



Best performance for your lab.



**Professional
High-Performance
Fluoroplastic Labware**

PTFE | PFA | FEP

A PRODUCT BRAND OF BOHLENDER

NEW: Easy ordering of spare parts
YOUR BENEFIT: extended product life

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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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Hastelloy®	by Haynes International	Tygon®	by Saint Gobain
Kalrez®	by DuPont	Viton®	by DuPont



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.



Volume/Quantity discount available.



Spare part



BESTSELLER

Our best-sellers



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

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Dear Customers and Partners,

Herewith we present you the latest edition of the BOLA catalogue - well-arranged with many technical information and tips for your everyday work in laboratory.

Sparte parts can now be easily ordered through a chart showing all individual catalogue numbers below their main product. Thus, product life times are extended. Moreover you will find many novelties in this catalogue e. g. BOLA Flexible Distributors for threads GL 45 or GLS 80. Our range of filtering membranes has been enlarged as well. For information on our materials, their chemical resistance, determination of threads or security advice, just have a look into the Technical Information.

As a manufacturer, we are looking forward to meet your special ideas and requirements. We are able to offer custom made products as per your specification - already starting with 1 piece and more favourable than you may expect.

Our experts are keen to manage your challenges!

Best regards,

A handwritten signature in blue ink, appearing to read 'V. Bohlender', written in a cursive style.

Volker Bohlender

Managing Director

BOLA stands for well-proven, sophisticated and nearly indestructible labware made of high-performance plastics.

Developed by our specialists, manufactured in-house.

With accuracy and attention to detail.

On request even custom made.

Welcome to BOLA!



What you should know about BOLA



6

FREQUENTLY ASKED QUESTIONS

1

Why shall I use Labware made of high-performance plastics?

Fluoroplastics such as PTFE and other offer unique properties such as universal chemical resistance, unbreakable, easy to clean, can be sterilized....ideal for the work in the lab!

2

What kind of products can I expect here?

E. g. stirrer shafts, screw joints, tubing, ground joint components, and many more. Optimally adapted to the needs in chemistry, pharmacy and industry.

3

What makes BOLA and BOLA products particular?

The fabrication in-house permits constantly high quality. We know our customers' business and answer fast to new requirements.

4

Where and how do you manufacture the products?

At our headquarters in Grünsfeld, Southern Germany. Experienced staff and modern production technology are the key for progressive products.

5

Who stands behind BOLA?

BOLA stands for Bohlender lab equipment – family operated in second generation by Volker Bohlender. Team spirit and fairness are practised at BOLA.



6

Can I get customized products as well?

Of course – your special requirements are welcome! No matter if you need a modification or a completely new item: Just provide a simple sketch and we produce to your requirements!

7

How do you get the BOLA products?

You place your order by fax, phone, letter, e-mail or in our online shop. Orders are executed by our distributors for labware. General lead times: 1 working day within Germany, 3-5 working days within the EU.

8

What happens if I should not be happy with the product?

Give us a call, send a fax or drop an e-mail. We take immediately care of your request and will arrange either a fast exchange or rework. It can be necessary to return the product for further examination.

9

Where can I get more information?

See our homepage www.bola.de or ask for our regular e-mail newsletter for latest information on our products

10

Are there any discounts...?

Good question: For bulk orders we grant discounts and special prices (except for customized items). Please contact us.

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BOLA – Best performance for your lab.



More flexibility.



Having design and production in house makes it possible to realise your requirements efficiently. We are open to any special requests. Please send us a drawing or sketch and our design department will start work.

More service.



Some enquiries are urgent. We are well prepared and keep the majority of our extensive product range in stock. Our efficient, well-established workflow assures shipment of your order at short notice. Waiting times and unnecessary shut downs can be prevented. You have no time to lose? We are here to help.

More expertise.



Each of our products has been designed by ourselves, thoroughly tried and tested as well as continuously improved and adapted to your everyday needs. Should you have any questions or requests, our professionals will give you expert advice.



Our **quality** commitment

BOLA products are manufactured in-house and are made of high-performance plastics with best material properties. We thoroughly control the quality of the raw materials.

Production is exclusively made by experienced and qualified staff at our headquarters in Grünsfeld, Southern Germany.

During the complete manufacturing process we strictly observe the standards of DIN EN ISO 9001.

As to products marked as FDA conform, we assure that all parts coming into contact with the medium are made of materials that correspond to FDA requirements.

All employees and I guarantee for the high quality of the complete range of BOLA products.

Thank you for your trust.

Volker Bohlender

Managing Director



Grünsfeld, September 2017



Made to measure.



BOLA offers custom manufacture.

Every lab is different. By offering an extensive range of established and sophisticated standard solutions, we take into account the varied requirements of the respective branches and sectors.

But maybe you are looking for something special? Something that is not included in our standard product range?

In that case we are able to offer an individual custom manufacture. This is easier and faster than you may expect. Discuss your idea with our professionals. They will give advise and support during design. Finally, your idea will become real: We produce as per your requirements and in compliance with the chosen raw materials – already from 1 piece.

We only need a drawing (a sketch is sufficient) and some further information

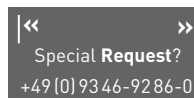
» You have a special request?

Give us a call: +49 (0) 93 46-92 86-0.

Or complete the attached form for custom enquiries including your contact details and return it by fax. We will be in touch to discuss details and provide you with a free quotation.

Checklist for your custom product.

- » Please describe the product required.
- » What is the application?
- » Which are the critical dimensions and tolerances?
- » Please specify material requirements.
- » Please specify the operating temperature range.
- » What is the chemical load?
- » Please state quantities.
- » What is the budgetary price range per piece?



This icon marks products which are especially suitable for individual modification.

Standard plus: our modifications...

The BOLA range already offers a huge choice of products and a wide range of accessories for different applications. Moreover, we offer you to adapt our standard products according to your requirements. Sometimes it is only a small detail that has to be modified or added - such as another thread size or a smaller bore diameter.

Your benefit is an individual product as well as fast availability due to short-term realization of the modification. And what is your special request? We will be pleased to assist you: Just give us a call **+49 (0) 9346 9286-0** or send us the enclosed „Made to measure“ form by fax.

Standard

Modification



Additional sealing: The o-ring provides better sealing and strong seating in the ground joint cone.



Belly-shaped bottles provide additional capacity. At the same time, the dimensions of the lid remain unchanged so that existing equipment can be used for filling and emptying.



A standard U-shaped blade has been enlarged to a window-shaped blade for improved mixing.



Female, male or vice versa? We are able to offer a counterpart to all our standard components, no matter whether you need a thread or a ground joint to be modified.



» One contact person for all your questions.

Highly qualified staff and continuous product training assure professional consultancy also for technical problems.

» Fast and reliable delivery.

Our modern production technology combined with optimised processes from production planning up to despatch assure a fast execution of your order.

» Accuracy is our passion.

We have great experience in all kind of processing of fluoroplastics in house. Continuous quality assurance from choosing suitable raw materials and throughout the whole manufacturing process.

» Everything for the modern lab.

Extensive range of lab equipment to meet the requirements of modern labs for nearly every application.

» Virtually all your desires will be fulfilled.

We can make products to your specification starting with 1 piece up to large-scale production. A sketch or drawing is sufficient. Reproducibility is assured by accurate technical documentation.

» We understand your requirements.

Many years of experience with processing of fluoroplastics.



Stirring and Mixing



Magnetic stirring bars and stirrer shafts have to feature many different qualities since they are used with many different products and in different vessels. The comprehensive BOLA range is offering the best possible solution – if not, we will manufacture according to your specifications.

PRODUCT TIPS



Page 56
Magnetic Stirring Bars



Page 18
Stirrer Shafts



Page 46
Stirrer Couplings

BOLA Stirrer Shafts



What you should know about BOLA Stirrer Shafts

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.

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.

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.

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



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 36).



BOLA Propeller Stirrer Shafts

BESTSELLER

Material: PTFE Temperature resistance: from -200 °C to +250 °C Chemical resistance: +++ universal Stirring effect: bottom-up

Product description:

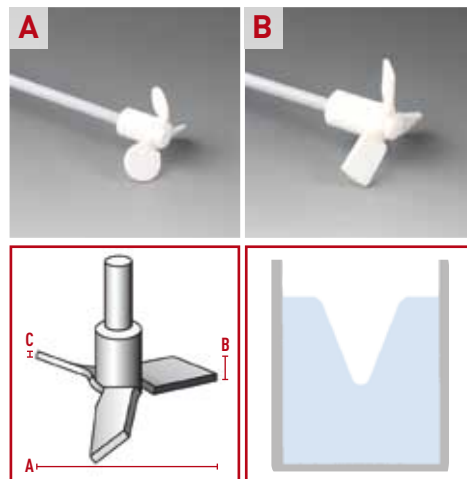
PTFE-jacketed stainless steel shaft, propeller completely made of PTFE with three 45° angled round or angular blades. Universal chemical resistance since the product is only exposed to PTFE.

FDA conform

	Length mm	Shaft dia. mm	Chucking dia. mm	Dimensions according to drawing			Cat. No.:
				A	B	C	
A	250	6	4	50	18	1,5	C 378-04
	350	6	4	50	18	1,5	C 378-06
	450	6	4	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.



BOLA Moon-Shaped Stirrer Shafts

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

Product description:

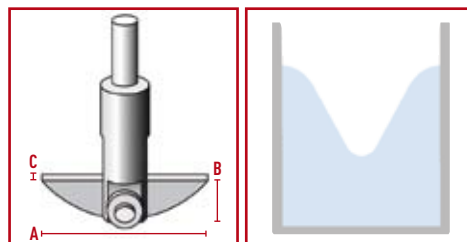
PTFE-jacketed stainless steel shaft, tilting half-moon stirrer blade with double-sided groove and access for the stirrer shaft completely made of PTFE. Universal chemical resistance since the product is only exposed to PTFE.

FDA conform

	Length mm	Shaft dia. mm	Chucking dia. mm	For ground joint NS	Dimensions according to drawing			Cat. No.:
					A	B	C	
	350	8	6,5	24/29	65	18	3	C 376-02
	450	8	6,5	24/29	65	18	3	C 376-04
	350	8	6,5	29/32	90	24	3	C 376-06
	450	8	6,5	29/32	90	24	3	C 376-08
	600	8	6,5	29/32	90	24	3	C 376-10
	450	8	6,5	45/40	125	35	3	C 376-54
	800	8	6,5	45/40	125	35	3	C 376-58
	350	10	8,0	29/32	90	24	3	C 376-12
	450	10	8,0	29/32	90	24	3	C 376-14
	450	10	8,0	45/40	125	35	3	C 376-64
	510	10	8,0	29/32	90	24	3	C 376-16
	600	10	8,0	29/32	90	24	3	C 376-18
	800	10	8,0	45/40	125	35	3	C 376-68
	1.000	10	8,0	29/32	90	24	3	C 376-19
	600	16	14,0	45/40	125	35	3	C 376-20
	800	16	14,0	45/40	125	35	3	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 52) are available separately and can be mounted additionally.



HELPFUL: page 132
Stirrer shafts made of static dissipative PTFE-EX

BOLA Double-Moon-Shaped Stirrer Shafts

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

Product description:

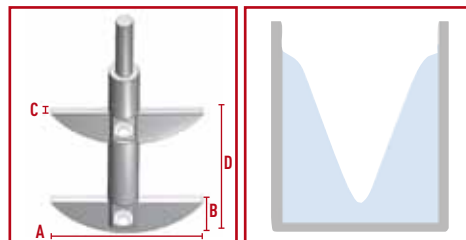
PTFE-jacketed stainless steel shaft, two each tilting half-moon stirrer blades with double-sided groove and access for the stirrer shaft completely made of PTFE. Universal chemical resistance since the product is only exposed to PTFE.

FDA conform

Length mm	Shaft dia. mm	Chucking dia. mm	For ground joint NS	Dimensions according to drawing				Cat. No.:
				A	B	C	D	
350	10	8,0	29/32	90	24	3	140	C 374-12
450	10	8,0	29/32	90	24	3	140	C 374-14
600	10	8,0	29/32	90	24	3	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 52) are available separately and can be mounted additionally.



BOLA INNOVATION

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.



SUITABLE: page 38
 Stirrer bearings for BOLA stirrer shafts

BOLA Stirrer Shafts with One Paddle

Material: PTFE
 Temperature resistance: from -200 °C to +250 °C
 Chemical resistance: +++ universal
 Stirring effect: bottom-up

Product description:

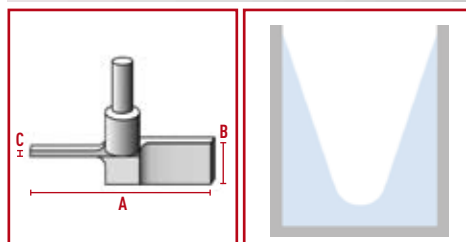
PTFE-jacketed stainless steel shaft, paddle completely made of PTFE with two 45° angled blades. Universal chemical resistance since the product is only exposed to PTFE.

FDA conform

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

Applications:

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



BOLA U-Shaped Stirrer Shafts

BESTSELLER

Material:
PTFE

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

Chemical resistance:
+++ universal

Product description:

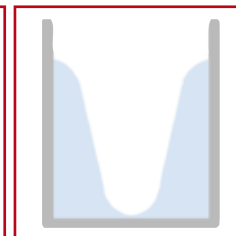
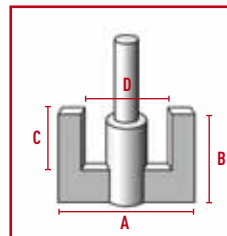
PTFE-jacketed stainless steel shaft, u-shaped stirrer blade completely made of PTFE. Universal chemical resistance since the product is only exposed to PTFE.

FDA conform

Length mm	Shaft dia. mm	Chucking 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
1.000	16	14,0	130	80	55	80	C 384-50
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
1.600	16	14,0	240	180	140	170	C 384-80

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.



22

STIRRING AND MIXING



SUITABLE: page 33
Additional stirrer blades



BOLA
Practical Tip

Marion Hammerich » construction

Big effective circular diameter, but small vessel neck?

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

see pages 20 and 25



HELPFUL: page 132
Stirrer shafts made of static dissipative PTFE-EX

BOLA 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

BESTSELLER

BOLA Globe Stirrer Couplings

Material: **POM** Temperature resistance: **from -30 °C to +100 °C** Chemical resistance: **++ very good**

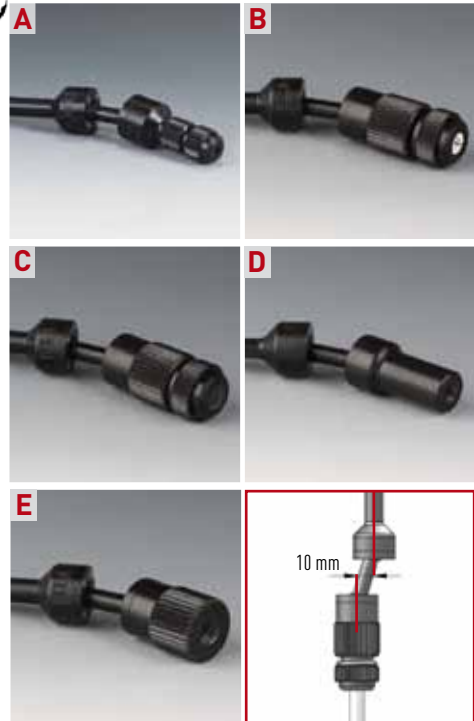
Product description:

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.

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

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 piece	4 mm 6,5; 8; 10 mm	C 398-04 C 398-08 / C 398-12	C 901-01 C 901-02	
Replacement-Reducing Sleeve	PTFE-GF	Pack size: 3 piece	6,5 mm 8,0 mm	C 398-08 C 398-12	C 911-01 C 911-02	



BOLA Maxi Propeller Stirrer Shafts

BESTSELLER

Material: **PTFE** Temperature resistance: **from -200 °C to +250 °C** Chemical resistance: **+++ universal** Stirring effect: **bottom-up**

Product description:

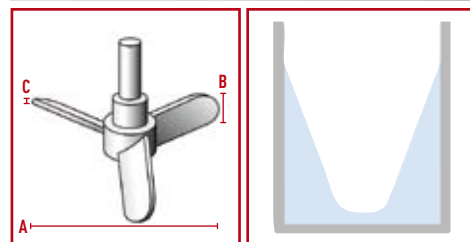
PTFE-jacketed stainless steel shaft, propeller completely made of PTFE with three 45° angled blades. Universal chemical resistance since the product is only exposed to PTFE.

FDA conform

Length mm	Shaft dia. mm	Chucking dia. mm	Dimensions according to drawing			Cat. No.:
			A	B	C mm	
450	10	8	140	20	4	C 392-28
600	10	8	140	20	4	C 392-34
800	10	8	140	20	4	C 392-40
1.200	10	8	140	20	4	C 392-42
800	16	14	140	26	6	C 392-44
1.000	16	14	140	26	6	C 392-46
600	16	14	200	26	6	C 392-52
800	16	14	200	26	6	C 392-58
1.000	16	14	200	26	6	C 392-64
1.200	16	14	200	26	6	C 392-70
1.600	16	14	200	26	6	C 392-74
1.200	16	14	280	26	8	C 392-80
1.200	16	14	400	26	8	C 392-90
1.600	16	14	400	26	8	C 392-94

Applications:

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



« »
Special Request?
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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.



Dieter Waldhaus » Merck KGaA

BOLA Impeller Stirrer Shafts

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

Product description:

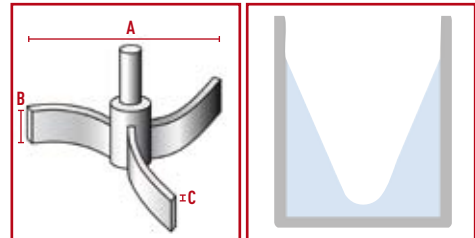
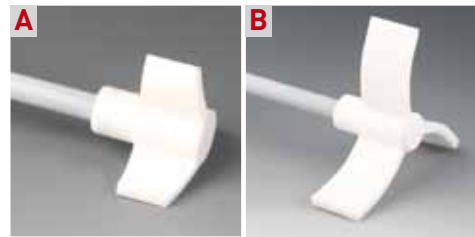
PTFE-jacketed stainless steel shaft, impeller completely made of PTFE with three blades bent backwards, lower side of impeller either even or 15° angled. Universal chemical resistance since the product is only exposed to PTFE.

FDA conform

	Length mm	Shaft dia. mm	Chucking dia. mm	Angle	Dimensions according to drawing			Cat. No.:
					A	B	C mm	
A	350	10	8	15°	45	22	5	C 389-18
	350	10	8	15°	60	25	5	C 389-20
	450	10	8	15°	60	25	5	C 389-22
B	350	10	8	0°	100	25	5	C 389-24
	450	10	8	0°	100	25	5	C 389-28
	600	10	8	0°	100	25	5	C 389-32
	800	10	8	0°	100	25	5	C 389-36
	600	10	8	0°	150	25	5	C 389-62
	800	10	8	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

Product description:

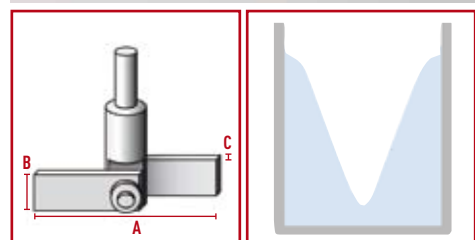
PTFE-jacketed stainless steel shaft, stirring unit (movable paddles, bolt and receiver for paddles) completely made of PTFE. The paddles open up at increasing speed. Universal chemical resistance since the product is only exposed to PTFE.

FDA conform

	Length mm	Shaft dia. mm	Chucking dia. mm	Dimensions according to drawing			Cat. No.:
				A	B	C mm	
	350	6	4	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 53
 Additional stirrer paddles

BOLA Gassing Stirrer

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

Product description:

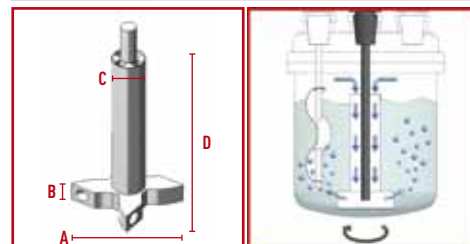
PTFE-jacketed stainless steel shaft, propeller with four blades completely made of PTFE. Clockwise rotation of the shaft produces a vacuum behind the stirrer blades. By this vacuum, the gas is transported from the gas compartment through the hollow shaft and into the product. The rotation speed depends 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.

FDA conform

Length mm	Shaft dia. mm	Chucking dia. mm	Dimensions according to drawing				Cat. No.
			A	B	C	D	
484	10	8	72	12	20	187	C 488-08
559	10	8	72	12	20	272	C 488-14
657	10	8	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:	Temperature resistance:	Chemical resistance:	Vacuum:	autoclave:
PTFE	from -200 °C to +250 °C	+++ universal	suitable	121°

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.

FDA conform

For ground joint NS	Width mm	For shaft dia. mm	Fitting length mm ca.	Cat.No.:
19/26	15	8	125	C 490-10
29/32	23	8	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 106 and D 692-.. Page 105).



SUITABLE: page 193
BOLA temperature probes for assembly
of a baffle.

BOLA Stirrer Shafts with Blade

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

Product description:

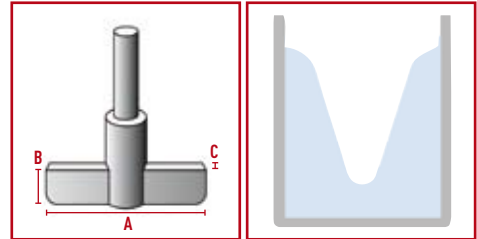
PTFE-jacketed stainless steel shaft, blade completely made of PTFE.
Universal chemical resistance since the product is only exposed to PTFE.

FDA conform

Length mm	Shaft dia. mm	Chucking dia. mm	Dimensions according to drawing			Cat. No.:
			A mm	B mm	C mm	
450	8	6,5	90	20	5	C 381-04
600	8	6,5	90	20	5	C 381-06
450	10	8,0	120	30	5	C 381-08
600	10	8,0	120	30	5	C 381-10
800	10	8,0	120	30	5	C 381-12
1.000	16	14,0	150	50	5	C 381-18

Applications:

Tangential flow with little turbulence, gentle stirring.



HELPFUL: page 292

Information on maximum revolutions per minute for BOLA stirrer shafts



BOLA offers custom manufacture.

Every lab is different. By offering an extensive range of established and sophisticated standard solutions we take into account the varied requirements of the respective branches and sectors.

But maybe you are looking for something special? Something that is not included in our standard product range?

In that case we are able to offer an individual custom manufacture. This is easier and faster than you may expect. Discuss your idea with our professionals. They will give advise and support during design. Finally, your idea will become real: We produce as per your requirements and in compliance with the chosen raw materials – already from 1 piece.

We only need a drawing (a sketch is sufficient) and some further information.

» You have a special request?

Give us a call: +49 (0) 93 46-92 86-0.

Hotline +49 (0) 93 46-92 86-0

BOLA Stirrer Shafts with Two Paddles

Material: PTFE Temperature resistance: from -100 °C to +240 °C Chemical resistance: +++ universal Stirring effect: bottom-up

Product description:

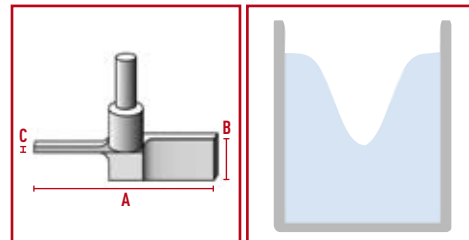
PTFE-jacketed stainless steel shaft, two PTFE paddles arranged crosswise at 90°. Upper paddle is fixed by means of clamp screws made of PEEK compound.

FDA conform

Length mm	Shaft dia. mm	Chucking dia. mm	Distance of blades mm	Dimensions according to drawing			Cat. No.:
				A mm	B mm	C mm	
450	8	6,5	50	80	18	4	C 380-02
600	8	6,5	50	80	18	4	C 380-04
800	8	6,5	50	80	18	4	C 380-06
600	10	8,0	100	110	20	5	C 380-08
800	10	8,0	100	110	20	5	C 380-10
1.000	10	8,0	100	110	20	5	C 380-12
600	16	14,0	150	140	25	12	C 380-14
800	16	14,0	150	140	25	12	C 380-16
1.000	16	14,0	150	140	25	12	C 380-18
1.200	16	14,0	150	140	25	12	C 380-20

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

Product description:

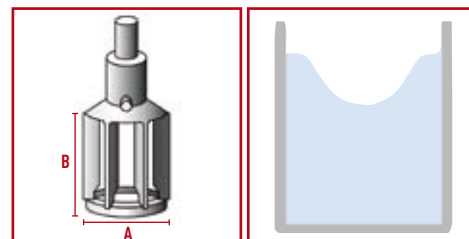
PTFE-jacketed stainless steel shaft, fan-shaped stirring unit completely made of PTFE.

FDA conform

Length mm	Shaft dia. mm	Chucking dia. mm	For ground joint NS	Dimensions according to drawing		Cat. No.:
				A mm	B mm	
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
450	10	8	60/46	53	55	C 382-12
600	10	8	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

Product description:

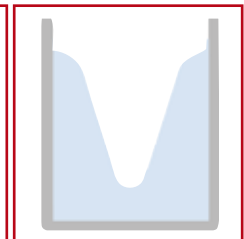
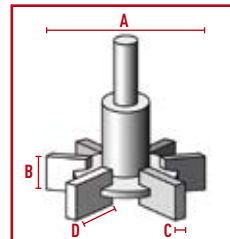
PTFE-jacketed stainless steel shaft, discoidal stirrer blade with six radial paddles completely made of PTFE, similar to a "Rushton Turbine" stirrer shaft. Universal chemical resistance since the product is only exposed to PTFE.

