308
Assortments of Tube End Fittings	308

309 Tubing and Thermoelectric Flanging Tools

Tubing	309
Thermoelectric Flanging Tools	309
Tubing Holders	310
Exchangeable Flanging Tips	310
Standard Construction Kits	310

312 Fittings and Connectors

Joining Fittings	312
Transition Fittings	312
Vario Couplings	313
GL Transition Fittings	313
UNF Screw-in Tube Fittings	314
Adaptors for Prominent®	
Pumps UNF	314
Connection Bolts	314
Sealing Cones for Connection Bolts	315
Double Sealing Cones for Connection Bolts	315



BOLA HPLC-Distributors for Bottles – what you should know about.

They consist of a screw cap made of glass-fibre reinforced PP with GL 45 thread and a movable body with connection ports. All necessary screw joints and gaskets for connecting hard-walled tubing (e.g. PTFE, FEP or PFA, see page 189) up to a maximum diameter of 6 mm are included in delivery and make the HPLC distributors usable immediately. Tubing up to a diameter of 4 mm can be passed and fixed absolutely tightly at the requested immersion depth. The distributors with stopcocks allow closing unused ports; the FEP stopcock plug provides a universal chemical resistance.

Because of the stopcocks, it is not possible to pass the tubing. A connection to the bottom of the bottle can still be made by pushing tubing with O.D. of 5 mm or I.D. of 6 mm in or on the port on the lower side of the distributor. A possible unevenness of the bottle neck is adjusted by an o-ring behind an elastic sealing lip, and the bottle is closed tightly. The product is only exposed to the body of the distributor.

The special feature: the body of the distributor can be turned independently from the screw cap. This means that the completely assembled distributor can be removed and fixed on another bottle without the risk of disarranging the tubing.

+ No disarrangements thanks to 360° clearance of distributor body

+ For tubing with O.D. 1,6 – 4 mm or 6 mm

+ Also available with integrated stopcocks made of FEP

+ Integrated seal ensures perfect sealing

+ Ready for immediate use, accessories such as sealing rings and silicone sealing plugs included in the scope of delivery

+ Handy cap geometry ensures good grip





BOLA HPLC Distributors for Bottles

Material: **PP, Silicone** Temperature resistance: **from 0°C to + 110°C** Chemical resistance: **++ very good** autoclave: **121°**



Product description:

Green screw cap made of glass-fibre reinforced PP for bottle thread GL 45 and body made of PP. Available either with four ports with screw joints suitable for tubing O.D. 1,6 to 2,0 mm and 2,1 to 4,0 mm or with four ports with screw joints suitable for tubing O.D. 6,0 mm. Plugs for closing unused ports are included in delivery.

Suitable for thread GL	Four ports for tubing O.D. mm		Cat. No.:
45	1,6 - 4,0		D 606-08
45	6,0		D 608-08



BOLA Extender with Adaptor for Syringe Filters

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal**

FDA conform

Product description:

Made of PTFE, with female Luer cone for fixing syringe filters.

Connection	O.D. mm		Cat. No.:
Luer cone	3,5		D 610-50

Applications:

For sterile aeration by means of syringe filters.



BOLA HPLC Distributors for Bottles with Stopcocks

Material: **PP, Silicone** Temperature resistance: **from 0°C to + 110°C** Chemical resistance: **++ very good** autoclave: **121°**




Product description:

Green screw cap made of glass-fibre reinforced PP for bottle thread GL 45 and body made of PP. With four ports with screw joints suitable for tubing O.D. 1,6 to 2,0 mm and 2,1 to 4,0 mm and four stopcocks with stopcock plugs made of FEP.

Suitable for thread GL	Four ports for tubing O.D. mm	Bore dia. of stopcock mm	Cat. No.:
45	1,6 - 4,0	2,4	D 607-08



Spare Parts for: HPLC Distributors for Bottles

Description	Material	Packing Unit	for tubing O.D.	suitable for	Cat. No.:	
Replacement Nuts	PP	1 piece	1,6 - 4,0 6,0	all HPLC-Distributors all HPLC-Distributors	D 610-02 D 610-04	
Replacement Sealing Rings	Silicone / FKM	Pack size: 10 pieces	1,6 - 2,0 2,1 - 4,0 6	all HPLC-Distributors all HPLC-Distributors all HPLC-Distributors	D 610-08 D 610-12 D 610-16	
Replacement Plugs	Silicone	Pack size: 10 pieces		all HPLC-Distributors	D 610-30	



BOLA Screw Joints for HPLC

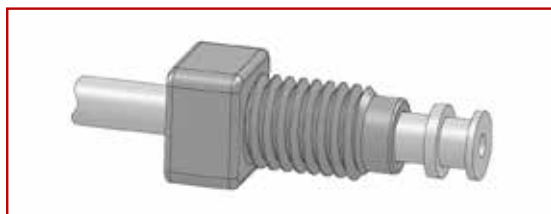
The BOLA HPLC Screw Joint System – what you should know about.

This system is based on flanged tubing and UNF 1/4" 28 G threads. These threads have their origin in the United States and are mainly used in chromatography/HPLC. 1/4" stands for the outer diameter of 6,35 mm. "28 G" stands for 28 thread pitches at the length of one inch (25,4 mm).

Following tubing sizes are mainly used in HPLC:

- » 1/8" (O.D. approx. 3,2 mm x I.D. approx. 1,6 mm)
- » 1/16" (O.D. approx. 1,6 mm x I.D. approx. 0,8 mm)

The screw joint itself consists of a screw (BOLA Tube End Fitting) with washer and flanged tubing. It resists pressures up to 30 bar.



The metal-free washer provides ideal contact pressure of the flanged tubing and prevents small folds during the last phase of tightening the tube end fitting.

The flowing product is only exposed to PTFE – the screw joint has a universal chemical resistance and is absolutely clean.

The PTFE tubing to be flanged must be made of a special type of PTFE. Our tubing fulfils this requirement (see page 189). Besides PTFE tubing, there can also be used FEP and PFA tubing (both gastight and transparent).

The different colours of the tube end fittings (see page 307) can be used for distinction.

How to flange PTFE tubing

- » cut tubing square
- » clamp tubing by means of tubing holder – overhang approx. 3-5 mm
- » press tubing on flanging tip and preform it
- » press preformed tubing end on cooling plate
- » push fitting and washer on the tubing and tighten the fitting
- » ready.



Of course we also have flanged tubing with assembled tube end fittings in different lengths in our standard range (see page 299).

We can also manufacture tubing according to your requirements

Don't confuse UNF 1/4" 28 G and M6 threads!

Besides the common UNF threads, there are also M6 threads circulating. These threads are very similar to the UNF thread, but please only use UNF tube end fittings to avoid damage or leakage of your fittings. You can find universal couplings for a transition from UNF 1/4" 28G to M6 on page 305.

BOLA Distributors for Bottles

Material: PTFE, PPS
Temperature resistance: from -15°C to +200°C
Chemical resistance: +++ universal



FDA conform

Product description:
Black screw cap made of PPS for bottle thread GL 45, distributor made of PTFE with ports UNF 1/4" 28G female to connect tubing on upper and lower side and to join them down to the bottom of the flask. For a tight closure, a possible unevenness of the bottle neck is compensated by an elastic sealing lip with o-ring. The product is only exposed to the body of the distributor. Freely rotating PTFE-insert, the cap can be fixed on another bottle without the risk of disarranging the assembled tubing. Very good chemical resistance, for working temperatures up to +200°C.
See page 299 for suitable flanged tubing.

	For tubing I.D. x O.D. mm		Bore dia. mm	Connections	Cat. No.:
A	0,8 x 1,6		0,8	2 x UNF 1/4" 28G	F 745-02
B	0,8 x 1,6		0,8	4 x UNF 1/4" 28G	F 745-10
	For tubing I.D. x O.D. mm		Bore dia. mm	Connections	Cat. No.:
A	1,6 x 3,2		1,6	2 x UNF 1/4" 28G	F 745-04
B	1,6 x 3,2		1,6	4 x UNF 1/4" 28G	F 745-12



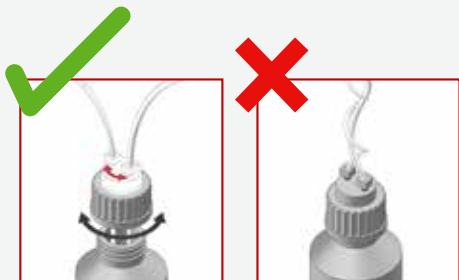
BOLA Distributors for Bottles with Stopcocks

Material: PTFE, PPS
Temperature resistance: from -15°C to +200°C
Chemical resistance: +++ universal

FDA conform

Product description:
Black screw cap made of PPS for bottle thread GL 45, distributor made of PTFE with ports UNF 1/4" 28G female to connect tubing on upper and lower side and to join them down to the bottom of the flask. Ports on upper side with integrated stopcocks. For a tight closure, a possible unevenness of the bottle neck is compensated by an elastic sealing lip with o-ring. The product is only exposed to the body of the distributor. Freely rotating PTFE-insert, the cap can be fixed on another bottle without the risk of disarranging the assembled tubing. Very good chemical resistance, for working temperatures up to +200°C. See page 299 for suitable flanged tubing.

	For tubing I.D. x O.D. mm	Number of stopcocks	Bore dia. mm	Connections	Cat. No.:
A	0,8 x 1,6	2	0,8	2 x UNF 1/4" 28G	F 746-02
B	0,8 x 1,6	3	0,8	3 x UNF 1/4" 28G	F 746-10
	For tubing I.D. x O.D. mm	Number of stopcocks	Bore dia. mm	Connections	Cat. No.:
A	1,6 x 3,2	2	1,6	2 x UNF 1/4" 28G	F 746-04
B	1,6 x 3,2	3	1,6	3 x UNF 1/4" 28G	F 746-12





BOLA Chromatography Adaptors

Material: PTFE, PPS
 Temperature resistance: from -15°C to +200°C
 Chemical resistance: +++ universal

FDA conform

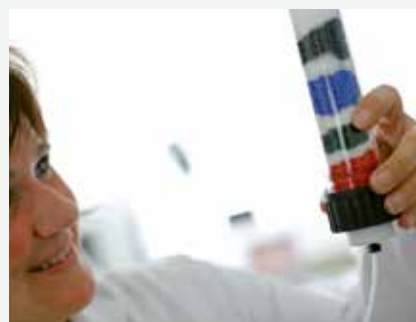
Product description:

Black screw cap made of PPS with GL thread. Body made of PTFE with one port with female thread UNF 1/4" 28 G for connection of Mini Fittings (see tube end fittings page 299).

A possible unevenness of the bottle neck is adjusted by an o-ring behind an elastic sealing lip, and the bottle is closed tightly. The product is only exposed to the body of the adaptor.

Very good chemical resistance, for working temperatures up to max. +200°C.

Thread of screw cap mm	For tubing I.D. x O.D. mm		Cat. No.:
14	(1/32" x 1/16") 0,8 x 1,6		F 755-03
18	(1/32" x 1/16") 0,8 x 1,6		F 755-06
25	(1/32" x 1/16") 0,8 x 1,6		F 755-09
32	(1/32" x 1/16") 0,8 x 1,6		F 755-12
45	(1/32" x 1/16") 0,8 x 1,6		F 755-15
Thread of screw cap mm	For tubing I.D. x O.D. mm		Cat. No.:
14	(1/16" x 1/8") 1,6 x 3,2		F 757-03
18	(1/16" x 1/8") 1,6 x 3,2		F 757-06
25	(1/16" x 1/8") 1,6 x 3,2		F 757-09
32	(1/16" x 1/8") 1,6 x 3,2		F 757-12
45	(1/16" x 1/8") 1,6 x 3,2		F 757-15



BOLA Flanged Tubing

Material: PTFE, PA
 Temperature resistance: from 0°C to +100°C
 Chemical resistance: +++ universal
 Pressure: 30 bar

**BEST
SELLER**

FDA conform

Product description:

Flanged PTFE tubing with black tube end fittings UNF 1/4" 28 G made of PP and washers made of PA. The tubing is ready for use.

Tubing I.D. x O.D. mm	Total length mm		Cat. No.:
(1/32" x 1/16") 0,8 x 1,6	100		F 740-02
(1/32" x 1/16") 0,8 x 1,6	250		F 740-04
(1/32" x 1/16") 0,8 x 1,6	500		F 740-06
(1/32" x 1/16") 0,8 x 1,6	750		F 740-08
(1/32" x 1/16") 0,8 x 1,6	1.000		F 740-10
Tubing I.D. x O.D. mm	Total length mm		Cat. No.:
(1/16" x 1/8") 1,6 x 3,2	100		F 740-20
(1/16" x 1/8") 1,6 x 3,2	250		F 740-22
(1/16" x 1/8") 1,6 x 3,2	500		F 740-24
(1/16" x 1/8") 1,6 x 3,2	750		F 740-26
(1/16" x 1/8") 1,6 x 3,2	1.000		F 740-28

Applications:

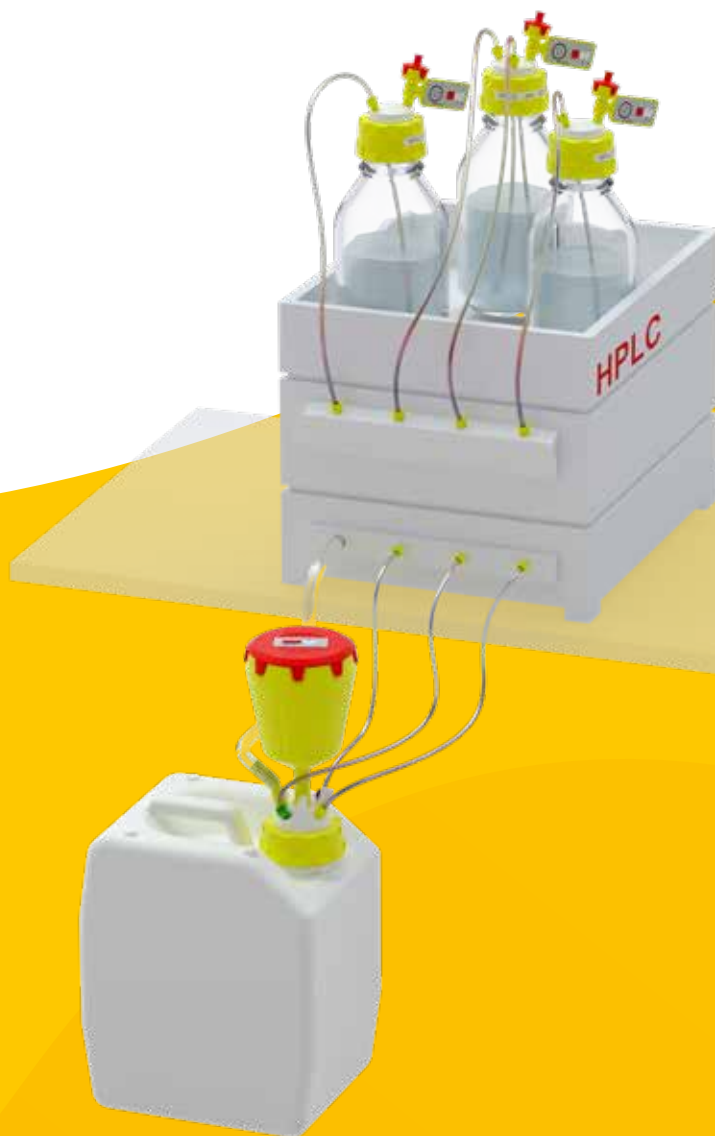
Connection to BOLA Distributors for Bottles or BOLA Chromatography Adaptors.



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BOLA **Miniature Couplings**Material:
PTFE, POMTemperature resistance:
from -30°C to +100°CChemical resistance:
+++ universal

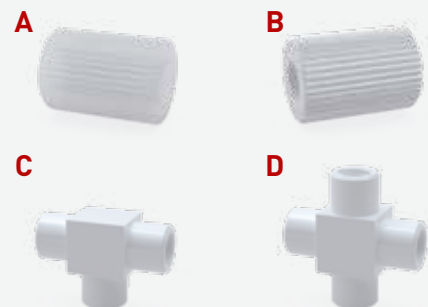
FDA conform

Product description:

Three types of couplings available: straight type made of PTFE or POM with higher mechanical strength, "T" type with three connections or "cross" type with four connections, all made of PTFE. The tubing is connected by means of tube end fittings (see page 299) to a female thread UNF 1/4" 28 G.

	Type	Material	For tubing I.D x O.D. mm	Connections	Total length mm	Cat. No.:
A		POM	(1/32" x 1/16") 0,8 x 1,6	2	17	F 707-02
B		PTFE	(1/32" x 1/16") 0,8 x 1,6	2	17	F 707-06
C		PTFE	(1/32" x 1/16") 0,8 x 1,6	3	25	F 707-14
D		PTFE	(1/32" x 1/16") 0,8 x 1,6	4	25	F 707-18

	Type	Material	For tubing I.D x O.D. mm	Connections	Total length mm	Cat. No.:
A		POM	(1/16" x 1/8") 1,6 x 3,2	2	17	F 707-04
B		PTFE	(1/16" x 1/8") 1,6 x 3,2	2	17	F 707-08
C		PTFE	(1/16" x 1/8") 1,6 x 3,2	3	25	F 707-16
D		PTFE	(1/16" x 1/8") 1,6 x 3,2	4	25	F 707-20

BOLA **Miniature Distributors**Material:
PTFETemperature resistance:
from -200°C to +250°CChemical resistance:
+++ universalPressure:
30 bar

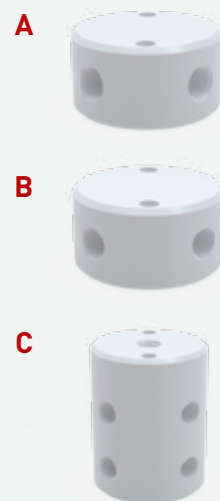
FDA conform

Product description:

Blocks with up to nine connections. The tubing is connected by means of tube end fittings (see page 299) to a female thread UNF 1/4" 28 G. With two mounting holes dia. 3,5 mm for fixing.

	For tubing I.D. x O.D. mm	Connections	O.D. mm	Height mm	Cat. No.:
A	(1/32" x 1/16") 0,8 x 1,6	3	28	15	F 710-01
B	(1/32" x 1/16") 0,8 x 1,6	4	28	15	F 710-05
C	(1/32" x 1/16") 0,8 x 1,6	9	28	36	F 710-09

	For tubing I.D. x O.D. mm	Connections	O.D. mm	Height mm	Cat. No.:
A	(1/16" x 1/8") 1,6 x 3,2	3	28	15	F 710-03
B	(1/16" x 1/8") 1,6 x 3,2	4	28	15	F 710-07
C	(1/16" x 1/8") 1,6 x 3,2	9	28	36	F 710-11





BOLA Miniature 2-Way Stopcocks

Material: PTFE, FEP Temperature resistance: from -200°C to +205°C Chemical resistance: +++ universal Pressure: 8 bar

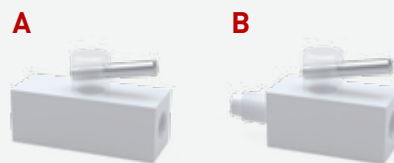
FDA conform

Product description:

2-way stopcock with straight bore and two connections. Available either with two female threads UNF 1/4" 28 G or with one female thread UNF 1/4" 28 G and one male thread UNF 1/4" 28 G. Total height including stopcock plug made of FEP: 20 mm.

	For tubing I.D. x O.D. mm	Connections female thread	Connections male thread	Total length mm	Cat. No.:
A	(1/32" x 1/16") 0,8 x 1,6	2		32	F 730-02
B	(1/32" x 1/16") 0,8 x 1,6	1	1	35	F 730-06

	For tubing I.D. x O.D. mm	Connections female thread	Connections male thread	Total length mm	Cat. No.:
A	(1/16" x 1/8") 1,6 x 3,2	2		32	F 730-04
B	(1/16" x 1/8") 1,6 x 3,2	1	1	35	F 730-08



BOLA Miniature 3-Way Stopcocks

Material: PTFE, FEP Temperature resistance: from -200°C to +205°C Chemical resistance: +++ universal Pressure: 8 bar

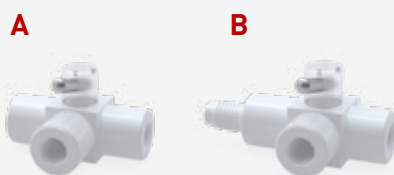
FDA conform

Product description:

3-way stopcock with "L"-shaped or "T"-shaped bore and three connections. Available either with three female threads UNF 1/4" 28 G or with two female threads UNF 1/4" 28 G and one male thread UNF 1/4" 28 G. Total height including stopcock plug made of FEP: 20 mm.

	For tubing I.D. x O.D. mm	Connections female thread	Connections male thread	Bore shape of stopcock	Total length mm	Cat. No.:
A	(1/32" x 1/16") 0,8 x 1,6	3			32	F 731-02
	(1/32" x 1/16") 0,8 x 1,6	3			32	F 731-06
B	(1/32" x 1/16") 0,8 x 1,6	2	1		42	F 731-10
	(1/32" x 1/16") 0,8 x 1,6	2	1		42	F 731-14

	For tubing I.D. x O.D. mm	Connections female thread	Connections male thread	Bore shape of stopcock	Total length mm	Cat. No.:
A	(1/16" x 1/8") 1,6 x 3,2	3			32	F 731-04
	(1/16" x 1/8") 1,6 x 3,2	3			32	F 731-08
B	(1/16" x 1/8") 1,6 x 3,2	2	1		42	F 731-12
	(1/16" x 1/8") 1,6 x 3,2	2	1		42	F 731-16



BOLA **Miniature Manifold Blocks**

Material: **PTFE, FEP** Temperature resistance: **from -200°C to +205°C** Chemical resistance: **+++ universal** Pressure: **8 bar**

FDA conform

Product description:

Block made of PTFE with one inlet and four outlets with female thread UNF 1/4" 28 G. Also available with four stopcocks with stopcock plugs made of FEP for easy interruption and control of flow. Suitable flanged tubing can be found on page 299.

For tubing I.D. x O.D. mm	Number of stopcocks	Bore dia. mm	Inlet	Outlet	Cat. No.:
(1/32" x 1/16") 0,8 x 1,6	4	0,8	1	4	F 712-10
(1/16" x 1/8") 1,6 x 3,2	4	1,6	1	4	F 712-12

BOLA **Miniature Pressure Relief Valves**

Material: **PTFE, PPS** Temperature resistance: **from -20°C to +250°C** Chemical resistance: **+++ universal** Pressure: **5 bar**

FDA conform

Product description:

Body made of PTFE with two connections with female thread UNF 1/4" 28 G. Valve made of PPS with set screw and lock nut for adjusting and fixing pressure between 0,1 and 5 bar (factory setting 1,5 bar). Suitable flanged tubing can be found on page 299.

For tubing I.D. x O.D. mm	O.D. mm	Total height mm	Cat. No.:
(1/32" x 1/16") 0,8 x 1,6	32	50	F 738-08

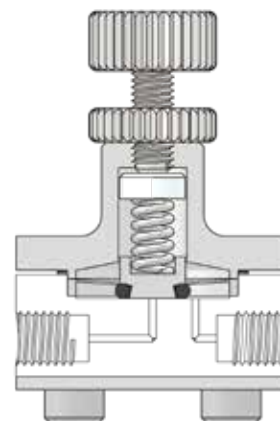
For tubing I.D. x O.D. mm	O.D. mm	Total height mm	Cat. No.:
(1/16" x 1/8") 1,6 x 3,2	32	50	F 738-16

Product advantages:

- » low dead volume
- » flow direction is marked by an arrow
- » two holes for panel mounting
- » universal chemical resistance, the flowing product is only exposed to PTFE

Applications:

Pressure control valve with adjustable opening pressure. For preventing pressure drop during filling.





BOLA Universal Couplings

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal**

FDA conform

Product description:

Coupling made of PTFE for transition from M6 thread to UNF 1/4" 28 G thread. The M6 thread is marked by a groove.

	Female thread	Female thread	Bore dia. mm	Cat. No.:
A	M 6	UNF 1/4" 28G	0,8	F 770-08

	Male thread	Male thread	Bore dia. mm	Cat. No.:
B	M 6	UNF 1/4" 28G	0,8	F 772-08

A



B



BOLA Miniature Screw-in Adaptors

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal**

FDA conform

Product description:

Adaptor made of PTFE for transition from female thread UNF 1/4" 28 G to male thread NPT 1/8" or NPT 1/4".

For tubing I.D. x O.D. mm	Female thread	Male thread	Bore dia. mm	Cat. No.:
(1/32" x 1/16") 0,8 x 1,6	UNF 1/4" 28G	NPT 1/8"	0,8	F 716-02
(1/32" x 1/16") 0,8 x 1,6	UNF 1/4" 28G	NPT 1/4"	0,8	F 716-06

For tubing I.D. x O.D. mm	Female thread	Male thread	Bore dia. mm	Cat. No.:
(1/32" x 1/16") 1,6 x 3,2	UNF 1/4" 28G	NPT 1/8"	1,6	F 716-04
(1/32" x 1/16") 1,6 x 3,2	UNF 1/4" 28G	NPT 1/4"	1,6	F 716-08



BOLA **Miniature Luer Connectors**

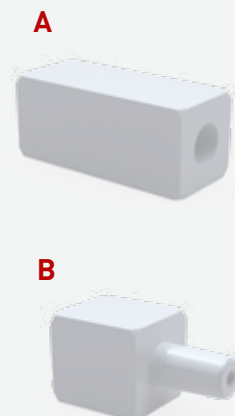
Material: PTFE Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal

FDA conform

Product description:

Connector made of PTFE for transition from Luer connection to female thread UNF 1/4" 28 G.