FDA conform

Length mm	Shaft dia. mm	Chucking dia. mm	Suitable for		Dimensions according to drawing				Cat. No.:
			NS	NW	A	B	C	D mm	
350	6	4	29/32		25	5	2	6,3	C 598-12
350	6	4	45/40		38	8	2	10	C 598-16
450	6	4	45/40		38	8	2	10	C 598-18
600	6	4	45/40		38	8	2	10	C 598-19
350	10	8		60	50	10	2	12,5	C 598-22
600	10	8		60	50	10	2	12,5	C 598-26
350	10	8		100	75	15	3	18,8	C 598-32
600	10	8		100	75	15	3	18,8	C 598-36
600	10	8		150	140	28	4	35	C 598-42
1.000	10	8		150	140	28	4	35	C 598-46
1.000	10	8		200	180	36	4	45	C 598-56
1.200	16	14		200	180	36	4	45	C 598-66

Applications:

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



Big effective circular diameter, but small vessel neck?

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

see pages 20 and 25

BOLA Double Impulse Stirrer Shafts

Material: PTFE
 Temperature resistance: from -100 °C to +240 °C
 Chemical resistance: +++ universal
 Stirring effect: bottom-up

Product description:

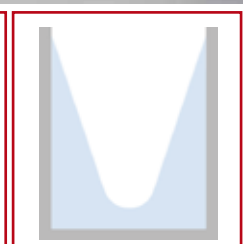
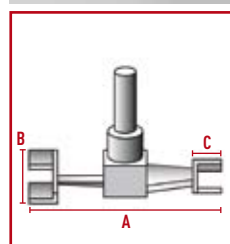
PTFE-jacketed stainless steel shaft, two paddles arranged crosswise at 90° completely made of PTFE. Upper paddle is fixed by means of clamp screws made of PEEK compound. Universal chemical resistance since the product is only exposed to PTFE.

FDA conform

Length mm	Shaft dia. mm	Chucking dia. mm	Distance of blades mm	Dimensions according to drawing			Cat. No.:
				A	B	C mm	
600	10	8	150	140	34	19	C 391-18
800	16	14	150	140	34	19	C 391-28
1.200	16	14	300	240	56	32	C 391-34

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
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Product description:

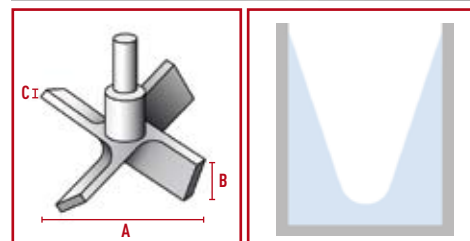
PTFE-jacketed stainless steel shaft, propeller completely made of PTFE with four 45° angled angular blades. Universal chemical resistance since the product is only exposed to PTFE.

FDA conform

Length mm	Shaft dia. mm	Chucking dia. mm	Dimensions according to drawing			Cat. No.:
			A	B	C mm	
350	8	6,5	50	18	4	C 484-18
600	8	6,5	100	20	5	C 484-22
450	10	8,0	75	20	5	C 484-32
600	10	8,0	75	20	5	C 484-34
600	10	8,0	100	20	5	C 484-36
800	10	8,0	140	22	6	C 484-40
1000	10	8,0	100	20	5	C 484-44
1000	16	14,0	200	25	8	C 484-50

Applications:

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



« »
Special Request?
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BOLA Mini-Propeller Stirrer Shafts

Material: PTFE Temperature resistance: from -200 °C to +250 °C Chemical resistance: +++ universal Stirring effect: bottom-up

Product description:

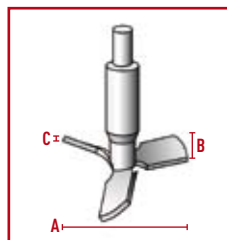
PTFE-jacketed stainless steel shaft, propeller completely made of PTFE with three 45° angled angular blades. Universal chemical resistance since the product is only exposed to PTFE.

FDA conform

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

Product description:

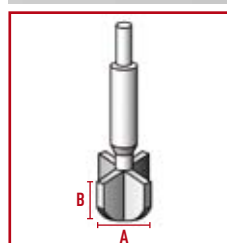
PTFE-jacketed stainless steel shaft, blade completely made of PTFE with four round paddles. Universal chemical resistance since the product is only exposed to PTFE.

FDA conform

Length mm	Shaft dia. mm	Chucking 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 narrow-mouth vessels, optimum mixture in round vessels and in vessels with low fill level.



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.



Dieter Waldhaus » Merck KGaA



BOLA Solo Stirrer Shafts

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

Product description:

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

FDA conform

Length mm	Shaft dia. mm	Chucking 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 for use together with BOLA Stirrer Blades which can be fixed individually on the Solo Stirrer Shaft. Also usable as stirring staff for manual stirring.



BOLA INNOVATION

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 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	Stirring effect: bottom-up
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A Type: BOLA Propeller Blades

FDA conform

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

Applications:

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

B Type: BOLA Impeller Blades

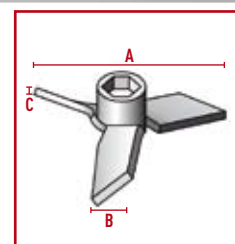
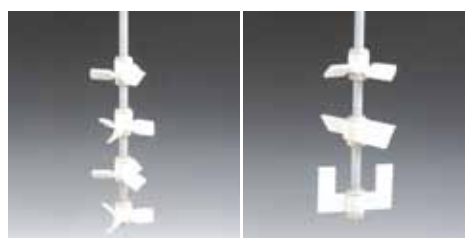
FDA conform

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

Applications:

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

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BOLA Stirrer Blades

Material: PTFE Temperature resistance: from -100 °C to +240 °C Chemical resistance: +++ universal Stirring effect: bottom-up

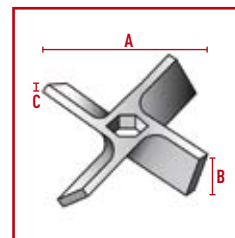
C Type: BOLA Propeller with 4 Blades

FDA conform

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

Applications:

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



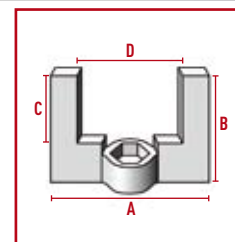
D Type: BOLA U-Shaped Blades

FDA conform

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



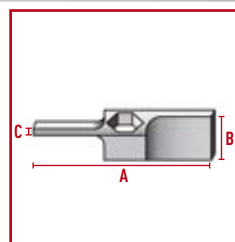
E Type: BOLA Paddle

FDA conform

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

Applications:

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



BOLA Stirrer Blades

Material: PTFE	Temperature resistance: from -100 °C to +240 °C	Chemical resistance: +++ universal	Stirring effect: bottom-up
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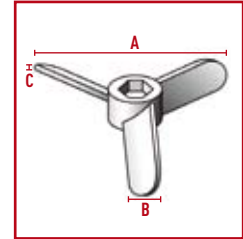
F Type: BOLA Maxi Propeller Blades

FDA conform

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

Applications:

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



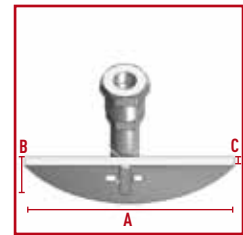
G Type: BOLA Moon-Shaped Blades

FDA conform

Shaft dia. mm	Dimensions according to drawing mm			For ground joint NS	Wrench size	Cat. No.:
	A	B	C			
8	65	18	3	24/29	15	C 442-08
10	90	24	3	29/32	19	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 52) and can be mounted additionally.



BOLA
Practical Tip

Marie-Luise Bender » final assembly

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

A BOLA Stirrer Shafts with Blade RCD

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 27.

FDA conform

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.



B BOLA Moon-Shaped Stirrer Shafts RCD

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 20.

FDA conform

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.



C BOLA Maxi Propeller Stirrer Shafts RCD

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 24.

FDA conform

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.



« »
Special Request?
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BOLA Stirrer Shafts with Reduced Chucking Diameter (RCD)

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

D BOLA Stirrer Shafts with One Paddle RCD

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. Blade dimensions see Cat. No. C 379-.. on page 21.

FDA conform

Length mm	Shaft dia. mm	Chucking dia. mm	Cat. No.:
1.000	16	10	C 579-18

Applications:

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



E BOLA Stirrer Shaft with Two Paddles RCD

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 28.

FDA conform

Length mm	Shaft dia. mm	Chucking dia. mm	Cat. No.:
600	16	10	C 580-14
800	16	10	C 580-16
1.000	16	10	C 580-18
1.200	16	10	C 580-20

Applications:

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



F BOLA U-Shaped Stirrer Shafts RCD

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 22.

FDA conform

Length mm	Shaft dia. mm	Chucking 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

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

BESTSELLER

Material: PTFE, PPS
 Temperature resistance: from -15 °C to +200 °C
 Chemical resistance: +++ universal

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.

FDA conform

Cone NS European standard	For stirrer shaft dia. mm	Total length mm	Thread of screw cap GL	Cat. No.:
19/26	6	63	18	C 424-04
19/26	8	65	25	C 424-05
24/29	8	69	25	C 424-08
24/29	10	70	25	C 424-09
29/32	6	72	18	C 424-12
29/32	8	74	25	C 424-13
29/32	10	72	25	C 424-14
45/40	10	80	25	C 424-16
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	PTFE and FKM-O-Ring	6 mm	GL 18	C 424-04 / C 424-12	C 425-69
		8 mm	GL 25	C 424-05 / C 424-08 / C 424-13	C 425-70
		10 mm	GL 25	C 424-09 / C 424-14 / C 424-16	C 425-71
		16 mm	GL 32	C 424-18	C 425-72
Replacement-Screw Caps	PPS	6 mm	GL 18	C 424-04 / C 424-12	C 425-82
		8 mm	GL 25	C 424-05 / C 424-08 / C 424-13	C 425-84
		10 mm	GL 25	C 424-09 / C 424-14 / C 424-16	C 425-86
		16 mm	GL 32	C 424-18	C 425-88



BOLA Glass Stirrer Bearings

BESTSELLER

Material: PTFE, PPS
 Temperature resistance: from -15 °C to +200 °C
 Chemical resistance: +++ universal

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.

FDA conform





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

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

Product description:

Combination of a borosilicate glass piece with ground joint, an interior PTFE shaft guide with integrated special gasket and a pressure screw made of PTFE with glass fibre. The FPM o-ring of the special gasket is compressed by the pressure screw and provides a good sealing of the stirrer shaft.

FDA conform

Cone NS	For stirrer shaft dia. mm	Total length mm ca.	Cat. No.:
29/32	8	108	C 426-08
29/32	10	108	C 426-09

Applications:

Perfect bearing for stirrer shafts made of stainless steel, glass and for BOLA Stirrer Shafts.



BOLA
Practical Tip

Raimund Heber » sales

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 176

BOLA Magnetic Stirrer Heads with Ground Joint (MRK)

Material: PTFE, PFA Temperature resistance: from -15 °C to +250 °C Chemical resistance: +++ universal Vacuum: 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 Magnetic Stirrer Heads with Flange (MRK)

Material: PTFE, PFA Temperature resistance: from -15 °C to +250 °C Chemical resistance: +++ universal Vacuum: suitable

Product description:

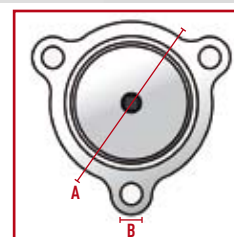
Gastight permanent magnetic coupling with ball bearing encapsulated in ceramics, square connection for cardan joint and flange NW 25. All products which are exposed to the medium do not contain any metals. The 8 mm shaft guide provides guidance without friction of stirrer shafts up to a speed of 800 rpm. The stirrer head can also be fixed directly into the chuck by mounting the included metal adaptor on the square connection (6 mm). Universal chemical resistance, since the product is only exposed to PTFE and PFA.



Torque Ncm	Flange NW	Viscosity up to mPas	Volume up to ml	Bolt circle dia. A mm	Bore dia B mm	Length mm	Cat. No.:
60	25	3.500	6.000	75	9	215	C 454-24

Applications:

For absolute vacuum.



BOLA INNOVATION

Magnetic Stirrer Heads

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

BOLA Special Stirrer Bearings

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

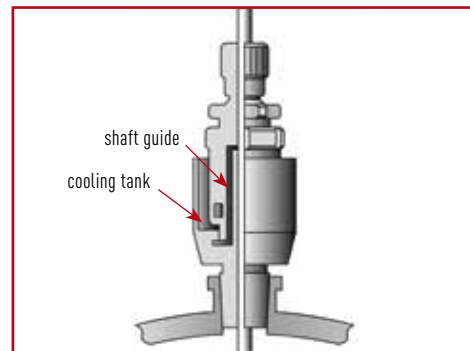
The 29/32 ground joint of these bearings provides a safe seat in the reactor lid. The stirrer shaft is held by an invisible shaft guide made of borosilicate glass which has an adjustable vacuum sealing. The stirrer can be adjusted in height by means of a lock nut. There is no abrasion. A cooling tank 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.

FDA conform


Ground Joint NS	For stirrer shafts 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	8 and 10 mm	C 430-20 / C 430-28	C 960-01	

BOLA Distributor with Stirrer Bearing

Material:	Temperature resistance:	Chemical resistance:	autoclave:
PTFE	from -15 °C to +200 °C	+++ universal	121°

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.

FDA conform

Dia. of stirrer shaft mm	Center neck GL	Lateral necks GL	For tubing O.D. 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
16	32	2 x 14	2 x 8	C 435-16

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. Suitable replacement parts for the Stirrer Bearing on page 38.



BOLA Stirrer Shafts for Magnetic Stirrer Heads

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

Product description:

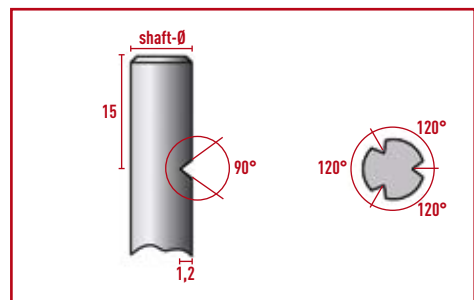
Ground and polished borosilicate stirrer shaft with integrated counterbores for the three stud screws of the rotor of the BOLA Magnetic Stirrer Head.

FDA conform

Length mm	Stirrer shaft dia. mm	Cat.No.:
400	10	C 492-16
600	10	C 492-24

Applications:

Accessory for BOLA Magnetic Stirrer Head (see page 44). Ideal for use together with BOLA Stirrer Blades which can be fixed individually. Shaft can be shortened on demand.



BESTSELLER**BOLA Magnetic Stirrer Heads (G-MRK)**

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



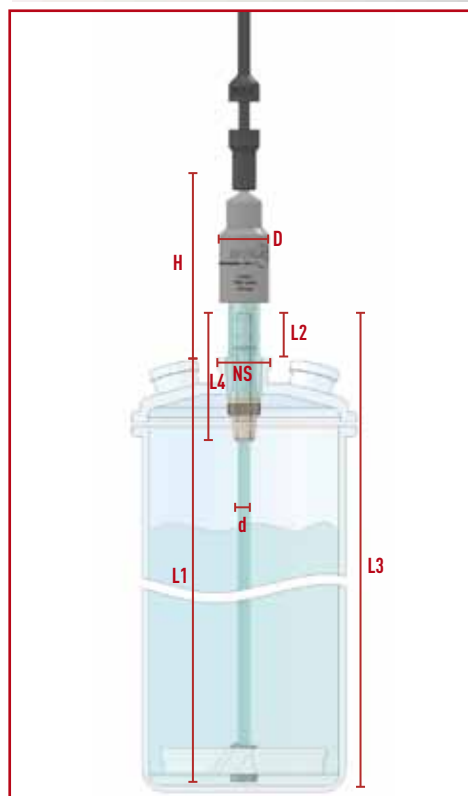
Stirrer shaft Ø d mm	Height H mm	Conductor NS	Top of ground joint to top of stirrer shaft mm L2	Insertion length of shaft mm L4	Cat.No.
6	90	19/26	20	63	C 512-08
8	148	29/32	33	97	C 502-08
10	148	29/32	33	97	C 502-16
8	140	45/40	25	97	C 504-08
10	140	45/40	25	97	C 504-16

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





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 NS 45/40	C 512-08 C 502-08 / C 502-16 C 504-08 / C 504-16	C 932-01 C 932-02 C 932-02	
Replacement-Conductors for Magnetic Stirrer Heads	Borosilicate glass	1 piece	NS 19/26 NS 29/32 NS 45/40	C 512-08 C 502-08 / C 502-16 C 504-08 / C 504-16	C 463-19 C 463-29 C 463-45	
Replacement-Rotor	PTFE-PEEK Compound	1 piece	NS 19/26 NS 29/32 NS 45/40	C 512-08 C 502-08 / C 502-16 C 504-08 / C 504-16	C 923-01 C 923-02 C 923-03	
Replacement-Lower Bearing	PTFE-GF	1 piece	NS 19/26 NS 29/32 NS 45/40	C 512-08 C 502-08 / C 502-16 C 504-08 / C 504-16	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 NS 45/40	C 512-08 C 502-08 / C 502-16 C 504-08 / C 504-16	C 929-01 C 929-02 C 929-03	
Replacement-Wearing Disc	PTFE-Glimmer	Pack size: 5 pieces	NS 19/26 NS 29/32 NS 45/40	C 512-08 C 502-08 / C 502-16 C 504-08 / C 504-16	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 45/40	C 502-08 / C 502-16 C 504-08 / C 504-16	C 933-01 C 933-02	



Magnet-Rührkupplungen

»» Dass die Magnet-Rührkupplungen sich außerhalb des Glasreaktors befinden, macht die Bedienung ganz einfach. Und mit den Magnet-Rührkupplungen kann sehr gut Vakuum gezogen werden. ««

Carina Cezanne » Merck KGaA



BOLA Magnetic Stirrer Heads (P-MRK)

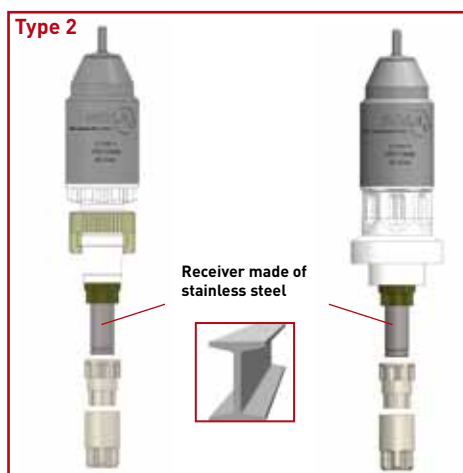
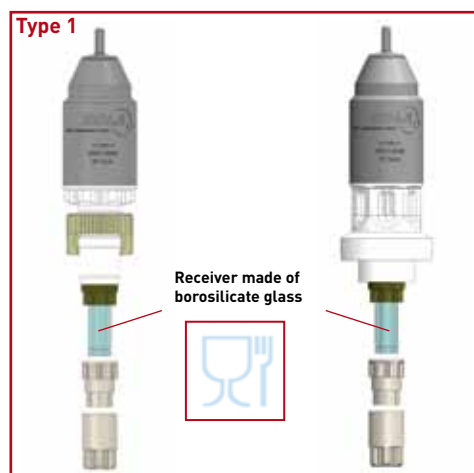
The Magnetic Stirrer Heads P-MRK are perfectly suitable for the use with PTFE-coated BOLA stirrer shafts with a shaft O. D. 8 or 10 mm. Power transmission is made from the agitator and the drive shaft onto the rotor magnet which is connected to the stirrer shaft. This way, the Magnetic Stirrer Head is a closed gas-tight system that is perfectly suitable for the use under vacuum. The sealing on the reactor lid is, depending on the model, either made through a ground joint cone (NS 29/32 or NS 45/40) or through a flat flange (DN40 or DN50) so that gases generated during the mixing process cannot exhaust.

A powerful power transmission of up to 90 Ncm and driving speeds of max. 1.500 rpm are optimal for all the different applications in laboratories and productions. BOLA Magnetic Stirrer Heads P-MRK do not require the use of grease and are made for long-term work. As the stirrer shaft is lead in a receiver that is connected to the drive shaft, neither the guiding nor the stirrer shaft are exposed to friction which could cause a pollution of the medium. All individual parts can be demounted for cleaning and exchanged, if necessary.

Depending on the application, BOLA Magnetic Stirrer Heads with ground joint or flat flange are available in the following versions:

Type 1 will be delivered with a receiver made of borosilicate glass. 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. This version is especially suitable for applications with chemically highly aggressive or highly pure products and biocompatible.

Type 2 will be delivered with a receiver made of stainless steel. Compared to glass, stainless steel is unbreakable and can be used with stirrer shafts made of other materials (such as stainless steel stirrer shafts). This version is 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.



BOLA Magnetic Stirrer Heads (P-MRK)

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

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 stainless steel. 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.



Receiver made of borosilicate glass (Type 1)

» universal chemical resistance

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



Receiver made of stainless steel (Type 2)

» robust construction

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

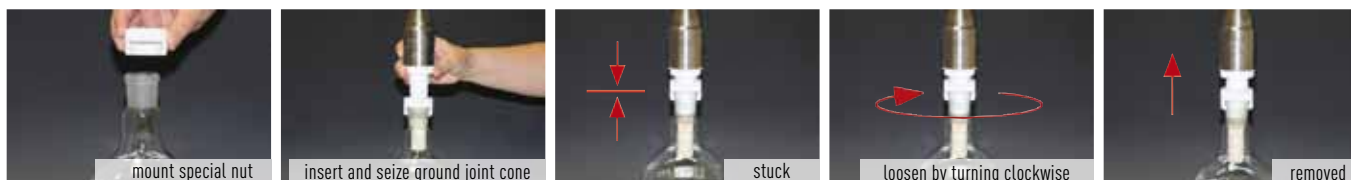
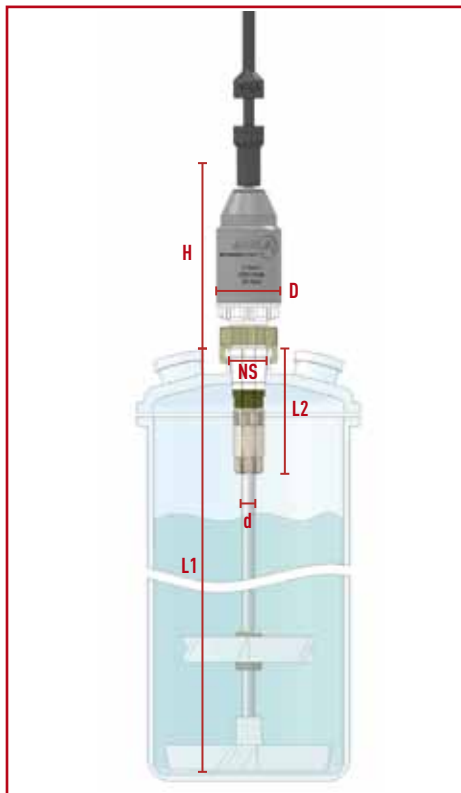


Product advantages:

- » 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 center ground joint.
- » L1 The max. shaft length corresponds to the internal height from the top of the ground joint to the vessel bottom.



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

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



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 stainless steel. 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.



Receiver made of borosilicate glass (Type 1)

» 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



Receiver made of stainless steel (Type 2)

» robust construction

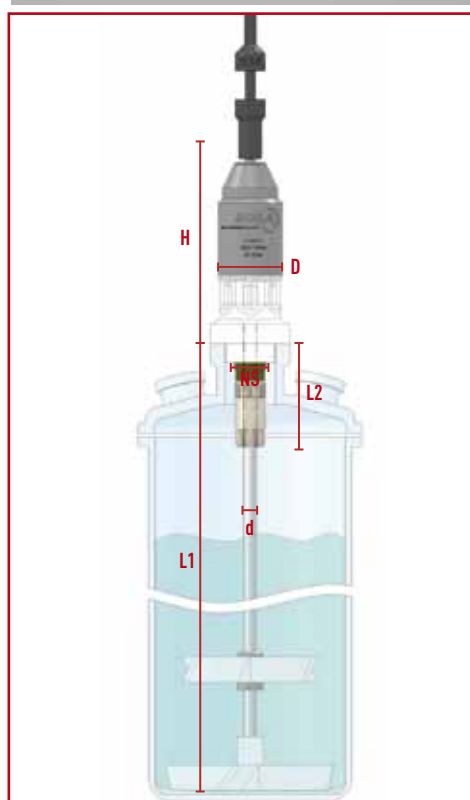
For stirrer shaft dia. d mm	Height H mm	Flat Flange DN	L2 Insertion length of shaft mm	Drive shaft D O.D. mm	Cat. No.
10	160	40	95	50	C 532-22
10	160	50	95	50	C 532-32

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.



BOLA INNOVATION

Metal-free Magnetic Stirrer Heads

Many chemicals react with metal magnetic stirrer heads. Therefore, all wetted parts of BOLA Magnetic Stirrer Heads 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		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-MRK	Borosilicate glass	1 piece		C 520-24 / C 520-28 / C 520-48 C 522-40 / C 522-50	C 936-01	
	Stainless steel	1 piece		C 530-08 / C 530-10 / C 530-15 / C 532-22 / C 532-32	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 520-28 / C 520-48 / C 522-40 / C 522-50 / C 530-10 / C 530-15 / C 532-22 / C 532-32	C 937-01 C 937-02	
Replacement-Clamp Ring P-MRK	PTFE-PEEK Compound	Pack size: 3 pieces		C 520-24 / C 530-08 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 927-01 C 927-01	
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 938-01	

BOLA GT Glass Stirrer Shafts

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

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.

FDA conform

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

Ernst Schweitzer » development

Protecting glass stirrer shafts effectively

For protection from 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 23

BOLA KPG Glass Stirrer Shafts

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

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.

FDA conform

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



Blocked: The blade does not tilt and cannot be removed from the vessel.

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.



How it should be: The blade has an excentric bore. It tilts and can easily be removed from the vessel.

BOLA Moon-Shaped Stirrer Blades

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

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

FDA conform

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

Applications:

For glass stirrer shafts and KPG glass stirrer shafts (Cat.No. C 375- ... on page 47).