	For tubing I.D. x O.D. mm	Female thread	Luer cone	Bore dia. mm	Cat. No.:
A	(1/32" x 1/16") 0,8 x 1,6	UNF 1/4" 28G	female	1,0	F 717-02
B	(1/32" x 1/16") 0,8 x 1,6	UNF 1/4" 28G	male	1,0	F 717-06
	For tubing I.D. x O.D. mm	Female thread	Luer cone	Bore dia. mm	Cat. No.:
A	(1/16" x 1/8") 1,6 x 3,2	UNF 1/4" 28G	female	1,6	F 717-04
B	(1/16" x 1/8") 1,6 x 3,2	UNF 1/4" 28G	male	1,6	F 717-08

BOLA **Miniature Luer Lock Connectors**

Material: PTFE Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal

FDA conform

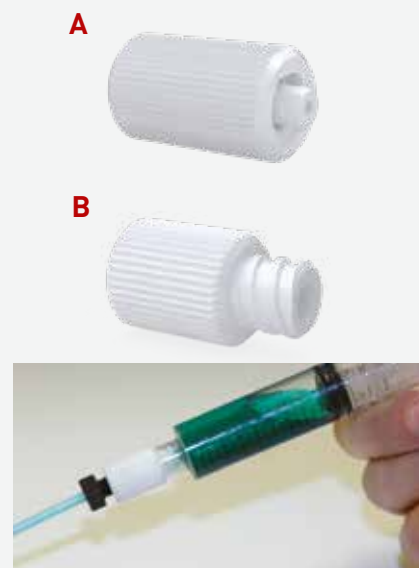
Product description:

Connector made of PTFE for transition from Luer Lock connection to female thread UNF 1/4" 28 G. The inner cone of the Luer-Lock connection provides good sealing, the additional thread (either male or female) prevents accidental loosening. The tubing is connected by means of tube end fittings (see page 299) to a female thread UNF 1/4" 28 G.

	For tubing I.D. x O.D. mm	Female thread	Luer Lock cone	Bore dia. mm	Cat. No.:
A	(1/32" x 1/16") 0,8 x 1,6	UNF 1/4" 28G	male	0,8	F 718-02
B	(1/32" x 1/16") 0,8 x 1,6	UNF 1/4" 28G	female	4	F 718-06
	For tubing I.D. x O.D. mm	Female thread	Luer Lock cone	Bore dia. mm	Cat. No.:
A	(1/16" x 1/8") 1,6 x 3,2	UNF 1/4" 28G	male	1,6	F 718-04
B	(1/16" x 1/8") 1,6 x 3,2	UNF 1/4" 28G	female	1,6	F 718-08

Applications:

Connection of components with Luer Lock such as syringes or cannulas to a tubing system.

BOLA **Double Tube End Fittings**

Material: PTFE Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal

FDA conform

Product description:

Made of PTFE, with two male threads UNF 1/4" 28 G. Packing unit: 10 pieces, differing ordering quantities are rounded up to factor 10.

For tubing I.D. x O.D. mm	Colour	Cat. No.:
(1/32" x 1/16") 0,8 x 1,6	white	F 703-02
For tubing I.D. x O.D. mm	Colour	Cat. No.:
(1/16" x 1/8") 1,6 x 3,2	white	F 703-04





BOLA Tube End Fittings

Material:
PTFE, PA

Temperature resistance:
from -40°C to +100°C

Chemical resistance:
+++ universal



FDA conform

Product description:

White tube end fittings made of PTFE. With male thread UNF 1/4" 28 G; washers made of PA are included in delivery. Packing unit: 10 pieces, differing ordering quantities are rounded up to factor 10.

For tubing I.D. x O.D. mm	Colour	Cat. No.:
(1/32" x 1/16") 0,8 x 1,6	white	F 702-02
For tubing I.D. x O.D. mm	Colour	Cat. No.:
(1/16" x 1/8") 1,6 x 3,2	white	F 702-04



Material:
PP, PA

Temperature resistance:
from 0°C to +100°C

Chemical resistance:
++ very good

FDA conform

Product description:

Coloured tube end fittings made of PP. With male thread UNF 1/4" 28 G; washers made of PA are included in delivery. Packing unit: 10 pieces, differing ordering quantities are rounded up to factor 10

For tubing I.D. x O.D. mm	Colour	Cat. No.:
(1/32" x 1/16") 0,8 x 1,6	natural (white)	F 702-06
(1/32" x 1/16") 0,8 x 1,6	black	F 702-10
(1/32" x 1/16") 0,8 x 1,6	red	F 702-18
(1/32" x 1/16") 0,8 x 1,6	orange	F 702-22
(1/32" x 1/16") 0,8 x 1,6	yellow	F 702-26
(1/32" x 1/16") 0,8 x 1,6	green	F 702-30
(1/32" x 1/16") 0,8 x 1,6	blau	F 702-34
(1/32" x 1/16") 0,8 x 1,6	violet	F 702-38
(1/32" x 1/16") 0,8 x 1,6	grey	F 702-42
For tubing I.D. x O.D. mm	Colour	Cat. No.:
(1/16" x 1/8") 1,6 x 3,2	natural (white)	F 702-08
(1/16" x 1/8") 1,6 x 3,2	black	F 702-12
(1/16" x 1/8") 1,6 x 3,2	red	F 702-20
(1/16" x 1/8") 1,6 x 3,2	orange	F 702-24
(1/16" x 1/8") 1,6 x 3,2	yellow	F 702-28
(1/16" x 1/8") 1,6 x 3,2	green	F 702-32
(1/16" x 1/8") 1,6 x 3,2	blau	F 702-36
(1/16" x 1/8") 1,6 x 3,2	violet	F 702-40
(1/16" x 1/8") 1,6 x 3,2	grey	F 702-44



Applications:

Different colours for better distinction.



#SUITABLE page 189
Tubing for all screw joints



BOLA **Plugs**Material:
PTFETemperature resistance:
from -200°C to +250°CChemical resistance:
+++ universal**FDA conform**

Product description:

Made of PTFE. For closing unused ports of miniature fittings. With male thread UNF 1/4" 28 G.
Packing unit: 10 pieces, differing ordering quantities are rounded up to factor 10.

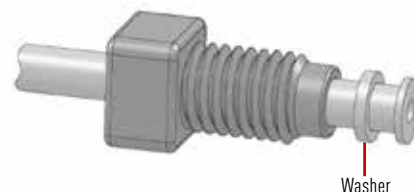
For tubing I.D. x O.D. mm	Colour	Cat. No.:
(1/32" x 1/16") 0,8 x 1,6	white	F 705-02
For tubing I.D. x O.D. mm	Colour	Cat. No.:
(1/16" x 1/8") 1,6 x 3,2	white	F 705-04

BOLA **Washers**Material:
PATemperature resistance:
from -40°C to +100°C

Product description:

Made of PA. For stabilising the flange and avoiding damages when tightening the tube end fitting. Packing unit: 10 pieces, differing ordering quantities are rounded up to factor 10.

For tubing I.D. x O.D. mm	Cat. No.:
(1/32" x 1/16") 0,8 x 1,6	F 728-08
For tubing I.D. x O.D. mm	Cat. No.:
(1/16" x 1/8") 1,6 x 3,2	F 728-16

BOLA **Assortments of Tube End Fittings**Material:
PPTemperature resistance:
from 0°C to +100°CChemical resistance:
++ very good**FDA conform**

Product description:

Tube end fittings made of PP in 9 different colours, two fittings per colour. With male thread UNF 1/4" 28 G; washers made of PA are included in delivery.

Colours: natural, black, orange, yellow, green, blue, violet and grey

For tubing I.D. x O.D. mm	Cat. No.:
(1/32" x 1/16") 0,8 x 1,6	F 704-02
For tubing I.D. x O.D. mm	Cat. No.:
(1/16" x 1/8") 1,6 x 3,2	F 704-04

Applications:

Different colours for better distinction.





BOLA Tubing

FDA conform

Product description:

Tubing especially suitable for making flanges with BOLA Thermoelectric Flanging Tool.

PTFE:

» competitive standard tubing in laboratories, transparent to milky white colour, working temperature range between -200°C and + 250°C, universal chemical resistance

PFA:

» transparent, non-porous and gastight tubing, wide temperature range between -200°C and + 260°C, universal chemical resistance

FEP:

» transparent, non-porous and gastight tubing, working temperature range between -200°C and + 205°C, universal chemical resistance

Dimensions I.D. x O.D. mm	Cat. No.: PTFE-Tubing	Cat. No.: PFA-Tubing	Cat. No.: FEP-Tubing
0,5 x 1,6	S 1810-09		
(1/32" x 1/16") 0,8 x 1,6	S 1810-10	S 1811-02	S 1815-04
1,6 x 2,4	S 1810-24		
(1/16" x 1/8") 1,6 x 3,2	S 1810-26	S 1811-04	S 1815-08
2,4 x 3,2	S 1810-33		

PTFE



PFA



FEP



BOLA Thermoelectric Flanging Tools

CE

Product description:

For making flanges at the ends of plastic tubing (e.g. PTFE, PFA or FEP see page 189)

Following sets are available:	For tubing I.D. mm	Version	Cat. No.:
1 x Basic flanging tool 230V/50 Hz 1 x Exchangeable flanging tip for flanging tubing I.D. 0,8 mm 1 x Tubing holder for tubing O.D. 1,6 mm (1/16") and 3,2 mm (1/8")	0,8	230V 50 HZ	F 701-12
1 x Basic flanging tool 230V/50 Hz 1 x Exchangeable flanging tip for flanging tubing I.D. 1,6 mm 1 x Tubing holder for tubing O.D. 1,6 mm (1/16") and 3,2 mm (1/8")	1,6	230V 50 HZ	F 701-14

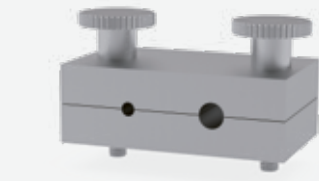


BOLA **Tubing Holders**

Product description:
For tubing with O.D. 1,6 mm (1/16") and 3,2 mm (1/8").

For tubing O.D. mm			Cat. No.:
(1/16") 1,6 x (1/8") 3,2			F 706-06

- Product advantages:**
- » safe fixing of the tubing during the flanging procedure
 - » easy assembly and handling
 - » injuries due to the hot flanging tips are avoided



BOLA **Flanging Tips**

Product description:
For flanging different inner diameters of tubing, suitable for BOLA Thermoelectric Flanging Tools see page 309.

For tubing I.D. mm			Cat. No.:
0,5			F 709-50
(1/32") 0,8			F 709-52
(1/16") 1,6			F 709-54
2,4			F 709-56



BOLA **Standard Construction Kits**



Product description:
For making flanges at the ends of plastic tubing
(e.g. PTFE, PFA or FEP see page 189)

Following sets are available	For tubing I.D. mm	Version	Cat. No.:
1 piece BOLA Thermoelectric Flanging Tool with exchangeable flanging tip for tubing I.D. 0,8 mm and suitable tubing holder 1 piece BOLA Tube End Fitting Set 5 piece BOLA Plugs 10 piece BOLA Miniature Couplings (straight) 2 piece Miniature Couplings (T) 1 piece BOLA Miniature Coupling (cross) 10 metres of PTFE tubing	0,8	230V 50 HZ	F 700-02
1 piece BOLA Thermoelectric Flanging Tool with exchangeable flanging tip for tubing I.D. 1,6 mm and suitable tubing holder 1 piece BOLA Tube End Fitting Set 5 piece BOLA Plugs 10 piece BOLA Miniature Couplings (straight) 2 piece BOLA Miniature Couplings (T) 1 piece BOLA Miniature Coupling (cross) 10 metres of PTFE tubing	1,6	230V 50 HZ	F 700-04





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For this, we just need a drawing (a rough sketch is sufficient) and some information.

Checklist for your customised product:

- » What is the article name?
- » In which application should the article be used?
- » What dimensions should the article have?
- » Are there any specific material specifications?
- » In which temperature range should the article be used?
- » What chemical stresses is the article exposed to?
- » In which quantities is the article required?
- » What cost per piece should the article not exceed?



You have a special request?
Call us on: **+49 (0) 93 46-92 86-0**

Or just send us a drawing (a rough sketch is sufficient) and some information to **info@bola.de**. We will then contact you to discuss further details and establish an offer for you free of charge.

BOLA **Joining Fittings**

Material: PTFE, ETFE Temperature resistance: from -50°C to +150°C Chemical resistance: +++ universal Pressure: 5 bar Vacuum: suitable

FDA conform

Product description:

Fitting made of PTFE. One side with connecting nut with compression rings for connecting tubing or tubes with O.D. 4, 6, 8 or 10 mm. Other side with laboratory screw joint for connecting tubing with O.D. 1,6 or 3,2 mm (see page 90).

From tubing I.D. x O.D. mm	To tubing O.D. mm	O.D. mm	Total length mm	Cat. No.:
(1/16" x 1/8") 1,6 x 3,2	4 and 6	25	70	F 762-14
(1/16" x 1/8") 1,6 x 3,2	8 and 10	25	70	F 762-18



#SUITABLE page 189
Tubing for all screw joints

BOLA **Transition Fittings**

Material: PTFE Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal Pressure: 5 bar

FDA conform

Product description:

Fitting made of PTFE. One side with metric thread and connecting nut with compression rings for connecting tubing or tubes with O.D. 4, 6, 8 or 10 mm. Other side with female thread UNF 1/4" 28 G for connecting flanged tubing with O.D. 1,6 or 3,2 mm by means of tube end fittings (see page 299).

From tubing I.D. x O.D. mm	To tubing O.D. mm	O.D. mm	Total length mm	Cat. No.:
(1/32" x 1/16") 0,8 x 1,6	4 and 6	21	40	F 760-04
(1/32" x 1/16") 0,8 x 1,6	8 and 10	26	46	F 760-14

From tubing I.D. x O.D. mm	To tubing O.D. mm	O.D. mm	Total length mm	Cat. No.:
(1/16" x 1/8") 1,6 x 3,2	4 and 6	21	40	F 760-08
(1/16" x 1/8") 1,6 x 3,2	8 and 10	26	46	F 760-18





BOLA Vario Couplings

Material: **PVDF** Temperature resistance: **from -30°C to +150°C** Chemical resistance: **++ very good** Pressure: **3 bar** autoclave: **121°C**

FDA conform

Product description:

Two-part coupling made of PVDF for connecting elastic tubing (e.g. Viton®, Tygon®, silicone) to hard-walled tubing made of PTFE, glass or other plastics. Easy and ingenious functioning: the elastic tubing is pushed on a cone and fixed on the coupling by means of a connecting nut. On the other side, the hard-walled tubing is connected as follows:

Flanged PTFE tubing with miniature connectors (e.g. Cat. No. F 740 page 299) is connected to a female thread UNF 1/4" 28 G.

Hard-walled tubing up to a maximum O.D. of 10 mm is connected to a GL thread by means of laboratory screw joints (see page 90). Restricted chemical resistance, working temperatures up to max. +150°C.

	For tubing I.D. mm	For tubing wall thickness mm	Bore dia. mm	Connecting thread UNF	Cat. No.:
A	0,8	0,8 to 1,2	0,8	1/4" 28G	F 778-08
	1,6	0,8	1,6	1/4" 28G	F 778-16

	For tubing I.D. mm	For tubing wall thickness mm	Bore dia. mm	Connecting thread GL	Cat. No.:
B	0,8	0,8 to 1,2	0,8	14	D 681-08
	1,6	0,8	1,6	14	D 681-16
	3,2	1,6	3,2	14	D 681-24
	4,0 to 4,8	1,6	4,0	14	D 681-32
	6,4	1,6	6,4	18	D 681-40
	8 to 11,5	1,6 to 2,4	8,0	18	D 681-48

Applications:

Peristaltic pumps.

A



B



BOLA GL Transition Fittings

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal**

FDA conform

Product description:

Fitting made of PTFE. One side with thread GL 14 for connecting hard-walled tubing and tubes by means of BOLA Laboratory Screw Joints. Other side with female thread UNF 1/4" 28G for connecting flanged tubing with O. D. 1,6 and 3,2 mm by means of tube end fittings.

	For tubing I.D. x O.D. mm	Bore dia. mm	Fitting Thread GL	Female Thread UNF	Total length mm	Cat. No.:
	(1/32" x 1/16") 0,8 x 1,6	0,8	14	1/4" 28G	39	F 761-08
	(1/16" x 1/8") 1,6 x 3,2	1,6	14	1/4" 28G	39	F 761-16



#SUITABLE page 90
Laboratory screw joints



BOLA **UNF Screw-in Tube Fittings**Material:
PTFETemperature resistance:
from -200°C to +250°CChemical resistance:
+++ universal**FDA conform**

Product description:

Straight tube fitting made of PTFE. One side with fitting thread GL 14 for connecting hard-walled tubes and tubing by means of BOLA Laboratory Screw Joints. Other side with male screw-in thread UNF 1/4" 28G for connection to units and fittings with female thread UNF 1/4" 28G.

For tubing I.D. x O.D. mm	Bore dia. mm	Fitting thread GL	Male thread UNF	Total length mm	Cat.-No.
(1/32" x 1/16") 0,8 x 1,6	0,8	14	1/4" 28G	39	F 763-08
(1/16" x 1/8") 1,6 x 3,2	1,6	14	1/4" 28G	39	F 763-16

BOLA **Adaptors for Prominent®-Pumps UNF**Material:
PTFE-GFTemperature resistance:
from -200 °C to +250 °CChemical resistance:
+++ universalPressure:
10 bar**FDA conform**

Product description:

Adaptor made of glass-fibre reinforced PTFE, transition from pump thread M20 x 1,5 to female thread UNF 1/4" 28G. Pressure resistant connection (max. 10 bar). The tubing is connected by means of tube end fittings to a female thread UNF 1/4 28G. Universal chemical resistance, the product is only exposed to PTFE.

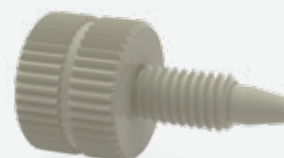
For tubing mm	Bore dia. mm	Cat. No.:
(1/32" x 1/16") 0,8 x 1,6	0,8	D 731-12
(1/16" x 1/8") 1,6 x 3,2	1,6	D 731-24

BOLA **Connection Bolts**Material:
PEEKTemperature resistance:
from -50°C to +250°CChemical resistance:
++ very goodPressure:
450 bar**FDA conform**

Product description:

Connection bolt and sealing cone made of PEEK, suitable for female thread UNF 10-32G. Suitable for pressures up to max. 450 bar.

For tubing/tube O.D. mm	Cat. No.:
(1/16") 1,6	F 830-10





BOLA Connection Bolts

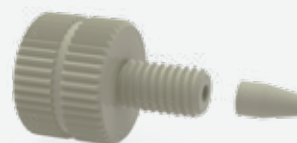
Material: **PEEK** Temperature resistance: **from -50°C to +250°C** Chemical resistance: **++ very good** Pressure: **280 bar**

FDA conform

Product description:

Connection bolt and sealing cone made of PEEK, suitable for female thread UNF 10-32 G. Exchangeable sealing cone available separately (Cat. No. F 834-10), knurled nut reusable. Suitable for pressures up to max. 280 bar

For tubing/tube O.D. mm			Cat. No.:
(1/16") 1,6			F 833-10



BOLA Sealing Cones for Connection Bolts

Material: **PEEK** Temperature resistance: **from -50°C to +250°C** Chemical resistance: **++ very good** Pressure: **450 bar**

FDA conform

Product description:

Replacement sealing cone made of PEEK, suitable for connection bolts (Cat. No. F 833-10).

For tubing/tube O.D. mm			Cat. No.:
(1/16") 1,6			F 834-10



BOLA Connection Bolts

Material: **PEEK** Temperature resistance: **from -50°C to +250°C** Chemical resistance: **++ very good** Pressure: **400 bar**

FDA conform

Product description:

Hexagonal connection bolt and double sided sealing cone made of PEEK, suitable for female thread UNF 10-32G. Exchangeable sealing cone available separately (Cat. No. F 837-10). Hexagonal nut reusable. Suitable for pressures of up to max. 400 bar.

For tubing/tube O.D. mm			Cat. No.:
(1/16") 1,6			F 836-10



BOLA Double Sealing Cones for Connection Bolts

Material: **PEEK** Temperature resistance: **from -50°C to +250°C** Chemical resistance: **++ very good** Pressure: **450 bar**

FDA conform

Product description:

Replacement double sided sealing cone made of PEEK, suitable for connection bolts (Cat. No. F 836-10).

For tubing/tube O.D. mm			Cat. No.:
(1/16") 1,6			F 837-10



Proved and tested, durable, optimally resistant against acids, caustic solutions and other aggressive chemicals: our solutions for efficient and safe filtration.





FILTRATION



320 Filter Devices

Flow Filters	320
Single-Stage Flow Filters	321
Three-Stage Flow Filters	321
Vacuum Filters	322
Vacuum Filtering Funnels	322
Buchner Funnels	324
Filter Adaptors for Syringes	325
Pressure Pre-Filters	325
Suction Filters	330
Dirt Traps	335

323 Adaptors

Vacuum Adaptors GL	323
Vacuum Adaptors with Ground Joint	323

324 Gas Distributors and Gas Scrubber Attachments

Vacuum Traps	324
Scrubber Bottles	326
Scrubber Columns	327
Scrubber Bottles Vitrum	328
Scrubber Adaptors for Bottles	328
Micro Scrubber Bottles	330
Gas Frits	326
Gas Distributors	327
Gas Inlet Tubes	329

331 Filters and Semi-finished Filters

Filtering Tiles	331
Filtering Sheets	331
Filtering Membranes	332
Filtering Discs	333
Filtering Rods	333
Filtering Rods	334



BOLA Filters and fitting devices – what you should know about.

Filters and filtering devices made of fluoroplastics characterize with extraordinary resistance against chemical substances. They are resistant against acids, caustic solutions and many other chemicals which makes them ideal for use in various laboratory applications. Beside this, PTFE filters are heat resistant and can withstand temperatures up to 250°C.

BOLA filters and filtering devices have excellent non-stick properties whereby particles slip off easily and make cleaning easier. The high mechanical stability ensures that they keep their form also under pressure.



Applicable for different bottle sizes



Universal connecting options owing to GL connectors



Riser tube easily adjustable to bottle height



No twirling thanks to 360° free movement of the distributor bodies



Universally chemical resistant



Integrated gasket ensures perfect sealing





BOLA Filtration



What you should know about porous PTFE.

For the production of porous rods, tubes and tiles, PTFE particles are melted together.

The pore size can be determined both by the selection of the PTFE granules and the process parameters.

Due to the non-adhesive surface, filtering devices made of fluoroplastics (PTFE/PFA) are easy to clean and have a long durability.

Microporous PTFE has the same unique properties like "normal" PTFE:

- » non-adhesive / dirt-repellent
- » hydrophobic / water-repellent
- » non-wettable
- » no release of trace elements in the filtrate (no plasticisers)
- » almost universal chemical resistance to acids, bases and solvents
- » excellent temperature resistance between -200°C and + 250°C (temporarily even +300°C)
- » autoclavable

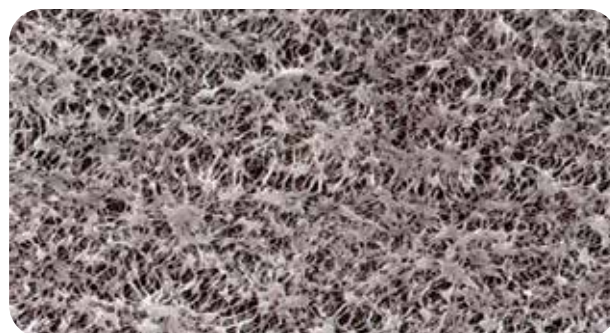
Information about pore sizes – what do these indications mean?

Class	Indication	Pore size in μm
00	P 500	250 - 500 *
0	P 250	160 - 250 *
1	P 160	100 - 160 *
2	P 100	40 - 100
3	P 40	16 - 40
4	P 16	10 - 16
5	P 1,6	1 - 1,6

* not feasible with PTFE at the moment

Typical applications – often asked.

Pore size	Application
50 μm	Filtration of coarse particles, distribution of gas in liquids
5 μm	Filtration of medium-sized particles, laboratory filtration, valve for packings (gas permeable, leak proof)
1 μm	Filtration of aqueous solvents, elimination of particles
0,45 μm	Prefiltration of aqueous solvents, HPLC solvents, protein solvents and alcohols, sterile filtration of air or other gases
0,2 μm	Ultracleaning of organic solvents and alcohols, sterile filtration of air or other gases
0,05 μm	Ultracleaning of solvents or gases (virus)



BOLA Flow Filters

Material: PTFE, PPS Temperature resistance: from -20°C to +160°C Chemical resistance: +++ universal Vacuum: suitable autoclave: 121°



FDA conform

Product description:

Suitable for overpressure or vacuum, usable for example as added filter or as large-area in-line apparatus in a line system. Suitable for temperatures up to +160°C. The optionally available filtering membranes (page 332) can be exchanged easily. Tubing can be connected to GL threads by means of the included laboratory screw joints.

The filters are produced without plasticisers and have an almost universal chemical resistance. They do not release any trace elements into the filtrate. Due to the non-adhesive surface, they are easy to clean and can be reused.

For membrane dia. mm	Filtration surface m ²	Connecting thread GL	For tubing O.D. mm	Cat. No.:
25	3,1	14	3,2 and 6,0	N 1670-08
47	13,8	18	6,0 and 8,0	N 1670-16
90	52,0	25	8,0 and 10,0	N 1670-24

Flow rate:

Flow capacity under vacuum of 100 kPa (1000 mbar) with Water / 1 kPa (10 mbar) with air using a PTFE filtering membrane with a thickness of 0,2 mm:

For membrane dia. mm	Pore size µm	Product	Flow ml/min.	For membrane dia. mm	Pore size µm	Product	Flow ml/min.
25	1,00	water	5	47	0,45	water	3
25	1,00	air	92	47	0,45	air	122
25	0,45	water	1	90	1,00	water	57
25	0,45	air	34	90	1,00	air	1.191
47	1,00	water	16	90	0,45	water	12
47	1,00	air	325	90	0,45	air	446



#SUITABLE PAGE 90
Ideally coordinated laboratory screw-joints



Spare parts for: Flow Filter

Description	Material	Packing Unit	For membrane dia. mm	suitable for: Cat. No.:	Cat. No.:	
Replacement Gasket with O-Ring	PTFE/ FKM	pack size: 3 pieces	25 47 90	N 1670-08 N 1670-16 N 1670-24	N 912-01 N 912-02 N 912-03	



BOLA Single-Stage Flow Filter

Material: PFA Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal Vacuum: suitable autoclave: 121°

FDA conform

Product description:

Filter made of PFA with connecting nut made of glass-fibre reinforced ETFE. Suitable for vacuum and overpressure up to max. 150 kPa (1.500 mbar) and for temperatures up to max. +160°C. Easy exchange of the optionally available filtering membrane (page 332). Couplings for connecting tubing (page 189) with O.D. 6,35 mm (1/4") are included.