BOLA Moon-Shaped Stirrer Blades

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

Product description:

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

FDA conform

Suitable for ml	For ground joint NS	Blade dimensions mm	Cat. No.:
100	24/29	50 x 18 x 3	C 402-07
100	29/32	50 x 24 x 3	C 402-09
250	24/29	65 x 18 x 3	C 402-14
250	29/32	68 x 24 x 3	C 402-16
500	24/29	75 x 18 x 3	C 402-19
500	29/32	75 x 24 x 3	C 402-21
1.000	29/32	90 x 24 x 3	C 402-24
2.000	29/32	110 x 24 x 3	C 402-26
4.000/6.000	29/32	125 x 24 x 3	C 402-31

Applications:

For glass stirrer shafts with one-sided pivot.



BOLA Moon-Shaped Stirrer Blades

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

Product description:

Completely made of PTFE, with double-sided groove.



FDA conform

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	C 400-06
100	8,5	29/32	50 x 24 x 3	C 400-08
250	8,5	24/29	65 x 18 x 3	C 400-12
250	8,5	29/32	68 x 24 x 3	C 400-14
500	8,5	24/29	75 x 18 x 3	C 400-16
500	8,5	29/32	75 x 24 x 3	C 400-18
1.000	8,5	29/32	90 x 24 x 3	C 400-20
2.000	8,5	29/32	110 x 24 x 3	C 400-22
2.000	12,5	45/40	125 x 35 x 3	C 400-24
4.000/6.000	8,5	29/32	125 x 24 x 3	C 400-26
4.000/6.000	12,5	45/40	145 x 35 x 4	C 400-28

Applications:

For glass stirrer shafts with double pivot, KPG glass stirrer shafts (Cat.No. C 387- ... on page 50) and PTFE-jacketed stainless steel stirrer shafts (Cat. No. C 376-... on page 20).



« »
Special Request?
+49 (0) 93 46-92 86-0

BOLA Centrifugal Stirrer Blades

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

Product description:

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

FDA conform

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 25).

Special Request?
+49 (0) 93 46-92 86-0



BOLA Bolts and Clamp Rings

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

Product description:

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

A Cylindrical shape

FDA conform

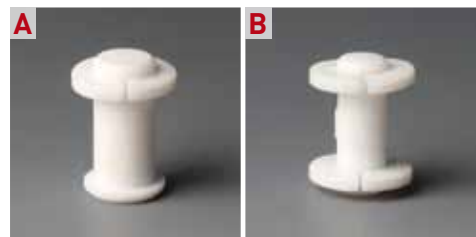
Bolt dia. mm	Usable length mm	For blades with bore dia. mm	Cat. No.:
6	12	6,5	C 410-02
12	16	12,5	C 410-06

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 52).





BOLA Stirring Bars



What you should know about magnetic stirring and mixing

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.

What you should know about the choice of stirring bars

Improperly selected stirring bars are 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.

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.

Ultra Magnetic Stirring Bars:

These magnetic stirring bars have very smooth and seamless surfaces. No substance can penetrate into their surfaces and thus, all following processes are not affected by any „carry-over“. They are mainly used for high-purity work or trace analysis

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.



HELPFUL: page 293
Detailed information on magnetic stirring

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.

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.

Star Head Magnetic Stirring Bars:

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

Center 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 +/- 5% in length and +/- 10% in diameter.



Results of stirring – tested for you

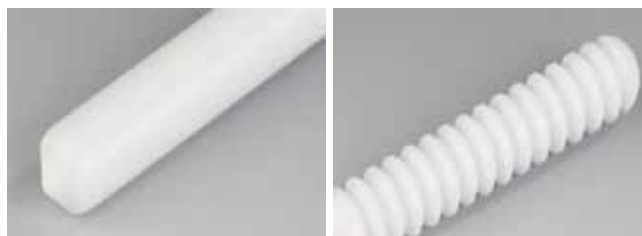
In order to help you choose the suitable magnetic stirring bar for your application, we have made tests with these data under real conditions. You will find graphs for each magnetic stirring bar on the next pages.

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



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 +/- 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

BESTSELLER

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

Product description:

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



Length mm	Dia. mm	Cat. No.:	Length mm	Dia. mm	Cat. No.:
2	2	C 350-01	30	6	C 350-21
3	3	C 350-02	30	7	C 350-22
5	2	C 350-03	30	10	C 350-41
6	3	C 350-04	35	6	C 350-23
7	2	C 350-05	40	7	C 350-24
8	2	C 350-06	40	8	C 350-25
8	3	C 350-07	40	10	C 350-26
10	3	C 350-08	45	8	C 350-27
10	6	C 350-09	50	7	C 350-28
12	4,5	C 350-10	50	8	C 350-29
13	3	C 350-11	55	12	C 350-30
15	2	C 350-12	60	7	C 350-31
15	4,5	C 350-13	60	9	C 350-32
15	6	C 350-14	70	9	C 350-33
20	3	C 350-15	70	13	C 350-34
20	6	C 350-16	80	10	C 350-35
20	7	C 350-17	110	27	C 350-36
25	5	C 350-18	120	12	C 350-37
25	6	C 350-19	127	12	C 350-38
25	7	C 350-20	155	27	C 350-39

Applications:

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

Special Request?
+49 (0) 9346-9286-0



BOLA Square Magnetic Stirring Bars

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

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 Magnetic Stirring Bars with Pivot Ring

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

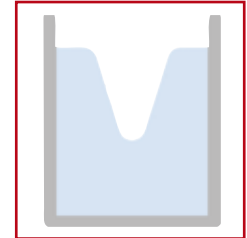
Product description:
PTFE-encapsulated magnetic core (Alnico 5), cylindrical shape with pivot ring, universal chemical resistance.

FDA conform

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 Practical Tip

Uwe Hossfeld » application engineering

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 62

BOLA Magnetic Stirring Bar Set

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

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

FDA conform

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 Triangular Magnetic Stirring Bars

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

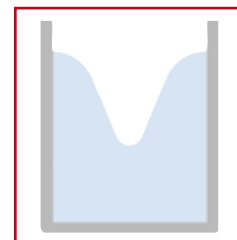
Product description:
 PTFE-encapsulated magnetic core (Alnico 5), universal chemical resistance.

FDA conform

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

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

FDA conform

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.



BOLA Power Magnetic Stirring Bars

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

Product description:

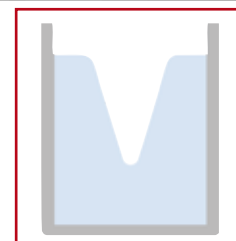
PTFE-encapsulated magnetic core made of a very strong magnetic material (rare earth magnet samarium-cobalt), torque loads transmitted are about 4 times larger than those of conventional magnetic stirring bars. No risk of demagnetization, sterilisable, extremely smooth surface avoiding contaminations,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

FDA conform

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

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 Ultra Magnetic Stirring Bars

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

Product description:

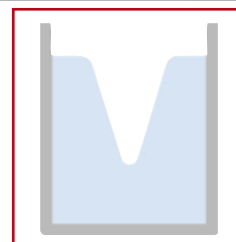
PTFE-encapsulated magnetic core (Alnico 5), extremely smooth and seamless surfaces, no substance can penetrate, universal chemical resistance.

FDA conform

Length mm	Dia. mm	Cat. No.:
10	6	C 353-10
15	5	C 353-15
20	7	C 353-20
25	5	C 353-25
30	5	C 353-30
40	7	C 353-40

Applications:

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





BOLA Magnetic Stirring Bar Retrievers

BESTSELLER

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

Product description:

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



FDA conform

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

Product description:

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

FDA conform

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 heaving stirring bars up to 400 g.



BOLA Glass Magnetic Stirring Bars

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

Product description:

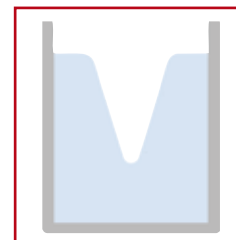
Magnetic core (Alnico 5) encapsulated in borosilicate glass, cylindrical shape, extremely smooth surface prevents from penetration of substances, non-porous, non-contaminating, universal chemical resistance.

FDA conform

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**

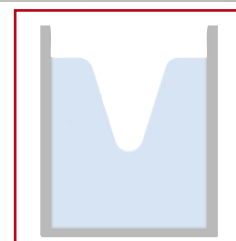
Product description:

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:

For better distinction.



BOLA Star Head Magnetic Stirring Bars

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

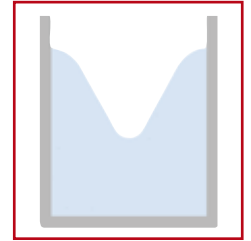
Product description:
PTFE-encapsulated magnetic core (Alnico 5), universal chemical resistance.

FDA conform

	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 Tipp

Uwe Hossfeld » application engineering

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

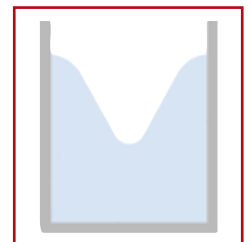
Product description:
PTFE-encapsulated magnetic core (Alnico 5), universal chemical resistance.

FDA conform

	Length mm	Dia. of discs mm	Cat. No.:
	37	20	C 359-03
	55	20	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

Product description:

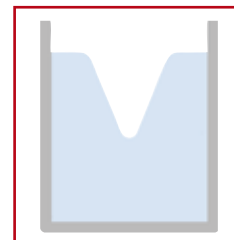
PTFE-encapsulated magnetic core (Alnico 5), conically tapered ends, universal chemical resistance.

FDA conform

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

Applications:

Extremely steady mixing due to small center seat.



HELPFUL: page 293
Detailed information on
magnetic stirring

BOLA Crosshead Magnetic Stirring Bars

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

Product description:

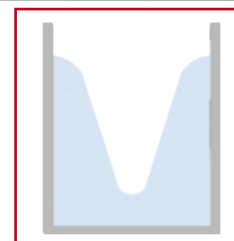
PTFE-encapsulated magnetic core (Alnico 5), universal chemical resistance.

FDA conform

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	13	C 369-25
32 x 32	14	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

Product description:

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

FDA conform

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

Product description:

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

FDA conform

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

Product description:

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

FDA conform

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

Product description:

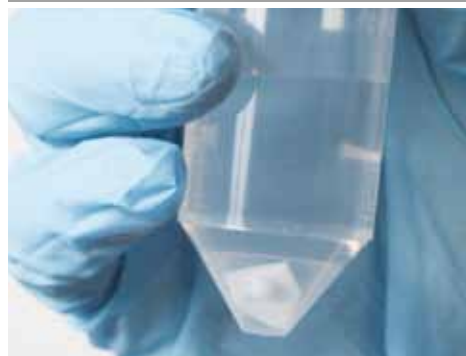
PTFE-encapsulated magnetic core (Alnico 5), tapered blade with fixed cylindrical stirring bar, universal chemical resistance.

FDA conform

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 Beakerliner

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

Product description:

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

FDA conform

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 baffle and thus provides optimum mixing results.



BOLA INNOVATION

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

Product description:

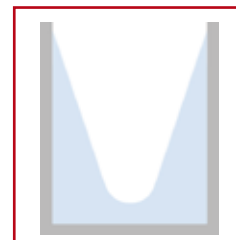
PTFE-encapsulated magnetic cores (Alnico 5), center bore for receiving the BOLA Bearing Neck or a glass neck (available from a glassblower), universal chemical resistance. Bearing neck not included in delivery.

FDA conform


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 75)



BOLA Tweezers

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

Product description:

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

FDA conform

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

Product description:

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

FDA conform

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



« »
Special Request?
+49 (0) 93 46-92 86-0

BOLA Scrapers

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

Product description:

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

FDA conform

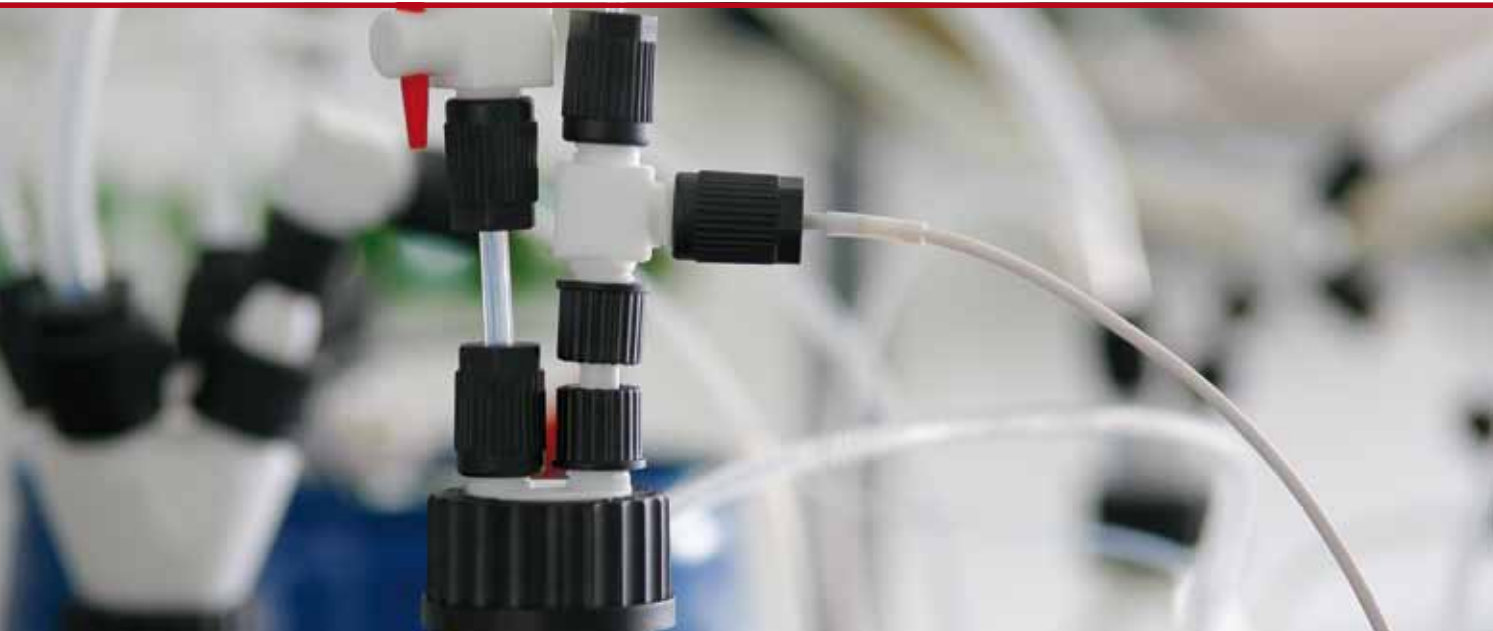
Total length mm	Width of blade mm	Dia. of handle mm	Cat. No.:
160	50	20	H 916-02
200	90	20	H 916-06
200	120	20	H 916-08

Applications:

For a very gentle peeling of products.



Screw Joints / Components with GL-Threads



71

SCREW JOINTS / COMPONENTS WITH GL THREAD

Tailored equipment in a few quick and incomplex steps:
with easily combinable screw joint elements from
BOLA you can flexibly react to all current requirements.

PRODUCT TIPS



Page 80:
Multiple Distributors for Bottles



Page 75:
Laboratory Screw Joints HT
(High Temp)



Page 84:
Flexible Distributors

The Modular Construction System

What you should know about the GL screw joint system:

The GL thread is the most common thread on lab equipment made of glass. BOLA offers a modular construction system with many different components with GL threads. All components can be combined and thus allow an easy transition from glass to plastic accessories.

Using BOLA Laboratory Screw Joints you can simply connect tubes or tubing made of glass, metall or plastics directly to GL threaded sockets, no matter whether it is an reactor lid made of glass or a BOLA GL-Fitting in PTFE or a bottle distributor made of PP.

Being assembled of sealing ring, tapered ring and v-ring, BOLA Laboratory Screw Joints provide a tight connection which is suitable for pressure and vacuum applications.

Furthermore, by exchanging the inner parts only, tubing with different outer diameters can be connected to the same GL thread. This way you can connect e. g. to a GL 14 thread tubing with an outer diameter from 0,8 to 8,00 mm. This system allows also to use BOLA GL Fittings for the assembly of a tubing reduction.

GL Tube-Fitting
Cat. No.: D 538-14
see page 110



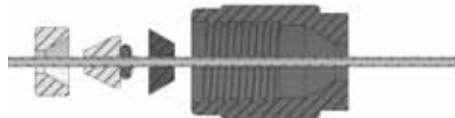
or

Glass thread GL 14



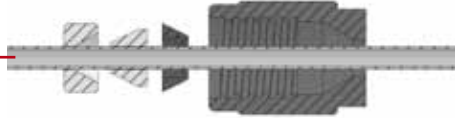
Laboratory Screw Joint HT

Cat. No.: D 628-26
see page 77



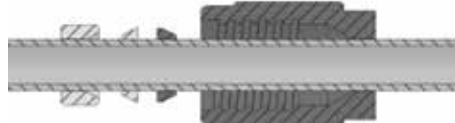
Laboratory Screw Joint HT

Cat. No.: D 628-66
see page 77



Laboratory Screw Joint HT

Cat. No.: D 628-82
see page 77



All advantages at a glance:

- » easily screwable without any tooling
- » optionally extensible
- » independent from tubing diameters
- » compatible with glass equipment with GL thread
- » many creative possibilities
- » no determination at the beginning of assembly

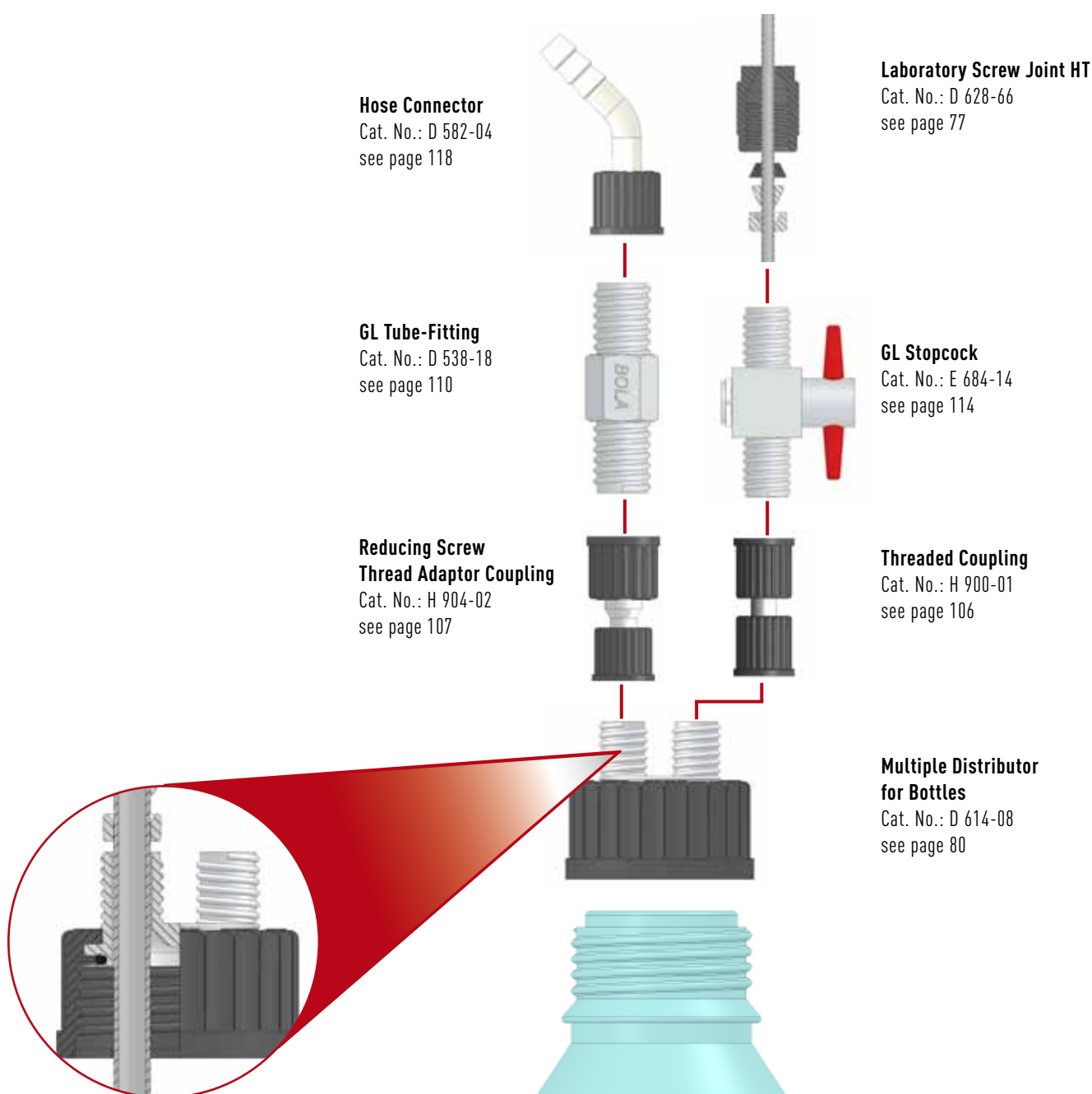
What you should know about the GL screw joint system:

But 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:



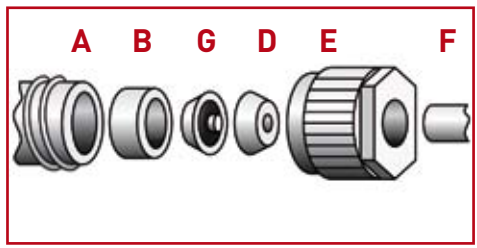
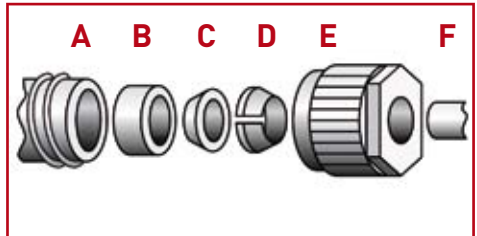
By means of Multiple Distributors for Bottles and Laboratory Screw Joints, tubes and tubing can be inserted to the bottom of the flask and fixed in any requested height.

The GL Screw Joint System



Component parts:

- 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 110
- B** 3 pieces of Laboratory Screw Joints HT GL 14 for tubing O.D. 6 mm, Cat. No. D 628-74, see page 77

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 111
- B** 1 piece of Laboratory Screw Joints HT GL 14 for tubing O.D. 6 mm, Cat. No. D 628-74, see page 77
- C** 1 piece of Laboratory Screw Joints HT GL 14 for tubing O.D. 2 mm, Cat. No. D 628-34, see page 77

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 302).

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 75) 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 154.

BOLA Laboratory Screw Joints

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

Product description:

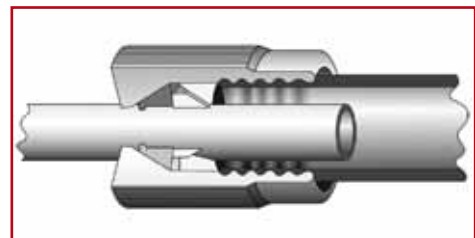
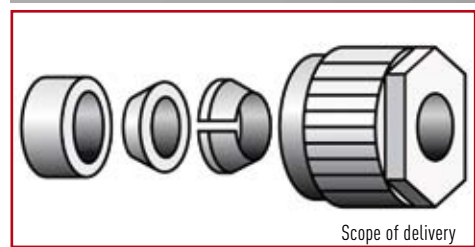
Red screw cap made of glass-fibre reinforced ETFE, inner parts consisting of a v-ring (ETFE), a tapered ring and a sealing ring (both PTFE) as well as an o-ring (FKM) for tubing diameters under 3 mm (not exposed to the medium). Very good chemical resistance, suitable for temperatures from -50°C to +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

FDA conform

For tubing O.D. mm	Thread GL 14 Cat. No.:	Thread GL 18 Cat. No.:	Thread GL 25 Cat. No.:
(1/32") 0,8	D 593-02		
1,0	D 593-04		
(1/16") 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
(1/8") 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
(1/4") 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

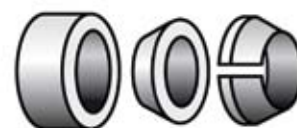
Material: PTFE, ETFE	Temperature resistance: from -50 °C to +150 °C	Chemical resistance: +++ universal	Pressure: 10 bar	Vacuum: suitable
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Product description:

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.

FDA conform

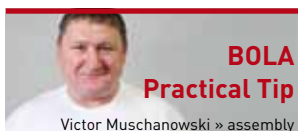
For tubing O.D. mm	Thread GL 14 Cat. No.:	Thread GL 18 Cat. No.:	Thread GL 25 Cat. No.:
(1/32") 0,8	D 598-02		
1,0	D 598-04		
(1/16") 1,6	D 598-06	D 598-26	
2,0	D 598-10	D 598-30	
2,4	D 598-12		
3,0	D 597-02	D 597-10	D 597-22
(1/8") 3,2	D 597-08	D 597-20	D 597-24
4,0	D 597-04	D 597-12	D 597-26
6,0	D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



Scope of delivery

76

SCREW JOINTS / COMPONENTS WITH GL THREAD



BOLA Practical Tip

Victor Muschanowski » assembly

For an easier assembly of laboratory screw joints:

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



SUITABLE: page 154
Tubing for all screw joints.

BOLA Replacement Caps

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

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 -20 °C to +250 °C
 Chemical resistance: +++ universal
 Pressure: 10 bar
 Vacuum: suitable

Product description:

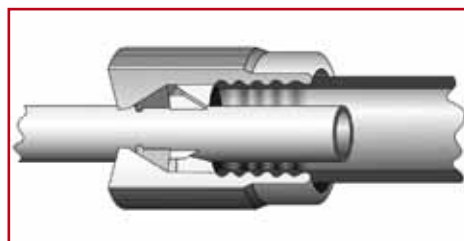
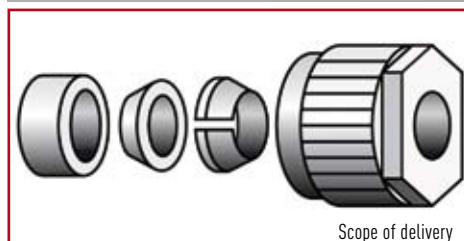
Black screw cap made of PPS, inner parts consisting of a v-ring (PPS), a tapered ring and a sealing ring (both PTFE) as well as an o-ring for tubing diameters under 3 mm (not exposed to the medium). Good chemical resistance, suitable for temperatures from -20°C to + 250°C.

FDA conform

For tubing O.D. mm	Thread GL 14 Cat. No.:	Thread GL 18 Cat. No.:	Thread GL 25 Cat. No.:	Thread GL 32 Cat. No.:	Thread GL 45 Cat. No.:
(1/32") 0,8	D 628-10				
1,0	D 628-18				
(1/16") 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		
(1/8") 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
(1/4") 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
(3/8") 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
(1/2") 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
(3/4") 19,5				D 631-84	
20,0				D 631-88	D 632-60
22,0					D 632-68
(1") 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

One for many

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.



Laboratory Screw Joints

» A quick assembly without any tools is important for us, also for connecting tubes. BOLA Screw Joints offer a high chemical resistance and are absolutely tight if assembled with BOLA tubing. «

Hans Kneuss » Glass Technology

BOLA Replacement Inner Parts HT (High Temp)

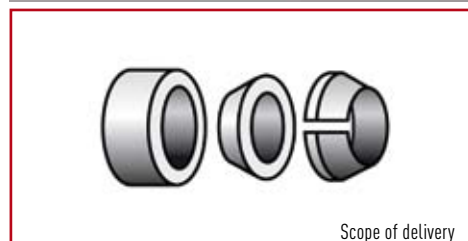
Material: PTFE, PPS	Temperature resistance: from -20 °C to +250 °C	Chemical resistance: +++ universal	Pressure: 10 bar	Vacuum: suitable
------------------------	---	---------------------------------------	---------------------	---------------------

Product description:

Consisting of a v-ring (PPS), a tapered ring and a seating 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.

FDA conform

For tubing O.D. mm	Thread GL 14 Cat. No.:	Thread GL 18 Cat. No.:	Thread GL 25 Cat. No.:	Thread GL 32 Cat. No.:	Thread GL 45 Cat. No.:
(1/32") 0,8	D 638-10				
1,0	D 638-18				
(1/16") 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		
(1/8") 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
(1/4") 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
(3/8") 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
(1/2") 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
(3/4") 19,05				D 641-84	
20,0				D 641-88	D 642-60
22,0					D 642-68
(1") 25,4					D 642-74
26,0					D 642-76
30,0					D 642-84
32,0					D 642-90



Scope of delivery

BOLA Fork Wrenches

Material: PA	Temperature resistance: from -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 Caps HT (High Temp)

Material: PPS
 Temperature resistance: from -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	0,8 - 10,0	D 634-20
25	0,8 - 10,0	D 634-30
25	10,1 - 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 -200 °C to +250 °C
 Chemical resistance: +++ universal

Product description:

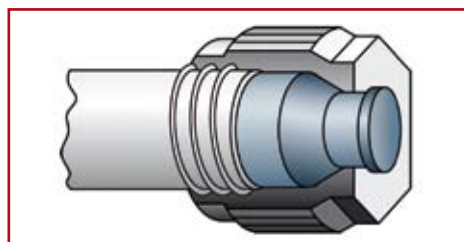
Plugs completely made of PTFE, suitable for replacement caps made of ETFE and PPS. The plug is inserted into the cap and snaps in as soon as the cap is tightened. It can easily be removed for cleaning.

FDA conform

Thread GL	Bore dia. mm	Suitable for cap Cat. No.:	Suitable for cap Cat. No.:	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

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 154) or tubes made of different materials (glass, metal, plastic) by means of BOLA Laboratory Screw Joints (see page 77).

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.

BOLA Multiple Distributors for Bottles

BESTSELLER

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

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

FDA conform

Material	Necks GL	Cat. No.:
PFA	2 x 14	D 614-08
PTFE	3 x 14	D 615-08

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

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.

FDA conform

Necks GL	Cat. No.:
2 x 14	D 612-08
3 x 14	D 613-08

Applications:

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



BOLA Multiple Distributors with Stopcocks

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

Product description:

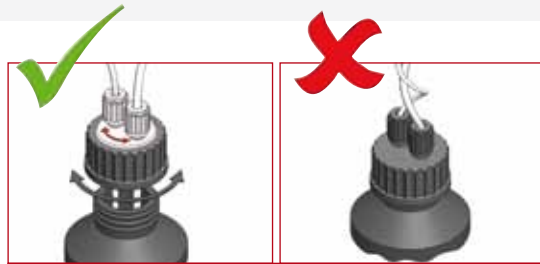
Black screw cap made of PPS for bottle thread GL 45, body made of PTFE. Each neck with stopcock. Tubing can not be inserted through the stopcocks. Bores with press fit on the lower side allow the connection of tubing with O.D. 6 mm so that a connection to the bottom can be made. Very good chemical resistance,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

FDA conform

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.



BOLA Multiple Distributors with Stopcock

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

Product description:

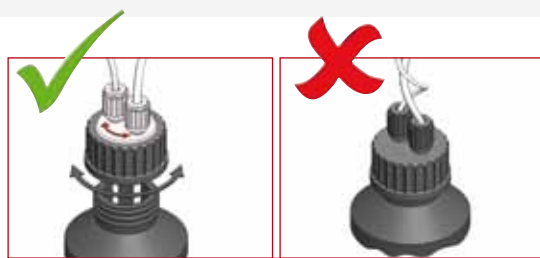
Black screw cap made of PPS for bottle thread GL 45, body made of PTFE. One stopcock for all connectors. Very good chemical resistance.

FDA conform

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

Applications:

Drawing or inserting aggressive or pure liquids.



BOLA Multiple Distributors for Bottles

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

Product description:

Blue screw cap made of PPS for bottle thread 38/430, body made of PTFE. One GL 18 neck for inserting tubing with a max. O.D. of 10 mm, additional opening for aeration with PTFE-membrane (2,5µm). Very good chemical resistance.

FDA conform

For thread	For tubing O.D. max. mm	Necks	Cat. No.:
38/430	10	1 x GL 18 and aeration	D 650-08

Applications:

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



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Multiple Distributors for Bottles

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

««

Krzysztof Kucias » Hitec Zang GmbH



BOLA INNOVATION

Multiple Distributors for Bottles

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

BOLA Multiple Distributors for Bottles

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

Product description:

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

FDA conform

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

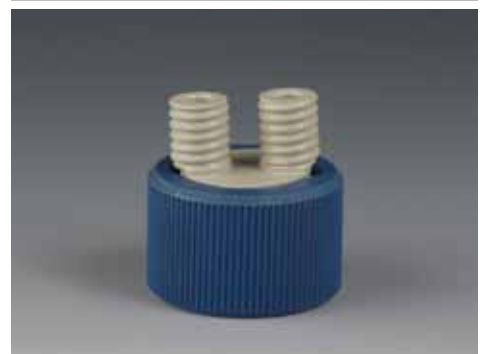
Material:	Temperature resistance:	Chemical resistance:	Vacuum:	autoclave:
PP	from -0 °C to +110 °C	++ very good	suitable	121°

Product description:

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

FDA conform

For thread	For tubing O.D. max. mm	Necks	Cat. No.:
38/430	2 x 6	2 x GL 14	D 652-08



BOLA Multiple Distributors for Bottles

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

Product description:

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

FDA conform

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

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

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

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

« »
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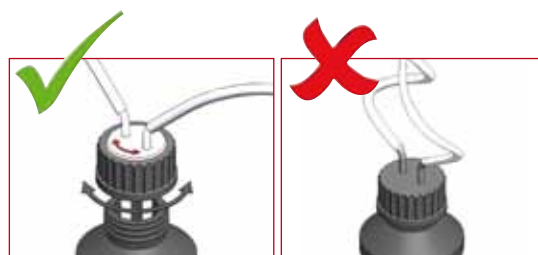


BOLA Flexible Distributors

BOLA Flexible Distributors have especially been developed for the connection of elastic tubing such as silicone, Viton® or Tygon®. They consist of a screw cap for bottle thread GL 45 or GLS 80 and a free movable distributor body with hose connectors on the top and bottom side.

Elastic tubing can be easily put on the hose connectors for a continuous connection to the bottom of the bottle. Bent hose connectors prevent bends in the tubing.

The body of the distributor can be turned independently from the screw cap. This means, the tubing will not be disarranged when the distributor is fixed on another bottle.



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

Product description:

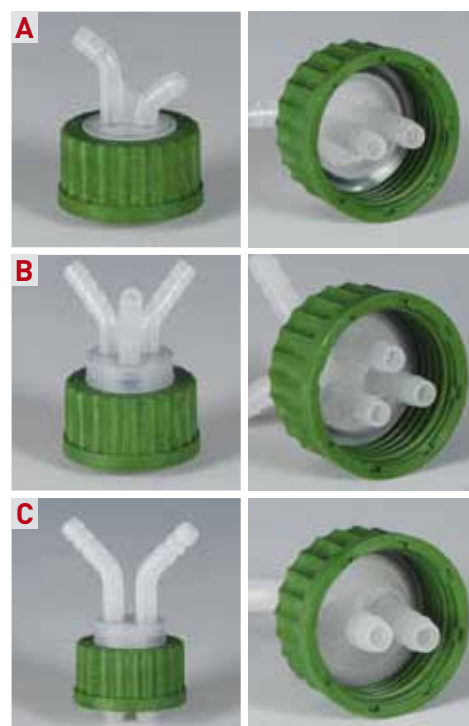
Screw cap green made of PP for bottle thread GL 45 and distributor body with hose connectors made of PP. Bent hose connectors on the upper side, straight hose connectors on the bottom side. Restricted chemical resistance, for working temperatures up to max. +110 °C.

FDA conform

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

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.

FDA conform

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

Anwendungen:

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



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

Product description:

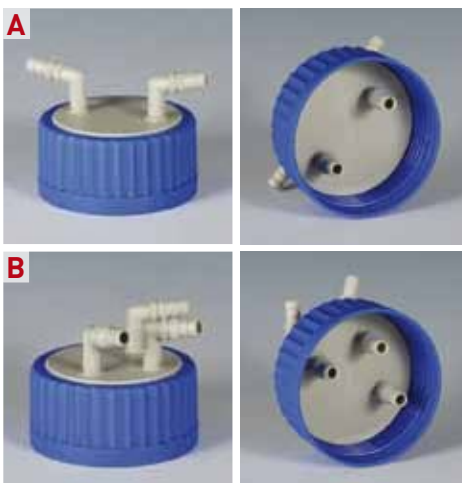
Screw cap blue made of PP for bottle thread GLS 80 and distributor body with hose connectors made of PP. Bent 2-step hose connectors on the upper side, straight hose connectors on the bottom side. Restricted chemical resistance, for working temperatures up to max. +110 °C.

FDA conform

	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

Applications:

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



« »
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BOLA GL Reductions

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

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.

FDA conform

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



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

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.

FDA conform

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



Applications:

For connecting or inserting tubing, tubes or probes.

BOLA Threaded Adaptors

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

Product description:

Allow the use of BOLA Multiple Distributors for Bottles (see page 83) 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:

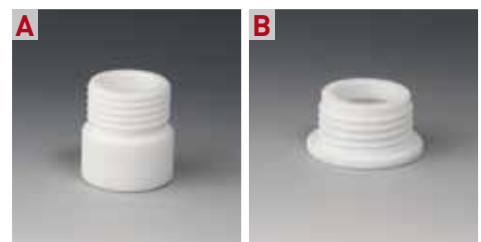
Transition from GL 32 to GL 45
 Suitable for bottles with GL 32 thread, e.g. from Duran Group (formerly Schott AG)

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

FDA conform

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





BOLA offers custom manufacture.

Every lab is different. By offering an extensive range of established and sophisticated standard solutions we take into account the varied requirements of the respective branches and sectors.

But maybe you are looking for something special? Something that is not included in our standard product range?

In that case we are able to offer an individual custom manufacture. This is easier and faster than you may expect. Discuss your idea with our professionals. They will give advise and support during design. Finally, your idea will become real: We produce as per your requirements and in compliance with the chosen raw materials – already from 1 piece.

We only need a drawing (a sketch is sufficient) and some further information.

» **You have a special request?**

Give us a call: +49 (0) 93 46-92 86-0.



BOLA Distributors for Reaction Vessels

Suitable for bottles with GLS 80 thread from Duran Group (formerly Schott AG).

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 77). 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 118).

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: +++ universal	Vacuum: suitable	autoclave: 121°
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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)

FDA conform

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



BOLA Distributors for Reaction Vessels (R)

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

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 39) with screw cap (PPS page 41) 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)

FDA conform

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

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BOLA INNOVATION

Multiple Distributors for Bottles

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

BOLA Distributors for Reaction Vessels (S)

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

Product description:

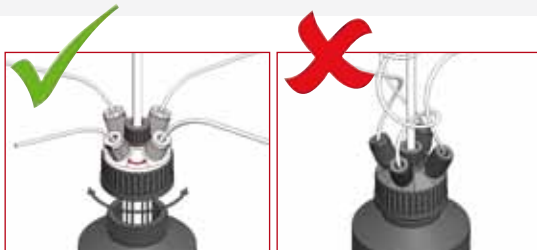
Blue screw cap made of PP with GLS 80 thread, body made of PP with center ground joint and lateral GL-threaded necks. Restricted chemical resistance, for working temperatures up to max. +110°C

FDA conform

Lateral necks GL	Center neck NS	For tubing O.D. max. mm	Cat. No.:
4 x 18	29/32	4 x 10	D 746-16

Applications:

Drawing or inserting aggressive or pure liquids. Inserting tubing, tubes and probes into vessels. Use of a stirrer bearing (see page 38) in center neck for central position of a stirrer shaft.



SUITABLE: page 154
Tubing for all screw joints.

BOLA Multiple Distributors for Bottles

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

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

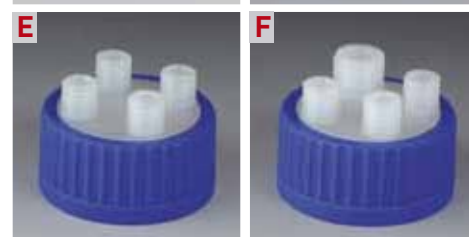
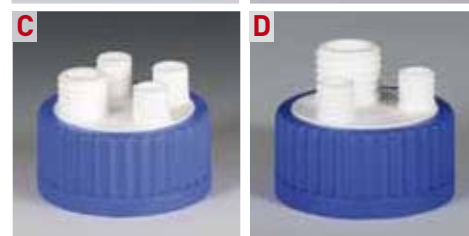
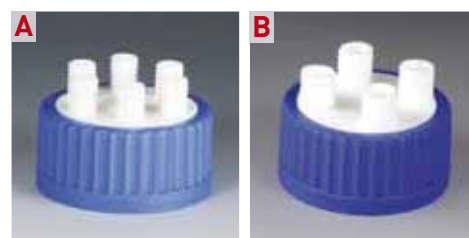
FDA conform

	For tubing O. D. max. mm	Necks	Cat. No.:
A	6 x 8,0	6 x GL 14	D 754-08
B	4 x 12,7	4 x GL 18	D 754-16
C	3 x 12,7 / 1 x 14	3 x GL 18 / 1 x GL 25	D 754-24
D	2 x 12,7 / 1 x 21	2 x GL 18 / 1 x GL 32	D 754-36

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	4 x 12,7	4 x GL 18	D 750-16
F	3 x 12,7 / 1 x 14	3 x GL 18 / 1 x GL 25	D 750-24



BOLA Screw Caps High Chem

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

FDA conform

	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 GLS Reductions

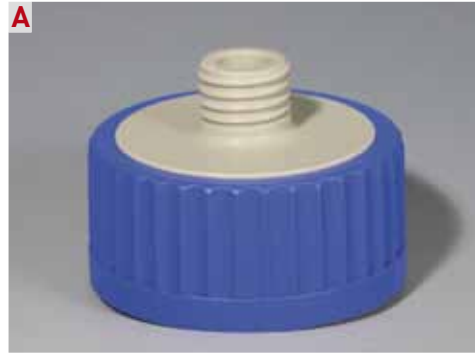
Material: **PP** Temperature resistance: **from 0 °C to +110 °C** Chemical resistance: **++ very good**

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.

FDA conform

	From Cap GLS	Reducing thread GL	For tubing-Ø mm	Cat. No.:
A	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, PSU** Temperature resistance: **from -45 °C to + 180°C** Chemical resistance: **+ good**

Product description:

White screw cap made of PSU, movable reduction body made of PTFE 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.

FDA conform

	From Cap GLS	Reducing thread GL	For tubing-Ø mm	Cat. No.:
B	80	14	0,8 - 8,0	D 788-08
	80	18	1,6 - 10,0	D 788-16
	80	25	1,6 - 14,0	D 788-24
	80	45	3,2 - 32,0	D 788-40



BOLA GLS-Reduction

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

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.

FDA conform

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





BOLA Distributors for Canisters

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 304) 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 77). 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.

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

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.

FDA conform

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



BOLA Distributors for Canisters

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

» Type with screw cap made of PE and body made of PTFE.

	Canister thread S	Necks GL	Cat. No.:
B	55	2 x 14 / 1 x 18	D 762-08
C	60	2 x 18	D 762-14
D	60	3 x 18	D 762-20
E	65	2 x 18	D 762-26
F	65	3 x 18	D 762-32
G	71	2 x 18 / 1 x 25	D 762-38
H	90	3 x 18 / 1 x 25	D 762-44
I	Nalge B53	2 x 14	D 766-16
J	Nalge B83	3 x 18 / 1 x 25	D 766-22

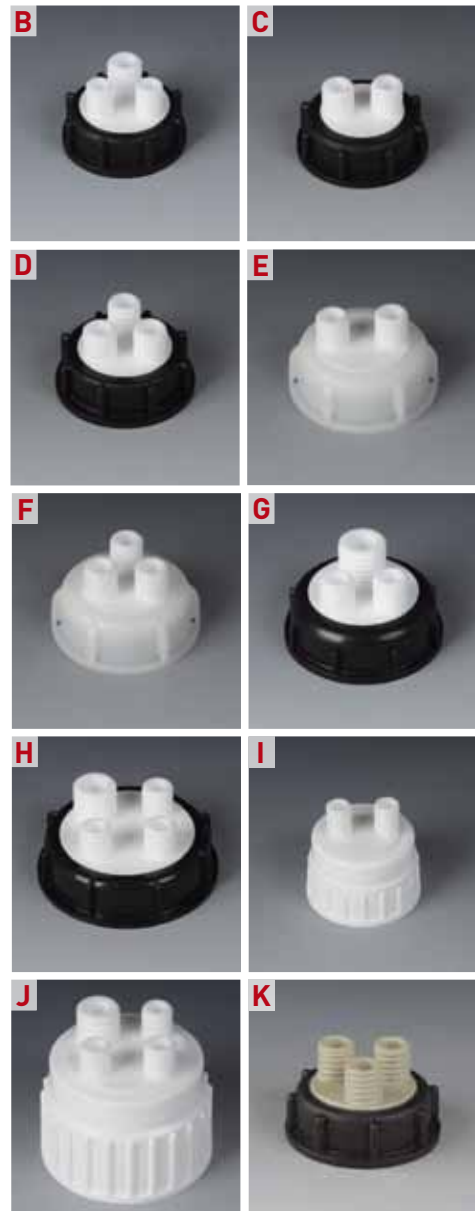
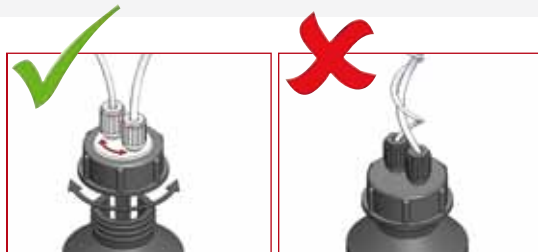
Material:	Temperature resistance:	Chemical resistance:	autoclave:
PP	from 0°C to +110°C	++ very good	121°

» Type with screw cap made of PE and body made of PP.

	Canister thread S	Necks GL	Cat. No.:
K	55	2 x 14 / 1 x 18	D 764-16
	60	3 x 18	D 764-24

Applications:

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



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BOLA Multiple Distributors for Barrels

These distributors are ideal for drawing liquids from barrels and for distributing these liquids to several vessels. They consist of a screw cap for barrels with female thread and a movable body with 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 77). Liquids can be drawn from the barrel without contamination of the ambient air by leaking vapours. In addition, the distributor can be integrated in a pressure or vacuum system.

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 barrel without the risk of disarranging the tubing.

For easy determination of the suitable distributor, you can find the dimensions of the barrel threads on page 305.

BOLA Multiple Distributors for Barrels

Material:	Temperature resistance:	Chemical resistance:	Pressure:	Vacuum:	autoclave:
PTFE	from -20°C to +200°C	+++ universal	1 bar	suitable	121°

Product description:

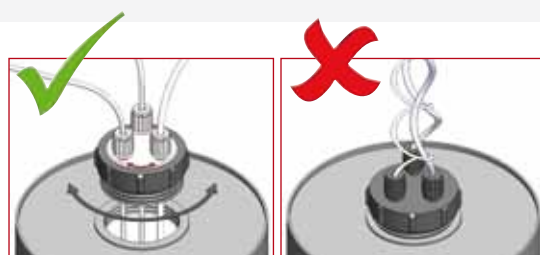
Screw cap made of glass-fibre reinforced PTFE for barrels with female thread, body with GL-threaded necks made of PTFE. Very good chemical resistance, for working temperatures up to max. + 200°C. The product is only exposed to PTFE.

FDA conform

For female barrel thread	Necks GL	For tubing O.D. max. mm	Cat. No.:
R2"/ G2"/ BSP 2"	3 x 14	8	D 696-06
R2"/ G2"/ BSP 2"	4 x 18	10	D 696-08
R2"/ G2"/ BSP 2"	2 x 18 / 1 x 25	2 x 10 / 1 x 14	D 696-14
Mauser 2"	4 x 18	10	D 697-08
Mauser 2"	2 x 18 / 1 x 25	2 x 10 / 1 x 14	D 697-14
Tri-Sure 2"	3 x 14	8	D 698-06
Tri-Sure 2"	4 x 18	10	D 698-08
Tri-Sure 2"	2 x 18 / 1 x 25	2 x 10 / 1 x 14	D 698-14

Applications:

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



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°**

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

FDA conform

For female barrel thread	O.D. of membrane mm	Thickness of membrane mm	Thread of screw cap GL	Cat. No.:
R3/4"	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 97).



BOLA Practical-Tip

Benjamin Schmitt
» engineering



Protecting your pump

To avoid a damage of your pump due to loose particles or dirt, simply include a dirt filter in your system.

see page 109

BOLA Barrel-GL-Adaptors

Material: PTFE	Temperature resistance: from -200°C to +250°C	Chemical resistance: +++ universal	Vacuum: suitable	autoclave: 121°
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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 304 for dimensions of the barrel threads.

FDA conform

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

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

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

FDA conform

	Material	For barrel thread	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 -20°C to +70°C	Chemical resistance: ++ very good	autoclave: 121°
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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.



BOLA Sets for Pressure Compensation

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

Product description:

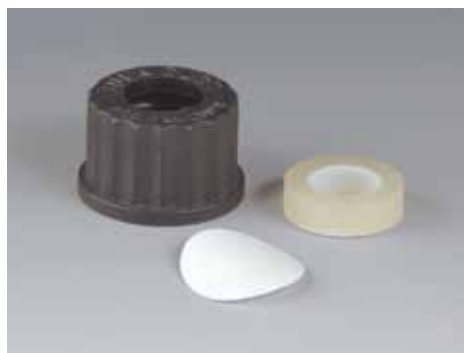
Consisting of screw cap made of PPS for GL thread, PTFE/silicone gasket and exchangeable filtering membrane made of PTFE (pore size 2,5 µm). High chemical resistance, the product is only exposed to PTFE. Pressure compensation already at 0,01 bar differential pressure.

FDA conform

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 overpressure or vacuum in the vessel. Integrated membrane prevents contamination of the product. Membranes are available separately (see Cat. No. N 1699-... on page 97).



Spare Parts for: Membranes for Pressure Compensation

Description	Material	Packing Unit	for Thread	suitable for Cat.No.:	Cat. No.:	
Replacement-Membranes for Pressure Compensation	PTFE	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	

Also made by Bohlender.

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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 with Aperture

Product description:

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

Material: PTFE-GF	Temperature resistance: from -200°C to +250°C	Chemical resistance: +++ universal
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FDA conform	For thread	Dia. of aperture	Cat. No.:
	GL	mm	
	14	9,2	H 983-01
	18	11,0	H 983-02
	25	15,0	H 983-03
	32	20,0	H 983-04
	45	34,0	H 983-05

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

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

Material: PBTP	Temperature resistance: from -50°C to +140°C	Chemical resistance: + good
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	For thread	Dia. of aperture	Cat. No.:
	GL	mm	
	14	9,2	H 984-01
	18	11,0	H 984-02
	25	15,0	H 984-03
	32	20,0	H 984-04
	45	34,0	H 984-05

Applications:

As joining piece between tubes with flange and tubes with GL thread, suitable gasket rings are available separately (Cat. No. H 975 / H 977 / on page 103, 104). As septum by inserting a separately available gasket (Cat. No. H 973 on page 104).



BOLA Screw Caps with Aperture

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

Product description:

Screw cap made of PPS with handy knurl, with aperture. The cap provides a high mechanical and thermal resistance (up to max. +250°C).

For thread	Bore dia.	Cat. No.:
S	mm	
40	28	H 989-40

Applications:

As joining piece between tubes with flange and tubes with GL thread, suitable gasket rings are available separately. As septum by inserting a separately available gasket (see Cat. No. H 973-.. on page 104) - e. g. bottles of Merck KGaA.



BOLA Screw Caps

Product description:

Screw cap with handy knurl, with integrated PTFE/silicone gasket, suitable for GL threads, made of glass-fibre reinforced PTFE without gasket, PPS or PBTP. After assembly, the product is only exposed to PTFE.

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

FDA conform

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



Material: PPS
 Temperature resistance: from -20°C to +230°C
 Chemical resistance: +++ universal

BESTSELLER



For thread	Cat. No.:
GL	
14	H 993-14
18	H 993-18
25	H 993-25
32	H 993-32
45	H 993-45



Material: PBTP
 Temperature resistance: from -50°C to +140°C
 Chemical resistance: + good

FDA conform

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



Applications:

For closing bottles and vessels with GL threads.