For membrane dia. mm	Filtration surface cm ²	O.D. mm	For tubing O.D. mm	Cat. No.:
47	14,1	62	(1/4") 6,35	N 1678-08

Flow rate:

Flow capacity under vacuum of 100 kPa (1000 mbar) with Water / 1 kPa (10 mbar) with air using a PTFE filtering membrane with a diameter of 47 mm and a thickness of 0,2 mm:

Pore size µm	Product	Flow ml/min.
1,00	water	16
0,45	water	4
1,00	air	325
0,45	air	122



BOLA Three-Stage Flow Filter

Material: PFA Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal autoclave: 121° autoclave: 121°

FDA conform

Product description:

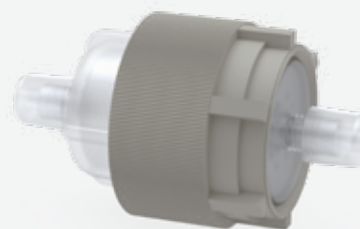
Filter made of PFA with connecting nut made of glass-fibre reinforced ETFE. Suitable for vacuum and overpressure up to max. 150 kPa (1.500 mbar) and for temperatures up to max. +160°C. Multi-stage filtrations with up to 3 different filtering membranes are possible. Easy exchange of the optionally available filtering membrane (page 332). Couplings for connecting tubing (page 189) with O.D. 6,35 mm (1/4") are included.

For membrane dia. mm	Filtration surface cm ²	O.D. mm	For tubing O.D. mm	Cat. No.:
47	3 x 14,1	62	(1/4") 6,35	N 1682-08

Flow rate:

Flow capacity under vacuum of 100 kPa (1000 mbar) with Water / 1 kPa (10 mbar) with air using a PTFE filtering membrane with a diameter of 47 mm and a thickness of 0,2 mm:

Pore size µm	Product	Flow ml/min.
1,00	water	6
0,45	water	1
1,00	air	418
0,45	air	231



BOLA Vacuum Filters

Material:
PTFE, PFATemperature resistance:
from -200°C to +250°CChemical resistance:
+++ universal

FDA conform

Product description:

Filtration unit made of PTFE, multi-stage hose connector with integrated lock screw for connecting vacuum tubing with I.D. 6 mm or 8 mm, PTFE supporting disc to fit optionally available filtering discs (page 332). Collecting vessel made of PFA, filling vessel with lid for protection against contaminations also made of PFA. The filters are produced without plasticisers and have an almost universal chemical resistance. They do not release any trace elements into the filtrate. Due to the non-adhesive surface, they are easy to clean and can be reused.

For membrane dia. mm	Filtration surface cm ²	Capacity of filling/collecting (vessel ml)	O.D. mm	Total height mm	Cat. No.:
47	13,8	240	86	250	N 1650-08
47	13,8	500	100	290	N 1650-16
90	55,4	1.000	130	370	N 1650-24

Flow rate:

Flow capacity for water under vacuum of 100 kPa (1000 mbar) using a PTFE filtering membrane with a thickness of 0,2 mm:

For membrane dia. mm	Pore size µm	Flow ml/min.	For membrane dia. mm	Pore size µm	Flow ml/min.
47	1,00	55	90	1,00	199
47	0,45	20	90	0,45	72
47	0,20	11	90	0,20	42



#SUITABLE PAGE 332

Dimensionally coordinated filtering membranes



BOLA Vacuum Filtering Funnels

Material:
PTFE, PFATemperature resistance:
from -200°C to +250°CChemical resistance:
+++ universal

FDA conform

Product description:

Filtration unit made of PTFE with cone size 29 for connection to a vessel (must be suitable for vacuum) with socket size 29. Multi-stage hose connector with integrated lock screw for vacuum tubing with I.D. 6 and 8 mm, filtration surface 13,8 cm², easily exchangeable filtering membrane dia. 47 mm (optionally available – page 332). Filling vessel made of PFA with PTFE lid for protection against contaminations.

Capacity of filling vessel mm	O.D. mm	Total height mm	Cat. No.:
125	62	188	N 1658-08

Flow rate:

Flow capacity for water under vacuum of 100 kPa (1000 mbar) using a PTFE filtering membrane with a diameter of 47 mm and a thickness of 0,2 mm:

Pore size µm	Flow ml/min.
1,00	61
0,45	15
0,20	8





BOLA Vacuum Adaptor GL

Material: PTFE Temperature resistance: from -15 °C to +200 °C Chemical resistance: +++ universal autoclave: 121° Vacuum: suitable

NEW

FDA conform

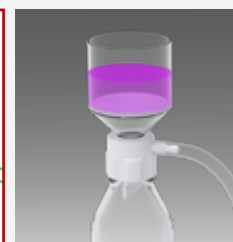
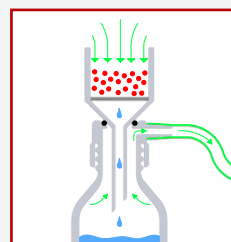
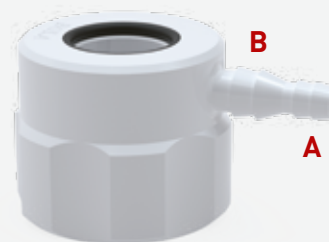
Product description:

Made of PTFE. Pass-through with o-ring made of FKM for safe assembly of standard filter funnels made of glass or plastic on flasks with thread GL 45. Lateral 2-step hose connector made of PTFE for connection to a vacuum pump by means of suitable tubing.

For thread GL	For funnel outlet max. Ø mm	2-Step hose connector		Cat. No.:
		A O.D. mm	B O.D. mm	
45	22	9	12	N 1656-45

Applications:

For vacuum filtration, the o-ring at the pass-through provides good sealing to the filter funnel. A slight vacuum is sufficient.



BOLA Vacuum Adaptor with Ground Joint

Material: PTFE Temperature resistance: from -15 °C to +200 °C Chemical resistance: +++ universal autoclave: 121° Vacuum: suitable

NEW

FDA conform

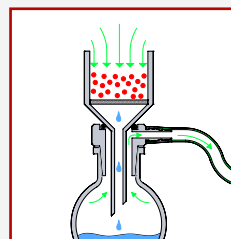
Product description:

Made of PTFE. Pass-through with o-ring made of FKM for safe assembly of standard filter funnels made of glass or plastic on vessels and round-bottom flasks with ground joint. Lateral 2-step hose connector made of PTFE for connection to a vacuum pump by means of suitable tubing.

Cone size GL	For funnel outlet max. Ø mm	2-Step hose connector		Cat. No.:
		A O.D. mm	B O.D. mm	
14/23	8	9	12	N 1655-01
19/26	11	9	12	N 1655-02
29/32	22	9	12	N 1655-04
45/40	22	9	12	N 1655-06

Applications:

For vacuum filtration, the o-ring at the pass-through provides good sealing to the filter funnel. A slight vacuum is sufficient.



BOLA Buchner Funnels

Material: PTFE	Temperature resistance: from -200 °C to +250 °C	Chemical resistance: +++ universal	Vacuum: suitable	autoclave: 121°
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NEW

FDA conform

Product description:

Made of PTFE. Two-part version demountable in upper and lower part for easy cleaning and removal of filter cake. Suitable for vacuum filtration. Nominal sizes and dimensions as per DIN 12 905. Suitable for commercial filter papers (not included in the scope of delivery). Universal chemical resistance, the medium is only exposed to PTFE.

Nominal size As per DIN 12 905	Volume ml	For filter paper dia. mm	Total height mm	Cat. No.:
45	50	45	94	N 1654-02
55	75	55	117	N 1654-04
70	135	70	142	N 1654-06
90	290	90	165	N 1654-08

Applications:

For suspension of solids.



BOLA Vacuum Traps

Material: PP, PBTB	Temperature resistance: from 0 °C to +110 °C	Chemical resistance: ++ very good	autoclave: 121 °C	Vacuum: suitable
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FDA conform

Product description:

Consisting of a screw cap red made of PBTP for thread GL 45, distributor body made of PP with 2-step hose connectors for connection of elastic tubing (such as silicone, Viton® or Tygon®) as well as a gas inlet tube made of FEP. With arrow on the top side of the distributor body to display the flow direction. The gas inlet tube can be cut to length on request. Limited chemical resistance, for working temperatures up to max. +110 °C.

	2-Step hose connector O.D. a O.D. b mm		Length gas inlet tube mm	Width including necks mm	Cat. No.
A	9	12	150	80	D 810-05

Applications:

Protection of pumps or vacuum systems from damages through vapour or condensate.

Material: PTFE, PPS	Temperature resistance: from -20 °C to +200 °C	Chemical resistance: +++ universal	autoclave: 121 °C	Vacuum: suitable
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Product description:

Consisting of a screw cap black made of PPS for thread GL 45, distributor body made of PTFE with 2-step hose connectors for connection of elastic tubing (such as silicone, Viton® or Tygon®) as well as a gas inlet tube made of FEP. With arrow on the top side of the distributor body to display the flow direction. The gas inlet tube can be cut to length on request. Universal chemical resistance, for working temperatures up to max. +200 °C.

	2-Step hose connector O.D. a O.D. b mm		Length gas inlet tube mm	Width including necks mm	Cat. No.
B	9	12	150	80	D 810-10

Applications:

Protection of pumps or vacuum systems from damages through vapour or condensate.





BOLA Filter Adaptors for Syringes

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Pressure: **2 bar** autoclave: **121°**

FDA conform

Product description:

Adaptors can be screwed together into multi-stage filters (prefilter, main filter). The low weight of only 14 g or 44 g allows easy exchange of the optionally available filtering membranes (page 332).

For membrane dia. mm	Filtration surface cm ²	O.D. mm	Total height mm	Cat. No.:
13	0,78	21	35	N 1666-08
25	3,80	34	40	N 1666-16

Flow rate:

Flow capacity for water under vacuum of 100 kPa (1000 mbar) using a PTFE filtering membrane with a thickness of 0,2 mm:

For membrane dia. mm	Pore size µm	Flow ml/min.
13	1,00	1
13	0,45	0,3
25	1,00	5
25	0,45	2



BOLA Pressure Pre-Filters

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Pressure: **10 bar** autoclave: **121°**

FDA conform

Product description:

For direct fine filtration in front of HPLC columns. For filtering membranes (available optionally – page 332) with a diameter of 13 mm and a thickness between 0,2 µm, filtration surface of 132 mm² for filtration with nearly no dead volume. The membrane can be exchanged by hand. Connection threads on both sides UNF 1/4" 28 G, suitable flanged tubing can be found on page 299.

For tubing I.D. mm	For filtering membrane with dia. mm	Cat. No.:
(1/32") 0,8	13	F 780-08
(1/16") 1,6	13	F 780-16



BOLA Scrubber Bottles

Material:	Temperature resistance:	Chemical resistance:	Pressure:	Transparency:
PFA, PTFE	from -200°C to +250°C	+++ universal	no pressure	transparent



Product description:

Bottle made of PFA. PTFE top with two threaded connections. The standard PTFE frit has a pore size of approx. 3 µm and is screwed on the riser tube with an M8x1 thread. It can be exchanged with the PTFE gas distributor with fine bores (Cat. No. N 1501-16 – page 327) which needs a lower primary pressure.

Capacity ml	Total height mm	Connection for tubing O.D. mm	Cat. No.:
250	175	2 x 6	A 118-01
500	200	2 x 6	A 118-02
1.000	240	2 x 8	A 118-03

Product advantages:

- » transparent
- » unbreakable
- » frit easily exchangeable

Flow rate:

Using the standard gas distributor and at the stated system pressure.

Cat. No.:	System pressure		
	0,1 bar	0,3 bar	0,6 bar
A 118-01	12,5 l/h	67,5 l/h	140,0 l/h
A 118-02	7,5 l/h	30,0 l/h	80,0 l/h
A 118-03	7,5 l/h	37,5 l/h	80,0 l/h



BOLA Gas Frits

Material:	Temperature resistance:	Chemical resistance:
PTFE	from -200°C to +250°C	+++ universal

FDA conform

Product description:

Microporous PTFE with pore size 5 µm for steady sparkling of the flowing gas. Suitable for scrubber bottles and columns (page 326) with M 8x1 thread and for gas inlet tubes (page 329).

O.D. mm	Length mm	Receiver	Suitable for Cat. No.:	Cat. No.:
15	15	M 6 x 1		N 1503-28
25	26	M 8 x 1	A 117-../A 118-..	N 1503-32
15	15	Ø 5 mm		N 1503-36
25	26	Ø 7 mm		N 1503-40





BOLA Gas Distributors

Material: PTFE
 Temperature resistance: from -200°C to +250°C
 Chemical resistance: +++ universal

FDA conform

Product description:

With finest bores (4 x 0,4 mm) for steady sparkling of the flowing gas, only low pressure is necessary. Suitable for scrubber bottles and columns (page 326) with M 8x1 thread and for gas inlet tubes (page 329).

O.D. mm	Height ca. mm	Receiver M	Suitable for Cat. No.:	Cat. No.:
28	24	8 x 1	A 117-../A 118-..	N 1501-16



BOLA Scrubber Columns

Material: FEP, PTFE
 Temperature resistance: from -200°C to +205°C
 Chemical resistance: +++ universal
 Pressure: no pressure
 Transparency: transparent

FDA conform

Product description:

Tall, slim scrubber column made of FEP. Inlet and outlet tube as well as riser tube are made of FEP (5,6 x 8 mm), bottom and top are made of pure PTFE. The standard PTFE frit has a pore size of approx. 3 µm and is screwed on the riser tube with an M8x1 thread. It can be exchanged with the PTFE gas distributor with fine bores (Cat. No. N 1501-16 – page 327) which needs a lower primary pressure.

Capacity ml	Total height mm	Connection for tubing O.D. mm	O.D. of column mm	Cat. No.:
500	400	2 x 8	54	A 117-04
1.000	700	2 x 8	54	A 117-08

Product advantages:

- » transparent
- » unbreakable
- » intense mixing of gas due to tall riser tube
- » frit easily exchangeable

Flow rate:

Using the standard gas distributor and at the stated system pressure.

Cat. No.:	System pressure		
	0,1 bar	0,3 bar	0,6 bar
A 117-04	15,0 l/h	62,5 l/h	130,0 l/h
A 117-08	5,0 l/h	50,0 l/h	117,5 l/h



#SUITABLE PAGE 328
 Scrubber Adaptors for Bottles
 for GL 45 and GLS 80

BOLA Scrubber Bottles Vitrum

Material: PTFE, PP
Chemical resistance: +++ universal
autoclave: 121°

FDA conform

Product description:
Consisting of PTFE body with screw cap and two lateral GL 18 threaded necks, suitable bottle made of borosilicate glass as well as a FEP inlet tube and a gas distributor with finest bores. Easy in- and outlet of gas by means of hard-walled tubing (e. g. PTFE) which can be connected to the threaded necks with BOLA Laboratory Screw Joints. Elastic tubing can be connected by means of hose connectors.
The special feature: The body of the distributor can be turned independently from the screw cap. This means that the completely assembled distributor can be removed and fixed on another bottle without the risk of disarranging the tubing.

	Capacity ml	For bottle thread	Necks GL	Total height mm	Cat.No.:
A	500	GL 45	2 x 18	207	N 1662-14
	1.000	GL 45	2 x 18	256	N 1662-24
B	500	GLS 80	2 x 18	186	N 1662-34
	1.000	GLS 80	2 x 18	256	N 1662-44

Flow rate:
Using the standard gas distributor and at the stated system pressure.

Cat.No.:	System pressure		
	0,1 bar	0,3 bar	0,6 bar
N 1662-14	150 l/h	325 l/h	425 l/h
N 1662-24	150 l/h	325 l/h	425 l/h
N 1662-34	500 l/h	1000 l/h	1500 l/h
N 1662-44	500 l/h	1000 l/h	1500 l/h



BOLA Scrubber Adaptors for Bottles

Material: PTFE, PP
Chemical resistance: +++ universal
autoclave: 121°

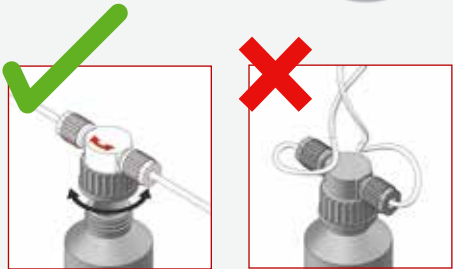
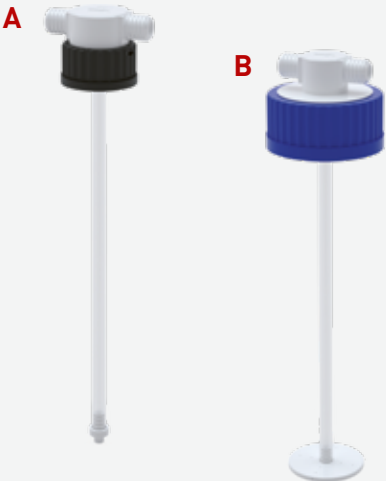
FDA conform

Product description:
Consisting of PTFE body with connecting nut and two lateral GL 18 threaded necks, a FEP inlet tube with a length of 300 mm and a gas distributor with finest bores. Easy in- and outlet of gas by means of hard-walled tubing (e.g. PTFE) which can be connected to the threaded necks by means of BOLA Laboratory Screw Joints (page 90). Elastic tubing can be connected by means of hose connectors (page 139). Inlet tube can be shortened individually.
The special feature: the body of the adaptor can be turned independently from the connecting nut. This means that the completely assembled adaptor can be removed and fixed on another bottle without the risk of disarranging the tubing. Suitable for bottles of Duran Group (formerly Schott AG) with GL 45 and GLS 80 thread and a volume between 100 and 5000 ml.

	For bottle thread	Gas inlet tube mm	Width incl. threaded necks mm	Cat. No.:
A	GL 45	300	76	N 1660-14
B	GLS 80	300	76	N 1660-24

Flow rate:
Using the standard gas distributor and at the stated system pressure.

Cat. No.:	System pressure		
	0,1 bar	0,3 bar	0,6 bar
N 1660-14	150 l/h	325 l/h	425 l/h
N 1660-24	500 l/h	1000 l/h	1500 l/h





BOLA INNOVATION



#1 Scrubber Adaptors for Bottles

Usable for different bottle sizes since the 300 mm FEP tube can be shortened individually. BOLA is offering two versions: suitable for bottle thread GL 45 or GLS 80 (e.g. from Duran Group).

BOLA Gas Inlet Tubes

Material:
PTFE

Temperature resistance:
from -200°C to +250°C

Chemical resistance:
+++ universal

FDA conform

Product description:

For constructing a gas washing equipment. Tube with inner diameter 5 mm, one side with hose connector dia. 9 mm for connecting tubing, other side with thread M 8x1 for connecting a gas frit or a gas distributor.

Length mm				Cat. No.:
200				N 1502-02
400				N 1502-04
600				N 1502-06






thread



hose connector



Spare parts for: Scrubber Adaptors for Bottles and Scrubber Bottles Vitrum

Description	Material	Packing Unit		suitable for Cat. No.:	Cat. No.:	
Replacement Gas Inlet Tubes	FEP	Pack size: 5 pieces		N 1660-14 / N 1660-24 / N 1662-14 N 1662-24 / N 1662-32 / N 1662-44	N 911-01	
Replacement Gas Distributor GL 45	PTFE	Pack size: 5 pieces		N 1660-14 / N 1662-14 / N 1662-24	N 910-01	
Replacement Gas Distributor GLS 80	PTFE	Pack size: 5 pieces		N 1660-24 / N 1662-34 / N 1662-44	N 910-02	

BOLA Micro Scrubber Bottles

Material: **PFA** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** Pressure: **no pressure** Transparency: **transparent**

FDA conform

Product description:

For use with volumes up to 50 ml. The gas inlet tube (not included, please choose a hard-walled tubing) is inserted through the fitting on the top and can be fixed safely. The side fitting is used as gas outlet.

Capacity ml	Total height mm	Connection for tubing O.D. mm	O.D. of bottle mm	Cat. No.:
50	180	6	31	A 119-24

Product advantages:

- » transparent
- » unbreakable
- » non-porous

Applications:

Can also be used as cold trap.



BOLA Suction Filters

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal** autoclave: **121°**

FDA conform


Product description:

Consisting of a receiver made of PTFE with female thread UNF 1/4" 28 G and an easily exchangeable frit made of porous PTFE (Cat. No. F 766-..). Ideal prefilters in front of pump systems for protecting gaskets, pistons or column packings against premature wearing due to contamination. Suitable flanged tubing can be found on page 299.

Pore size µm	For tubing I.D. mm	Dia. of filter mm	Length of filter mm	Cat. No.:
2	(1/32") 0,8	14	25	F 765-08
2	(1/16") 1,6	14	25	F 765-16
10	(1/32") 0,8	14	25	F 765-48
10	(1/16") 1,6	14	25	F 765-56



Spare Parts for: Suction Filters

Description	Material	Packing Unit	Pore size µm	suitable for Cat. No.	Cat. No.:	
Replacement-Frits for Suction Filters	PTFE	1 piece	2 10	F 765-08 / F 765-16 F 765-48 / F 765-56	F 766-08 F 766-48	



BOLA Filtering Tiles

Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal**

FDA conform

Product description:

Made of microporous PTFE, standard tiles with dimensions of 320 x 320 mm for cutting or stamping.

Pore size µm	Thickness mm	Cat. No.:
5	1	N 1610-10
10	1	N 1616-10
10	2	N 1616-20
10	3	N 1616-30



BOLA Filtering Sheets

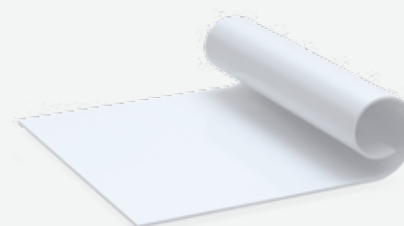
Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal**

FDA conform

Product description:

Made of porous PTFE, width approx. 150 mm x length 300 mm.

Pore size µm	Thickness mm	Cat. No.:
0,05	0,2	N 1617-02
0,20	0,2	N 1617-04
0,45	0,2	N 1617-06
1,00	0,2	N 1617-10
1,00	1,0	N 1617-15
2,50	0,2	N 1617-20
2,50	1,0	N 1617-25
5,00	0,2	N 1617-30
5,00	1,0	N 1617-35
10,00	0,2	N 1617-40
10,00	1,0	N 1617-45
25,00	1,0	N 1617-55



Applications:

Suitable for cutting and blanking. A reduction of stability and mechanical load capacity has to be observed when processing materials with larger pore sizes.



BOLA **Filtering Membranes**Material:
PTFETemperature resistance:
from -200°C to +250°CChemical resistance:
+++ universal**FDA** conform

Product description:

Made of microporous PTFE, thickness 0,2 mm, packing unit: 10 pieces

Dia. of membrane mm	Pore size µm	Filtration surface mm ²	Cat. No.:
13	0,05	132	N 1690-08
13	0,20	132	N 1690-12
13	0,45	132	N 1690-16
13	5,00	132	N 1690-24
25	0,05	490	N 1690-28
25	0,20	490	N 1690-32
25	0,45	490	N 1690-36
25	5,00	490	N 1690-44
47	0,05	1.735	N 1690-48
47	0,20	1.735	N 1690-52
47	0,45	1.735	N 1690-56
47	1,00	1.735	N 1690-60
47	5,00	1.735	N 1690-64
47	10,00	1.735	N 1690-65
90	1,00	6.362	N 1690-80
90	5,00	6.362	N 1690-84

**Flow rate:**

Flow capacity under air pressure of 1 kPa (10 mbar) / water pressure of 100 kPa (1000 mbar) using a PTFE filtering membrane with a diameter of 47 mm and a thickness of 0,2 mm:

Pore size µm	Medium	Flow ml/min.
0,05	air	102
0,05	water	8
0,20	air	230
0,20	water	11
0,45	air	420
0,45	water	13
1,00	air	800
1,00	water	262
5,00	air	2360
5,00	water	868
10,00	air	9845
10,00	water	4723



BOLA Filtering Discs

Material:
PTFE

Temperature resistance:
from -200°C to +250°C

Chemical resistance:
+++ universal

FDA conform

Product description:

Made of porous PTFE, thickness 1,0 mm, packing unit: 10 pieces.

Dia. of membrane mm	Pore size µm	Filtration surface mm ²	Cat. No.:
47	1,0	1.735	N 1565-06
47	5,0	1.735	N 1565-12
47	10,0	1.735	N 1565-18
47	25,0	1.735	N 1565-24



Flow rate:

Flow capacity under air pressure of 1 kPa (10 mbar) / water pressure of 100 kPa (1000 mbar) using a PTFE filtering disc with a diameter of 47 mm and a thickness of 1,0 mm:

Pore size µm	Medium	Flow ml/min.
1,00	air	101
1,00	water	14
5,0	air	311
5,0	water	60
10,0	air	981
10,0	water	568
25,0	air	2997
25,0	water	1996

BOLA Filtering Rods

Material:
PTFE

Temperature resistance:
from -200°C to +250°C

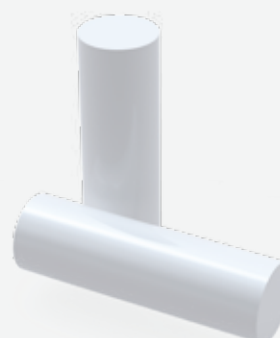
Chemical resistance:
+++ universal

FDA conform

Product description:

Made of microporous PTFE for further treatment and processing. Diameter and length are nominal dimensions and can contain a machining tolerance.

Pore size µm	Dia. of rod mm	Length mm	Cat. No.:
5	28	100	N 1505-28
5	32	120	N 1505-32
10	28	100	N 1510-28
50	28	100	N 1520-28



BOLA **Filtering Rods**

Material: **PTFE** Temperature resistance: **from -200 °C to +250 °C** Chemical resistance: **+++ universal**

FDA conform

Product description:
Made of porous PTFE, roundly machined cylinder with approximate dia. 40 mm and height approx. 115 mm. Round shape for easier treatment.

Pore size µm			Cat. No.:
1,00			N 1530-05
2,50			N 1530-10
5,00			N 1530-15
10,00			N 1530-20
25,00			N 1530-25
50,00			N 1530-30
100,00			N 1530-35

Applications:
For further treatment by turning, milling or cutting e.g. to become filtering frits. A reduction of stability and mechanical load capacity has to be observed when processing materials with larger pore sizes.





BOLA Dirt Traps

Material: **PTFE** Temperature resistance: **from -200°C to 250°C** Chemical resistance: **+++ universal** Pressure: **10 bar** Vacuum: **suitable**

FDA conform

Product description:

With two threads GL 18 for the connection of hard-walled hoses (e. g. of PTFE, PFA, FEP) or tubes with BOLA laboratory screw joints. Lateral connection with plug for easy exchange of filtering membrane (membrane thickness: 0,2 – 3,0 mm) and for cleaning. The flow direction is marked with an embossed arrow. Completely made of PTFE, the liquid come only in contact with PTFE.