BOLA Screw Caps

Material: PPS	Temperature resistance: from -20°C to +230°C	Chemical resistance: +++ universal
-------------------------	--	--

Product description:
Screw cap made of PPS with handy knurl, with integrated PTFE/silicone gasket for compensation of unevenness on the sealing surface. After assembly, the product is only exposed to PTFE. The cap provides a high mechanical and thermal resistance.

For thread S			Cat. No.:
40			H 988-40

Applications:
For closing bottles and vessels with S40 threads - e.g. bottles of Merck KGaA



BOLA Screw Caps with Aperture

Material: PP	Temperature resistance: from -20°C to +110°C	Chemical 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 GL	Bore dia. mm		Cat. No.:
45	34		H 999-45



BOLA Screw Caps HT (High Temp)

Material: PPS	Temperature resistance: from -20°C to +250°C	Chemical resistance: +++ universal	Vacuum: suitable
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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 GL			Cat. No.:
14			H 994-14
18			H 994-18
25			H 994-25
32			H 994-32
45			H 994-45

Applications:
For all applications which need high chemical resistance and sealing. Usable under vacuum, e.g. cold traps. The gasket is physiologically safe according to VDI/VDE guideline 2480 and fulfils FDA 21 CFR 177-1550 requirements.



BOLA One-Sided Gaskets

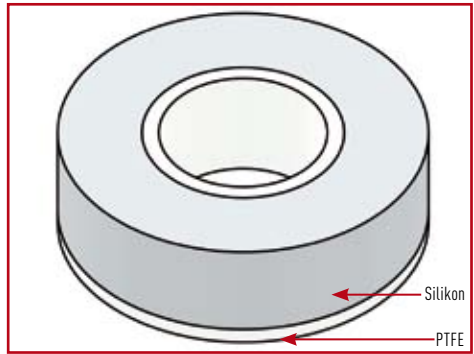
Material: PTFE Temperature resistance: from -60°C to +230°C Chemical resistance: +++ universal

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	12 x 6,0 x 3,5	5,5 - 6,5	H 975-02
18	16 x 6,0 x 4,5	5,5 - 6,5	H 975-04
18	16 x 8,0 x 4,5	7,5 - 9,0	H 975-06
18	16 x 10,0 x 4,5	9,0 - 11,0	H 975-10
25	22 x 8,0 x 6,5	7,5 - 9,0	H 975-12
25	22 x 10,0 x 6,5	9,0 - 11,0	H 975-14
25	22 x 12,0 x 6,5	11,0 - 13,0	H 975-18
32	29 x 10,0 x 9,0	9,0 - 11,0	H 975-20
32	29 x 12,0 x 9,0	11,0 - 13,0	H 975-22
32	29 x 14,0 x 9,0	13,0 - 15,0	H 975-26
32	29 x 16,0 x 9,0	15,0 - 17,0	H 975-28
32	29 x 18,0 x 9,0	17,0 - 19,0	H 975-30
45	42 x 26,0 x 9,0	25,0 - 27,0	H 975-34
45	42 x 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 on page 100). Also suitable for GL caps of Duran Group (formerly Schott AG).




One-Sided Gaskets

» The soft silicone core provides flexibility and perfect sealing. The detachable PTFE sleeve makes this gasket versatile. Very convenient! «

Dieter Verhees » Glastechnische Werkstatt Dieter Verhees

BOLA SVL Gaskets

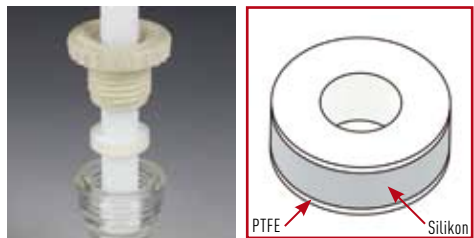
Material: PTFE Temperature resistance: from -60°C to +230°C Chemical resistance: +++ universal

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 - 6,4	5	H 979-12
15	15	7,6 - 8,4	5	H 979-24
22	22	13,6 - 14,4	5	H 979-32

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



BOLA Gaskets for Screw Caps

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

Product description:

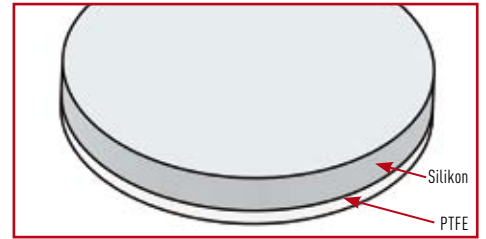
Upper side made of PTFE, lower side made of silicone-elastomer for balancing unevennesses on sealing surfaces. After assembly, the product is only exposed to PTFE.



For thread	Dia. of gasket mm	Thickness of gasket mm	Cat. No.:
GL 14	13,0	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 on page 100, 101, 102). As gasket for BOLA Screw Caps with Aperture (Cat. No. H 986/ H 987/ H 988/ H 993 on page 101, 102).



BOLA Double-Sided Gaskets

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

Product description:

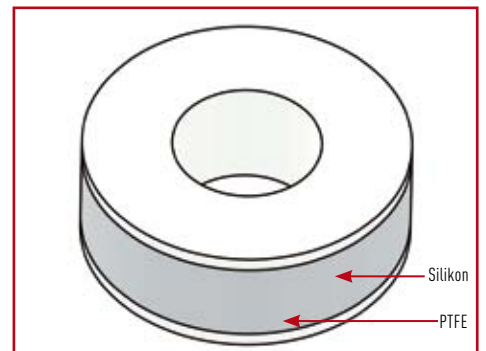
Silicone ring with double-sided PTFE washer. After assembly, the product is only exposed to PTFE.



For thread GL	O.D. x I.D. x Height mm	For tube dia. mm	Cat. No.:
14	12 x 6,0 x 3,6	5,5 - 6,5	H 977-08
18	16 x 6,0 x 4,6	5,5 - 6,5	H 977-16
18	16 x 8,0 x 4,6	7,5 - 9,0	H 977-18
18	16 x 10,0 x 4,6	9,0 - 11,0	H 977-20
25	22 x 8,0 x 6,6	7,5 - 9,0	H 977-28
25	22 x 10,0 x 6,6	9,0 - 11,0	H 977-32
25	22 x 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 on page 100). Also suitable for GL caps of Duran Group (formerly Schott AG).



BOLA BENEFITS

- » 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

105

BOLA Swivelling Screw Fittings with Ground Joint

BESTSELLER

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

Product description:

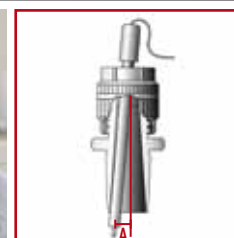
Ground joint body made of PTFE, screw cap made of PPS. Probes, tubes or tubing are firstly inserted through the fitting, then the fitting is put into the ground joint and the inserted element can be fixed in the requested position.

FDA conform

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

Applications:

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



SCREW JOINTS / COMPONENTS WITH GL THREAD

BOLA Swivelling Screw Fittings

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

FDA conform

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 INNOVATION

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 Threaded Couplings

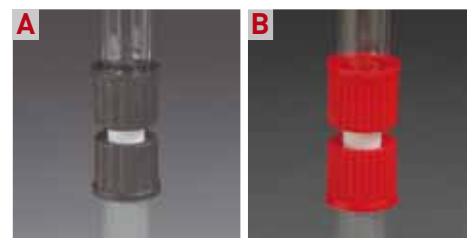
Material: PTFE	Temperature resistance: from -20°C to +200°C	Chemical resistance: +++ universal
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Product description:

Two 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.

FDA conform

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



BOLA Reducing Screw Thread Adaptor Couplings

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

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.

FDA conform

From thread GL	To thread GL	Length from seating lip to seating 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



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BOLA GL Bellows

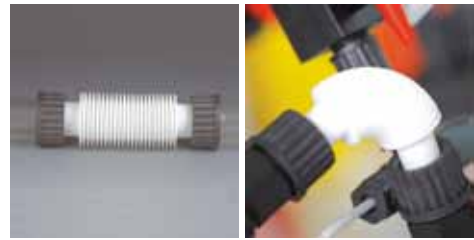
Material: PTFE
 Temperature resistance: from -20°C to +200°C
 Chemical resistance: +++ universal
 Vacuum: suitable

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.

FDA conform

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



SCREW JOINTS / COMPONENTS WITH GL THREAD

BOLA GL Dispenser

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

Product description:

Black screw cap made of PPS with GL 45 thread, movable dispenser with stopcock made of PTFE, integrated ventilation. With PTFE cap for sealing the discharge tube.

FDA conform

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

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.

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

Product description:

Insertion for reaction vessels with GL-threaded necks.

FDA conform

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

Product description:

Insertion for reaction vessels with ground joint sockets.

FDA conform

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

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 Dirt Traps

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

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.

FDA conform

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

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 272).



BOLA Adaptors for Prominent® Pumps

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

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.

FDA conform

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



BOLA GL Tube Fittings

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 (see page 77), 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
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Product description:

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

FDA conform

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

Application:

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



BOLA Practical Tip

Marion Stoppel » construction

Don't fear blocked passage bores:

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



SUITABLE: page 123
Fittings and laboratory screw joints made of static dissipative PTFE-EX.

BOLA GL Tube Fittings T

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

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

FDA conform

Thread GL	Bore dia. mm	Length without screw joint mm	Height mm	Wrench size square mm	Cat. No.:
14	6,5	54	37	20	D 540-14
18	10,5	56	39	20	D 540-18
25	14,5	70	51	27	D 540-25
32	21,0	83	58	33	D 540-32
45	32,5	98	73	48	D 540-45

Application:

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



BOLA GL Tube Fittings Elbow

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

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

FDA conform


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	33	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.



SUITABLE: page 77
Laboratory screw joints



BOLA Practical Tip
Uwe Hossfeld » application engineering

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 Cross

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

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

FDA conform

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
32	21,0	83	33	D 541-32

Application:

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



BOLA GL Quick Connectors

BESTSELLER

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

Product description:

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.

FDA conform

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 INNOVATION

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 Thread Adaptor GL

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

Product description:

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

FDA conform

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**

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.

FDA conform

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

Special Request?
+49 (0) 93 46-92 86-0



BOLA
Practical Tip
Marion Stoppel » construction

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 305

BOLA GL Stopcocks

BESTSELLER

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

FDA conform

	Type	Bore shape	Bore dia. mm	Connecting thread GL	External dimensions 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
B	3-Way	L	4	14	64 x 47 x 43	E 686-14
	3-Way	L	6	18	74 x 57 x 57	E 686-18
	3-Way	L	6	25	78 x 59 x 57	E 686-25
C	3-Way	T	4	14	74 x 57 x 57	E 688-14
	3-Way	T	4	18	74 x 57 x 57	E 688-18
	3-Way	T	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.



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
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Product description:

Ground joint 2-way-stopcock with straight bore and one connection with GL thread or ground joint 3-way-stopcock with T-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.

FDA conform

	Type	Bore shape	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
B	3-Way	L	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 Ball Valves

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

Product description:

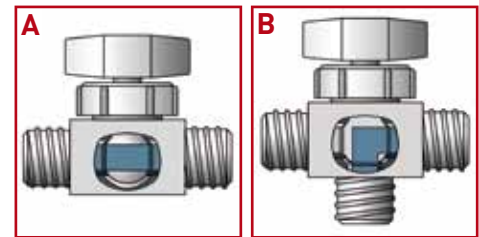
Two-way valve with straight bore and two connections with GL thread or three-way valve with L-shaped bore and three connections with GL thread. Ball-shaped stopcock plug for excellent tightness, free-moving stop valve. Suitable for pressure up to max. 12 bar, or for vacuum. Universal chemical resistance,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

FDA conform

	Type	Bore shape	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
B	3-Way	L	3	14	50 x 20 x 52	E 667-10
	3-Way	L	4	18	80 x 40 x 90	E 667-20
	3-Way	L	8	25	90 x 50 x 98	E 667-30
	3-Way	L	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.



GL Stopcocks

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

Krzysztof Kucias » Hitec Zang GmbH

BOLA GL-Distributor with Stopcock

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

Product description:

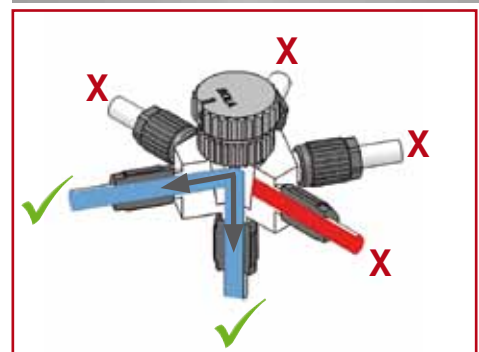
Distributor body made of PTFE with six lateral, GL-threaded connectors and one on the bottom. Conical stopcock made of PTFE with L-Bore for good sealing and knurled grip made of PP for marking and regulation of flow direction. Universal chemical resistance, the flowing product is only exposed to PTFE.

FDA conform

Bore shape Stopcock	Bore dia. mm	Supply / Drain GL-neck	For tubing O.D. mm	Outer dimensions Dia. x H mm	Cat. No.
L	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 Pressure-Relief Valves with Manual Ventilation**BESTSELLER**

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

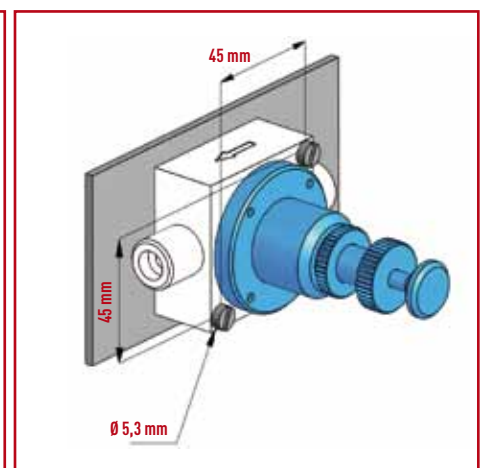
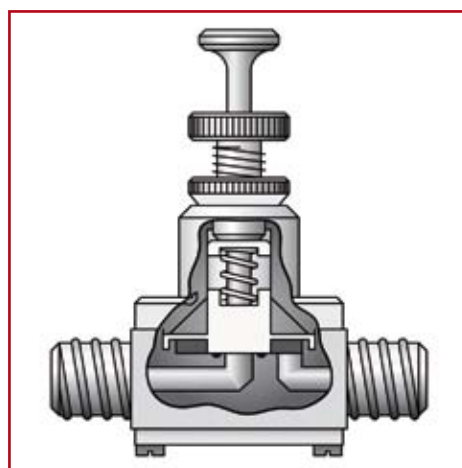
Body made of PTFE with two connections with GL 18 thread, valve made of PPS with toggle for manual ventilation by pulling and adjusting screw with conternut for adjusting and fixing of requested pressure in a range between 0,1 and 10 bar (factory setting 1,5 bar). Universal chemical resistance, the flowing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

FDA conform

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

Product description:

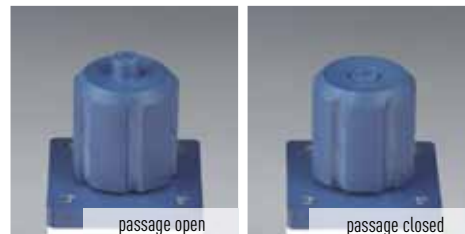
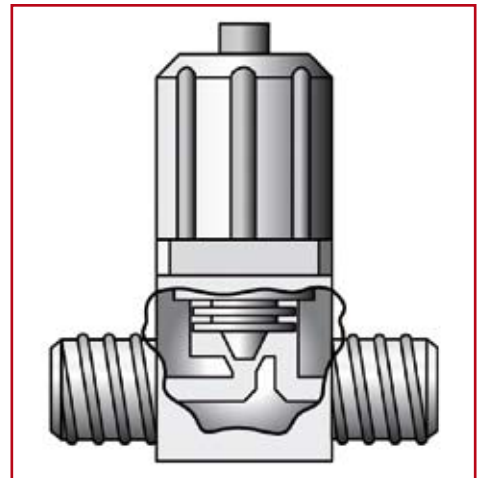
Two-way valve with straight bore and two connections with GL thread completely made of PTFE. Motionless sealing without wearing parts due to integrated bellow. For best possible tightness even with considerable thermal fluctuations, the conical nipple of the bellow is prestressed by means of a spring. 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.

FDA conform

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.



SUITABLE: page 77
Laboratory screw joints

BOLA Hose Connectors (with Nut)

BESTSELLER

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

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.

FDA conform

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.



BOLA INNOVATION

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
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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.

FDA conform

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.



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 GL 18 GL 25	D 585-14 D 585-18 D 585-25	D 583-14 D 583-18 D 583-25	
Replacement-Hose Connectors Bent type	PP	1 piece	GL 14 GL 18	D 586-14 D 586-18	D 584-14 D 584-18	
Replacement-Screw Caps	PBTP	1 piece	GL 14 GL 18	D 585-14 / D 586-14 D 585-18 / D 586-18	H 984-01 H 984-18	

Screw Joints / Components for Ex-Protection



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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.

PRODUCT TIPS



Page 126:
Distributors for Bottles EX



Page 129:
Antistatic Explosion Proof
Tubing EX



Page 132:
Stirrer Shafts EX

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

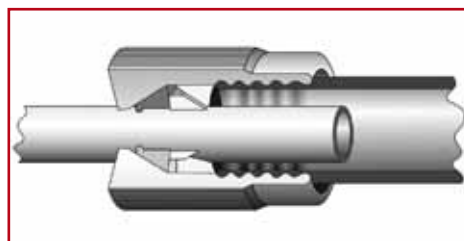
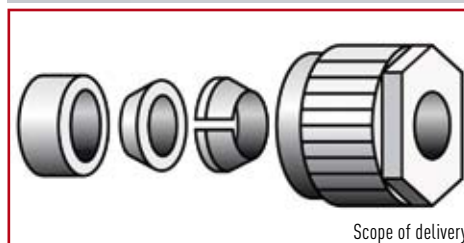
Product description:

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 74

Detailed information on the assembly and function of BOLA Laboratory Screw Joints.

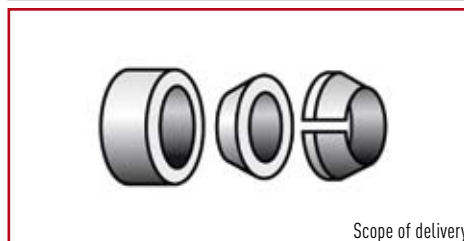
BOLA Replacement Inner Parts EX

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	10,1 - 14,0	D 846-34





Tube Fittings EX

»» 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. ««

Hans Kneuss » Glass Technology

BOLA 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.



«« »»
Special Request?
+49 (0) 93 46-92 86-0

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 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
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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
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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.

Type	Bore shape	Bore dia. mm	Connecting thread GL	External dimensions L / D / H mm	Cat. No.:
A	2-Way	—	4	54 x 20 x 38	E 712-14
	2-Way	—	6	64 x 30 x 45	E 712-18
	2-Way	—	8	78 x 40 x 57	E 712-25
B	3-Way	L	4	64 x 47 x 43	E 714-14
	3-Way	L	6	74 x 57 x 57	E 714-18
	3-Way	L	6	78 x 59 x 57	E 714-25
C	3-Way	T	4	74 x 57 x 57	E 716-14
	3-Way	T	4	74 x 57 x 57	E 716-18
	3-Way	T	6	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:	Temperature resistance:	Chemical resistance:	Vacuum:	Conductivity:
PTFE-, PPS-EX	from -20°C to +200°C	++ very good	suitable	10 ⁶ Ohm

Product description:

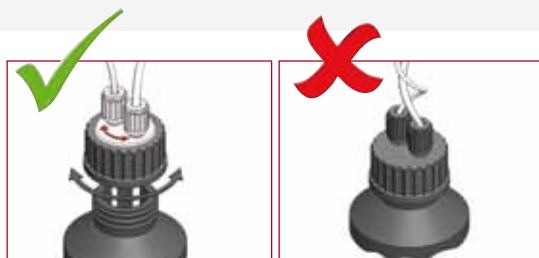
Screw cap black for thread GL 45 made of conductive PPS-EX. Distributor body made of conductive PTFE-EX with GL-threaded necks. Tubes can be inserted through the necks. Connection of tubes and tubing by means of BOLA Laboratory Screw Joints EX.

Detailed information in the product description of the identical Multiple Distributors for Bottles on page 80.

	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.



BOLA Multiple Distributors for Barrels EX

Material:	Temperature resistance:	Chemical resistance:	Vacuum:	Conductivity:
PTFE-EX	from -20 °C to +200 °C	++ very good	suitable	10 ⁶ Ohm

Product description:

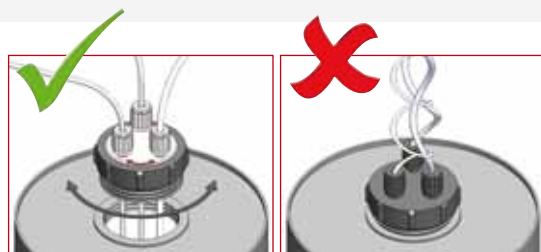
Screw cap for barrels with female thread and body with GL-threaded necks made of conductive PTFE-EX. Bore with female thread M5x6 for connecting a grounding cable. GL-threaded necks for inserting tubing with a max. O.D. of 14 mm. Connection of tubing or tubes by means of BOLA Laboratory Screw Joints EX.

Detailed information in the product description of the identical Multiple Distributors for Barrels on page 94.

For female barrel thread	Necks GL	For tubing O.D. max. mm	Cat. No.
G 2" / 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:	Temperature resistance:	Chemical resistance:	autoclave:	Conductivity:
PTFE-EX	from -20 °C to +200 °C	++ very good	121 °C	10 ⁶ Ohm

Product description:

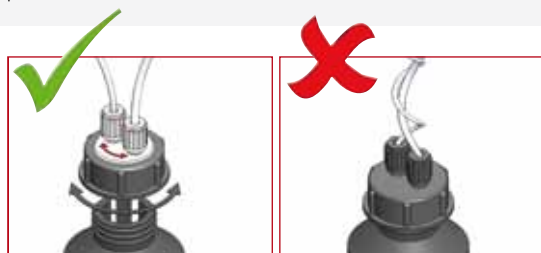
Screw cap and movable body with GL-threaded necks made of conductive PTFE EX. Without earthing connection. Earthing is made via a conductive canister. Connection of tubing made by BOLA Laboratory Screw Joints EX.

Detailed information in the product description of the identical Multiple Distributors for Barrels on page 92.

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	3x 18	3x 10	D 772-20
65	3x 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	H 898-14
18	11,0	H 898-18
25	15,0	H 898-25
45	34,0	H 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
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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.:
18	14	0,8 - 10,0	D 872-05
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 Connector EX (with Nut)

Material: PTFE-, PPS-EX	Temperature resistance: from -20 °C to +200 °C	Chemical resistance: ++ very good	Conductivity: 10⁶ Ohm
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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: PFA-EX	Temperature resistance: from -200°C to +260°C	Chemical resistance: +++ universal	Conductivity: 10⁶ Ohm
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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.



Tubing end		Bending radius ¹ mm	Burst pressure ² bar	Length 0,5 m Cat. No.:	Length 1,0 m Cat. No.:	Length 2,5 m Cat. No.:
I.D.	O.D.					
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:

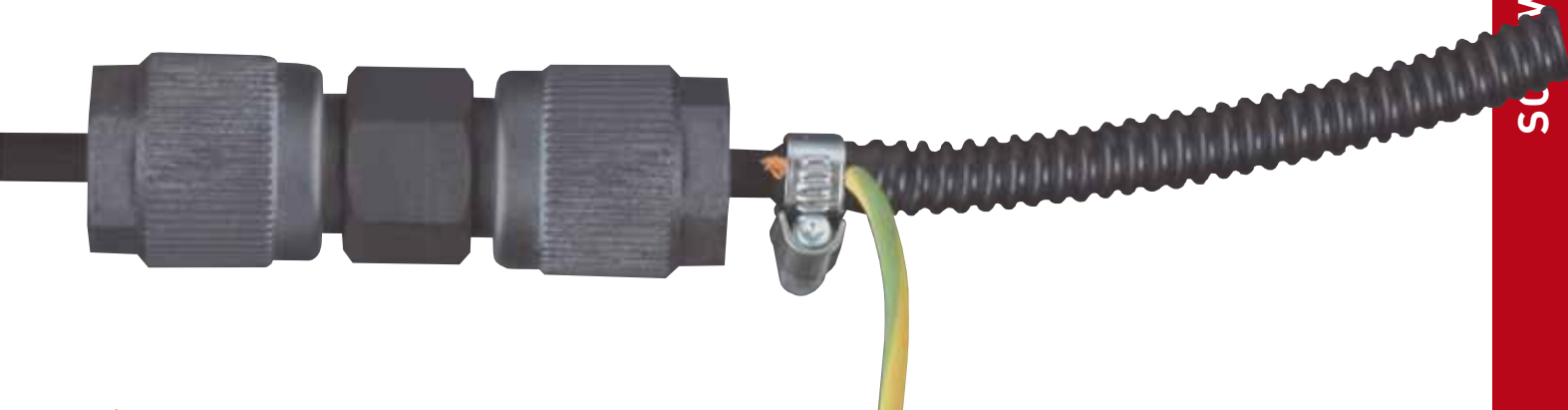
- » flexible to highly flexible
- » tight bending radius only causes little cross-section reduction
- » non-porous

Applications:

- » antistatic applications
- » in explosive ambience (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 124
Conductive fittings and stopcocks made of 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 284. It is the user's responsibility to check if the used tubing fulfils the respective requirements.



BOLA BENEFITS

- » extensive chemical resistance due to PTFE parts
- » resistance of less than 10^6 Ohm according to EN 12115 directive
- » ideal for light-sensitive substances

BOLA Antistatic Explosion-Proof Tubing

BESTSELLER

Material:	Temperature resistance:	Chemical resistance:	Conductivity:
PTFE-EX	from -200°C to +250°C	+++ universal	10 ⁶ Ohm

Product description:

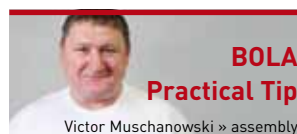
Very good electric conductivity due to a special "antistatic compound" made of pure PTFE and finest, highly pure carbon dust (less than 2,5%).
Colour: black

FDA conform

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

Applications:

- » antistatic applications
- » in explosive ambiance (explosion protection)
- » for transport of solvents or alcohols



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 284. It is the user's responsibility to check if the used tubing fulfils the respective requirements.



BOLA BENEFITS

- » the flowing product is only exposed to PFA
- » no chemical restrictions due to the outer conducting stripes
- » resistance less than 10^6 Ohm
- » smooth, non-porous interior surface
- » clear visibility of the flowing product
- » no corrosion unlike metal lines or metal meshes
- » almost universal chemical resistance

BOLA Zebra Explosion-Proof Tubing

BESTSELLER

Material: **PFA-EX** Temperature resistance: **from -200°C to +260°C** Chemical resistance: **+++ universal** Conductivity: **10^6 Ohm**

Product description:

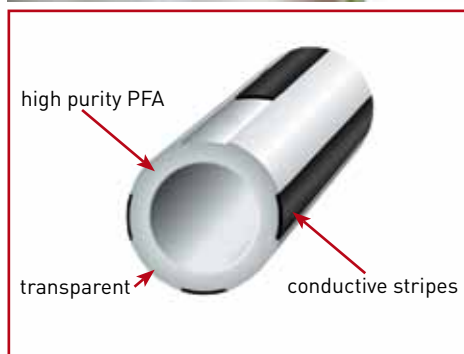
Transparent PFA tubing with black longitudinal conductive stripes on the outer surface. The tubing is absolutely round and can be connected to all common fittings.

FDA conform

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

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

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 284. It is the user's responsibility to check if the used tubing fulfils the respective requirements.

BOLA U-Shaped Stirrer Shafts EX

Material: PTFE-EX	Temperature resistance: from -200 °C to +250 °C	Chemical resistance: ++ very good	Conductivity: 10 ⁶ Ohm
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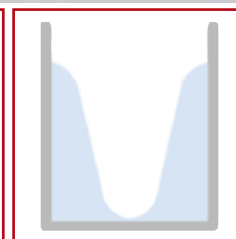
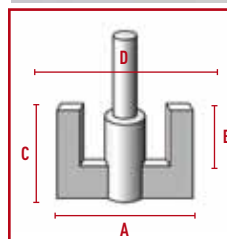
Product description:

PTFE-EX jacketed stainless steel shaft, U-shaped stirrer blade completely made of static dissipative PTFE-EX. Good chemical resistance, 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 mm	
350	8	6,5	60	40	25	30	C 284-02

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. Earthing is made for example via a stirrer bearing made of PTFE-EX (Cat. No. C 423-08 on page 138).



BOLA Propeller Stirrer Shafts EX

Material: PTFE-EX	Temperature resistance: from -200 °C to +250 °C	Chemical resistance: ++ very good	Conductivity: 10 ⁶ Ohm
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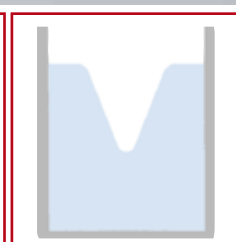
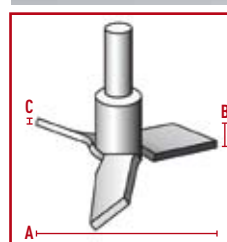
Product description:

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 mm	
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 138).



BOLA Moon-Shaped Stirrer Shafts EX

Material: PTFE-EX	Temperature resistance: from -200 °C to +250 °C	Chemical resistance: ++ very good	Conductivity: 10 ⁶ Ohm
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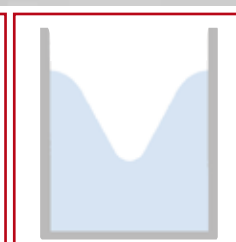
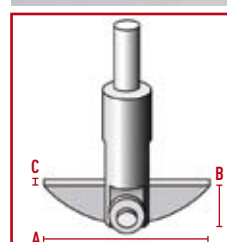
Product description:

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 mm	
350	8	6,5	24/29	65	18	3	C 276-02
450	10	8,0	29/32	90	24	3	C 276-14
600	10	8,0	29/32	90	24	3	C 276-16

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 138).



BOLA Double Temperature Probes PT 100 Lemo® Compact EX

Material: PTFE-EX	Temperature resistance: from -200°C to +250°C	Chemical resistance: ++ very good	Temperature range from -50°C to +250°C	Conductivity: 10⁶ 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.

CE

Typical response times:

- » T 50: 20 - 24 s
- » T 90: 30 s

See page 290 for detailed explanation.

Usable length mm	Probe dia. mm	Total length mm	Number of sensors	Width of coupling A mm	Cat. No.:
300	8	400	2 x PT 100	27	P 1744-20
400	8	500	2 x PT 100	27	P 1744-23
500	8	600	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



BOLA Temperature Probes PT 100 Lemo® Compact EX

Material: PTFE-EX	Temperature resistance: from -200 °C to +250 °C	Chemical resistance: ++ very good	Temperature range from -50 °C to +250 °C	Conductivity 10⁶ 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.

CE

Typical response times:

- » T 50: 7 - 12 s
- » T 90: 14 - 16 s

See page 290 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



BOLA Modular System for Reactor Lids EX



Worth knowing on the BOLA Modular System for Reactor Lids EX

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, 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 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 222)

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 132

B Stirrer Bearing EX

Cat. No.: C 423-10
see page 138

C Screw-in Connector with Ground Joint EX

Cat. No.: B 174-06
see page 138

D Screw-in Connector with Ground Joint EX

Cat. No.: B 174-02
see page 138

E Screw-in Connector GL EX

Cat. No.: B 172-32
see page 139

F Antistatic Tubing

Cat. No.: S 1827-50
see page 130

G Screw-in Stopper EX

Cat. No.: B 173-04
see page 140

H Laboratory Screw Joints EX

Cat. No.: D 841-62
see page 123

I Screw-in Connector EX

Cat. No.: B 172-18
see page 139

J Reactor Lid DN100 EX

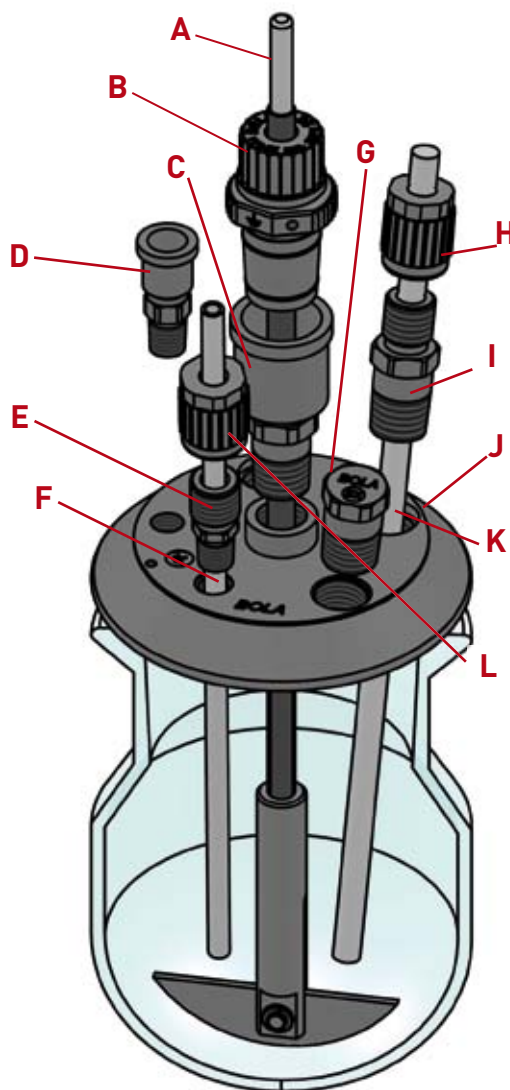
Cat. No.: B 170-16
see page 137

K Temperature Probe Lemo Compact EX

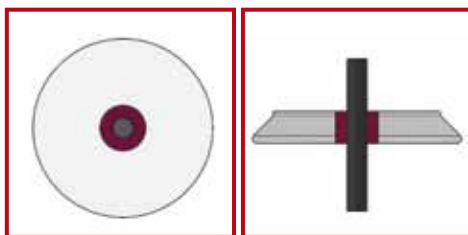
Cat. No.: P 1734-20
see page 133

L Laboratory Screw Joint EX

Cat. No.: D 841-62
see page 123

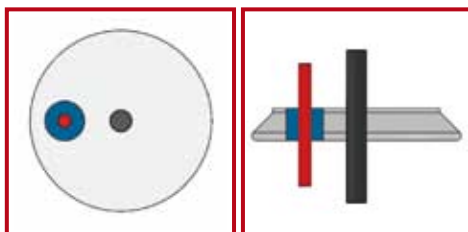


Thread connections in detail:



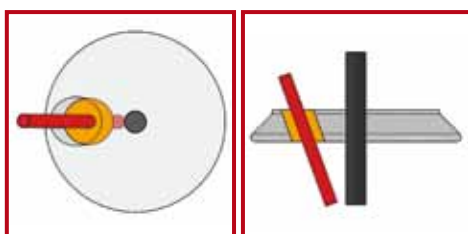
Centric thread connection (purple):

For insertion of the stirrer bearing (see page 134).



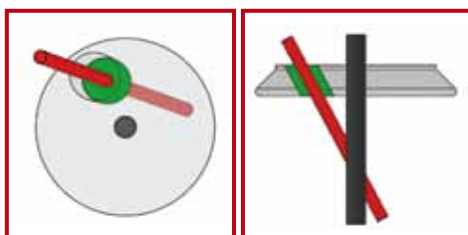
Vertical thread connection with parallel alignment to the stirrer shaft (blue):

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 EX

Material: PTFE-EX	Temperature resistance: from -200 °C to +250 °C	Chemical resistance: ++ very good	Conductivity: 10 ⁶ Ohm
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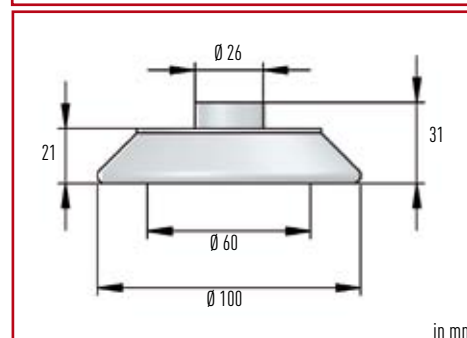
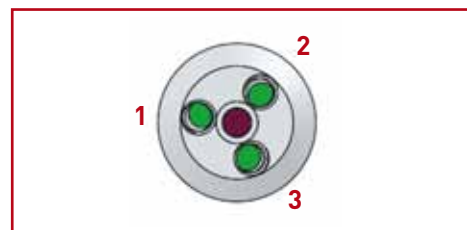
Product description:

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.

1 Connection	2 Connection	3 Connection	Cat. No.:
NPT 1/2" Connection aside the shaft	NPT 1/2" Connection aside the shaft	NPT 1/2" Connection aside the shaft	B 170-04

Applications:

For assembly of reactor lids using transition fittings made of static dissipative PTFE-EX from page 138 to 140.



in mm

BOLA Reactor Lid DN 100 EX

Material: PTFE-EX	Temperature resistance: from -200 °C to +250 °C	Chemical resistance: ++ very good	Conductivity: 10⁶ Ohm
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Product description:

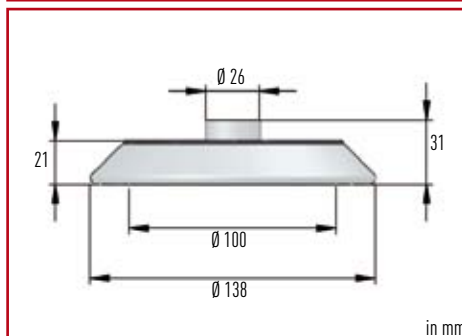
Made of static dissipative PTFE-EX. Suitable for glass reactors DN 100 with SCHOTT flat flange. With screw-in threads for connection of transition fittings. Bore with female thread M5x6 for earthing connection on the upper side of the lid.

1 Connection	2 Connection	3 Connection	4 Connection	5 Connection	Cat. No.:
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 170-16

Applications:

For assembly of reactor lids using transition fittings made of static dissipative PTFE-EX from page 138 to 140.

« Special Request? »
+49 (0) 93 46-92 86-0



BOLA Reactor Lid DN 150 EX

Material: PTFE-EX	Temperature resistance: from -200 °C to +250 °C	Chemical resistance: ++ very good	Conductivity: 10⁶ Ohm
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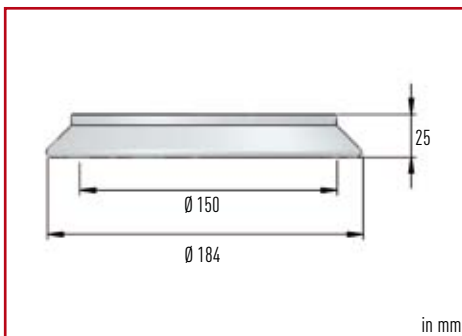
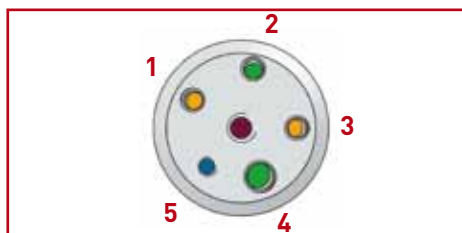
Product description:

Made of static dissipative PTFE-EX. Suitable for glass reactors DN 150 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.

1 Connection	2 Connection	3 Connection	4 Connection	5 Connection	Cat. No.:
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 170-24

Applications:

For assembly of reactor lids using transition fittings made of static dissipative PTFE-EX from page 138 to 140.



BOLA Screw-In Connectors EX with Ground Joint

Material:	Temperature resistance:	Chemical resistance:	Conductivity:
PTFE-EX	from -200 °C to +250 °C	++ very good	10 ⁶ 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
1"	29/32	34	B 174-10

Applications:

For assembly on BOLA Reactor Lids made of PTFE-EX, Cat. No. B 170-... on page 136. For connection to existing components with ground joint such as Liebig Condensers, dropping funnels etc.



BOLA Stirrer Bearings EX

Material:	Temperature resistance:	Chemical resistance:	Conductivity:
PTFE-EX	from -15 °C to +200 °C	++ very good	10 ⁶ 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 <i>European standard</i>	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: Stirrer Bearings EX

Description	Material	Packing Unit	suitable for	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	

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 136. For connection of hard-walled tubes, tubing and probes by means of BOLA Laboratory Screw Joints made of PTFE-EX.



BOLA offers custom manufacture.

Every lab is different. By offering an extensive range of established and sophisticated standard solutions we take into account the varied requirements of the respective branches and sectors.

But maybe you are looking for something special? Something that is not included in our standard product range?

In that case we are able to offer an individual custom manufacture. This is easier and faster than you may expect. Discuss your idea with our professionals. They will give advise and support during design. Finally, your idea will become real: We produce as per your requirements and in compliance with the chosen raw materials – already from 1 piece.

We only need a drawing (a sketch is sufficient) and some further information.

» You have a special request?

Give us a call: +49 (0) 93 46-92 86-0.

BOLA Screw-In Stoppers EX

Material:	Temperature resistance:	Chemical resistance:	Conductivity:
PTFE-EX	from -200 °C to +250 °C	++ very good	10 ⁶ 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.

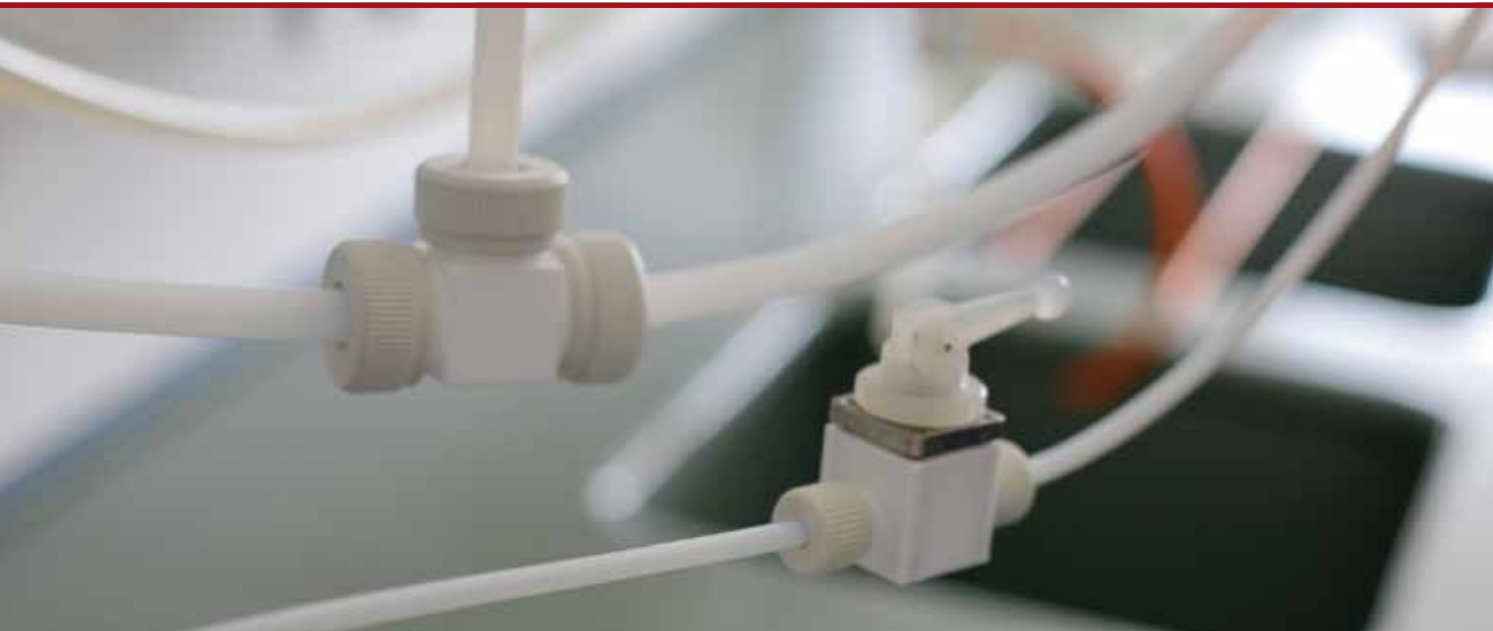
Screw-In Thread NPT (male)	Wrench Size SW	Cat. No.:
1/4"	15	B 173-02
1/2"	22	B 173-04
3/4"	32	B 173-06
1"	45	B 173-08

Applications:

For assembly on BOLA Reactor Lids made of PTFE-EX, Cat. No. B 170-... on page 136.



Screw Joints For Pressure up to 5 bar



Joining things together: we have the ideal screw joints and connectors for almost all equipment and applications.

PRODUCT TIPS



Page 142:
Tube Fittings



Page 146:
Stopcocks

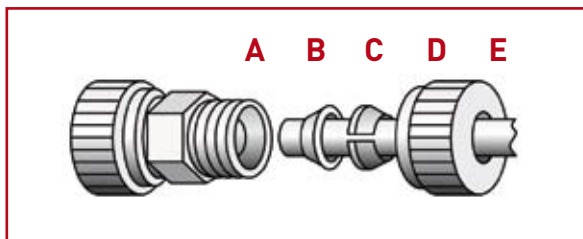


Page 150:
Tubing Connectors

BOLA Screw Joints for Pressures up to 5 Bar

Components:

- A** Threaded neck of fitting
- B** Tapered ring
- C** V-ring
- D** Nut
- E** Tubing or tube



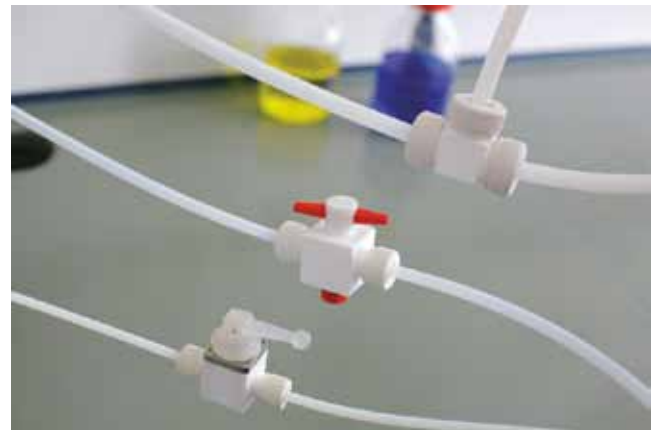
Assembly:

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

What you should know about the screw joint system up to 5 bar

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

BESTSELLER

Material: PTFE	Temperature resistance: from -200°C to +250°C	Chemical resistance: +++ universal	Pressure: 5 bar	Vacuum: suitable
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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.

FDA conform

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 T

Material: PTFE Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal Pressure: 5 bar Vacuum: suitable

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.

FDA conform

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 154
Tubing for all fittings

BOLA Tube Fittings Elbow

Material: PTFE Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal Pressure: 5 bar Vacuum: suitable

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.

FDA conform

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

Uwe Hossfeld » application engineering

Protection from buckling

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

BOLA Reducing Unions

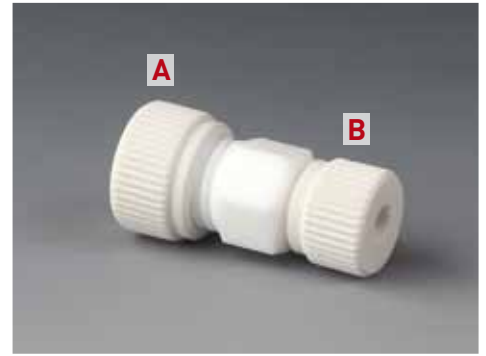
Material: PTFE Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal Pressure: 5 bar Vacuum: suitable

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.

FDA conform

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

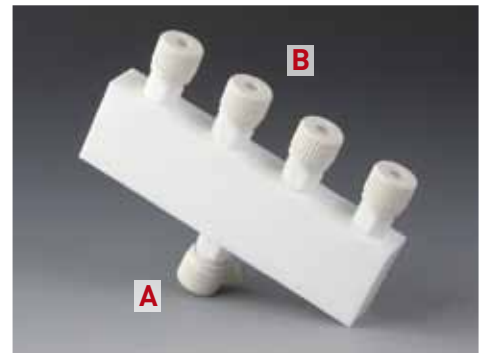
Material: PTFE Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal Pressure: 5 bar Vacuum: suitable

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.

FDA conform

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

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.

FDA conform

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	NPT 3/8"	56	D 518-48
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	NPT 1/2"	56	D 518-60
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



« | »
Special Request?
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BOLA Practical Tip

Marion Hammerich » construction

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 302



SUITABLE: page 154
Tubing for all fittings

BOLA (2-Way/3-Way) Stopcocks

Material: PTFE	Temperature resistance: from 0°C to +110°C	Chemical resistance: +++ universal	Pressure: 2 bar
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Product description:

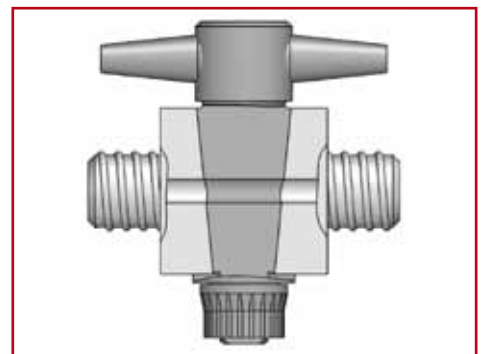
2-way stopcock with straight bore and two connections or 3-way stopcock with T-shaped bore and three connections, with nuts made of glass-fibre reinforced PTFE for connecting tubing or tube. Conical stopcock plug, tightness is increased by turning the nut on the lower side. 3-way stopcock plug with T-shaped mark of flow direction. Universal chemical resistance, the flowing product is only exposed to PTFE.

FDA conform

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	T	1,5	4	14 x 2	59 x 41 x 53	E 654-02
3-Way	T	1,5	6	14 x 2	59 x 41 x 53	E 654-04
3-Way	T	3,5	8	18 x 2	74 x 54 x 69	E 654-06
3-Way	T	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.



BOLA Control Valves

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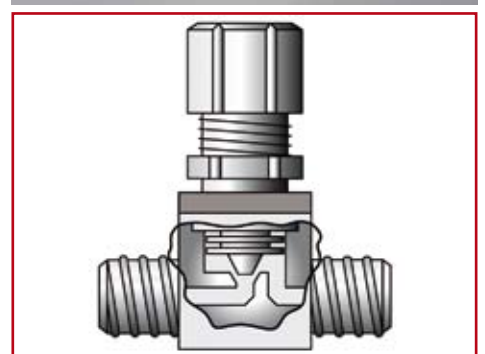
Product description:

Body made of PTFE with 2 connections and nuts made of glass-fibre reinforced PTFE for connecting tubing or tube. Bore dia. 6 mm. Motionless sealing by means of a gastight bellows made of PTFE with flat cone point. No leakages.

FDA conform

- » volume flow can be regulated manually (without regulation scale).
- » suitable for panel mounting
- » easy disassembly for cleaning
- » 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 84	E 672-54
18 x 2	10	85 x 44 x 84	E 672-56



BOLA Snap Valves

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

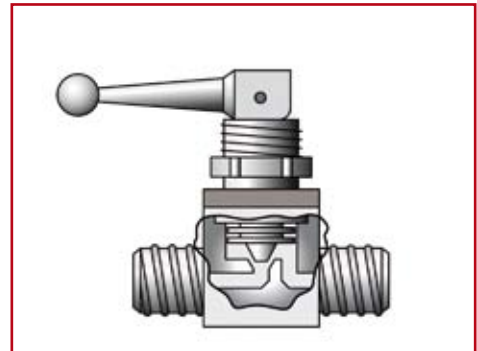
Body made of PTFE with 2 connections and nuts made of glass-fibre reinforced PTFE for connecting tubing or tube. Bore dia. 6 mm. Motionless sealing by means of a gastight bellow made of PTFE with flat cone point. No leakages.

Lever locks when valve is open, switch setting is easily visible at position of the lever.