Connection Thread GL	Diameter Filtering Discs mm	Through hole mm	Total height mm	Cat. No.:
18	25	8	88	N 1674-18

Applications:

For further processing through turning, milling or cutting e. g. as filtering frits. With increasing pore size, a decrease in strength and mechanical load capacity can be noted.



#SUITABLE PAGE 90

Ideally coordinated laboratory screw joints.

BOLA PRACTICAL TIP Protect Pump

In order to prevent that dirt or loosened particles destruct your pump, just insert a dirt trap in your piping system.



For versatile use, easy handling, compact:
BOLA pumps are made to meet almost all
requirements in practice and allow safe
transfer of liquids.





Pumps



338 Pumps

Cordless Pumps for Acids and Caustic Solutions	338
Sampling Pump	338

339 Adaptors

Adaptors for Prominent® Pumps	339
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BOLA Cordless Pumps for Acids and Caustic Solutions

Material:
PP

Temperature resistance:
from +5°C to +60°C

Chemical resistance:
++ very good



FDA conform



Product description:

Made of polypropylene, PTFE, Hastelloy®, driven by two commercial 1,5 V batteries (we recommend the use of rechargeable batteries)

Length of suction pipe mm	Dia. of suction pipe mm	Cat. No.:
400	25	G 870-01
600	25	G 870-01

Product advantages:

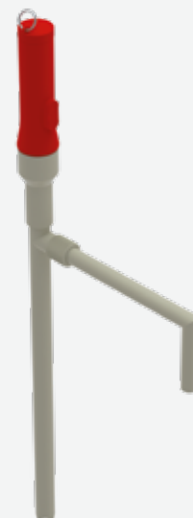
- » powerful – pumping capacity of up to 6 litres per minute free flowing
- » compact construction
- » battery operated and therefore usable anywhere
- » easy handling
- » very light weight (only 500 g including batteries)
- » low-risk pumping
- » also suitable for narrow mouth vessels with ground joint 29/32 or thread GL 45, carboys or barrels

Applications:

For pumping low viscous liquids (e.g. acids, bases etc.)



#SUITABLE PAGE 189
Tubing for all screw joints



BOLA Sampling Pump

Material:
PTFE, PP

Temperature resistance:
from -10°C to +90°C

Chemical resistance:
++ very good



FDA conform

Product description:

Made of polypropylene and PTFE. A pull on the ball handle produces a slight vacuum in the sampling bottle. Due to this vacuum, the sample is sucked into the sampling bottle. Both glass bottles and plastic bottles with a GL 45 thread can be used as sampling bottles. The pump provides universal chemical resistance since the sample is only exposed to PTFE.

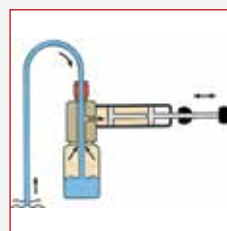
Thread for connection GL	For bottles with a capacity of ml	Suction lift of water max. m	Cat. No.:
18	100 - 2.000	4,5	A 124-16

Product advantages:

- » compact construction
- » usable anywhere (no power or air supply needed)
- » easy handling
- » quick and low-risk pumping of ultrapure liquids
- » no cleaning necessary, only the PTFE tubing gets in contact with the product.
- » volume per stroke 50 ml
- » for tubing O.D. 6 mm, PTFE tubing (length 2 m) included in delivery

Applications:


For pumping liquids from sources that are not easily accessible; also suitable for liquids with a high viscosity, e.g. oils.





Spare Parts for: Sampling Pump



Description	Material	Packing Unit		suitable for Cat. No.	Cat. No.:	
Replacement Suction Membrane	Silicone	Pack size: 5 pieces		A 124-16	A 910-01	

BOLA Adaptors for Prominent®-Pumps

Material:
PTFE

Temperature resistance:
from -200°C to +250°C

Chemical resistance:
+++ universal

Pressure:
10 bar

FDA conform

A Product description:

Adaptor made of glass-fibre reinforced PTFE, transition from pump thread M20x1,5 to GL thread. Pressure resistant connection (max. 10 bar) of hard-walled tubing with Prominent® pumps by using BOLA Laboratory Screw Joints. Universal chemical resistance, the product is only exposed to PTFE.

Connecting thread GL	Bore dia. mm		Cat. No.:
14	3,0		D 730-12
18	10,5		D 730-24

B Product description:

Adaptor made of glass-fibre reinforced PTFE, transition from pump thread M20 x 1,5 to female thread UNF 1/4" 28G. Pressure resistant connection (max. 10 bar). The tubing is connected by means of tube end fittings to a female thread UNF 1/4 28G. Universal chemical resistance, the product is only exposed to PTFE.

For tubing mm	Bore dia. mm		Cat. No.:
(1/32" x 1/16") 0,8 x 1,6	0,8		D 731-12
(1/16" x 1/8") 1,6 x 3,2	1,6		D 731-24

A



B



Technical information gives us the knowledge to understand technologies and use them effectively. It enables us to solve problems and develop innovative solutions.





TECHNICAL INFORMATION



BOLA Materials

General information

Fluoroplastics belong to the family of thermoplastics. Due to their high molecular weight, polytetrafluorethylene as well as modified PTFE (PTFE-TFM) cannot be processed with the classic thermoplast methods like injection moulding or extrusion. Both materials are transferred from powder form to semi-finished products by using special press-sintering techniques or the so called paste extrusion. All other fluoropolymers like PFA, FEP, ETFE, ECTFE, PVDF, THV or PVF are processed using the known production methods for thermoplastics.

The fully fluorinated materials PFA and FEP in particular require a corrosion resistant construction of the processing machines. With increasing the content of fluorine, the fluoropolymers offer a better chemical and higher thermal load.

Especially PTFE, PTFE-TFM, PFA and FEP have the following unique properties:

- » almost universal chemical resistance
- » high thermal load capacity (–200 °C up to +250 °C)
- » non-flammable
- » resistant to environmental changes (weather, light)
- » non-adhesive
- » ultra low friction coefficient
- » unbreakable
- » physiologically safe
- » inert, tasteless, odourless
- » UV-resistant
- » not ageing, the properties do not change even during long-term storage
- » without any aggregates like plasticizers or antioxidants
- » unlimited sterilization with steam or ethylene oxide possible. A sterilization using high-energy radiation is not recommended.

All other fluorinated thermoplastics include beside the fully fluorinated monomer block tetrafluorethylene additional, non-fluorinated components. This allows to adapt systematically the properties and thus to facilitate the processing and to enlarge the range of applications.

The chart below gives some general advice on the choice of the best suitable fluoropolymers:

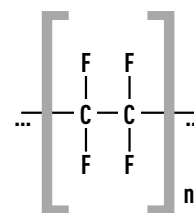
Properties	PTFE	TFM	PFA	FEP	ETFE	THV	PCTFE	ECTFE	PVDF	PVF
Continuous operating temperature (°C)	250	250	250	205	150	110	140	125	120	110
Tear strength (MPa)	30	30	28	25	40	22	31	42	45	30
Permeation (Helium)	-	o	o	o	+	+	+++	++	+++	+++
Sterilisable with Y-radiation	-	-	-	-	o	++	o	+	+	+
Chemical resistance	+++	+++	+++	+++	+	o	++	++	o	o

Definition: - not suitable, not recommended
 o possible, moderate to good
 + good
 +++ very good, best choice



PTFE – Polytetrafluorethylene

Discovered in 1938 by research-chemists of the DuPont (USA) it was not introduced to the market until 1946. A partly crystalline fluoroplastic that belongs to the family of thermoplastics (but not suitable for injection moulding). The strong bond of the fluorine atom to the carbon atom as well as the almost complete shielding of the unbranched carbon chain by fluorine atoms result in a remarkably high chemical and thermal load. PTFE has a thermal resistance ranging from -260 °C up to +250 °C, at short term up to +300 °C (e. g. no brittleness in boiling helium at -269 °C). This temperature range is not reached by any other plastic material. The continuous operating temperature depends on the load. This means that PTFE can be used from -200 °C to +250 °C at moderate mechanical load. PTFE labware has a white appearance and a non-adhesive surface which is easy to clean. Furthermore, this material has excellent slip characteristics. A lubrication of turning steel or glass shafts is not necessary. Semi-finished PTFE rods are fabricated by isostatic pressing processes or extrusion. The final products are produced by machining the semi-finished materials.



Trade names

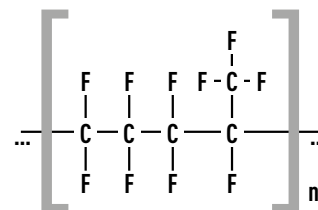
3M™ Dyneon™ PTFE
by Dyneon
Teflon® by Chemours
Fluon® by AGC
Chemicals Europe

PTFE - TFM

A further development of the classic Polytetrafluorethylene (PTFE) with additional modifier (PPVE). Due to a five times lower molecular weight going along with a lower melting viscosity, the single particles merge to an almost pore-free polymer structure. Compared to PTFE, the tightness as well as the barrier effect at the same wall thickness are doubled. The flowing under pressure load, so-called cold flow, is reduced by factor three. This is particularly advantageous at high working temperatures. PTFE-TFM has an almost universal chemical resistance. Sticking of any contaminations is prevented by an extremely smooth surface. Special methods allow a simple and safe heat seal. This material is ideal for e. g. digestion vessels or gaskets. As a consequence of the excellent barrier function, chemicals cannot penetrate the material. Instruments and components made of PTFE-TFM are therefore especially suitable for frequently changed products.

FEP – Tetrafluorethylene-Perfluoropropylene

A molten copolymer of tetrafluorethylene and perfluoropropylene with a high-molecular, partly crystalline structure which had been introduced on the market in 1960. Its mechanical and chemical properties are comparable with those of PTFE, however, the upper limit of the permanent working temperature is 50 °C lower (max. +205 °C). FEP is a typical thermoplastic material, which can be processed with the known production methods for this kind of material. New types with lower melting viscosity (= high melt flow index MFR) allow the processing at higher speed. FEP labware is translucent to transparent and non-porous.



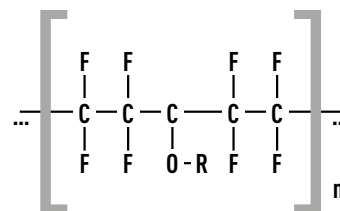
Trade names

Teflon® FEP by Chemours
Dyneon™ Fluorothermoplastics
FEP by Dyneon
Neoflon® by Daikin

PFA – Perfluoroalkoxy Copolymer

Fluorinated hydrocarbon with a high-molecular, partly crystalline structure. Compared to PTFE, it has additional side chains consisting of perfluorated alkoxy groups.

PFA can be processed using thermoplastic production methods and offers chemical and thermal properties equal to those of PTFE. PFA labware is translucent to transparent, non-porous and particularly useful in high-purity work. Big components with a total weight of several kilograms can be fabricated in a „single shot“ by using transfer moulding.



Trade names

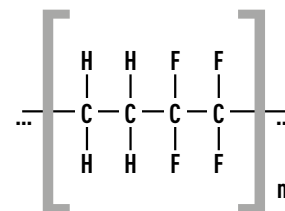
Teflon® PFA by Chemours
Dyneon™ Fluorothermoplastics
PFA by Dyneon



BOLA Materials

ETFE – Ethylen-Tetrafluorethylene Copolymer

Partly fluorinated ethylene-tetrafluorethylene copolymer. Unlike the high-molecular PTFE which can be processed only by means of pressing or sintering, ETFE can be thermoplastic processed as already described before for PFA and FEP. I. e. this plastic material can be injection moulded or extruded with appropriate machines. In laboratories, this material is mainly used as compound with glass fibres for e. g. screw caps or screw joints. ETFE films have an excellent tear resistance. They are pervious to UV-rays and are therefore used for laboratory green houses as the VIS as well as the UV spectrum of the sun light can pass.

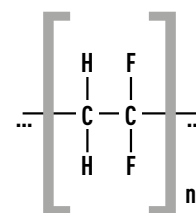


Trade names

Fluon® ETFE Resins by AGC
Chemicals Europe
Tefzel® by Chemours
Dyneon™ Fluorothermo-
plastics ETFE by Dyneon

PVDF – Polyvinylidene Fluoride

A fluoroplastic that can be machined or thermoplastic processed. Characterised by a good to excellent chemical resistance. Unlike PTFE, it is much harder and more rigid but its functional temperature range is lower. Within the range of fluoropolymers, PVDF is the best qualified self-supporting structural material due to its high rigidity. Its advantages over other fluoroplastics are its easy processing, the high mechanical values and the low specific weight. PVDF is mainly used for the production of components used in high-purity water supply systems. It is the only fluorothermoplastic with piezoelectric properties.

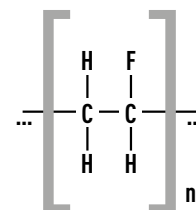


Trade names

Solef® PVDF by Solvay
Kynar® PVDF by Arkema

PVF – Polyvinylfluoride

Containing fluorine, it displays a stronger chemical linkage than common polymers and thus a better inherent stability. It shows its unique properties when used at temperatures ranging from -70 °C to +110 °C, whereas temperatures of up to +200 °C can be withstood. Polyvinylfluoride does not contain any softener, is resistant to fading and can be easily cleaned due to its dirt-repelling surface. In particular, foils, films and bags for gas analysis are made of PVF.



Trade names

Tedlar® Foils by DuPont

THV – Tetrafluorethylene-Hexafluorpropylene-Vinylidenfluoride Terpolymer

THV consists of the monomers tetrafluorethylene, hexafluorpropylene and vinylidenfluoride. This fluorothermoplastic has properties close to those of elastomers but does not require vulcanization. This material can be thermoplastic processed by injection moulding or extrusion. Due to the low processing temperature of approx. +200 to +250 °C a corrosion resistant construction of the processing machines might not be necessary. In laboratories, THV is mainly used for non-permeating tubing especially for the transport of hydrocarbons, fuel or mineral oils. In the lab and production areas of the semi-conductor and photovoltaic industry, THV is the preferred material for clean-room curtains as well as for blind tiles and cover plates for machines as it is one of few plastic materials which are FM 4910 approved. This standard includes a low inflammability, low build-up of soot or grime while burning in an external flame, low release of toxic products in case of fire.

Trade names

Dyneon™ Fluorothermo-
plastics THV by Dyneon



Standard Plastics – Technical Plastics – High-performance Plastics

General Information

The permanent operating temperature is the most common characteristic to distinguish between standard plastics, technical plastics and high-performance plastics: for standard plastics, the limit is 90 to max. 100 °C, technical plastics can be operated within a range of 90 up to 150 °C. All high-performance plastics have a permanent operating temperature of more than 150 °C.

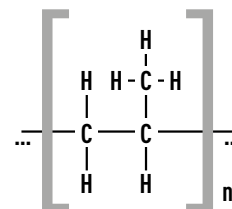
The permanent operating temperature is defined as the maximum temperature with which the material can be operated for 20.000 hours but without losing more than 50 % of its original rigidity and ductility. This means, a plastic material having a rigidity of 40 MPa in new condition has to show a rigidity of minimum 20 MPa after having been stored at its maximum permanent operating temperature for 20.000 hours.



Standard-Plastics

PP – Polypropylene

A polymer of ethylene with isotactic arrangement of methyl groups. It does not belong to the family of fluoroplastics. PP can be autoclaved (at +121 °C) and is distinguished by good mechanical and chemical properties almost up to its softening point. PP labware is unbreakable and an economical alternative with, however, restricted chemical and thermal resistance.



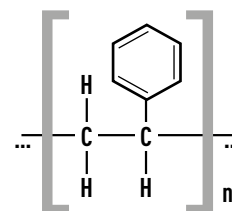
Trade names

Norolen® by BASF
Hostalen® by BASF



PS – Polystyrene

A polymerisation product of styrene. Polystyrene is one of the most commonly used plastic materials. For many years it has been processed by injection moulding, extruding or blowing. Because of its structure, it belongs to the family of amorphous thermoplastics and is transparent, inflexible and brittle. Polystyrene has a low thermal and chemical resistance. New developed PS-HI types provide an increased impact strength (HI = High Impact).



Trade names

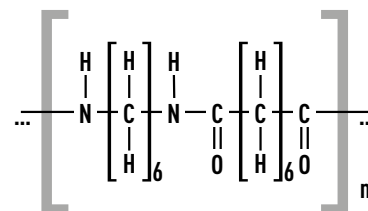
Lacqrene® by ATO
Vestylon® by Innovene
Edistir® by Montedison



Technical Plastics

PA – Polyamides

Condensation polymers obtained either from amino acids respectively from their lactams (e. g. caproic lactam) or diamine and dicarboxylic acid (e. g. adipic acid and hexamethylene-diamine). In general, polyamides are defined according to the number of carbon atoms of their monomers, e. g. PA 6 = polycarbonic lactam or PA 12 = polylauric lactam. PA 6 is the most commonly used polyamide. All polyamides are characterised by high strength and scuff resistance. The application range varies from simple turned parts such as screws or nuts to plain bearings or toothed wheels.

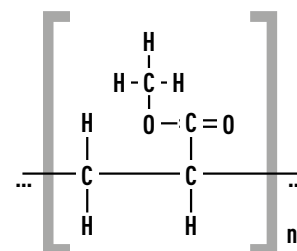


Trade names

Ultramid® by BASF
Durethan® by Bayer
Grilon® by Ems Chemie

PMMA – Polymethylmethacrylate

An acrylic resin based on methyl methacrylate. It has become generally known under the trade name Plexiglas®. On the one hand, PMMA is approx. 60 times more elastic than window glass but on the other hand it is approx. 10 times more permeable than silicate glass. Of course, the hardness of its surface does not correspond to that of glass but compared with other materials it can be easily polished to high brilliance. As to weight, Polymethylmethacrylate is much more lightweight than normal window glass.



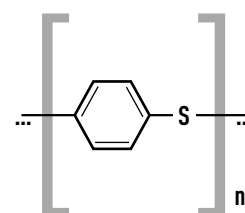
Trade names

Plexiglas® by Evonik Röhm
Perspex® by ICI
Oroglass® by Rohm and Haas

High-performance Plastics

PPS – Polyphenylsiloxan

Technical high-performance plastic. This macromolecule consists of phenylene rings and one S-atom which provide a good chemical resistance even at high working temperatures. PPS is particularly suitable for the production of moulded pieces which are exposed to high mechanical and thermal stresses. Injection moulding is the most common processing technology for this material, in addition, single components can be made of semi-finished products by cutting. Special glass-fibre reinforced compounds offer an improved rigidity, sturdiness and dimensional stability under heat compared to non-reinforced compounds.



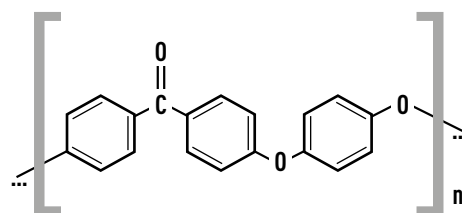
Trade names

Fortron® by Celanese
Ryton® by Phillips
Petroleum Chemicals
Alton® by Intern. Polymer Corp.



PEEK – Polyetheretherketone

Partly crystalline thermoplastic that withstands high temperatures. Due to its unique properties, PEEK is mainly used for high-value and highly stressable components. The high upper working temperature (+250 °C), the good chemical stability and resistance to hydrolysis as well as the high mechanical values of this material will allow PEEK to become the material of the future. PEEK components are commonly used as HPLC fittings, screw joints or as tubing. Its natural colour is brown, its price is considerably higher than that of PTFE or PFA. PEEK is available in many different types, e. g. modified for self-lubricating bearings.



Trade names

Victrex® by Victrex

VESTAKEEP® PEEK by Evonik

Materials - Chemical Resistance

Please note:

All information in our catalogue is based on current technical knowledge, experience and manufacturers' data. Users should check the suitability of parts and materials described in the catalogue before purchase.

BOLA does not accept any warranty claims as to suitability and fitness of purpose of the materials and products described in this catalogue. Users should avoid making any assumptions on, or interpretation of, the data herein. **Therefore we cannot provide warranty and cannot accept responsibility for any damage.**

Additionally, an overview stating the chemical resistance of all BOLA materials against many different substances from A like Accumulator Acid up to Z link Zinc Nitrates is available for download on our website in pdf-format:

<http://www.bola.de/en/technical-information/bola-materials/material-properties.html>

Categories of substances

Classes of substances at +20 °C	PTFE	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA
Aldehydes	+	+	+	+	+	+	o	o	-	-
Alcohols	+	+	+	+	+	+	+	-	o	o
Amines	+	+	+	+	+	o	o	o	+	-
Bases/Caustic solutions	+	+	+	+	+	+	+	o	o	-
Esters	+	+	+	+	+	o	+	+	-	-
Ether	+	+	+	o	o	o	o	o	-	-
Glycols	+	+	+	+	+	+	+	+	+	o
Ketones	+	+	+	o	o	o	o	+	-	-
Hydrocarbons, aliphatic	+	+	+	+	+	+	o	+	-	-
Hydrocarbons, aromatic	+	+	+	+	+	+	o	+	-	-
Hydrocarbons, halogenated	o	+	+	+	+	+	o	o	-	-
Mineral oils	+	+	+	+	+	+	-	+	+	o
Oxidizing agents, strong	+	+	+	o	o	+	o	-	-	-
Vegetable oils	+	+	+	+	+	+	o	+	+	o
Acids inorganic	+	+	+	o	o	+	+	-	+	o
Acids organic	+	+	+	o	o	+	+	-	o	+
Lubricating oils	+	+	+	+	+	+	+	+	+	+

Definitions and abbreviations:

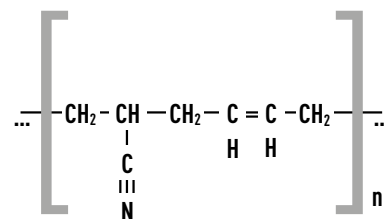
- **Excellent chemical resistance** – continuous exposure for more than 30 days does not cause any damage or only minor damages.
- **Limited chemical resistance** – depending on the plastic material, a continuous exposure for a longer period of time may cause damages such as cracks, decrease of mechanical strength, discoloration, etc.
- **Poor resistance** – the plastic material can be deformed or destroyed.

Elastomers

Their main characteristic is their elasticity: Elastomers can easily be stretched and bent and return to their original shape and size after being released. These synthetic materials are most commonly used for o-rings, flat gaskets or resilient elements.

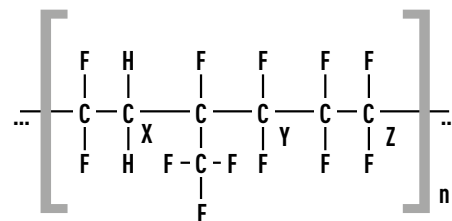
NBR – Acrylonitrile-Butadiene-Caoutchouc

Elastomer on the base of acrylonitrile-butadiene-caoutchouc which is mainly used as budget-priced sealing material (e. g. O-rings for stop-cocks). This material has a good resistance to mineral oils and fats as well as to HFA, HFB and HFC-hydraulic fluids. It has a very good elasticity. PERBUNAN® (its well-known trade name of BAYER AG) is not resistant to brake fluids on the basis of glycol, HFD liquids, aromatic compounds (e. g. benzol), ester, ketone and amines as well as in concentrated acids and caustic solutions. Due to its restricted chemical resistance, PERBUNAN® is not the ideal material for chemistry.



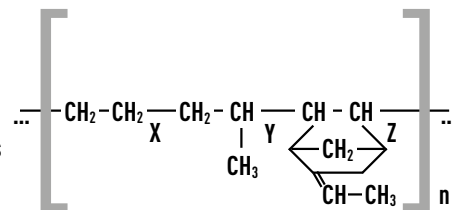
FKM – Fluorocaoutchouc

Elastomer on the base of fluorocaoutchouc, more familiar as VITON® (DuPont). Many O-rings, lip seals and sleeves are made of FPM. It has a very good resistance to heat, chemicals, weather and ozone. Furthermore, it is resistant to sulphurated mineral oils and fats and to hardly inflammable HFD liquids (basis phosphor ester or chlorinated hydrocarbon). It is not resistant to anhydrous ammonia, caustic soda, potassium, ketones, ether, dioxane, as well as some amines and organic acids. For BOLA products, FPM is mainly used as sealing material, mostly protected from the medium by a PTFE sealing lip.



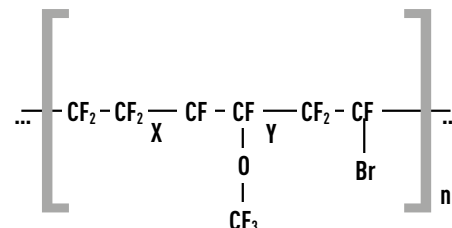
EPDM

EPDM 3 is an elastomer on the base of ethylene-propylene-diene-caoutchouc which is mostly used for gaskets and O-rings. The main applications are in the area of hot water, steam and suds. It is not resistant to hydraulic fluids on the base of mineral oil but it is weather-proof, non-ageing and resistant to ozone. At BOLA, EPDM O-rings are mainly used for applications where VITON® O-rings are not sufficient.



FFKM – Perfluoro-Caoutchouc

An elastic sealing material with natural recovery and good accommodation to the sealing surfaces and a chemical resistance comparable with PTFE. FFKM O-rings have a very high chemical and thermal resistance. Such seals can withstand virtually all kinds of chemicals and can be used at long duration conditions with temperatures up to +260 °C. Perfluoro-caoutchouc is better known under the trade names KALREZ® by DuPont, CHEMRAZ® by Greene Tweed, respectively Dyneon™ Perfluoroelastomers PFE by Dyneon.



Elastomers - Chemical Resistance

Classes of substances at 20°C	NBR	FKM	FFKM	EPDM
Water	++	++	++	++
Acids	+	+	++	++
Lyes	+	+	0	++
Oils and fats	+	++	++	-
Fuels	+	++	++	-
Ozone	0	++	++	++
Hydrocarbon, aliphatic	++	++	++	-
Hydrocarbon, aromatic	-	++	++	-
Hydrocarbon, chlorinated	-	++	++	-
Temperature range, °C	-40 up to +130	-20 up to +200	-20 up to +250	-30 up to +140

Definition: - not suitable, not recommended
 0 possible, moderate to good
 + good
 +++ very good, best choice



Materials - Physical Properties



Property	Standard	Unit	PTFE ¹	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA ³	PPS	PEEK
Density	DIN 53 479	g/cm ³	2.14–2.19	2.12–2.17	2.12–2.17	1.71–1.78	1.67–1.70	1.75–1.78	0.904–0.907	1.10–1.15	1.04–1.05	1.19	1.65	1.32
Service temperature without loading		°C	250–260	250–260	200–205	150–180	150–180	150–170	90–100	80–100	55–70	80	250	260
Inflammability			non-flammable	non-flammable	non-flammable	self-extinguishing	self-extinguishing	self-extinguishing	flammable	flammable	flammable	yes	self-extinguishing	V-0
Water absorption	DIN 53 495	%	<0.01	0.03	<0.01	<0.1	<0.1	0.03	<0.05	9–10	<0.3	—	0.02	0.5
Transparency			opaque	milky opaque	milky opaque	milky opaque	milky opaque	opaque	milky opaque	milky opaque	transparent	transparent	black	
Radioresistance		MGy	0.006	0.040	0.010	0.030	0.010	0.100	0.020	0.040	10	0.050	—	
Food suitability			Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	No	
Mechanical	Standard	Unit	PTFE ¹	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA ³	PPS	PEEK
Tensile strength 23 °C	DIN 53 456	N/mm ²	29–39	27–32	19–25	36–48	41–54	38–50	25–40	40–60	35–60	72	195	
at 70 °C			—	—	—	—	—	—	18–28	18–28	28–38	35	150	
at 150 °C			14–20	15–21	4–6	8–12	3.5–4.5	7.5–10.5	—	—	—	—	70	
Limit of elasticity 23 °C	DIN 53 455	N/mm ²	10	14	12	24	34	46	25–40	40–80	32–57	—	—	97
Elongation a. tear 23 °C	DIN 53 455	%	200–500	300	250–350	200–500	200–300	20–250	400–800	40–280	2–4	—	1.9	50
Tension E-module 23 °C	DIN 53 457	N/mm ²	400–800	650	350–700	500–1200	1200–1800	800–1800	1100–2100	1600–2000	2900–3500	3300	14700	3600
Limit of bending stress at 23 °C	DIN 53 452	N/mm ²	18–20	15	—	25–30	50	55	45–60	40–60	breaks	—	—	
Bending E-module	DIN 53 457	N/mm ²	600–800	650–700	660–680	1000–1500	1700	1200–1400	800–1500	1000–1600	3000–3400	—	—	
Ball hardness 132/60	DIN 53 456	N/mm ²	25–30	25–30	23–29	34–40	55–65	62–68	58–80	50–80	110–160	—	—	200
Rockwell hardness R	ASIM d-785		—	—	—	45–55	85–95	100–115	—	90–100	—	—	100	99
Shore hardness D	DIN 53 505		55–72	60–65	55–60	63–75	70–80	73–85	70–75	—	—	—	—	
Coefficient of friction dyn. against steel, dry	²		0.05–0.2	0.2–0.3	0.3–0.35	0.3–0.5	0.65	0.2–0.4	0.3–0.5	0.3–0.35	—	0.5	0.4	
Thermal	Standard	Unit	PTFE ¹	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA ³	PPS	PEEK
Melting temperature	ASTM 2116	°C	327	300–310	253–282	265–275	240–247	165–178	158–167	215–221	—	—	285	335
Dimensional stability u. heat A (18.5)Kp/cm ³	DIN 53 461	°C	50–60	—	51	71–74	76	80–92	55–60	55–80	70–88	105	—	152
heat B (4.6) Kp/cm ³	DIN ISO R 75		130–140	—	70	104	115	146–150	85–95	165–195	76–100	—	—	
Coeff. of linear thermal expansion		1K x 10 ⁻⁵	10–16	10–16	8–14	8–12	4–8	8–12	15–18	6–12	6–8	7	2.6–4.8	
Thermal conductivity at 23 °C	DIN 52612	W/K x m	0.23	0.22	0.20	0.23	0.15	0.17	0.22	0.21–0.23	0.15–0.16	0.19	0.20	0.25
Specific heat at 23 °C		Kj /Kg x K	1.01	1.09	1.17	1.95	—	1.38	1.68	1.5–2.1	1.18–1.34	—	—	2.16
Oxygen value		%	>95	>95	>95	30	60	43	<30	<30	<30	1.47	56	35
Electrical	Standard	Unit	PTFE ¹	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA ³	PPS	PEEK
Dielectric constant at 10 ³	DIN 53 483		2.0–2.1	2.06–2.1	2.1	2.6	2.6	7.8–9.0	2.26–2.4	4–12	2.4–2.74	3.6	4.0	3.2
at 10 ⁶			2.0–2.1	2.06–2.1	2.06–2.1	2.6	2.5	6.4–7.6	2.25	3.5–9	2.5	2.7	4.1	3.2
Dielectric loss factor at 10 ³	DIN 53 483	10 ⁻⁴	0.3–0.5	0.2	2–8	6–8	90	120–200	<4	270–2700	1–20	0.06	2	3.0
at 10 ⁶			0.7–1.0	0.8	2–8	50	90	1500–1900	<5	300–3300	1–14	0.02	20	
Volume resistivity	DIN 53 482	Ω x cm	10 ¹⁸	10 ¹⁸	10 ¹⁸	10 ¹⁶	10 ¹⁵	10 ¹⁴	>10 ¹⁶	10 ¹²	>10 ¹¹	10 ¹⁵	>10 ¹³	5x10 ¹⁴
Surface resistivity	DIN 53 482	Ω	10 ¹⁷	10 ¹⁷	10 ¹⁶	10 ¹⁴	10 ¹⁴	10 ¹³	>10 ¹³	10 ¹⁰	>10 ¹³	5 x 10 ¹³	>10 ¹⁵	10 ¹²
Creep resistance	DIN 53 480		KA3c	—	KA3c	—	—	KA1	KA3c	KA3a-b	KA2-1	600	—	KC 150
Arc resistance	ASTM 495	sec	>360	—	>300	>75	135	>30	—	—	—	—	—	
Dielectric strength	DIN 53 481	KV/mm	40–80	50–80	50–80	60–90	50–80	40–80	60–90	30–80	60–90	30	25–28	25
Gas permeability	Standard	Unit	PTFE ¹	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA ³	PPS	PEEK
Nitrogen permeability		cm ³ /m ² d/bar	0.7	—	3.8	4.7	1.5	0.06	4.3	0.5	0.27	1	—	
Oxygen permeability		cm ³ /m ² d/bar	2.05	—	30	15.6	0.39	0.05	19	1.2	2.35	1	—	
Carbon dioxide permeability		cm ³ /m ² d/bar	5.7	—	60	38	17	0.2	61	4	8	—	4	
Water vapor permeability		g/m ² /d	0.03	—	2	0.6	9	4.5	2.1	1	14	300	—	

¹ Not extrudable thermoplastic » ² Not a standardised test. Friction coefficient is subject to different effects and can therefore only be used as a guide.

All information stated without engagement.

³ Tested partially by methods other than those stated; upon request additional physical characteristics available based on the actual test methods used.



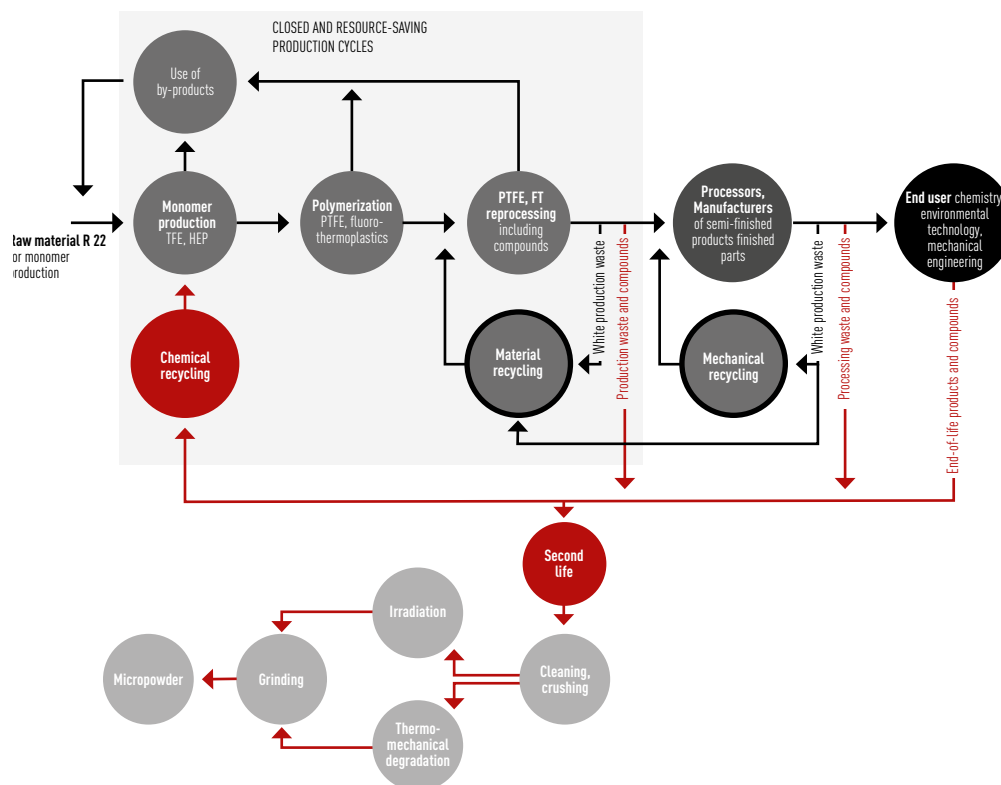
Recycling of fluoropolymers and other plastics

Dr. Michael Schlipf

With more than 50 percent, polytetrafluoroethylene (PTFE) is the most important representative of the fluoropolymers. For PTFE and other fully fluorinated fluoropolymers, the same applies from the beginning of their use: The material costs are comparatively high and the most important raw material, fluorspar

(CaF₂), is one of the finitely available resources. Reasons enough why various recycling cycles for fluoropolymers were developed early on and integrated into their life cycle. Today, they are general practice (Fig. 1).

Established cycles during production, processing and use of fluoropolymers



Waste incineration with recovery

If waste from monomer production and polymerisation is incinerated, integrated lime flue gas purification (Ca(OH)₂) enables the recovery of fluorspar. This can then be used again as a raw material for monomer production.

Beginning of a "second life"

It is also possible to extend the life cycle. For this purpose off-spec batches from polymer production are converted into PTFE micropowder by thermomechanical degradation of the molecules. This is then used as an additive in paints, printing inks or lubricants.

The thermomechanical degradation of fluoropolymers is particularly environmentally friendly: New, stricter purity regulations, which stipulate low-molecular „fragment“ content of less than 25 ppb, are easily complied with.

Mechanical recycling

Machining waste from the production of semi-finished and finished parts is collected, cleaned and ground. This can then be used to produce semi-finished products such as rods, tubes or sheets by means of ram extrusion. It is also possible to break down polymers by high-energy irradiation and reuse the resulting PTFE micro powder.

If products are easy to clean at the end of their life cycle, they too can be ground and used either as a raw material for Ram-extrusion or, after radiation degradation, as PTFE micro powder in additive applications. The reprocessing is done by companies specialised in this. They deliver the recycled products back to their point of origin, where they are processed again.

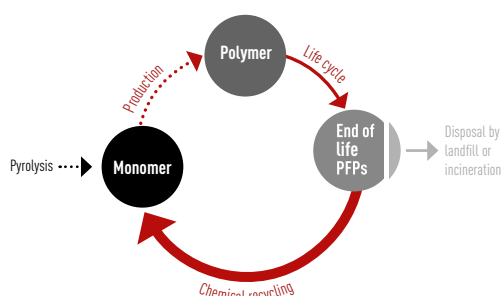
Fluorothermoplastics such as PFA, FEP, ETFE or PVDF can be used in injection moulding or extrusion after state-of-the-art processes such as grinding, cleaning and reuse. The fact that these thermoplastics are usually marketed without the use of fillers makes recycling particularly easy.



Chemical recycling

Chemical recycling, also referred to as upcycling in the case of fully fluorinated fluoroplastics, is a new technology (Figure 2). It has been developed on an industrial scale since 2015 in an experimental industrial plant with a capacity of one thousand tons per year. In the meantime, it is ready for market launch. The fully fluorinated polymers, PTFE, modified PTFE, PFA and FEP, as well as some PTFE compounds can be recycled. The monomer recovery rate is around 85 percent.

Figure 2: In the upcycling process, the products are not incinerated after reaching the end of their life, but are returned to the cycle. The polymers produced again in this way polymers produced in this way show no loss of quality.



For the upcycling process, too, the products are collected after reaching the end of their lives, cleaned and then mechanically shredded. This is followed by thermal splitting back into the monomers at over 600 °C. Reaction products are primarily tetrafluoroethylene (TFE) mixed with a little hexafluoropropene (HFP). After purification of the raw gas mixture by distillation and special washing processes, high-purity monomers are recovered. These can be reused for the polymerisation of new fluoropolymers.

Polymers produced with this process show no reduction in quality compared to the original polymers. Upcycling thus transforms „old“ into „new“ materials. The quality is thereby raised to the initial level. Fears that the properties of upcycled products are inferior to those of new products do not apply.

Raw-material saving by upcycling

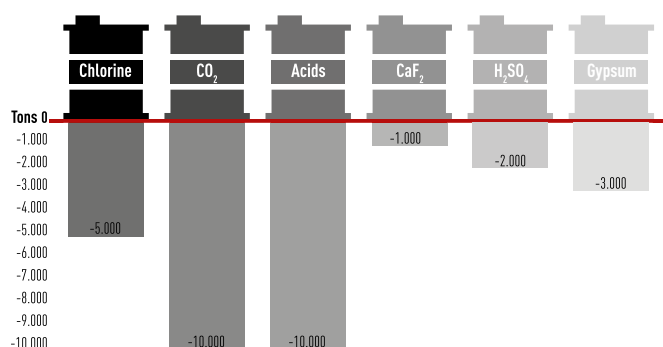
The raw materials for fluoropolymers are fluorspar, crude oil/natural gas, methane and common salt (NaCl). From these, first the fluorocarbon intermediate R22 and finally tetrafluoroethylene (TFE) are produced in a multi-stage process. All fluoropolymers are made from this raw material. Besides a high energy demand, waste products are also produced, especially hydrochloric acid (HCl). These have to be reprocessed or recycled in complex processes. In addition, all the raw materials mentioned are only available in limited quantities. Once these resources are used up, substitute products will be in short supply.

However, if fluoropolymers that have reached the end of their useful life or machining waste are used instead of these finite resources, the raw material and waste savings that can be achieved are enormous. Figure 3 shows the environmental relief per 1,000 tonnes of fully fluorinated polymer returned to the cycle through upcycling. The amounts of „waste acid“ or saved carbon dioxide (CO₂) are about ten times the

weight of the recycled fluoropolymers. The CO₂ footprint („carbon footprint“) of fluoropolymers is thus significantly reduced via the upcycling process to better values.

Figure 3: The environmental impact per 1,000 tonnes of upcycled monomer TFE is enormous. Unwanted by-products of the regular monomer production process, such as CO₂ and hydrochloric acid, are even completely avoided.

Environmental relief per 1000 t of recovered TFE



Re-use of PE and PP

Two important representatives of the „standard plastics“ are polyethylene (PE) and polypropylene (PP). Due to the comparatively low raw material prices of virgin materials, only low-cost recycling processes are used here; chemical recycling is not possible because of the comparatively high costs.

PE and PP in the production of laboratory supplies are essentially chips or remnants. These are collected, shredded, cleaned and then converted back into new products via thermoplastic processing methods. The preferred recycling method for PE is film production. Recycled PP is reused by means of injection moulding mainly for technical products, for example bumpers or lamp housings for motor vehicles. In these applications, the material cycles can also be passed through several times. About 14 per cent of the plastics currently used in Germany come from such recycling processes.

Plastic mixtures collected via the „yellow bag“, for example, provide a „PE-rich fraction“ and a „PP-rich fraction“ in automated processes. These are then also suitable for further processing by extrusion or injection moulding. Non-separable municipal plastic waste ends up in so-called „energy recycling“ as substitute fuel in coal-fired power plants and thus replaces lignite or hard coal.

Fluoroplastics - Cleaning and Worth Knowing



All fluoroplastics, PTFE, PFA and FEP have a smooth, non-wetting surface and can usually be cleaned without any problems. Abrasive scouring agents might damage the surface and result in a milkiness of the vessels – especially those made of PFA and FEP. You may use all neutral detergents (pH 7). For a stronger contamination we recommend to use an alkaline detergent up to pH 12. Clean or dry vessels in a laboratory washing machine only when they are completely opened.

Cleaning and re-utilisation of tubing

In principle, fluoroplastic tubing shall only be reused provided the material which shall be conveyed is known and rated with + in the chemical resistance chart. If the first conveyed products or components of chemical compounds are unknown, the reuse of tubing cannot be recommended. Appropriate detergents are all water-soluble substances (such as salts, acids, lyes, etc.). Volatile solvents such as alcohols, ester, ketones, low-boiling hydrocarbons, chlorinated hydrocarbon, etc. will be reversibly dispensed during aerated storage provided the substance was not absorbed by the inner layer of the tubing. After use with toxic or hazardous materials as well as with substances which only can be removed by using organic solvents, the tubing should be professionally disposed. Prior to reuse, cleaned tubing has to go through a visual inspection, respectively in case of doubt an inspection as per EN 12115 has to be made.

Autoclaving at +121 °C and 134 °C

Vessels made of PTFE, PFA or FEP can be sterilised using steam at +121 °C / 30 minutes respectively at 134 °C / 10 minutes. Besides a steam pressure sterilisation, a dry sterilisation at +160 °C is also possible. In order to avoid any plastic deformation, vessels with screw covers or stoppers have to be open while being autoclaved respectively sterilised. Autoclaving/Sterilisation of closed vessels can destroy them. Sterilisation of vessels made of fluoropolymers with high-energy radiation, gamma radiation or electron radiation is not recommended since this can cause a degeneration of the mechanical properties of the fluoropolymers.

Cleaning for trace analysis

To prevent contamination with cations or anions in trace analysis, the vessels should first be filled with an 1N HCL and HNO₃ solution. This solution should be left inside the vessels for maximum 6 hours at room temperature before rinsing the vessels with clean distilled water. Following test methods, which are common in the semiconductor industry, the vessel surfaces can also be cleansed by storing them for 24 hours in deionised water at +85 °C. In this case the vessels should be rinsed with deionised water as well.

Pressure resistance of bottles

Due to their thin walls, standard PTFE, PFA or FEP bottles should not be pressurised (from inside). Pressurisation could result in permanent deformation. More suitable for such applications are BOLA digestion vessels on page 215 or BOLA reaction vessels on page 206.

Plastics in microwave ovens

Plastics in general and fluoroplastics with their high thermal resistance in particular are suitable for microwave energy. The microwaves solely heat the contents of the vessel. Fluoroplastic vessels are particularly suitable for heating of aggressive chemicals such as acids or solvents. However, it should be noted that produced vapours are sufficiently drawn off. The more, a controlled drainage to a collecting vessel has to be arranged in case of bursture of the rupture membrane in the digestion vessel. Other vessels or containers than digestion vessels may only be heated when open.

Response times of temperature probes

The response time of a temperature probe is determined by introducing the probe to a step change in temperature and measuring how long the probe takes to reach a certain proportion of its final, steady-state reading. Normally, T_{50} (the time taken to reach 50% of the final reading) or T_{90} (the time taken to reach 90% of the final reading) are stated.



Field-proven method of determination: Put the temperature probe in an ice cold water bath and let it reach a steady-state. Then transfer it quickly to a column of steam and monitor its resistance until a steady state is reached again.



Fluoroplastics - Heating

Due to the low heat transfer and the maximum surface temperature that may not be exceeded, it is very difficult to heat PTFE vessels. There are different methods to heat PTFE vessels:

» Heating by a heating mantle with surface sensor:

When heating with a heating mantle, a large surface of the vessel is covered. This supports the heat transmission and reduces the heating period. The mantle must have a sensor on its surface. This probe measures the temperature on the surface of the PTFE and switches the mantle off upon exceeding +250 °C. Only this way a deformation of the laboratory equipment caused by temporary overheating is avoided. In case of an intense increase of the temperature of > 380 °C hazardous decomposition products can occur.

We advise against the use of "usual" heating mantles and control systems. Their use may result in the same effects as the use of hotplates (see below).

» Heating by a thermostat:

The heat transmission is provided by the bath medium (oils or other liquids). Controlled by an adjusted thermostat, the temperatures on the surface of the PTFE vessel will not become too high. Depending on the immersion depth, a big surface for a good heat transmission is provided. The handling of oils at high temperatures and the associated risk potential requires to work cautiously and safely, if necessary use protective clothing and equipment.

Not appropriate methods are:

» Flame (e.g. gas burner):

With this method, the surface temperature cannot be controlled. Due to temporary overheating decomposition products in the form of both invisible gases and white smoke occur. Those products are extremely hazardous to health.

» Hotplate:

Overheating can occur as well. Usual hotplates can only be switched on or off. During the heating period, the plate is heated with full energy so that it almost glows. Afterwards, the hotplate is switched off and only heats for a few seconds. This so-called „pointing“ is enough to exceed the maximum temperature of +260 °C. It does not make sense to put the adjusting knob only to +150 °C. PTFE labware char on the underside and glue to the hotplate. The thermoplastics PFA and FEP melt directly, similar to a hot-melt-type adhesive. This can be prevented by putting an aluminium foil between hotplate and vessels but dangers for health cannot be avoided.

» For further information regarding "Safe handling of Fluoropolymers" we refer to the leaflet of Plastics Europe, which can be downloaded on the following sources:

Safety Advice

» PlasticsEurope AISBL; Avenue E. van Nieuwenhuysse 4/3; B-1160 Brussels/Belgium, Phone: +32 (0) 2 675 32 97, info@plasticseurope.org, www.plasticseurope.org

Main risks and adversarial effects

Fluoroplastics are inert plastics, at normal use there are no risks for human health and environment. If the material is exposed to temperatures of more than +350 °C, it is possible that hazardous materials such as HF, COF₂ and others are released and can cause bad chemical burns which are not immediately noticeable.

Symptoms after contact

The materials released during thermal decomposition are very dangerous when getting in contact with eyes, skin or when being breathed in.

» **Eyes:** Redness, irritation, burning

» **Skin:** Redness, irritation, burning

» **Breathing in:** Headache, shortness of breath, illness, shivering, fever ("polymerisation-fever", raised pulse).

Special instructions for the case of breathing in:

The symptoms might only start some hours after breathing in. It is extremely important to seek medical advice to avoid lasting impacts!

First aid procedures

After breathing in, it is extremely important to seek medical advice. The person concerned should be immediately brought to a place with fresh air. It is also necessary to give him/her oxygen. In case of apnoea it is necessary to give artificial respiration, possibly by mouth-to-mouth resuscitation.

» In case of eye contact rinse immediately with water for at least 15 minutes.



» In case of skin contact wash immediately with water and soap (especially the skin under the nails).

» Additionally seek medical advice!

Dangers of fire

There are possible risks due to acid and toxic production which can occur during thermal decomposition (HF and COF₂).

Precautionary measures in case of fire:

Take away the product from the fire but be careful. Stay against the wind direction and in sufficient distance. Appropriate extinguishing agents are water, CO₂, foam, earth/sand. Wear special clothes such as respirator and skin protection against HF-vapours.

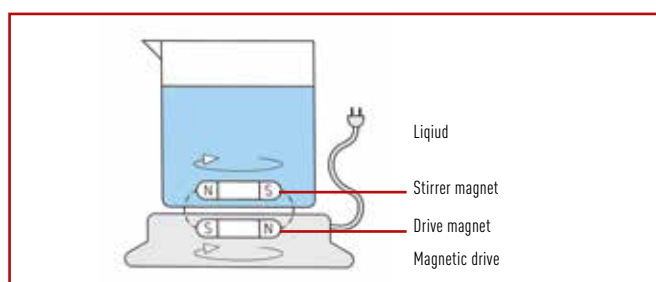


Stirrer - Magnetic Stirring

Magnetic stirring is a widely used method of stirring and mixing in liquid media. This process can be used over a broad temperature range and with virtually any chemical agent, as well as in open and closed systems, under pressure or vacuum.

The basic system consists of two components:

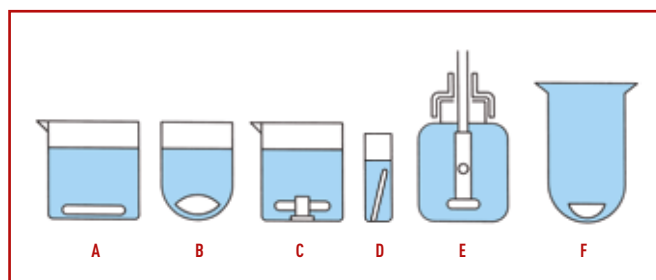
A stirrer magnet placed in the liquid and a magnetic drive located outside the vessel. Both, stirrer magnet and magnetic drive form a magnetic circuit. For trouble-free stirring in liquids with different viscosities the magnetic drive shall have a wide range of different speeds. That is why the strength and form of the magnetic circuit between stirrer magnet and drive magnet is so important.



The **stirrer magnet** is a bar magnet encapsulated in a material which protects the magnet and prevents contamination of the liquid medium.

The core of the stirrer magnet is usually Alnico V, a less used alternative is Samarium-Cobalt. Due to its exceptional chemical and thermal (-200 °C to +260 °C) properties, Polytetrafluoroethylene is the most preferred encapsulant. It can easily be processed, is readily sterilised and satisfies FDA and USP Class IV requirements.

In principle, it is difficult to find the most effective magnetic stirring bar for a particular application, but important factors are the vessel shape and the viscosity of the stirring medium. In a petri dish, a long stirring bar at low speed will be effective, in a round bottom vessel egg-shaped (oval) magnetic stirrers will be a suitable choice. The ideal configuration is where the magnet of the stirring bar and the magnet of the drive are of equal length and with a minimum distance between them.

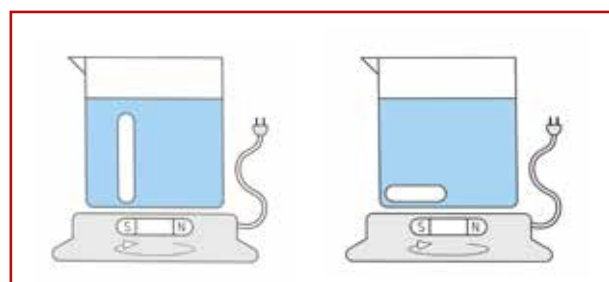


A Cylindrical magnetic stirring bar » **B** Oval or Egg-shaped magnetic stirring bar » **C** Magnetic stirring bar with bearing neck » **D** Magnetic stirring bar for cuvettes » **E** Magnetic stirring bar for culture bottles » **F** Custom manufacture for flanged reactors

The increase of the magnetic strength by using a SmCo magnet may be advantageous for many applications. However, this can have also negative consequences:

» Migration

Where the stirrer magnet and drive magnet have very different lengths, the stirrer magnet can migrate to a pole of the drive magnet.