FDA conform

- » suitable for panel mounting
- » easy disassembly for cleaning
- » 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 90	E 674-54
18 x 2	10	85 x 44 x 90	E 674-56



BOLA Non-Return Valves

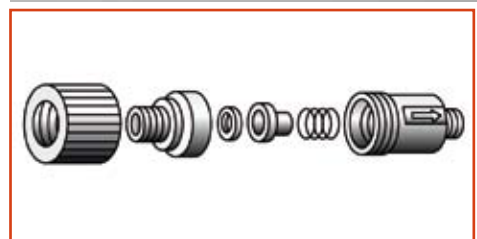
Material: PTFE	Temperature resistance: from -200°C to +250°C	Chemical resistance: +++ universal
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Product description:

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.

FDA conform

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
28 x 2	12	140	54	E 680-33



SUITABLE: page 154
Tubing for all fittings

BOLA Ground Joint Tube Fittings

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

FDA conform



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 M14 x2 all components with thread M18 x2 all components with thread M28 x2	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 M14 x2 all components with thread M14 x2 all components with thread M14 x2 all components with thread M18 x2 all components with thread M18 x2 all components with thread M18 x2 all components with thread M28 x2 all components with thread M28 x2 all components with thread M28 x2 all components with thread M28 x2	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 BOLA Plugs

Material: PTFE	Temperature resistance: from -200°C to +250°C	Chemical resistance: +++ universal	Pressure: 5 bar	Vacuum: suitable
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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 148).

FDA conform

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 Stopcocks with Hose Connectors

Material: PTFE, PP	Temperature resistance: from 0°C to +110°C	Chemical resistance: +++ universal	Pressure: 2 bar
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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.

FDA conform

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	T	1,0	4	4,5	60 x 41 x 53	E 650-50
3-Way	T	2,0	6	6,8	60 x 41 x 53	E 650-53
3-Way	T	3,0	8	9,0	60 x 41 x 53	E 650-56
3-Way	T	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 Tubing Connectors

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

FDA conform

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
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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.

FDA conform

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
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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.

FDA conform

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



« »
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BOLA Tubing Connectors Cross

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

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.

FDA conform

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

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.

FDA conform

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

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.

FDA conform

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

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.

FDA conform

Total length mm	Bore dia. mm	O.D. of connector mm	Thread		Wrench size mm	Cat. No.:
			NPT	G		
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



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SCREW JOINTS FOR PRESSURE UP TO 5 BAR



BOLA offers custom manufacture.

Every lab is different. By offering an extensive range of established and sophisticated standard solutions we take into account the varied requirements of the respective branches and sectors.

But maybe you are looking for something special? Something that is not included in our standard product range?

In that case we are able to offer an individual custom manufacture. This is easier and faster than you may expect. Discuss your idea with our professionals. They will give advise and support during design. Finally, your idea will become real: We produce as per your requirements and in compliance with the chosen raw materials – already from 1 piece.

We only need a drawing (a sketch is sufficient) and some further information.

» You have a special request?

Give us a call: +49 (0) 93 46-92 86-0.

Tubing » Films » Tiles



Totally practice-oriented: BOLA Tubing, Films and Tiles meet the highest demands and are used in more and more laboratories.

PRODUCT TIPS



Page 159:
PTFE Tubing



Page 158:
Flexible Tubing

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.

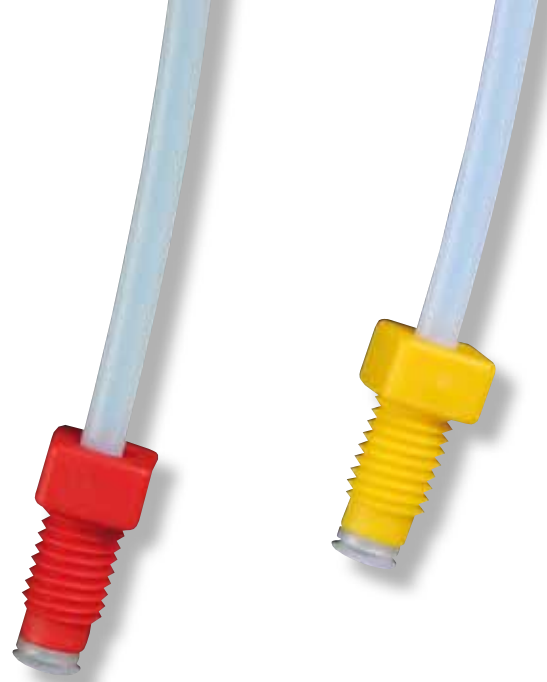
BOLA Tubing is perfectly suitable for the use with all BOLA Screw Joint Systems. You can be sure that all fittings and screw joints fit together with the tubing. The production of tubing always involves certain tolerances in outer diameter and wall thickness.

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 299
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 287).

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 +/- 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 Flexible Tubing

BESTSELLER

Material: PFA	Temperature resistance: from -200°C to +260°C	Chemical resistance: +++ universal	Transparency: transparent	Vacuum: suitable
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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.



Tubing size NW	Tubing end I.D.	Tubing end O.D.	Bending radius ¹ mm	Pressure load max. bar	Length 0,25 m Cat. No.:	Length 0,5 m Cat. No.:	Length 1,0 m Cat. No.:	Length 2,5 m Cat. No.:
4,5	2	4	5	1,7		S 1822-01	S 1822-19	S 1822-52
8	6	8	15	2	S 1822-92	S 1822-02	S 1822-20	S 1822-56
10	8	10	18	2	S 1822-93	S 1822-04	S 1822-22	S 1822-60
13	10	12	23	2	S 1822-94	S 1822-06	S 1822-24	S 1822-64
14	12	14	25	2		S 1822-08	S 1822-26	S 1822-68
16	14	16	28	2		S 1822-10	S 1822-28	S 1822-72
19	16	18	32	2	S 1822-98	S 1822-14	S 1822-32	S 1822-76
21	17,5	20	35	2		S 1822-16	S 1822-34	S 1822-80
23	20,9	(1") 25,4	40	1,2		S 1822-18	S 1822-36	S 1822-84

« Special Request? »
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Product advantages:

- » flexible to highly flexible
- » tight bending radius only causes little cross-section reduction
- » non-porous
- » translucent

Applications:

- » ideal for connections under vibrations
- » usable with a small bending radius
- » for compensation of thermal expansions
- » for easy handling of liquids



HELPFUL: page 129
Flexible tubing made of static dissipative PFA-EX

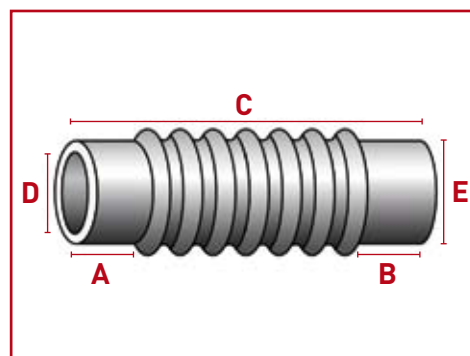


SUITABLE: page 77
Laboratory screw joints

BOLA Customized 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 PTFE Tubing

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



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

FDA conform



SUITABLE: page 110
Fittings, Screw Joints,
Stopcocks, Valves

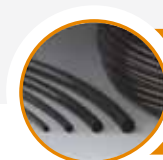
I.D. mm	O.D. mm	Wall thickness mm	Bending radius ¹ mm	Burst pressure ² bar	Cat. No.:
0,2	[1/16"] 1,6	0,70	6	960	S 1810-01
0,2	0,4	0,10	2	960	S 1810-02
0,3	0,6	0,15	3	140	S 1810-04
0,3	[1/16"] 1,6	0,65	4	606	S 1810-05
0,4	0,9	0,25	3	175	S 1810-06
0,5	1,0	0,25	4	140	S 1810-08
0,5	[1/16"] 1,6	0,55	5	308	S 1810-09
[1/32"] 0,8	[1/16"] 1,6	0,40	7	140	S 1810-10
1,0	[1/16"] 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
[1/16"] 1,6	[1/8"] 3,2	0,80	13	140	S 1810-26
[1/16"] 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	[1/8"] 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

I.D. mm	O.D. mm	Wall thickness mm	Bending radius ¹ mm	Burst pressure ² bar	Cat. No.:
Continuation of tubing diameters					
[1/8"] 3,175	[1/4"] 6,35	1,58	26	140	S 1810-39
4,0	6,0	1,00	36	70	S 1810-40
[11/64"] 4,35	[1/4"] 6,35	1,00	40	64	S 1810-42
[3/16"] 4,78	[1/4"] 6,35	0,79	51	46	S 1810-43
5,0	6,0	0,50	72	28	S 1810-44
5,0	7,0	1,00	49	56	S 1810-46
6,0	7,0	0,50	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	[3/8"] 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
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

Applications:

- » Perfect tubing for aggressive and pure liquids or gases



HELPFUL: page 130
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 284. It is the user's responsibility to check if the used tubing fulfils the respective requirements.

BOLA FEP Tubing

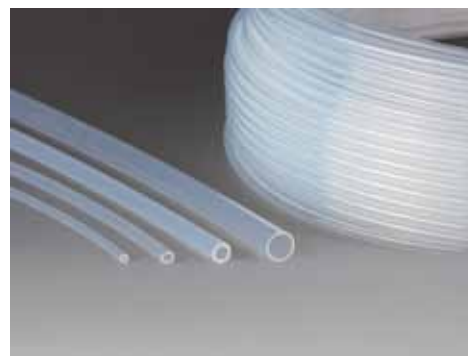
Material: FEP	Temperature resistance: from -200°C to +205°C	Chemical resistance: +++ universal	Transparency: transparent
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Product description:
Transparent, gastight tubing



Product advantages:

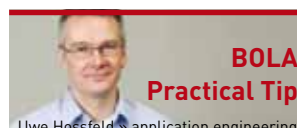
- » non-porous
- » almost universal chemical resistance
- » free from extractable agents
- » physiologically safe
- » non-adhesive surface
- » very good sliding characteristics
- » very good dielectric characteristics
- » flame retardant according to UL94V0
- » oxygen value more than 95
- » resistant 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.:
(1/32") 0,8	(1/16") 1,6	0,40	7	112	S 1815-04
1,5	3,0	0,75	12	112	S 1815-05
(1/16") 1,6	(1/8") 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
(1/8") 3,175	(1/4") 6,35	1,58	26	112	S 1815-14
3,6	6,0	1,20	30	75	S 1815-16
(5/32") 3,96	(1/4") 6,35	1,20	34	67	S 1815-24
4,0	6,0	1,00	36	56	S 1815-20
(11/64") 4,35	(1/4") 6,35	1,00	52	51	S 1815-28
(3/16") 4,78	(1/4") 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
(1/4") 6,35	(3/8") 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
(3/8") 9,52	(1/2") 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

Uwe Hossfeld » application engineering

How can you calculate the maximum bending radius?

Very easy: Squared outer diameter of tubing divided by wall thickness.



PTFE and PFA Tubing

- » All BOLA Tubing have small tolerance on the outer diameter and the wall thickness. This assures that fittings and screw joints always match.



Inge Fenstad » Chiron AS

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 284. It is the user's responsibility to check if the used tubing fulfils the respective requirements.

BOLA PFA Tubing

Material: PFA	Temperature resistance: from -200°C to +260°C	Chemical resistance: +++ universal	Transparency: transparent
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Product description:
Transparent, gastight tubing



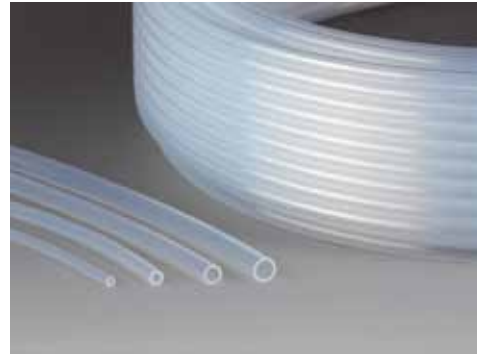
Product advantages:

- » 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.:
(1/32") 0,8	(1/16") 1,6	0,40	7	140	S 1811-02
1,5	3,0	0,75	12	140	S 1811-03
(1/16") 1,6	(1/8") 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
(1/8") 3,175	(1/4") 6,35	1,58	26	140	S 1811-07
3,6	6,0	1,20	30	96	S 1811-08
(5/32") 3,96	(1/4") 6,35	1,20	34	84	S 1811-12
4,0	6,0	1,00	36	70	S 1811-10
(11/64") 4,35	(1/4") 6,35	1,00	52	64	S 1811-14
(3/16") 4,78	(1/4") 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
(1/4") 6,35	(3/8") 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
(3/8") 9,52	(1/2") 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



BOLA INNOVATION

Perfect connection

Tubing 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.



HELPFUL: page 129
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 284. It is the user's responsibility to check if the used tubing fulfils the respective requirements.

BOLA Flanged Corrugated Tubing

Material: PFA	Temperature resistance: from -50 °C to +140 °C	Chemical resistance: +++ universal	Transparency: transparent	Vacuum: suitable
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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.

FDA conform

Tubing size NW	I.D. mm	O.D. mm	For thread GL	Bending radius ¹ mm	Pressure load max. bar	Length 0,5 m Cat. No.:	Length 1,0 m Cat. No.:
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

Applications:

Ideal for connections under vibrations or thermal expansions. Small bending radius allow connections in a tight space. More lengths on demand.



BOLA Heat Shrinkable Tubing

Material: PTFE	Temperature resistance: from -200°C to +250°C	Chemical resistance: +++ universal	Transparency: transparent	Shrink rate: 4:1
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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. 1/4 of the original inner diameter and that the length shrinks to approx. 15%. Good heat transmission due to low wall thickness.

FDA conform

Expanded I.D. mm	Min. shrunk O.D. mm	Wall thickness after shrinkage mm	Cat. No.:
(5/64") 2,0	0,7	0,22	S 1828-08
(1/8") 3,2	1,0	0,25	S 1828-16
(3/16") 4,7	1,3	0,30	S 1828-24
(1/4") 6,3	(1/16") 1,6	0,30	S 1828-32
(3/8") 9,5	2,5	0,30	S 1828-40
(1/2") 12,7	3,7	0,38	S 1828-48
(3/4") 19,0	5,7	0,38	S 1828-56
(1") 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 electric strength
- » flame retardant



HELPFUL: page 299
Detailed instructions
for processing

¹ Bending radius: minimum bending radius in mm at a room temperature of 23°C

BOLA PFA Corrugated Tubing

Material: PFA	Temperature resistance: from -200°C to +260°C	Chemical resistance: +++ universal	Transparency: transparent	Vacuum: suitable
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Product description:

Circular corrugations around the longitudinal axis. Can be shortened easily by means of a tubing cutter (see page 166).

FDA conform

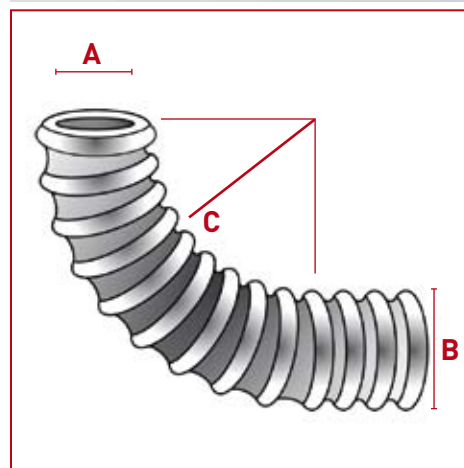
Nominal width NW	I.D. A mm	O.D. B mm	Bending radius ¹ C mm	Pressure load max. bar	Cat. No.:
4,5	4,3	6,8	5	1,7	S 1820-01
8	7,7	10,7	15	3,4	S 1820-02
10	9,7	13,0	18	2,8	S 1820-04
13	12,4	16,1	23	2,6	S 1820-06
14	13,7	17,8	25	2,3	S 1820-08
16	15,4	19,7	28	2,3	S 1820-10
19	18,4	23,2	32	2,2	S 1820-14
21	19,8	24,8	35	2,1	S 1820-16
23	23,8	28,8	40	1,2	S 1820-23

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

Applications:

- » Perfect tubing for aggressive and pure liquids or gases



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:

This completely imbued tubing is lightfast, different colours assure high safety against confusions. The colour pigments can possibly affect 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

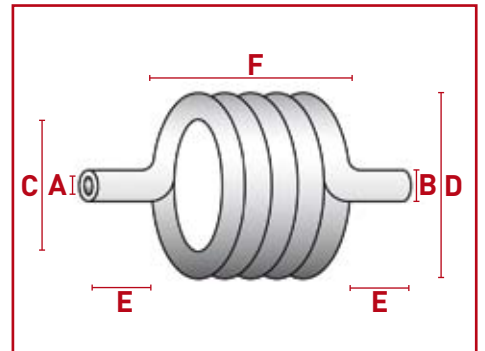
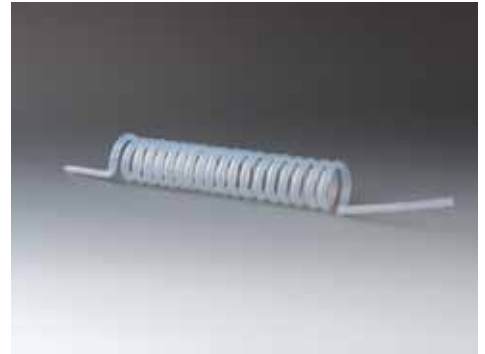
Product description:

Spiral tubing made of PFA is manufactured individually according to your specifications. Please take the possible tubing dimensions from the list on page 157. 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.

FDA conform

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:	



¹ Bending radius: minimum bending radius in mm at a room temperature of 23°C

BOLA Assortment of Remainder Tubing

Material: PTFE Material: PFA Material: FEP Chemical resistance: **+++ universal**

Product description:

No rejections. Approx. 10 rolls of unsorted tubing made of PTFE, FEP and PFA with different diameters. Length of up to 2 metres per roll. No selection possible.

FDA conform

				Cat. No.:
				S 1899-10



BOLA PEEK Capillary Tubing

Material: PEEK Temperature resistance: **from -50°C to +250°C** Chemical resistance: **+++ universal**

Product description:

Flexible, brown high-pressure tubing for almost all organic or inorganic liquids.

FDA conform

I.D. mm	O.D. mm	Bending radius mm	Pressure resistant up to bar	Cat. No.:
0,25	(1/16") 1,6	4	350	S 1817-08
0,50	(1/16") 1,6	4	350	S 1817-12
(1/32") 0,80	(1/16") 1,6	4	280	S 1817-16
(1/16") 1,60	(1/8") 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. max. mm			Cat. No.:
28			S 1852-28



Spare Parts for: Replacement Blades

Description	Packing Unit		suitable for	Cat. No.:	
Replacement Blades	1 piece		S 1852-28	S 1853-28	

BOLA Tiles

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

Product description:

Standard sizes with different thicknesses.

FDA conform

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**

Product description:
Delivered in rolls with a length of 1000 mm. Colour: white

FDA conform

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 Rods

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

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.

FDA conform

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
50	S 1800-50



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

Product description:
 Deformable, virginal PTFE flat tape with expanded fibre structure.

FDA conform

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
5	30	5	H 959-40
5	50	5	H 959-50

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 Fluorslidepaste

Material: PTFE	Temperature resistance: from -36°C to +260°C	Chemical resistance: +++ universal
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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 Sealing Paste

Material: PTFE	Temperature resistance: from -240 °C to +260 °C	Chemical resistance: +++ universal
-------------------	--	---------------------------------------

Product description:
Odourless and nontoxic paste for all kinds of sealings, non-hardening, eliminates leaks on threads even if high pressure resistance is needed, threaded connections can easily be closed and opened, the threads are prevented from being damaged.

Capacity g			Cat. No.:
500			S 1874-16

- Product advantages:**
- » no dropping or flowing during use
 - » resealable can including brush

Applications:
Suitable for many bases and acids, any kinds of solvents or gases including hydrogen, ammoniac, chlorine, propane, butane, nitrogen, as well as for air, steam, refrigerants, salt water, and fuels (do not use on liquid or gaseous oxygen and lactic acid).



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

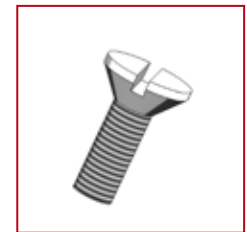
Material: **PTFE** Temperature resistance: **from -200°C to +250°C** Chemical resistance: **+++ universal**

Product description:

Similar to DIN 963/DIN EN ISO 2009

FDA conform

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
10	1,50	40	18,3	H 1124-30



BOLA Screws with Cylindrical Head

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

Product description:

Similar to DIN 84/DIN EN ISO 1207

FDA conform

Thread M	Pitch mm	Usable length mm	Dia. of head x Height 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
10	1,50	40	16,0 x 7,0	H 1128-30



« »
Special Request?
+49 (0) 93 46-92 86-0

BOLA Hexagon Nuts

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

Product description:
Similar to DIN 934 / DIN EN ISO 4032

FDA conform

Thread M	Pitch mm	Hexagon mm	Height 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
10	1,50	16	11,0	H 1132-30



BOLA Washers

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

Product description:
Similar to DIN 125-1, packing unit: 10 pieces

FDA conform

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
10	20,0	10,5	2,2	H 1126-30



BOLA Boiling Stones

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

Product description:
Prevent splashes and production of bubbles during boiling.
Packed in resealable bag.

FDA conform

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

Product description:

Made of solid PTFE, with smooth surface. Different packing units.

FDA conform

Dia. of ball mm	Packing unit	Cat. No.:
3	pack of 100 pieces	H 964-03
6	pack of 100 pieces	H 964-06
9	pack of 100 pieces	H 964-09
15	pack of 50 pieces	H 964-15
20	pack of 50 pieces	H 964-18
25	pack of 25 pieces	H 964-21
30	pack of 25 pieces	H 964-24

Applications:

For extension of surfaces of e. g. distillation apparatus;
as splash guard



Ground Joint Components



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GROUND JOINT COMPONENTS

No matter if you use sleeves with gripping ring, with ribs or sleeves for spherical ground joints - you always make the right choice since they all feature the unique properties of PTFE.

PRODUCT TIPS



Page 179:
Bellows



Page 176:
Sleeves with Gripping Ring



Page 185:
Tri Clamp Connectors

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.

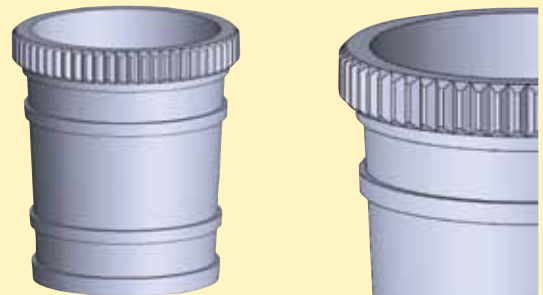
All common joint clamps can still be used.

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

BESTSELLER

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

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.



FDA conform

European standard Size	NS	ES Cat. No.:	US standard Size	US 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

BESTSELLER

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

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.


FDA conform

European standard Size	NS	ES Cat. No.:	US standard Size	US 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 INNOVATION

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 Spherical Ground Joint Sleeves

Material: PTFE	Temperature resistance: from -200 °C to +250°C	Chemical resistance: +++ universal	Vacuum: suitable	Feature: reusable
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Product description:
Made of PTFE, with gripping ring and sealing rings on the outside, high-vacuum tight sealing; low leak rate: $<1 \times 10^{-2}$ mbar x l x s⁻¹; solid construction for continued use.

FDA conform

European standard Size S	ES Cat. No.:	US standard Size KS	US Cat. No.:
13	H 934-02	18	H 931-04
19	H 934-04	28	H 931-06
29	H 934-06	35	H 931-10
35	H 934-08	55	H 931-16
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
--------------------------	---	--	-----------------------------

Product description:
PTFE-encapsulated steel spring core. Universal chemical resistance since the product is only exposed to PTFE.

FDA conform

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 Bellows

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

Product description:

Made of PTFE, with round folds and sealing rings on the outside; maximum deflection: 40°.

FDA conform

Socket NS	Cone NS	Total minimum length mm	Total maximum length mm	Cat. No.:
14/23	14/23	86	90	H 907-03
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.



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GROUND JOINT COMPONENTS

BESTSELLER

BOLA Bellows

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

Product description:

Made of PTFE, with sharp folds and sealing rings on the outside; maximum deflection: 120°.

FDA conform

A	Socket NS <small>European standard</small>	Cone NS	Total minimum length mm	Total maximum length mm	ES 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
B	Socket <small>US standard</small>	Cone	Total minimum length mm	Total maximum length mm	US Cat. No.:
	14/35	14/35	82	90	H 905-02
	19/22	19/22	95	97	H 905-07
	24/40	24/40	120	137	H 905-15
	29/42	29/42	124	142	H 905-17
	45/50	45/50	150	165	H 905-21

Applications:

Strainless connection of ground joint equipment; for compensating vibrations from vacuum pumps; for length compensation of heated columns; angular misalignment.



Special Request?
+49 (0) 93 46-92 86-0

BOLA Stoppers

BESTSELLER

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

Product description:

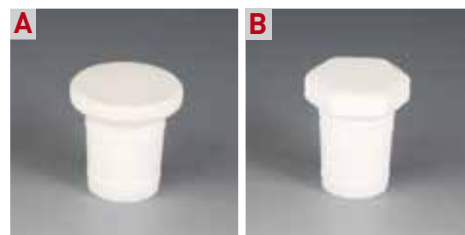
Made of PTFE, with ground joint and sealing rings on the outside; knurled or hexagonal grip. Compared with glass stoppers, they are easily removable and can be used without grease. The stoppers can expand under heat which might lead to a breaking of the ground joint sockets.

FDA conform

A			B		
Size NS	Knurled grip Cat. No.:		Size NS	Wrench size (SW) mm	Hexagonal grip Cat. No.:
10/19	H 936-02				
12/21	H 936-03				
14/23	H 936-04		14/23	19	H 937-04
19/26	H 936-05		19/26	26	H 937-05
24/29	H 936-06				
29/32	H 936-07		29/32	35	H 937-07
34/35	H 936-08				
45/40	H 936-10		45/40	52	H 937-10

Applications:

For closing ground joint parts.



Special Request?
+49 (0) 93 46-92 86-0

BOLA Ground Joint Adaptors

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

Product description:

Made of PTFE, socket in cone, with sealing rings on the outside and knurled grip.