» Braking

A very powerful force between drive and stirrer magnet can result in a braking effect. Due to the pressure of the stirrer magnet on the bottom of the vessel, the speed of rotation is reduced and rotation can even be prevented.

In general, no advice for or against a certain stirring bar form can be given. In case of doubt, a test of different stirring bars under your own conditions may be helpful.

The second part of this stirring system is the **magnetic drive** that consists in its simplest form of a simple, speed controlled induction motor or a stepper motor. In some cases the motor incorporates automatic reversing to improve mixing. Normally, the drive magnet is a simple square bar magnet, a U-magnet or a composite SmCo-magnet. Its rotation induces rotation of the stirrer magnet in the liquid. The designated speed can be adjusted by an incorporated speed control.



Choice of Stirring Elements

With the following we would like to assist you in the choice of stirrer shafts. All stated values are experienced data established by experimentation and practical testing. All stirring elements are made for clockwise rotation (view from the top of the stirring agitator).

The **diameter of the stirring shaft** depends on the products used as well as on their viscosity. The higher the viscosity, the larger the shaft diameter. If you are in doubt, you should choose always the larger shaft diameter, in most cases it is possible to reduce the chucking diameter.

Stirrer shafts with a diameter of 8, 10 and 16 mm are most commonly used. For standard applications up to a rotation speed of 350 rpm and a max. length of 600 mm, a shaft diameter of 10 mm will be sufficient. For stirring of high viscous products or shaft lengths over 600 mm, it should be checked whether the use of a stirrer shaft with 16 mm will make sense. Furthermore, adequate stirrer bearings and chucks at the agitator should be available.

Do not forget that the ideal diameter of the stirring element also will go through the "bottleneck" of your vessel, e. g. a ground joint or a flange. A tiltable stirrer blade might be helpful.

Example Propeller Stirrer Shaft:

Assumption: Inner diameter of the vessel (D) = 300 mm

1. Determination of the outer diameter of the stirring element
 $R = (0.2 \text{ to } 0.4) \times D$, thereafter follows 90 mm = 0.3×300 mm.
 Recommended outer diameter of the stirrer element is 90 mm.

2. Determination of the distance of the stirrer to the bottom
 $B = (1 \text{ to } 1.5) \times R$, thereafter follows 120 mm = 1.2×100 mm.
 The recommended distance of the stirrer to the bottom is 120 mm.

Signs and symbols:

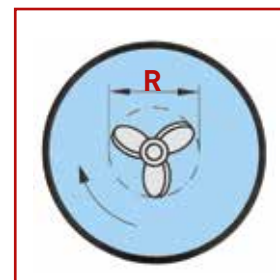
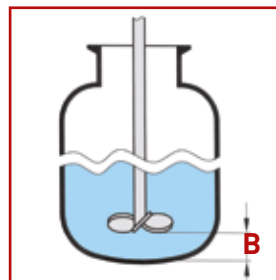
- D** Inner diameter of the vessel
- R** Outer diameter of the stirring element (stirring diameter)
- B** Distance of the stirrer to the bottom
- H** Height of the stirring element

Propeller stirrer shafts

Stirrer shaft with several, inclined, arched and partly twisted blades. Also with draught tube. Stirring effect is based on a mainly axial flow which moves away from the agitator; changes in the blade inclination or rotating direction result in a change of the flow direction.

$$R = (0.2 \text{ to } 0.4) \times D$$

$$B = (1.0 \text{ to } 1.5) \times R$$



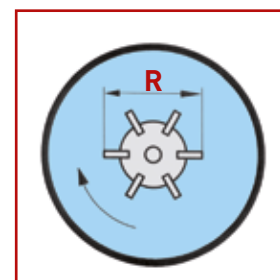
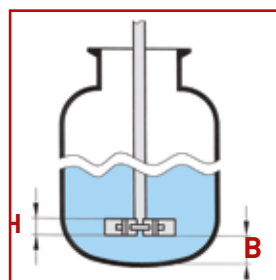
Discoidal stirrer shafts

Stirrer shaft with a blade with several, plane or curved paddles. Stirring effect is based on a radial, outwards directed flow with axial suction from the bottom and the top. The dispersing liquid is exposed to a high shearing.

$$R = (0.3 \text{ to } 0.4) \times D$$

$$H = 0.2 \times R$$

$$B = R$$



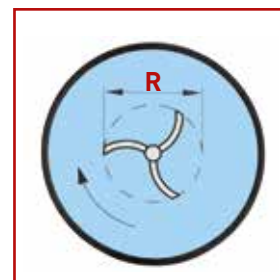
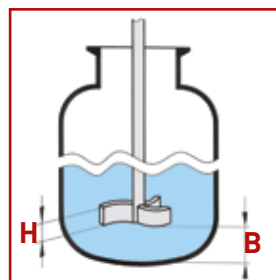
Impeller stirrer shafts

Stirrer shaft with three angular, arched paddles. The stirring effect is based on a radial flow which is diverted axially due to the ground level position of the stirrer.

$$R = (0.50 \text{ to } 0.70) \times D$$

$$H = (0.12 \text{ to } 0.17) \times R$$

$$B = (0.08 \text{ to } 0.18) \times R$$



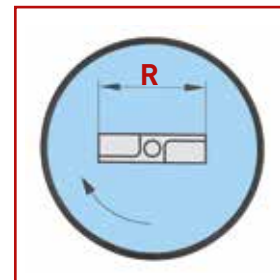
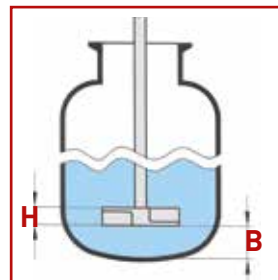
Stirrer Shafts with **rigid paddle**

Stirrer with a narrow blade. The stirring effect is based on a radial and axial flow. The product is opposed to shear forces ranging from moderate to strong.

$$R = (0.70 \text{ to } 0.9) \times D$$

$$H = (0.05 \text{ to } 0.1) \times R$$

$$B = (0.10 \text{ to } 0.2) \times R$$



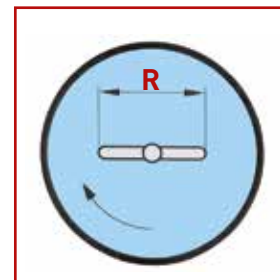
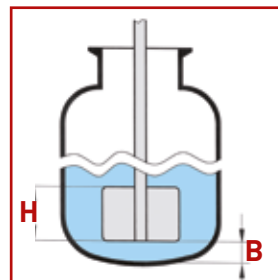
Stirrer Shafts with **rigid blade**

Solid, plane blade in user-defined form. Stirring effect due to different rotation speeds of the product displaced by stirring and the residual vessel content.

$$R = (0.4 \text{ to } 0.5) \times D$$

$$H = (0.9 \text{ to } 1) \times R$$

$$B = 0.3 \times R$$



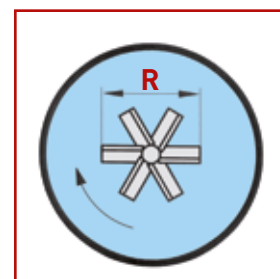
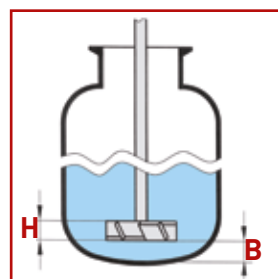
Stirrer Shafts with **angular blades**

Stirrer shaft with several inclined, rectangular, straight blades (special form $\alpha = 90$ degrees, also curved blades). The stirring effect is based on an axially directed flow combined with an increased shear rate. Reversion of the flow can be obtained by changing the inclination of the blades or the rotation direction.

$$R = (0.30 \text{ to } 0.40) \times D$$

$$H = (0.15 \text{ to } 0.25) \times R$$

$$B = (0.50 \text{ to } 1.00) \times R$$



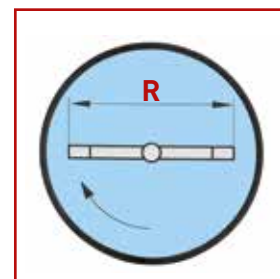
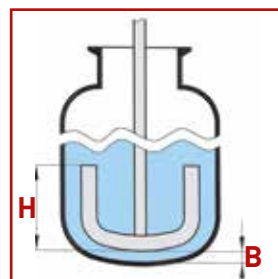
U-shaped stirrer shafts

Anchor stirrer blade adapted to the vessel's wall, reaches from edge to edge. The stirring effect is based on a mainly tangential flow with poor axial forces.

$$R = (0.90 \text{ to } 0.95) \times D$$

$$H = (0.50 \text{ to } 1.00) \times R$$

$$B = (0.003 \text{ to } 0.005) \times R$$



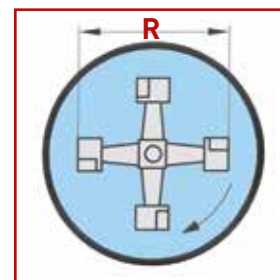
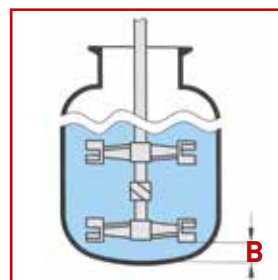
Double impulse stirrer shafts

Stirrer shaft with two contrarily aligned blades on a radial arm. The stirring effect is based on an axial flow with poor radial forces. Analogue to the conveying direction of the blades an axial flow arises near to the shaft. The conveying direction of the outer paddles is adapted to the mixing demands.

$$R = 0.70 \times D$$

$$H = 0.20 \times R$$

$$B = 0.28 \times R$$





Stirrer shafts - Maximum Revolutions per Minute

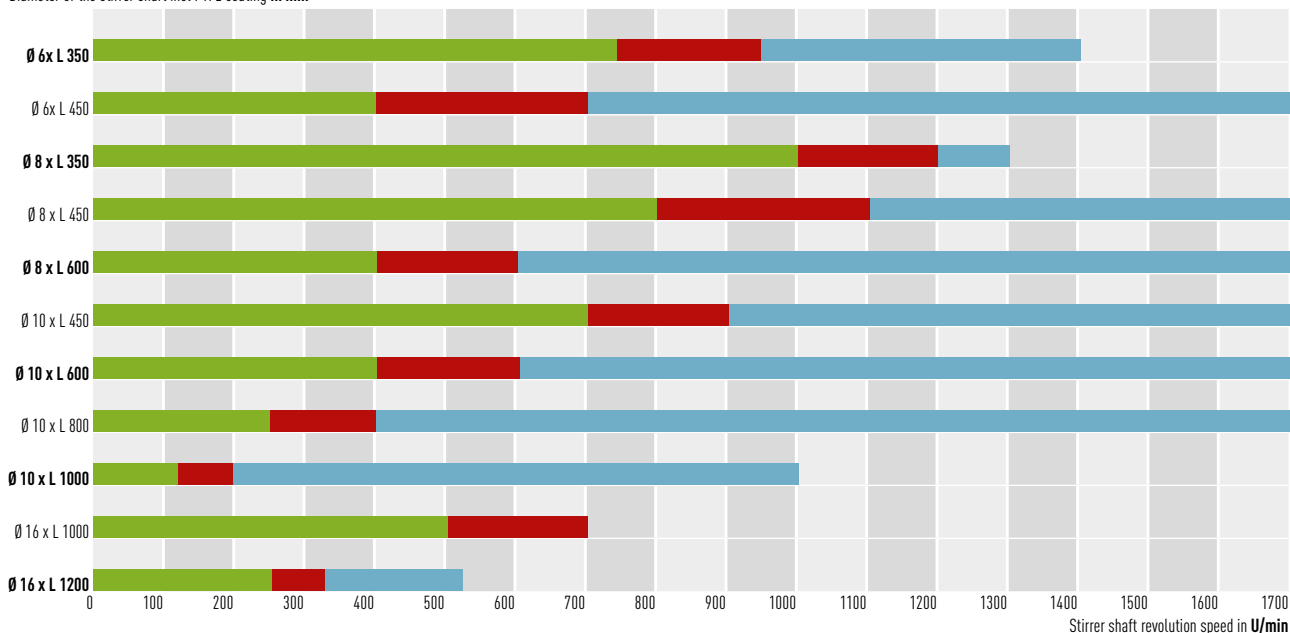
We would like to give advice on the appropriate RPMs, but unfortunately this question is not easy to answer. The following data are based on field-experience tests done with BOLA stirrer shafts.

Those tests have shown that it is not possible to state a maximum RPM but the range in which the shafts vibrate heavily. Such vibrations are called resonance. At a certain speed, a superposition of the oscillations takes place and the resonance becomes visible as vibrations. Due to those vibrations the bearings of the agitator are exposed to high stresses and in worst case accidents can be caused by tipping over agitators. The use

of liquids as medium can reduce vibrations, worn out agitator bearings or insufficient stability of the agitator support increase vibrations.

In practice, these "critical RPMs" should simply be avoided by either staying below or skipping quickly this "critical RPM range" to obtain a quiet running stirrer shaft. **In general:** the longer a stirrer shaft is, the larger its diameter should be.

Diameter of the stirrer shaft incl PTFE coating in mm



The chart

shall help you to choose the right stirrer shaft respectively to determine the maximum RPM. As many different parameters affect the quiet running of a stirrer shaft, it is recommended that the user will test it under his own conditions.

Please note that for double impulse stirrer shafts the critical RPM range lies 200 rpm below the stated values.

- » **Green Area** – indicates up to which rpm the shaft will not be affected by vibration
- » **Red Area** – marks the critical RPM range. These rpms should be avoided whenever possible.
- » **Blue Area** – is reached after quick skipping of the critical RPM range, vibration seldom occurs, however, agitators and stirrer shafts are extremely stressed by high RPMs. Therefore we recommend to use stirrer shafts only in the green range – if possible.



Tubing - Notes

Thin hoses for vacuum or high temperatures

We recommend to support the tubes in the area of the laboratory screwing for high temperatures, vacuum operation or thin wall thickness. This can be done using a glass or metal tube section. This prevents that the tube can swerve inwards and become leaky. With this trick it is also possible to fix elastic, rubbery tubes at glass threads with the BOLA laboratory screwing.



Tolerances for BOLA Tubes

The tubes mentioned match exactly to the BOLA Screwing Systems. Therefore, you can be sure that all fittings and screwing fit together. The practise showed that tubes show a certain tolerance as to external diameter and the wall thickness. The tubes mentioned are checked several times. The basis for this are strong BOLA internal standards which go far beyond the usual market requirements as to quality and measurements.

Beside the outer diameter of a tube, the wall thickness is also important for the quality evaluation. We at BOLA, have also set a stronger tolerance for the wall thickness than typically applied. Above all, we do not allow that due to chaining of tolerances the tube gets a totally different measurement than actually required. Therefore, the wall thickness of the BOLA tubes may vary only within the tolerance of the outer diameter as mentioned in the table beside.

Furthermore, the tubes are controlled that there are no material faults (e.g., inclusions of foreign particles), lengthwise grooves and/or gross grooves, and no unevenness at the outer and inner diameter.

Tolerances for Pure, Unfilled PTFE, PFA, FEP Tubes

Nominal outer diameter mm	0,4–2,9	3,0–10,0	10,1–16,0	16,1–22,0	über 22,1
Tolerance outer diameter mm	± 0,05	± 0,10	± 0,15	± 0,20	± 0,20

Wall thickness mm	0,1–0,3	0,4–1,0	1,1–2,0	über 2,1
Tolerance mm	± 0,025	± 0,05	± 0,10	± 0,20

Tolerances for antistatic ex-proof tubes, PTFE-EX

Nominal outer diameter mm	1,6–3,2	3,3–6,35	8,0–14,0	16,0
Tolerance outer diameter mm	± 0,10	± 0,25	± 0,30	± 0,40

Wall thickness mm	0,4–0,8	1,0		
Tolerance mm	± 0,10	± 0,20		



Tubing - Pressure Resistance

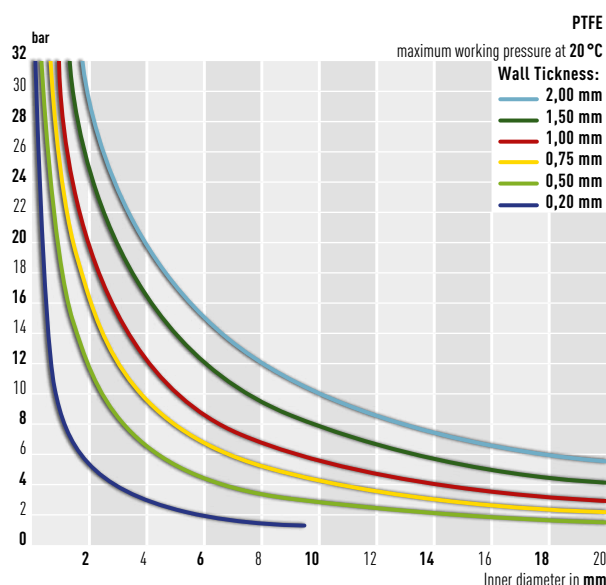
PTFE Tubing

The graph on the right side will help you to determine the recommended working pressure (approx. 0.25 x short time burst pressure) for PTFE tubing. For working temperatures above +20 °C the working pressures stated in this graph have to be multiplied by the corresponding reduction factor. For temperatures below +20 °C no reduction factors have to be considered.

Example:

For PTFE tubing with inner diameter of 6 mm and a wall thickness of 1 mm the working pressure at +20 °C is about 8.8 bar. At a temperature of +50 °C, this value has to be reduced to 7.6 bar (**pressure 8.8 bar x reduction factor 0.87 = 7.65 bar**).

Temperature °C	50	75	100	150	200	250
Reduction Factor	0,87	0,77	0,68	0,53	0,39	0,28



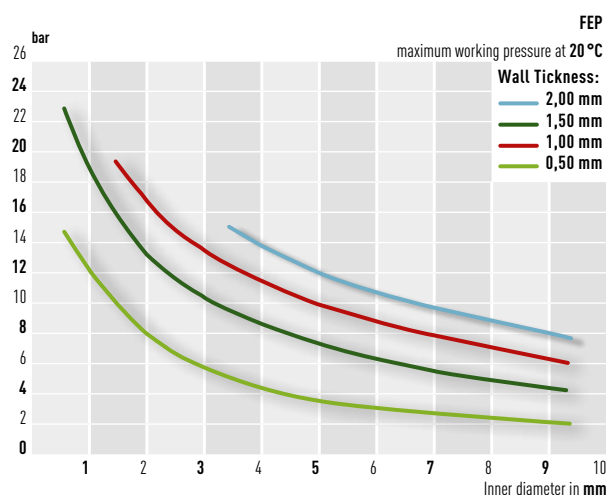
FEP Tubing

The graph on the right side will help you to determine the recommended working pressure (approx. 0.25 x short time burst pressure) for FEP tubing. For working temperatures from -50 °C to +150 °C the working pressures stated in this graph have to be multiplied by the corresponding reduction factor.

Example:

For FEP tubing with inner diameter of 6 mm and a wall thickness of 1 mm the working pressure at +20 °C is about 7.8 bar. At a temperature of +50 °C, this value has to be reduced to 6.1 bar (**pressure 7.8 bar x reduction factor 0.78 = 6.1 bar**).

Temperature °C	-50	0	20	50	100	150
Reduction Factor	1,13	1,04	1,00	0,78	0,45	0,21



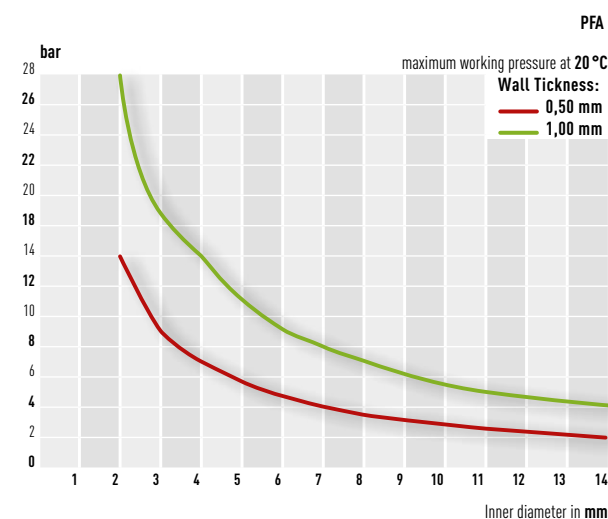
PFA Tubing

The graph on the right side will help you to determine the recommended working pressure (approx. 0.25 x short time burst pressure) for PFA tubing. For working temperatures above +20 °C the working pressures stated in this graph have to be multiplied by the corresponding reduction factor. For temperatures below +20 °C no reduction factors have to be considered.

Example:

For PFA tubing with inner diameter of 6 mm and a wall thickness of 1 mm the working pressure at +20 °C is about 14 bar. At a temperature of +50 °C, this value has to be reduced to 12 bar (**pressure 14 bar x reduction factor 0.86 = 12 bar**).

Temperature °C	50	100	200
Reduction Factor	0,86	0,50	0,26



Tubing - Choice and Assembly

Choice of wall thickness

When choosing the wall thickness, a couple of issues have to be considered:

- » What max. pressure will be applied?
In the charts on page 292 the minimum wall thickness can be easily found.
- » To which temperatures will the tubing be exposed?
The maximum pressure has to be reduced by the on page 292 stated reduction factors.
- » Shall the tubing be applied under vacuum?
Then the wall thickness has to be sufficient (rule of thumb).

Rule of thumb for determination of wall thickness:

$$\text{outer-}\varnothing \times 0.1 = \text{wall thickness}$$

For a "normal" use in the lab without thermal load or pressure, a wall thickness of 10-15 % of the outer diameter of the chosen tubing is sufficient and offers a certain security.
E. g. for a PTFE-tubing with outer diameter 8 mm the wall thickness should be 0,8-0,9 mm respectively rounded up to the next bigger standard wall-thickness of our range.

Fitting and tubing have to fit

Practice has proved that tubing varies in diameter. We therefore recommend to check before assembly whether the tubing outer diameter corresponds to the nominal size (e. g. \varnothing 6 mm). The values in the right chart will be helpful.

The surface of PTFE tubing can be damaged if V-rings are inserted by force and result in leakage.

Nominal- \varnothing of screw joint in mm	0.5–3,2	4.0–14	> 16
Recommended max. tolerance of tube/tubing in	± 0.05	± 0.1	$\pm 0,25$

Transition from imperial to metric tubing

With BOLA Tube Fittings and Reducing Unions, transition from imperial to metric tubing or connections between both can easily be made. For example: A pipe socket of an analytical device with an outer diameter of 1/4" shall be connected to a PTFE tubing with an outer diameter of 8 mm.
Needed components: Reducing union 6 mm to 8 mm (Cat.No. D 526-10) and a set of tapered V-rings \varnothing 1/4" (6.35 mm; Cat.No. D 502-03).

By exchanging the 6 mm V-rings with the 1/4" V-rings, the pipe socket can be connected to the 1/4" reducing union and the 8 mm PTFE tubing on the other side.





Tubing - Choice and Assembly

Easy assembly

First check whether your laboratory screw joint (inner diameter) fits your tubing (outer diameter). If it is still difficult to put the tubing inside the inner parts of the laboratory screw joint, a trick can be helpful. Just either sharpen the tubing with a simple sharpener or cut it diagonally. You should now be able to easily put the tubing through the inner parts.



Processing of heat shrinkable PTFE tubing

Shrinking should be done at a temperature of $+340^{\circ}\text{C} \pm 10^{\circ}\text{C}$. (At approx. $+327^{\circ}\text{C}$ the appearance of PTFE changes from white to transparent). Please note that the part to be coated has to withstand the shrinking temperature. Temperatures exceeding $+350^{\circ}\text{C}$ lead to overheating of the heat shrinkable tubing and destroy its plastic memory (shrinking capacity). Thus, the tubing becomes unusable. Steady heating and cooling from all sides provides the best result, otherwise creases and tearing can arise. Appropriate heat sources are ovens or air heaters. We strongly advise against using gas flames as this can lead very easily to irregular overheating. Longitudinal shrinkage can occur during shrinking. The longitudinal shrinkage is approx. 15 %.



Tubing - Useful Hints

Bending radius of PTFE, PFA and FEP tubing

During the assembly of devices with fluoroplastic tubing we are often confronted with the problem of how to create the smallest bending radius when the space is limited. To avoid buckling of the tubing with all its negative aspects, the following graph will be helpful to determine the smallest possible bending radius.

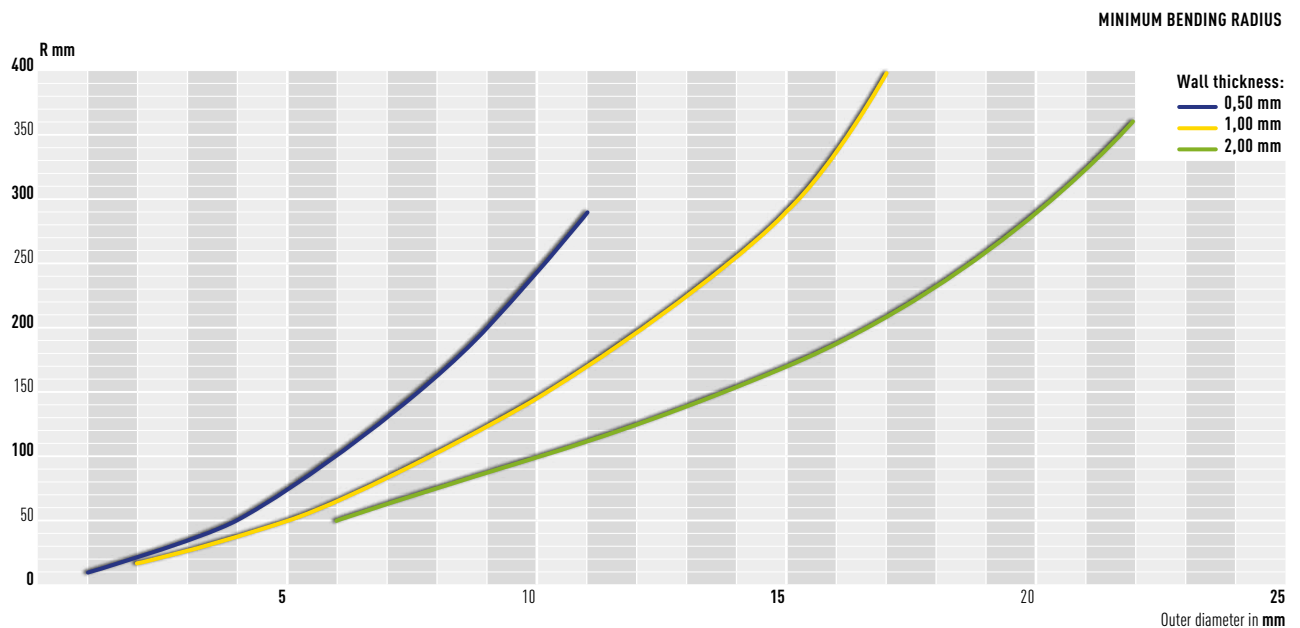
Take the outer diameter indicated on the horizontal axis, then follow the line upwards until it crosses with the appropriate wall thickness. From this intersection, follow the line to the left until it reaches the vertical axis which shows the minimum bending radius.

Rule of thumb for the bending radius:

$$\frac{\text{outer-}\varnothing^2}{\text{wall thickness}} = \text{min. bending radius}$$

As reference value, the smallest possible bending radius can be determined by the square of the outer diameter divided by the wall thickness.

Calculation example: PTFE tubing with an OD of 8 mm and a wall thickness of 1 mm results in a minimum radius of 64 mm.



Example: A PTFE tubing with outer diameter 10 mm and a wall thickness of 2 mm has a minimum bending radius of 100 mm.



Permeation values in a diagramm

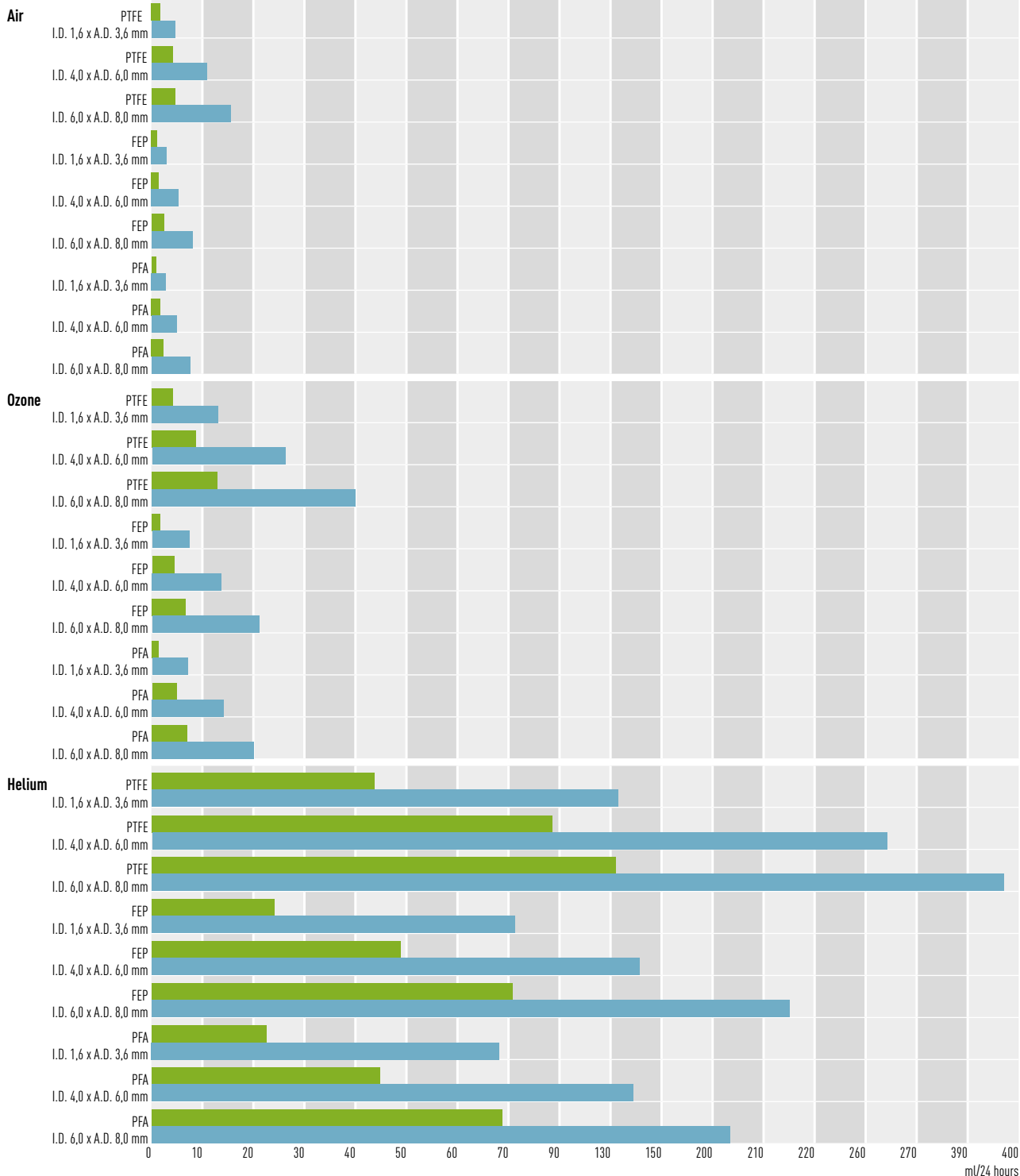
Tubes made of fluorocarbon polymers PTFE, PFA or FEP are manufactured in special production processes. They are examined to be free of pores and can therefore be classified as gastight. The fluoropolymers used are high-performance materials with a partially crystalline polymer structure. As it is usual for these partially crystalline materials,

a gas flow occurs in the course of time through the amorphous phase. This gas flow is named permeation. This slow permeation of fluids through plastics is a typical property. It should not be mixed with "leakage", which means the passage of media through plastics as a result of damages or improper connection.

Frame parameters

» 10 m, 0,5 bar, at 23 °C / at 50 °C

Tube material



Tubing - Permeation at short-term use

In case of short-term use of tubes with fluids - gaseous or liquid, no permeation occurs. Only after the passage of the first fluid molecules through the tubing wall, permeation starts. After an initial period, it achieves a constant flow. This can be identified when the permeation value per interval does not change any more. It is not easy to calculate the permeation start for the individual media such as gases, acids, bases or

solvents as it depends on many factors. Factors which promote permeation are higher temperatures, higher pressure or the addition of filling material. Dyed or electrostatic dischargeable plastics normally show a higher permeation rate than comparable non-filled plastics. The duration which is required for a passage of the fluid through a wall thickness 1 mm, can be defined as follows:

Fluid	Duration until start of permeation, wall thickness 1 mm
Easily volatile gases such as helium (He) or hydrogen (H ₂)	One hour
Gases with reduced volatility such as dry HCl-gas	One day
Non-volatile media such as hydrous sulphuric acid (H ₂ SO ₄)	More than one day



Tips for the use of plastic tubing for easily volatile media

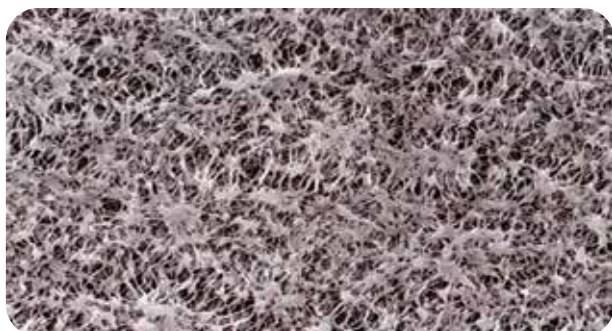
The installation should be built up in a well-vented room respectively under an extractor hood. In times off from work (such as over night or on the weekend), close the gas supply valve and release pressure.

Filter - Notes

Specification of pore sizes - what they mean.

Classification	Identification	Pore sizes in µm
00	P 500	250 - 500 *
0	P 250	160 - 250 *
1	P 160	100 - 160 *
2	P 100	40 - 100
3	P 40	16 - 40
4	P 16	10 - 16
5	P 1,6	1 - 1,6

* Actually, not available in PTFE



Typical applications - frequently asked.

Pore size	Application
50 µm	Filtration of rough particles, gas distribution in liquids
5 µm	Filtration of medium particles, laboratory filtration, valves for packing (gas permeable, liquid tight)
1 µm	Filtration of aqueous solutions, removal of particles
0,45 µm	Pre-filtration of aqueous solutions, HPLC solutions, protein solutions and alcohols. Sterile filtration of air and other gases
0,2 µm	Ultra cleaning of organic solutions and alcohols, sterile filtration of air and other gases
0,05 µm	Ultra cleaning of solutions and gases (viruses)



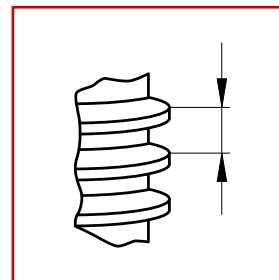
Determination – Thread Types

Choosing a suitable fitting, screw cap or multiple distributor with the correct thread type and size is not as easy as it might seem with regards to the multitude of thread types.

On the following pages we have summarized the most common threads that we use at BOLA for our fittings, screw caps and multiple distributors.

Please use a sliding calliper for the determination of a thread type. Use it for the determination of the thread O. D. and the thread pitch. The pitch is the distance from one thread crest to the other as shown on our schematic drawings. Now the thread type can be determined by comparing the original thread with our figures. Once you have found a similar type, the actual thread size is identified by comparing the measured dimensions (thread O. D. and pitch) with the typical dimensions stated in the related chart.

Of course we will help you if you should still have problems in determining your thread. Just send us a sample or counterpiece, we will be glad to help you with your choice.



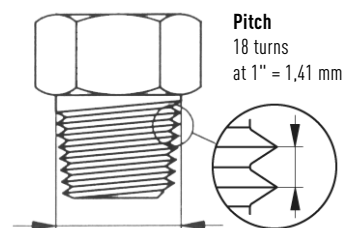
NPT (National Pipe Taper) Thread, American Pipe Thread or BSP (British Standard Pipe) Thread

Easy recognisable by its tapered outer and inner diameter which is self sealing. Therefore, NPT threads are also known as "sealing thread" or "tightly threaded connection".

Thread	Type	O. D. mm	Pitch mm
NPT	1/8"	9,9	27 turns at 1" = 0,94
NPT	1/4"	13,2	18 turns at 1" = 1,41
NPT	3/8"	16,6	18 turns at 1" = 1,41
NPT	1/2"	20,6	14 turns at 1" = 1,81
NPT	3/4"	26,0	14 turns at 1" = 1,81
NPT	1"	32,5	11,5 turns at 1" = 2,21

Example:

NPT 3/8" – O. D. = 16,6 mm



Determination – Thread Types

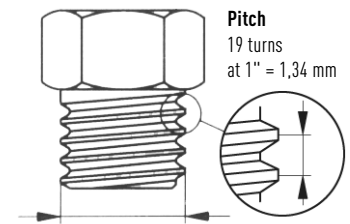
G or R (Whitworth) or BSP (British Standard Pipe) Thread

Cylindrical threads which are mainly used in countries with imperial system. The size of e. g. R 3/4" does not stand for a diameter. Thus the corresponding size has to be determined according to charts. Please note for the final determination whether you have a fitting with G- or R-threads: G-threads, male as well as female, are cylindrical whereas you have to distinguish that male R-threads have a conical form and its female counterpart is cylindrical.

Thread	Type	O. D. mm	Pitch mm
G or R	1/8"	9,6	28 turns at 1" = 0,91
G or R	1/4"	13,0	19 turns at 1" = 1,34
G or R	3/8"	16,5	19 turns at 1" = 1,34
G or R	1/2"	20,8	14 turns at 1" = 1,81
G or R	5/8"	22,8	14 turns at 1" = 1,81
G or R	3/4"	26,3	14 turns at 1" = 1,81

Example:

G 3/8" – O. D. = 16,5 mm



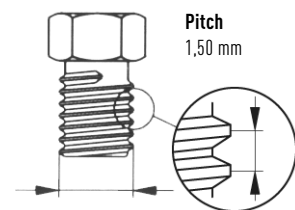
M thread (metric ISO-thread) – standard in Europe

Cylindrical inner and outer diameter which is precise in millimetres. The extremely fine taper of this thread allows the best possible force transmission. Metric threads are designated by a capital M plus an indication of their nominal outer diameter, for instance M 10. A pitch deviating from the standard is marked with an appendix like for instance M 10 x 0.75.

Thread	Type	O. D. mm	Pitch mm
M	5	5	0,80
M	6	6	1,00
M	8	8	1,25
M	10	10	1,50
M	12	12	1,75
M	16	16	2,00

Example:

M 10 – O. D. = 10 mm



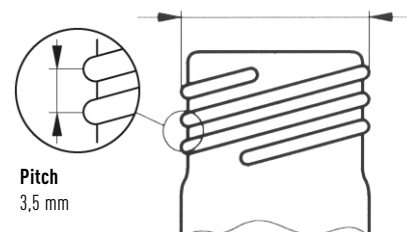
GL Threads

GL threads are round threads, i. e. there are only round and no sharp ends at the flanks of the screw thread. Due to its simple shape and the round ends of the flanks, this thread can be easily formed on glass pipes. The extremely high pitch and the large flanks give this thread an important carrying power.

Thread	Type	O. D. mm	Pitch mm
GL	12	12	2,0
GL	14	14	2,5
GL	18	18	3,0
GL	25	25	3,5
GL	32	32	4,0
GL	45	45	4,0
GLS	80	80	15,0

Example:

GL 25 – O. D. = 25 mm





Determination – Thread Types

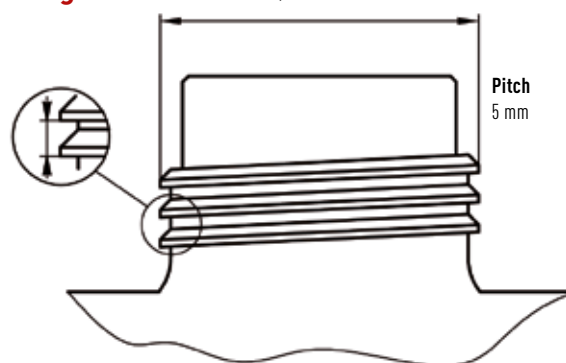
Nalgene Threads

The US-based company Nalgene produces amongst others plastic containers and flasks for storing chemicals. Especially Nalgene carboys are widely-used in laboratories. Nalgene threads can be recognized by their high collar on the buttress thread.

Thread	Type	O. D. mm	Pitch mm
Nalgene B53	Typ 2	54,0	6,0
Nalgene B83	Typ 2	88,0	12,7

Example:

Nalgene B53 – O. D. = 54,0 mm



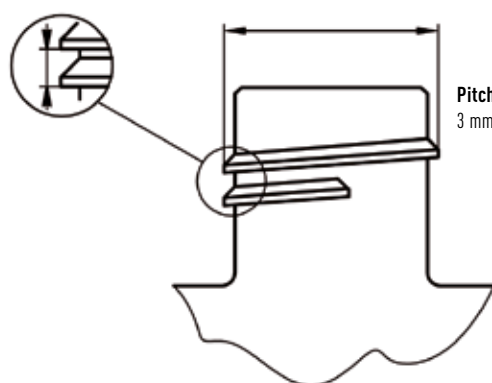
GPI Threads

The abbreviation GPI stands for Glass Packaging Institute, the trade association representing the North American glass container industry. The GPI sets voluntary standards, i. e. they are defined as an basis to achieve interchangeability and compatibility of glass containers and their respective closures.

Thread	Type	O. D. mm	Pitch mm
GPI 33	Typ 2	31,8	3,0
GPI 38	Typ 1	37,05	4,0

Example:

GPI 33 – O. D. = 31,8 mm



UNF 1/4" 28G thread

It has its origin in the USA. Mainly used in chromatography / HPLC applications. Most common sizes are UNF 1/4" 28G and UNF 10 32G. The digits 28 G and 32 G stand for the number of thread pitches at a length of one inch (25.4 mm).

UNF 1/4" 28G versus M 6

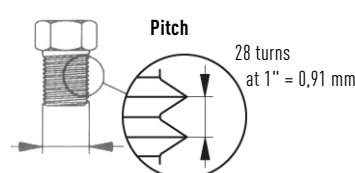
Without exception all BOLA HPLC Fittings come with the most common HPLC thread UNF 1/4" 28G. In addition, fittings and distributors with the very similar thread M 6 are used.

Thread	Type	O. D. mm	Pitch mm
UNF	1/4" 28G	6,2	28 turns at 1" = 0,91
UNF	3/8" 24G	9,4	24 turns at 1" = 1,06
UNF	1/2" 20G	12,6	20 turns at 1" = 1,27
UNF	5/8" 18G	15,7	18 turns at 1" = 1,41
UNF	3/4" 16G	18,9	16 turns at 1" = 1,59
UNF	1" 12G	25,2	12 turns at 1" = 2,12

These threads can only be distinguished by exact determination of their outer diameter or by using a test mandrel (it is possible to screw in a tube end fitting in the counterpart of the other thread for at least 2-3 rotations). The UNF 1/4" thread has an outer diameter of 6.35 mm, the M 6 thread has precisely 6 mm (work tolerances are possible). We recommend to use only the UNF 1/4"-28 G thread to avoid confusion and double inventory.

Example:

UNF 1/4"-28G – O. D. = 6,2 mm



Determination – Thread Types

Canister Thread S

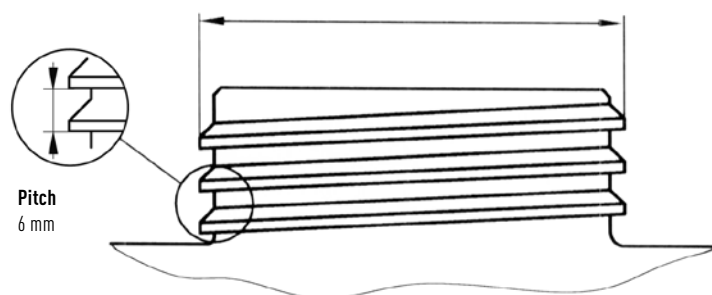
Coarse buttress thread commonly used for many plastic containers and flasks.

On the market you can find canisters with known standardized threads as well as models which are made as per special manufacturers' specifications. Just contact us if you have problems to determine your canister thread.

Thread	Type	O. D. mm	Pitch mm
S	40	39,5	3,5
S	55	54	5,0
S	60	59,5	6,0
S	65	65,0	6,0
S	71	70,5	6,0
S	90	89,5	6,0

Example:

S 65 – O. D. = 65,0 mm



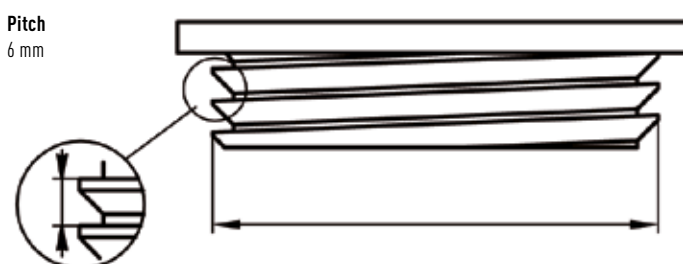
Barrel Threads Mauser 2", G 2"/R 2" and Tri Sure 2"

Coarse buttress threads which can be distinguished by their pitch. On the market you can find barrels with known standardized threads as well as models which are made as per special manufacturers' specifications. Just contact us if you have problems to determine your barrel thread.

Thread	Type	O. D. mm	Pitch mm
Mauser 2"	BCS 70 x 6	69,5	6,00
G2" / R 2"	BSP 2"	59,6	11 turns at 1"=2,3
Tri Sure 2"	BCS 56 x 4	56,6	4,00

Example:

BCS 70x6 MAUSER 2"® – O. D. = 69,5 mm





BOLA's Commitment



For the environment

BOLA takes its responsibility for the environment seriously. Our responsibility is not only a respectful handling of natural resources but also avoiding waste and integration of recycling in the production process.

- » Even during the machining of PTFE (e. g. drilling, turning or milling) all cuttings are collected by means of suction through a special tube system directly on our machines. All chips as well as remnants of semi-finished items are sorted according to their purity and stored contamination-free in large containers before later being recycled. During recycling, all chips and remnants are converted by a specially developed process into usable semifinished items.
- » With regard to the environment, disposable products are no longer in our mind. Therefore all our products are designed for long-time use.
- » Generation of chips can be avoided by using moulded parts. In addition, moulding reduces the consumption of PTFE powder and energy.
- » Products made of the most common fluoroplastics are free of plasticizers and solvents. Thus, they are not harmful for the environment.

No PFOA / APFO use in production

Formerly, perfluorooctanoic acid (PFOA) respectively sal ammoniac (APFO) have been used as additives in the polymerisation process during the production of polytetrafluorethylene (PTFE).

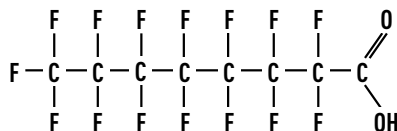
The use of these additives was obligatory in the emission polymerization process but has also partly been used in the suspension polymerisation process.

Although PFOA respectively APFO are almost completely removed from the final product and can mostly be regained during the production process, the well-known manufacturers of PTFE have committed themselves by self-declaration to waive the use of PFOA and APFO in any production process as of the production year 2015. With the renunciation of PFOA and APFO it is ensured that these chemicals, which have not been classified as toxic so far, do not accumulate in the environment.

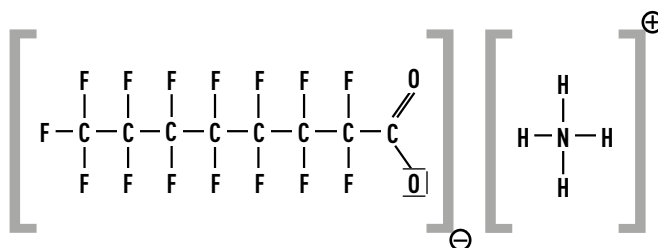
By supplier agreements, BOHLENDER GmbH ensures that all fluoroplastic materials used for our products have been manufactured without the use of the additives PFOA and/or APFO. Besides PTFE and PTFE-TFM, this includes also all fluoro-thermoplastics such as PFA, FEP ETFE or PVDF.



PFOA:



APFO:



Numerical Index

Cat. No.	Page	Cat. No.	Page	Cat. No.	Page	Cat. No.	Page	Cat. No.	Page	Cat. No.	Page	Cat. No.	Page	Cat. No.	Page
A		B 318-	254	C 446-	41	D 571-	215	D 740-	217	F 704-	308	H 969-	281	P 1730-	234
A 100-	248	B 323-	277	C 448-	40	D 572-	180	D 744-	106	F 705-	308	H 972-	205	P 1734-	159
A 103-	249	B 325-	277	C 450-	50	D 573-	179	D 748-	105	F 706-	310	H 973-	123	P 1740-	323
A 111-	249	B 326-	277	C 463-	59	D 574-	179	D 750-	107	F 707-	302	H 975-	122	P 1744-	159
A 114-	250			C 472-	43	D 575-	178	D 754-	107	F 709-	310	H 977-	122	P 1750-	233
A 117-	246	C		C 474-	43	D 576-	179	D 760-	111	F 710-	302	H 978-	99	P 1760-	233
A 118-	247	C 276-	158	C 476-	43	D 577-	178	D 762-	111	F 712-	304	H 979-	123	P 1762-	235
A 119-	248	C 278-	158	C 482-	38	D 579-	180	D 766-	111	F 716-	305	H 980-	214	P 1780-	236
A 124-	338	C 348-	71	C 484-	37	D 581-	139	D 772-	152	F 717-	306	H 981-	218	P 1790-	237
A 130-	253	C 349-	77	C 486-	38	D 582-	139	D 780-	243	F 718-	306	H 983-	119	P 1792-	237
A 131-	253	C 350-	68	C 488-	33	D 583-	140	D 782-	109	F 728-	308	H 984-	120	P 1850-	242
A 135-	259	C 351-	73	C 490-	34	D 584-	140	D 784-	109	F 730-	303	H 986-	119	P 1860-	242
A 136-	255	C 352-	77	C 492-	59	D 585-	140	D 785-	108	F 731-	303	H 987-	120	P 1950-	238
A 137-	256	C 354-	69	C 502-	58	D 586-	140	D 787-	108	F 738-	304	H 988-	118	P 1962-	238
A 149-	252	C 355-	76	C 512-	58	D 590-	88	D 790-	215	F 740-	299	H 989-	118	P 1980-	239
A 151-	259	C 356-	76	C 520-	53	D 593-	88	D 800-	101	F 745-	298	H 993-	118	P 1992-	239
A 155-	251	C 357-	70	C 522-	54	D 597-	89	D 802-	101	F 746-	298	H 994-	119		
A 156-	251	C 358-	70	C 530-	53	D 598-	89	D 804-	103	F 755-	299	H 995-	118	S	
A 158-	250	C 359-	74	C 532-	54	D 600-	89	D 810-	324	F 757-	299	H 997-	262	S 1800-	200
A 164-	256	C 360-	74	C 540-	56	D 606-	295	D 840-	146	F 760-	312	H 998-	106	S 1803-	201
A 169-	256	C 361-	69	C 576-	44	D 607-	296	D 841-	146	F 761-	313	H 999-	120	S 1805-	200
A 170-	257	C 362-	78	C 580-	45	D 608-	295	D 842-	146	F 762-	312	H 1001-	177	S 1810-	189
A 171-	258	C 363-	79	C 581-	44	D 610-	295	D 846-	147	F 763-	314	H 1124-	204	S 1811-	192
A 176-	258	C 364-	79	C 584-	45	D 612-	96	D 848-	146	F 765-	330	H 1126-	204	S 1815-	190
A 177-	258	C 365-	71	C 592-	44	D 613-	96	D 849-	146	F 766-	330	H 1128-	204	S 1817-	199
A 185-	260	C 367-	75	C 598-	36	D 614-	96	D 850-	146	F 770-	305	H 1132-	204	S 1820-	195
A 194-	254	C 368-	73	C 901-	28	D 615-	96	D 856-	147	F 772-	305	H 1138-	261	S 1822-	196
A 195-	254	C 369-	75	C 911-	28	D 616-	97	D 857-	147	F 778-	313	H 1140-	262	S 1824-	154
A 200-	257	C 371-	72	C 921-	55	D 617-	97	D 858-	149	F 780-	325			S 1827-	155
A 223-	260	C 372-	72	C 922-	55	D 618-	98	D 859-	149	F 830-	314	K		S 1828-	197
A 226-	260	C 374-	25	C 923-	54	D 619-	98	D 864-	151	F 833-	315	K 1349-	290	S 1833-	201
A 240-	263	C 375-	60	C 924-	59	D 620-	216	D 865-	151	F 834-	315			S 1852-	199
A 244-	263	C 376-	24	C 925-	55	D 621-	98	D 866-	151	F 836-	315	N		S 1853-	199
A 910-	339	C 377-	32	C 926-	55	D 623-	216	D 872-	153	F 837-	315	N 910-	329	S 1855-	156
		C 378-	23	C 927-	55	D 624-	98	D 874-	153			N 911-	329	S 1861-	198
		C 379-	26	C 928-	59	D 625-	132	D 898-	152	G		N 912-	320	S 1862-	198
B		C 380-	34	C 929-	59	D 628-	90	D 901-	223	G 870-	338	N 1501-	327	S 1863-	198
B 120-	267	C 381-	33	C 930-	59	D 629-	90	D 911-	223			N 1502-	329	S 1864-	198
B 150-	267	C 382-	35	C 931-	55	D 630-	90	D 915-	225	H		N 1503-	326	S 1870-	203
B 151-	272	C 384-	27	C 932-	55	D 631-	90	D 917-	224	H 898-	152	N 1505-	333	S 1872-	203
B 152-	273	C 387-	60	C 933-	59	D 632-	90	D 930-	224	H 900-	127	N 1510-	333	S 1880-	197
B 153-	273	C 389-	31	C 934-	55	D 634-	93			H 901-	127	N 1520-	333	S 2010-	193
B 154-	271	C 391-	36	C 935-	55	D 638-	92	E		H 902-	129	N 1530-	334	S 2012-	193
B 156-	272	C 392-	30	C 936-	55	D 639-	92	E 650-	176	H 903-	128	N 1565-	333	S 2020-	194
B 170-	163	C 393-	28	C 937-	55	D 640-	92	E 652-	173	H 904-	128	N 1610-	331	S 2022-	194
B 172-	164	C 394-	28	C 938-	55	D 641-	92	E 654-	173	H 906-	213	N 1616-	331	S 2030-	194
B 173-	164	C 398-	28	C 940-	56	D 642-	92	E 661-	136	H 907-	212	N 1617-	331	S 2032-	194
B 174-	164	C 399-	28			D 646-	103	E 664-	137	H 908-	127	N 1650-	322	S 2040-	157
B 210-	280	C 400-	62	D		D 647-	93	E 667-	137	H 909-	80	N 1654-	324		
B 271-	270	C 401-	61	D 501-	177	D 648-	178	E 672-	172	H 912-	80	N 1655-	323		
B 277-	270	C 402-	62	D 502-	177	D 651-	98	E 674-	172	H 915-	81	N 1656-	323		
B 280-	283	C 407-	63	D 503-	168	D 681-	313	E 680-	176	H 916-	81	N 1658-	322		
B 285-	290	C 410-	63	D 504-	169	D 690-	127	E 683-	137	H 918-	124	N 1660-	328		
B 286-	286	C 420-	80	D 505-	169	D 692-	126	E 684-	134	H 920-	261	N 1662-	328		
B 287-	285	C 423-	165	D 512-	170	D 693-	151	E 686-	134	H 927-	255	N 1666-	325		
B 288-	287	C 424-	46	D 516-	133	D 695-	151	E 688-	134	H 930-	209	N 1670-	320		
B 289-	287	C 425-	47	D 517-	133	D 696-	113	E 694-	138	H 931-	210	N 1674-	129		
B 290-	285	C 428-	47	D 518-	171	D 697-	113	E 689-	136	H 932-	209	N 1678-	321		
B 291-	291	C 429-	46	D 526-	170	D 698-	113	E 690-	136	H 933-	210	N 1682-	321		
B 292-	288	C 430-	49	D 537-	133	D 701-	113	E 712-	150	H 934-	210	N 1690-	332		
B 293-	288	C 432-	165	D 538-	130	D 720-	218	E 714-	150	H 935-	210	N 1696-	114		
B 295-	284	C 433-	165	D 539-	131	D 730-	339	E 716-	150	H 936-	213	N 1697-	115		
B 301-	284	C 435-	48	D 540-	131	D 731-	339			H 937-	213	N 1698-	114		
B 302-	289	C 440-	40	D 541-	132	D 734-	217	F		H 942-	211	N 1699-	114		
B 303-	288	C 441-	42	D 549-	94	D 736-	115	F 700-	310	H 958-	203				
B 304-	289	C 442-	42	D 568-	140	D 737-	115	F 701-	309	H 959-	202	P			
B 306-	212	C 443-	40	D 569-	140	D 738-	125	F 702-	307	H 960-	202	P 1720-	241		
B 317-	291	C 445-	41	D 570-	214	D 739-	125	F 703-	306	H 964-	205	P 1724-	241		



Alphabetical Index

A		
Adaptors		
» Adaptors for Prominent®-Pumps	129	
» Adaptors for Prominent®-Pumps UNF	314	
» Adaptors for Temperature Probes	241	
» Barrel-GL-Adaptors	115	
» Glas Flange Metal Adaptors	218	
» Ground Joint Adaptors	214	
» Ground Joint GL Adaptors	217	
» Mini Screw-in Adaptors	305	
» Threaded Adaptors	99, 291	
» Vacuum Adaptor GL	323	
» Vacuum Adaptor with Ground Joint	323	
Assortments of Tube End Fittings	308	
B		
Balls	205	
Barrel Aeration	114	
Barrel-GL-Adaptors	115	
Beakerliners	78	
Beakers		
» PFA Beakers	256	
» PTFE Beakers	255	
» PTFE Lid	255	
» Thermo Beakers	259	
Bearing Necks	79	
Bellows		
» GL Bellows	129	
» Ground Joint Connector	212	
Boiling Stones	205	
Bottles		
» Culture Bottles	80	
» Micro Scrubber Bottles	330	
» Scrubber Adaptors for Bottles	328	
» Scrubber Bottles Vitrum	328	
» Wash Bottles	250	
» Wide Mouth Bottles	248	
» Wide Mouth Bottles with Conical Neck	249	
Buchner Funnels	324	
C		
Caps EX	147	
Centrifugal Stirrer Shafts	32	
Chromatography Adaptors	298-299	
Cold Traps	291	
Condensers	284	
Connection Bolts	315	
Connectors		
» PFA Hose Connectors GL	139	
» PP Hose Connectors GL	140	
» PTFE Hose Connectors GL EX	153	
» PTFE Reducing Tubing Connectors	180	
» PTFE Screw-in Tubing Connectors	180	
» PTFE Tubing Connectors	178	
» PTFE Tubing Connectors Elbow	179	
» PTFE Tubing Connectors T	178	
» PTFE Tubing Connectors Y	179	
» PTFE Tubing Connectors Cross	179	
Control Valves	138	
Corrugated Tubing	195	
Couplings		
» Vario Couplings	313	
» GL Quick Connectors	132	
» Globe Stirrer Couplings	28	
» Magnetic Stirrer Heads	53-58	
» Miniature-Couplings	302	
» Quick Connectors	132	
» Threaded Couplings	127	
» Universal Couplings	305	
Culture Bottles	80	
D		
Digestion Vessels	263	
Dipper Baskets	262	
Dipper Vessels	261	
Dipping Sieves	262	
Dirt Traps	129, 335	
Disc Stirrer Shafts	36	
Distillation Apparatus	283	
Distillation Heads	287	
Distillation Thermometers	285	
Distributors		
» Distributor with Thread metrical	170	
» Distributors for Canisters	111	
» Distributors for HPLC	295	
» Distributors for Thread 38/430	98	
» Distributors for Thread GL 25	98	
» Distributors for Thread GL 45	96-98	
» Distributors for Thread GL 45 EX	151	
» Distributors for Thread GLS 80	105-107	
» Distributors for Thread S 40	98	
» Distributors for Thred GL 32	98	
» Distributors for Reaction Vessels	105	
» Flexible Distributors	101-103	
» GL Distributors with Stopcock	136	
» Minature Manifold Blocks	304	
» Miniature Distributors	302	
» Multiple Distributors for Barrels	113	
» Multiple Distributors with Ground Joint	216	
» Multiple Distriutors with Stopcocks	97	
Distributors for Canisters	111	
Distributors for Canisters EX	152	
Double Sealing Cones for Connection Bolts	315	
Double Tube End Fittings	306-307	
Ground Joint Distributor with Stirrer Bearings	48	
E		
Erlenmeyer Flasks	259	
Extension Cable for Temperature Probe Lemo®	241	
Extender with Adaptor for Syringe Filters	295	
F		
Fan-Shaped Stirrer Shafts	35	
Filter Adaptors for Syringes	325	
Filters		
» Buchner Funnels	324	
» Filter Adaptors for Syringes	325	
» Filtering Discs	333	
» Filtering Membranes	332	
» Filtering Rods	333-334	
» Filtering Sheets	331	
» Filtering Tiles	331	
» Frits for Suction Filters	330	
» Pressure Pre-Filters	325	
» Single-Stage Flow Filters	321	
» Suction Filters	330	
» Three-Stage Flow Filters	321	
» Vacuum Filtering Funnels	322	
» Vacuum Adaptors	323	
» Vacuum Traps	324	
Filtration		
» Flow Filters	320	
» Vacuum Filters	322	
Fittings		
» Fittings with Thread Metrical	168-169	
» GL Screw-in Tube Fittings	133	
» GL Tube Fittings	130-133	
» GL Tube Fittings Cross	132	
» GL Tube Fittings Cross EX	149	
» GL Tube Fittings EX	147-149	
» GL Tube Fittings GL Elbow	131	



Alphabetical Index

» GL Tube Fittings GL Elbow EX	149	
» GL Tube Fittings T	131	
» GL Tube Fittings T EX	147	
» Ground Joint Connectors	212	
» Ground Joint GL Tube Fittings	214	
» Joining Fittings	312	
» Miniature Screw-in Adaptors with UNF Thread	305	
» Screw-in Tube Fittings metrical	171	
» Socket GL Tube Fittings	215	
» Spherical Ground Joint GL Tube Fittings	215	
» Transition Fittings	312, 313	
» Tube Fittings Elbow metrical	169	
» Tube Fittings metrical	168	
» Tube Fittings T metrical	169	
Flanged Corrugated Tubing	197	
Flanged Tubing	299	
Flanging Tools	309	
Flasks		
» Erlenmeyer Flasks	259	
» Round Bottom Flasks	250-252	
Flat Flange Distillation Apparatus	283	
Flat Flange Joining Pieces	277	
Flat Flange Lids	277	
Flat Flange Reaction Vessels		
» PFA Flat Flange Reaction Vessel	277	
» PTFE Flat Flange Reaction Vessel	280	
Flanged Corrugated Tubing	197	
Flexible Distributors	101- 03	
Fluoroplastic Spray	203	
Flourside Paste	203	
Flow Filters	320	
Fluoroplastic Grease Tubes	203	
Fluorslide Paste	203	
Fork Wrenches	93	
Frits	326	
Funnels		
» Buchner Funnels	324	
» Dropping Funnels	290	
» Funnels	261	
» Funnels with GL Thread	125	
» Vacuum Filtering Funnels	322	
G		
Gaskets for Screw Caps	123	
Gassing Stirrers with 4 blades	33	
GL Aeration	115	
GL Distributor with Stopcock	136	
GL Quick Connectors	132	
GL Reductions EX	153	
GL Stopcocks	134, 137	
GL Tube Fittings	130	
Glass Flange Metal Adaptors	218	
GLS Reductions	108	
Ground Joint Adaptors	214	
Ground Joint Distributors	289	
Ground Joint GL Adaptors	217	
Ground Joint GL Tube Fittings	214	
Ground Joint Reduction Set	218	
Ground Joint Swivelling Screw Fittings	126	
Ground Joint Tube Fittings	177, 215, 289	
Ground Joint Tube Fittings Metric	177	
GT Glass Stirrer Shafts	60	
H		
Heat Shrinkable Tubings	197	
Hose Connectors EX	153	
Hose Connectors with Nut	139 - 140	
HPLC Distributors	295 - 296	
HPLC Stopcocks	303	
HPLC Tubing	309	
I		
Immersion Probes		
» Total Immersion Probes PT 100	236	
» Total Immersion Probes PT 100 Lemo®	237	
Impeller Stirrer Shafts	31	
Inserts for Vessels	263	
J		
Jars		
» Jars	253	
» Jars with connections for tubing	253	
Joint Clamps	211	
K		
KPG Glass Stirrer Shafts	60	
L		
Laboratory Screw Joints	88	
Laboratory Screw Joints EX	146	
Laboratory Screw Joints HT	90	
Lids		
» Flat Flange Lids	277, 280	
» Lids	255	
» Reactor Lids with Center Ground Joint Neck	267-269	
» Reactor Lids with flat flange EX	163	
Liebig Condensers		
» Liebig Condensers „Vacuum“	284	
» Liebig Condensers „Transparent“	291	
» Liebig Condensers Vertical	284	
Links	288	
Luer Connectors	306	
Luer Lock Connectors	306	
M		
Magnetic Stirrer Heads		
» Ground Joint Magnetic Stirrer Heads	50	
» Magnetic Stirrer Heads (G-MRK)	58	
» Magnetic Stirrer Heads (P-MRK)	53	
» Magnetic Stirrer Heads (P-MRK) Rodaviss	56	
» Magnetic Stirrer Heads (P-MRK) with Flat Flange	54	
Magnetic Stirring Bars		
» Ball Magnetic Stirring Bars	76	
» Beakerliners	78	
» Center Magnetic Stirring Bars	75	
» Chamfer Magnetic Stirring Bars	76	
» Colour Magnetic Stirring Bars	73	
» Crosshead Magnetic Stirring Bar	75	
» Cylindrical Magnetic Stirring Bars	68	
» Dumbbell-Shaped Magnetic Stirring Bars	74	
» Egg-Shaped Magnetic Stirring Bars	70	
» Glass Magnetic Stirring Bars	73	
» Magnetic Stirring Bar Retrievers	72	
» Magnetic Stirring Bar Sets	71	
» Magnetic Stirring Bars with Blade	77	
» Magnetic Stirring Bars with Pivot Ring	69	
» Power Magnetic Stirring Bars	71	
» Square Magnetic Stirring Bars	69	
» Star Head Magnetic Stirring Bars	74	
» Star Magnetic Stirring Bars	77	
» Tandem Magnetic Stirring Bars	79	
» Triangular Magnetic Stirring Bars	70	
Maxi Propellor Stirrer Shafts	30	
Measuring Cylinders	256	
Membranes		
» FEP Sheets	201	
» Filtering Membranes	332	
» PTFE Sheets	201	
» Replacement Sealing and Rupture Membranes	263	
» Sets for Pressure Compensation	114	
Micro Reaction Vessels	254	
Micro Scrubber Bottles	248, 330	



Alphabetical Index

Micro Surface Stirrer Shafts	38
Miniature Luer Connectors	306
Miniature Luer Lock Connectors	306
Miniature Pressure Relief Valves	304
Moon-Shaped Stirrer Blades	61
Moon-Shaped Stirrer Shafts	24
Multiple Distributors Bottles	96-98, 107
Multiple Distributors Bottles with Stopcocks	97
Multiple Distributors for Bottles EX	151
Multiple Distributors for Barrels EX	151
Multiple Distributors for Bottles EX	151
Multiple Distributors for Barrels	113
Multiple Distributors for Canisters	111

N

Non-Return Valves	176
Nuts	
» „SAFE LAB“ Nuts	290
» Hexagon Nuts	204

O

O-rings	
» FEP O-Rings for Laboratory Flat Flanges	219, 270
» PTFE O-Rings	219

P

Paste	203
Plugs	
» Dummy Plugs	178
» Stoppers	213
Plugs for Screw Caps	94
Porous PTFE	
» Filtering Discs	333
» Filtering Membranes	332
» Filtering Rods	334
» Filtering Sheets	331
» Filtering Tiles	331
» Gas Frits	326
» Membranes for Pressure Compensation	114
» Suction Filters	330
Pressure Pre-Filters	325
Pressure-Relief Valves with Manual Ventilation	137
Probe Insertion	243
Propeller Stirrer Shafts	23
Propeller Stirrer Shafts with 4 Blades	37
Propellor Stirrer Shafts EX	158
Pumps	
» Adaptors for Prominent®-Pumps	339
» Cordless Pumps for Acids and Caustic Solutions	338
» Sampling Pump	338

R

Reaction Vessel Lids	
» Flat Flange Reaction Vessels	270-277
» Reactor Lids with Center Ground Joint Neck	267-269
» Reactor Lids with Center Ground Joint Neck EX	163
Reaction Vessels	254
Reactor Lids EX	163
Receiver Adaptors	288
Reductions	
» GL Reductions	109
» GL Reductions EX	153
» GLS 80 Reductions	108
» Ground Joint Reduction Set	218
» Reducing Screw Thread Adaptor Couplings	128
» Reducing Unions metrical	170
Replacement Blades	199
Replacement Screw Cone Caps	89
Replacement Screw Cone Caps HT	93
Replacement Inner Parts HT	92
Replacement Inner Parts	89

Replacement Inner Parts EX	146
Replacement Membranes for Pressure Compensation	114
Replacement Sealing and Rupture Membranes	263
Rigid Threaded Couplings	128
Ring Wrench	113
Rods	
» Microporous PTFE Rods	333
» Rods of PTFE	200
Round Bottom Flasks	
» Round Bottom Flasks with Threaded Ground GL Necks	252
» Round Bottom Flasks with Two or Three Ground Joint Necks	251

S

Connectors for sampling bags	260
Scrapers	81
Screw Caps	
» Screw Caps	118-120
» Screw Caps High Chem	106
» Screw Caps with Aperture EX	152
» Screw Caps for Laboratory Screw Joints	89
» Screw Caps for Laboratory Screw Joints EX	147
» Screw Caps for Laboratory Screw Joints HT (High Temp)	93
» Screw Caps (High Temp)	119
Screw Joints	
» Swivelling Screw Fittings with Ground Joint	126
» Laboratory Screw Joints	88
» Laboratory Screw Joints EX	146
» Laboratory Screw Joints HT	90
» Swivelling Screw Fittings	127
Screw-in Connectors EX with Ground Joint	164
Screw-in for Caps	
» Screw-in Connectors with Ground Joint	271
» Screw-in Fittings GL	273
» Screw-in Fittings PG	272
» Screw-in Stirrer Bearings	271
» Screw-in Stopcocks	272
» Screw-in Stoppers	273
Screws	
» Assortments of Tube End Fittings	308
» Connection Bolts	315
» Double Sealing Cones for Connection Bolts	315
» Double Tube End Fittings	306
» Plugs	308
» Screws with Countersunk Head	204
» Screws with Cylindrical Head	204
» Sealing Cones for Connection Bolts	315
» Tube End Fittings	307
Scrubber Adaptors for Bottles	328
Scrubber Columns	246, 327
Scrubber Bottles	247, 326, 328
Sealing Cones for Connection Bolts	315
Sealing Tape	202
Septum	123
Sets for Pressure Compensation	114
Sleeves	
» Dipping Sieves	262
» Sleeves with Rips	209
» Sleeves with Gripping Ring	210
» Spherical Ground Joint Sleeves	210
Slip-On Baffle	34
Snap Valves	172
Solo Stirrer Shafts	43
Spare Parts for Sampling Bags	260
Spatulas	81
Special Stirrer Bearings	49
Spherical Ground Joint Sleeves	210
Spiral Tubing	198
Spray	203
Stage Flow Filters	321



Alphabetical Index

Stirrer Bearings			
» Glass Stirrer Bearings	47		
» Ground Joint Distributor with Stirrer Bearings	48		
» Screw-in Stirrer Bearings	271		
» Special Stirrer Bearings	49		
» Stirrer Bearings	46, 287		
Stirrer Bearings EX	165		
Stirrer Blades	61-63		
Stirrer Blades			
» Centrifugal Stirrer Blades	63		
» Bolts and Clamp Rings	63		
» Stirrer Blades	40-42		
Stirrer Heads			
» Globe Stirrer Couplings	59		
» Ground Joint Magnetic Stirrer Heads	50		
Stirrer Shafts			
» Centrifugal Stirrer Shafts	32		
» Discs Stirrer Shafts	36		
» Double Impulse Stirrer Shafts	36		
» Double-Moon-Shaped Stirrer Shafts	25		
» Fan-Shaped Stirrer Shafts	35		
» Gassing Stirrer with 4 Blades	33		
» GT Glass Stirrer Shafts	60		
» Impeller Stirrer Shafts	31		
» KPG Glass Stirrer Shafts	60		
» Maxi Propeller Stirrer Shafts	30		
» Micro Surface Stirrer Shafts	38		
» Mini Propeller Stirrer Shafts	38		
» Moon-Shaped Stirrer Shafts	24		
» Propeller Stirrer Shafts	23		
» Propeller Stirrer Shafts with 4 Blades	37		
» Solo Stirrer Shafts	43		
» Stirrer Shafts with Blade	33		
» Stirrer Shafts with One Paddle	26		
» Stirrer Shafts with Two Paddles	34		
» U-Shaped Stirrer Shafts	27		
Stirrer Shafts for Magnetic Stirrer Heads (G-MRK)	59		
Stirrer Shafts with Blade	33		
Stirrer Shafts with Paddle	26		
Stirrer Shafts with Reduced Chucking Diameter	44-45		
Stirring Bar Retrievers	72		
Stirring Bars	68-79		
Stopcocks			
» GL Stopcocks	134		
» GL Stopcocks EX	150		
» GL Stopcocks with Thread	137		
» Ground Joint GL 2-Way Stopcocks	136		
» Miniature 2-Way Stopcocks	303		
» Miniature 3-Ways Stopcocks	303		
» Screw-in Stopcocks	272		
» Stopcocks 2-Way/3-way	173		
» Stopcocks with Hose Connectors Metric	176		
» Stopcocks with Hose Connectors	176		
» Stopcocks with Thread Metric	173		
» Vacuum Stopcocks	288		
Stopcocks EX	150		
Stoppers	213		
Suction Filters	330		
SVL Gaskets	123		
Swivelling Screw Fittings	127		
» Temperature Probes PT 100		233	
» Temperature Probes PT 100 Lemo®		233, 235	
» Temperature Probes PT 100 Lemo® Compact		234	
» Temperature Probes PT 1000		238	
» Temperature Probes PT 1000 Lemo®		238	
Temperature Probes PT 100 Lemo® Compact EX		159	
Temperature Probes K		242	
Temperature Probes K with SMP Connector		242	
Thermo Beakers		259	
Flanging Tips		310	
Standard Construction Kits		310	
Thermoelectric Flanging Tools		309	
Tubing Holders		310	
Thermometer Holders		286	
Thermometers			
» Distillation Thermometers		285	
» Thermometers for Flasks		285	
Threaded Adaptors		99, 291	
Threaded Adaptors GL		133	
Threaded Couplings		127	
Tiles			
» PTFE Filtering Tiles		200	
» PTFE Filtering Tiles, microporous		331	
Tri-Clamp Fittings		223-225	
» Adaptor Tri-Clamp Hose Connector		225	
» Tri-Clamp GL-Adaptor		223	
» Tri-Clamp Multiple Distributor		223	
» Tri-Clamp GL Stopcocks		224	
» Tri-Clamp Gaskets		224	
Tube Fittings EX		149	
Tubing			
» Antistatic Explosion-Proof Tubing EX		155	
» Colour Tubing		198	
» PFA Corrugated Tubing		195	
» FEP Tubing		190	
» FEP Tubing Reels		194	
» Flanged Corrugated Tubing		197	
» Flanged Tubing		299	
» Flexible Corrugated Tubing		196	
» Flexible Tubing EX		154	
» PEEK Capillary Tubing		199	
» PFA Tubing		192	
» PFA Tubing Reels		194	
» PTFE Explosion-Proof Tube Reels EX		157	
» PTFE Tubing		189	
» PTFE Tubing Reels		193	
» Heat Shrinkable Tubing		197	
» Spiral Tubing		198	
» Zebra Explosion-Proof Tubing EX		156	
Tubing Connectors		178 - 179	
» Tubing Connectors T		178	
» Tubing Connectors Elbow		179	
» Tubing Connectors Cross		179	
» Tubing Connectors Y		179	
Tubing Cutter		199	
Tube End Fittings		306 - 308	
Tubing EX		155	
Tubing Holder		310	
Tweezers		80	
U			
U-Shaped Stirrer Shafts		27	
T			
Temperature Probes			
» Adaptors for Temperature Probes	241		
» Double Temperature Probes PT 100 Lemo® Compact	232		
» Extension Cable for Temperature Probe Lemo®	241		
» Total Immersion Probes PT 100 Lemo®	237		
» Total Immersion Probes PT 1000	239		
» Total Immersion Probes PT 1000 Lemo®	239		
» Slip-On Baffle	34		
» Temperature Probes	233-238		
V			
Vacuum Adaptors		323	
Vacuum Filtering Funnels		322	
Vacuum Filters		322	
Vacuum Stopcocks		288	
Vacuum Traps		324	
Valves			
» Control Valves metrical		172	



Alphabetical Index

» GL Control Valves	138
» Miniature Pressure Relief Valves	303
» Non-Return Valves	176
» Pressure Relief Valves	137
» Snap Valves	172
Vessels	
» Digestion Vessels	263
» Flat Flange Reaction Vessel	270, 277
» Micro Reaction Vessels	254
» PFA Evaporating Dishes	257
» PTFE Evaporating Dishes	258
» Vials	254
» Watch Dishes	257

W

Wash Bottles	250
Washers	
» Washers	205, 308
» Filtering Discs	333
» Bolts and Clamp Rings	63
Watch Dishes	257 - 258
Wide Mouth Bottles	248 - 249
Wrench for Screw Caps	103





Alphabetical Index

» GL Control Valves	138
» Miniature Pressure Relief Valves	303
» Non-Return Valves	176
» Pressure Relief Valves	137
» Snap Valves	172
Vessels	
» Digestion Vessels	263
» Flat Flange Reaction Vessel	270, 277
» Micro Reaction Vessels	254
» PFA Evaporating Dishes	257
» PTFE Evaporating Dishes	258
» Vials	254
» Watch Dishes	257

W

Wash Bottles	250
Washers	
» Washers	205, 308
» Filtering Discs	333
» Bolts and Clamp Rings	63
Watch Dishes	257 - 258
Wide Mouth Bottles	248 - 249
Wrench for Screw Caps	103