FDA conform

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
--------------------------	--	--	----------------------------

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.

FDA conform

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

NEW

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
--------------------------	--	--	----------------------------

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 75). The product is only exposed to PTFE.

FDA conform

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
45/40	20,5	32	D 571-40



BOLA Spherical Ground Joint-GL Tube Fittings

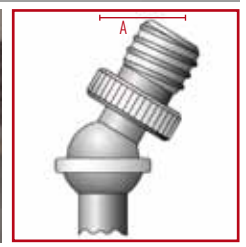
Material: PTFE	Temperature resistance from -200°C to +250°C	Chemical resistance: +++ universal	Vacuum: suitable
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Product description:
Fitting made of PTFE, for transition from spherical ground joints to GL threads. For connection of hard-walled tubing (e.g. PTFE, PFA, FEP) with BOLA Laboratory Screw Joints (see page 75). The product is only exposed to PTFE.

FDA conform

Spherical ground joint size S	Thread GL	Bore dia. mm	Angle A max.	Cat. No.:
19	18	10,5	25°	D 790-24
29	25	14,5	20°	D 790-36
35	25	14,5	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°
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Product description:

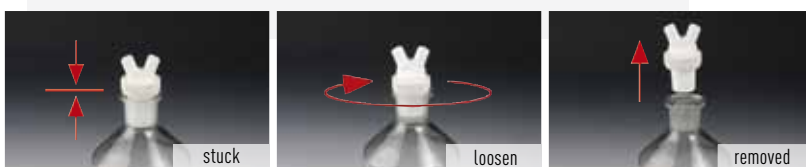
Completely made of PTFE. With ground joint size 29/32 and two GL-threaded necks. Integrated special nut for easy unlocking of the ground joint. For the connection of tubing or tube made of glass, plastic or metal by means of laboratory screw joints.

FDA conform

For ground joint NS	For tubing O.D. max. 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 Praxis-Tip

Benjamin Schmitt
» engineering



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 183

BOLA Ground Joint-GL-Adaptors

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

FDA conform

	For bottle thread GL	Socket NS	Cat. No.:
A	45	29/32	D 734-40
	45	45/40	D 734-44

NEW B

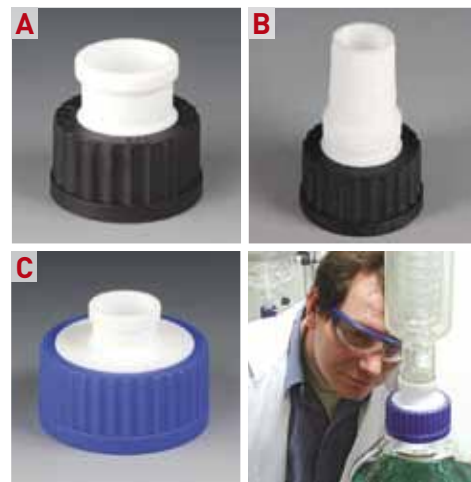
	For bottle thread GL	Cone NS	Cat. No.:
	45	29/32	D 740-40

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

	For bottle thread GLS	Socket NS	Cat. No.:
C	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 Ground Joint Reducing Set

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

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.

FDA conform

Dimensions NS	Height/length of ground joint mm	Cat. No.:
14 - 60	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
------------------------------------	--	--	-------------------------	----------------------------

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.

FDA conform

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

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.

FDA conform

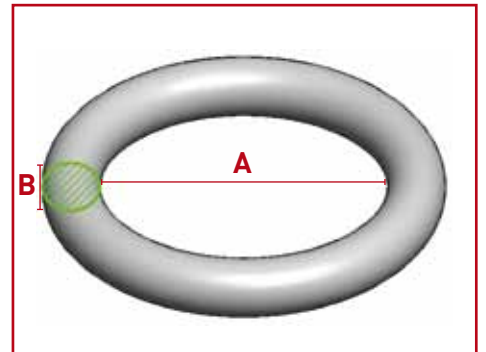
Quantity:

A O-Ring I.D.:

B Thickness:

Applications:

As sealing.



BOLA O-Rings for Laboratory Flat Flanges

Material: FEP Temperature resistance: from -60°C to +205°C Chemical resistance: ++ very good

Product description:

Silicone core with seamless FEP coating; manufactured according to DIN 12214:1996-12; flexible, almost universal chemical resistance.

FDA conform

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 5	H 969-55
200	214 x 5	H 969-75

Applications:

As sealing for flat flange with groove.



BOLA Tri-Clamp Fittings

Tri-Clamp is a standardized fitting system which is widely used in the chemical, pharmaceutical and food industry for all kind of applications that require easy to clean, reliable and safe to assemble components.

Besides the low dead volume, the easy assembly is another advantage of the Tri-Clamp system.

The flangelike connectors are pressed on each other and secured with a locking clip.

A suiting gasket provides additionally a reliable sealing. The wing screw on the locking clip allows a fast loosening and closing of the connection whenever necessary.

Using BOLA Tri-Clamp-Fittings, hard walled tubes and tubing made of glass or plastics can easily be connected to the GL threaded sockets of the single components by using BOLA Laboratory Screw Joints (see page 75). This connection is tight and can be operated under pressure and vacuum. All BOLA Tri-Clamp-connectors are made of PTFE and therefore provide a high chemical as well as thermal resistance. All components can be sterilized if necessary.

BOLA products with Tri-Clamp are manufactured as per the standard DIN 32 676. Other dimensions or adaptors for transition to other threads can be offered on request.

BOLA Adaptor Tri-Clamp Hose Connector

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

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.

FDA conform

Plate-Ø mm	Nominal size as per DIN	For tube I.D. mm	Hose Connector O.D. mm	Cat. No.:
25,5	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.



BOLA Tri-Clamp GL-Adaptor

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

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.

FDA conform

Plate-Ø mm	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
91,0	DN 65	66,0	18	D 901-72
91,0	DN 65	66,0	25	D 901-74
91,0	DN 65	66,0	45	D 901-76

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.

« »
Special Request?
+49 (0) 93 46-92 86-0



BOLA Tri-Clamp Multiple Distributor

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

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.

FDA conform

Plate-Ø mm	Nominal size as per DIN	For tube I.D. mm	Threaded Neck GL	Bore diam. mm	Cat. No.:
25,5	DN 10	10,0	2x 14	2x 4,5	D 911-02
34,0	DN 20	20,0	2x 14	2x 8,5	D 911-22
50,5	DN 40	38,0	3x 14	3x 8,5	D 911-42
50,5	DN 40	38,0	3x 18	3x 10,5	D 911-44
91,0	DN 65	66,0	3x 18	3x 10,5	D 911-72

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, PP
 Temperature resistance: from 0 °C to +110 °C
 Chemical resistance: +++ universal

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.

FDA conform

Plate-Ø mm	Nominal size as per DIN	For tube I.D. mm	connecting thread GL	bore dia. mm	Cat. No.:
25,5	DN 08	8,0	18	6,0	D 917-02
34,0	DN 10	10,0	18	6,0	D 917-22
34,0	DN 15	16,0	25	8,0	D 917-24
50,5	DN 25	26,0	25	8,0	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.



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BOLA Tri-Clamp Gaskets

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

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.

FDA conform

Plate-Ø mm	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 offers custom manufacture.

Every lab is different. By offering an extensive range of established and sophisticated standard solutions we take into account the varied requirements of the respective branches and sectors.

But maybe you are looking for something special? Something that is not included in our standard product range?

In that case we are able to offer an individual custom manufacture. This is easier and faster than you may expect. Discuss your idea with our professionals. They will give advise and support during design. Finally, your idea will become real: We produce as per your requirements and in compliance with the chosen raw materials – already from 1 piece.

We only need a drawing (a sketch is sufficient) and some further information.

» **You have a special request?**

Give us a call: +49 (0) 93 46-92 86-0.

Temperature Measurement



Precise and reliable measurements even in aggressive liquids - all probes are encapsulated with PTFE for maximum chemical resistance.

PRODUCT TIPS



Page 195:
PT 100 Temperature Probes



Page 193:
Double PT 100 Temperature
Probes



Page 197:
Total Immersion Probes

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

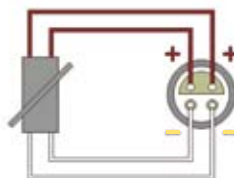
The four-wire system of the PT 100 probes eliminates nearly completely the influence of the resistivity and the transition resistance (failure: approx. 0,002-0,004 % / Ohm). Normally, a calibration is not necessary. Long connecting cables can be used with the four-wire system.

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:

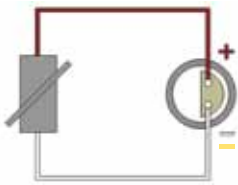
at 0°C: +/- 0,15°C

at 100°C: +/- 0,35°C



Performance Data of BOLA Temperature Probes 2-wire-system - PT 1000

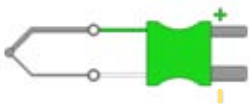
Pin configuration of the LEMO® socket plug



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:	0°C to +300°C
Specification:	IEC60584.3:2007
Type:	Type K Thermocouple
Tolerance:	+/- 0,15° C

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.



HELPFUL: page 290
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 133. Please see also page 122 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.

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!

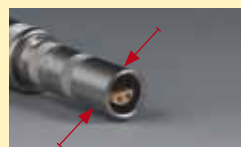
You can find out your plug or socket size as follows:



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
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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.



FDA conform

Typical response times:

- » T 50: 20 - 24 s
- » T 90: 30 s

See page 290 for detailed explanation.

Usable length mm	Probe dia. mm	Total length mm	Number of sensors	Width of coupling A mm	Cat. No.:
300	8	400	2 x PT 100	27	P 1740-20
400	8	500	2 x PT 100	27	P 1740-23
500	8	600	2 x PT 100	27	P 1740-30
300	6	400	2 x 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 133)

BESTSELLER



probe tip

socket



BOLA INNOVATION

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 BENEFITS

- » Compact production series
- » Different length of cable can be connected
- » Exchange of the cable is possible without any problems

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
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Product description:

One measuring sensor PT 100 in a PTFE-encapsulated stainless steel tube (1.4571). Temperature probe \varnothing 8 mm, tip \varnothing 6 mm, collar ring \varnothing 12 mm. Connection by a coupling (type Lemo®, socket size 1, 4-wire system) fixed directly at the end of the probe.



FDA conform

Typical response times:

- » T 50: 7 - 12 s
- » T 90: 14 - 16 s

See page 290 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 133)

BESTSELLER



probe tip



socket



BOLA INNOVATION

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.



SUITABLE: page 105
Swivelling screw fittings

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
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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 290 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 liquids
- » cable provides flexible connection from measuring device to medium



probe tip

connecting cable



SUITABLE: page 26
Slip-on Baffles to transform temperature probes to baffles.

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
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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 290 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

« | »
Special Request?
+49 (0) 93 46-92 86-0

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
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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 290 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
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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 290 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



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
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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.

CE

FDA conform

Typical response times:

- » T 50: 4 - 6 s
- » T 90: 6 - 8 s

See page 290 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



probe tip



socket

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
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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.

CE

FDA conform

Typical response times:

- » T 50: 4 - 6 s
- » T 90: 6 - 8 s

See page 290 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



probe tip



plug



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 290 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



probe tip

connecting cable



SUITABLE: page 26
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 290 for detailed explanation.

Usable length mm	Total length mm	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



probe tip

plug

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
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Product description:

Total immersion probe PT 1000, collar ring Ø 5 mm. 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 290 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
- » can be immersed totally into the liquid

« »
Special Request?
+49 (0) 93 46-92 86-0



probe tip

connecting cable

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
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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 290 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



probe tip

plug



Temperature Probes

- » Compared to stainless steel probes, BOLA Temperature Probes offer best chemical resistance. And unlike glass, they are unbreakable. «

Inge Fenstad » Chiron AS

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
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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)

FDA conform

Typical response times:

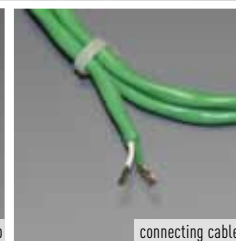
- » T 50: 25 s
- » T 90: 59 s

See page 290 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



probe tip

connecting cable

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
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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.

FDA conform

Typical response times:

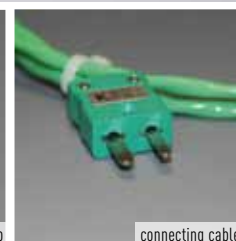
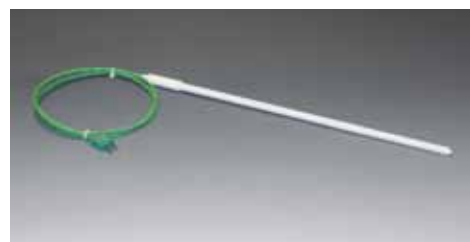
- » T 50: 25 s
- » T 90: 59 s

See page 290 for detailed explanation.

Usable length mm	Total length mm	Connector	Cat. No.:
200	260	SMP plug, 2-wire-system	P 1860-15
300	360	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



probe tip

connecting cable



SUITABLE: page 26

Slip-on Baffles to transform temperature probes to baffles.

BOLA Conductivity Probe

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

Product description:

Two PTFE-encapsulated electrodes made of Hastelloy® C4 (material no. 2.4610). Bare measuring tip, the electrodes with a diam. of 2,5 mm are separated by a PTFE spacer. Application: for measurement of electric conductivity and specific resistance to determine the salinity in solvents. Connection to the measuring device is made with a PFA-coated cable (length: 1,5 m, 2-wire) by connecting the braids directly or with a plug/socket to be provided by customer.

FDA conform

Usable length mm	Probe dia. mm	Cat. No.:
400	10	L 1390-40

Product advantages:

- » non-breakable
- » very good chemical resistance
- » easily cleanable

Applications:

- » Measurement of salinity in solvents in reaction vessels or flasks
- » Control of water purity
- » Testing for contaminants in fuels



probe tip

connecting cable

BOLA Leading-in for Sensors

Material: PTFE
 Temperature resistance: from 0°C to +110°C
 Chemical resistance: +++ universal

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.

FDA conform

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.



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 Extension Cable for Temperature Probe Lemo®

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®.

FDA conform

	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
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



Vessels and Distillation Equipment



203

VESSELS AND DISTILLATION EQUIPMENT

A suitable solution for practically every application in well-known BOLA-quality and optimally adapted to your needs.

PRODUCT TIPS



Page 204:
Scrubber Bottles



Page 219:
Digestion Vessels



Page 231:
Distillation Apparatus

BOLA Scrubber Columns

Material: FEP, PTFE	Temperature resistance: from -200°C to +205°C	Chemical resistance: +++ universal	Pressure: no pressure	Transparency: transparent
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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 264) which needs a lower primary pressure.

FDA conform

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 l/h	62,5 l/h	130,0 l/h
A 117-08	5 l/h	50,0 l/h	117,5 l/h



SUTABLE: page 263
Scrubber Adaptor for Bottles with
GL 45 and GLS 80

BOLA Scrubber Bottles

BESTSELLER

Material: PFA, PTFE	Temperature resistance: from -200°C to +250°C	Chemical resistance: +++ universal	Pressure: no pressure	Transparency: transparent
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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 264) which needs a lower primary pressure.

Capacity ml	Total height mm	Connection for tubing O.D. mm	O.D. of bottle mm	Artikel-Nr.:
250	175	2 x 6	60	A 118-01
500	200	2 x 6	75	A 118-02
1.000	240	2 x 8	95	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 l/h
A 118-02	7,5 l/h	30,0 l/h	80 l/h
A 118-03	7,5 l/h	37,5 l/h	80 l/h



BOLA Micro Scrubber Bottles

Material: PFA	Temperature resistance: from -200°C to +250°C	Chemical resistance: +++ universal	Pressure: no pressure	Transparency: transparent
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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.

FDA conform

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.



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VESSELS AND DISTILLATION EQUIPMENT

BOLA Wide-Mouth Bottles

Material: PTFE	Temperature resistance: from -200°C to +250°C	Chemical resistance: +++ universal	Pressure: no pressure
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Product description:

Thick-walled, smooth interior surface, screw cap.

FDA conform

Capacity ml	Total height mm	I.D. mm	O.D. mm	Thread of screw cap	Cat. No.:
1	22	9	12	M 12 x 1,0	A 100-01
5	35	15	20	M 20 x 1,5	A 100-03
10	44	18	28	GL 25 x 3,5	A 100-04
25	53	25	34	GL 32 x 4,0	A 100-05
50	72	31	45	GL 40 x 4,0	A 100-06
100	87	34	50	GL 45 x 4,0	A 100-07
250	122	34	63	GL 45 x 4,0	A 100-08
500	157	46	75	GL 56 x 4,0	A 100-09
1.000	194	58	100	GL 70 x 5,0	A 100-10



BOLA Practical Tip

Gertrud Steinam » final examination

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 Wide-Mouth Bottles with Conical Neck

Material: PFA	Temperature resistance: from -200°C to +250°C	Chemical resistance: +++ universal	Pressure: no pressure	Transparency: transparent
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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 80
Distributors for different threads and tubing diameters



SUITABLE: page 86
Threaded adaptors for connecting different kinds of bottle threads

BOLA Wide-Mouth Bottles with Conical Neck

Material: PTFE	Temperature resistance: from -200°C to +250°C	Chemical resistance: +++ universal	Pressure: no pressure
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Product description:
Thick-walled, smooth interior surface, ergonomic grips on bottle and screw cap.

FDA conform

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 Narrow-Mouth Bottles with Conical Neck

Material: PFA	Temperature resistance: from -200°C to +250°C	Chemical resistance: ++ very good	Pressure: no pressure	Transparency: transparent
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Product description:
Transparent, non-porous, conical neck, tall shape, screw cap.

Capacity ml	Total height mm	I.D. of neck mm	O.D. mm	Thread GL	Cat. No.:
50	93	10	38	18	A 105-03
100	122	10	45	18	A 105-06
250	163	17	61	25	A 105-09
1.000	235	22	96	32	A 105-15



BOLA Wash Bottles

Material: PFA	Temperature resistance: from -200°C to +250°C	Chemical resistance: +++ universal	Transparency: transparent
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Product description:

Transparent, non-porous, graduated, screw cap.

FDA conform

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



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BOLA Round Bottom Flasks

BESTSELLER

Material: PFA	Temperature resistance: from -200°C to +250°C	Chemical resistance: +++ universal	Transparency: transparent
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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 180
Different types of stoppers

BOLA Round Bottom Flasks with Two or Three Ground Joint Necks

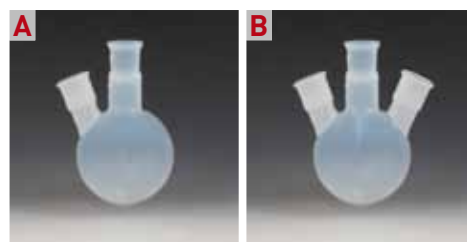
Material: PFA	Temperature resistance: from -200°C to +250°C	Chemical resistance: +++ universal	Transparency: transparent
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Product description:

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

« Special Request? »
+49 (0) 93 46-92 86-0



BOLA Round Bottom Flasks with Threaded GL Necks

Material: PFA	Temperature resistance: from -200°C to +250°C	Chemical resistance: +++ universal	Transparency: transparent
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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 77).

	Capacity ml	Total height mm	O.D. of ball mm	Cat. No.:
	100	117	67	A 149-12
	250	149	88	A 149-20
	500	177	107	A 149-36



BOLA INNOVATION

Round Bottom Flasks with Lateral Necks

A standard glass product but made of PFA. BOLA is offering two versions: with central ground joint and two lateral necks or with ground joint or GL thread.

BOLA Jars

Material: PFA	Temperature resistance: from -200°C to +250°C	Chemical resistance: +++ universal	Pressure: no pressure	Transparency: transparent
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Product description:

Translucent, non-porous, sturdy design, screw cap.

FDA conform

Capacity ml	Total height mm	O.D. mm	I.D. mm	Thread S	Depth mm	Cat. No.:
7	37	22	18,5	24	32	A 130-01
60	47	50	45,5	52	40	A 130-05
90	67	50	45,5	52	58	A 130-06
120	53	66	60,0	69	45	A 130-07
240	95	66	60,0	69	86	A 130-09
500	120	85	80,0	88	109	A 130-11
1.000	151	107	100,0	110	139	A 130-12



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BOLA Jars

Material: PFA	Temperature resistance: from -200°C to +250°C	Chemical resistance: +++ universal	Pressure: no pressure	Transparency: transparent
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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 159.

FDA conform

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



BOLA Practical Tip

Gertrud Steinam » final examination

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.



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 291 for further advice on the heating of fluoroplastics.

BOLA Micro Reaction Vessels

Material: PFA, PTFE Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal Pressure: no pressure Transparency: transparent

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.

FDA conform

Capacity ml	Total height mm	O.D. mm	I.D. mm	for Tube O.D. max. mm	Threaded necks	Cat. No.:
90	96	50	45,5	2 x 8,5 / 1 x 10	2 x GL14 / 1 x GL18	B 318-40
240	130	66	60,0	2 x 10,0 / 1 x 16	2 x GL18 / 1 x GL25	B 318-64
500	158	85	80,0	3 x 16	3 x GL25	B 318-80



SUITABLE: page 77
Laboratory Screw Joints

BOLA Vials

Material: PFA Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal Pressure: no pressure Transparency: transparent

Product description:

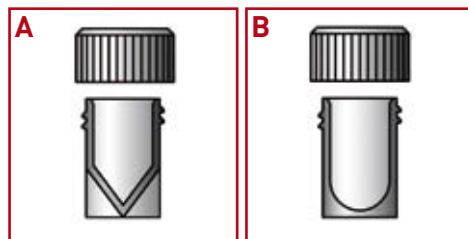
Translucent, non-porous, with round or conical bottom, screw cap.

FDA conform

	Capacity ml	Total height mm	O.D. mm	Bottom shape	Thread S	Cat. No.:
A	5	36	22	conical	25	A 194-04
B	7	36	22	round	25	A 195-04

Applications:

For centrifugal or evaporation work.



BOLA Beakers

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

Product description:
Thick-walled, smooth interior surface, reinforced upper rim, with spout.
Optional PTFE lid with centering shoulder is available.

FDA conform

Capacity ml	Height mm	O.D. mm	I.D. mm	Cat. No.:
3	22	17	15	A 136-02
5	24	21	19	A 136-03
10	36	26	23	A 136-04
25	47	31	28	A 136-05
50	57	41	35	A 136-06
100	78	51	44	A 136-07
150	92	56	48	A 136-08
250	97	65	58	A 136-09
500	119	81	76	A 136-11
1.000	152	105	97	A 136-13
2.000	198	142	136	A 136-14
3.000	232	156	148	A 136-15



BOLA Lids

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

Product description:
Lid with centering shoulder.

FDA conform

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 215
Thermo Beakers for hot-plates

BOLA Jars with Ground Joint

Material: PFA, PTFE	Temperature resistance: from -200°C to +250°C	Chemical resistance: +++ universal	Transparency: transparent
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FDA conform

Product description:
Jar made of translucent, non-porous PFA, screw cap made of PFA with integrated ground joint neck size 29 made of PTFE.

Capacity ml	Total height mm	O.D. mm	I.D. mm	Cat. No.:
1.000	193	107	100	A 159-24

Applications:
Evaporation vessel for rotary evaporators, reaction vessel.



BOLA Beakers

Material: PFA	Temperature resistance: from -200°C to +250°C	Chemical resistance: +++ universal	Transparency: transparent
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Product description:
Translucent, non-porous, graduated, with spout.

Capacity ml	Total height mm	O.D. mm	Cat. No.:
25	50	32	A 137-01
50	58	39	A 137-02
100	71	50	A 137-03
250	95	67	A 137-05
500	119	82	A 137-07
1.000	141	104	A 137-09



BOLA Measuring Cylinders

Material: TFM, PTFE	Temperature resistance: from -200 °C to +250 °C	Chemical resistance: +++ universal
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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.
50	1	172	24	A 164-12
100	2	202	30	A 164-16
250	2,5	268	40	A 164-20
500	5	308	53	A 164-30

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**

Product description:

Convex shape

FDA conform

	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**

Product description:

Cylindrical shape, without spout.

FDA conform

Capacity ml	Height mm	O.D. mm	I.D. mm	Cat. No.:
25	27	43	40	A 170-01
50	25	66	62	A 170-02
100	29	80	75	A 170-03
250	56	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 291 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**

Product description:

Conical shape, with spout.

FDA conform

Capacity ml	Height mm	O.D. top mm	O.D. bottom mm	Cat. No.:
25	37	38	34	A 169-01
50	41	49	46	A 169-02
100	54	64	60	A 169-03
250	62	97	90	A 169-04



BOLA Evaporating Dishes

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

Product description:
Cylindrical shape, with spout.

FDA conform

Capacity ml	Height mm	O.D. mm	I.D. mm	Cat. No.:
100	18	105	100	A 176-02
250	36	130	125	A 176-03

« Special Request? »
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SUITABLE: page 69 and 70
Spatula and tweezers



BOLA Evaporating Dishes

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

Product description:
Cylindrical shape, without spout, transparent, non-porous, stackable.

FDA conform

Capacity ml	Height mm	O.D. mm	I.D. mm	Cat. No.:
15	14,0	56	50	A 177-01
100	19,5	105	100	A 177-03



BOLA Evaporating Dishes

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

Product description:
Conical shape, with spout, transparent, non-porous.

FDA conform

Capacity ml	Height mm	O.D. top mm	O.D. bottom mm	Cat. No.:
100	30	90	60	A 171-01



BOLA Crucibles

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

Product description:
 Conical, bellied shape, without spout.

FDA conform

Capacity ml	Height mm	O.D. top mm	O.D. bottom mm	Cat. No.:
25	26	49	33	A 197-03
50	35	62	33	A 197-04



BOLA Erlenmeyer Flasks

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

Product description:
 Thick-walled, with ground joint.

FDA conform

Capacity ml	Height mm	O.D. bottom mm	Ground Joint NS	Cat. No.:
50	86	54	19/26	A 151-01
100	128	63	19/26	A 151-02
250	144	85	29/32	A 151-03
500	190	107	29/32	A 151-04



SUITABLE: page 180
 ideal coordinated stoppers

BOLA Thermo Beakers

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

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.

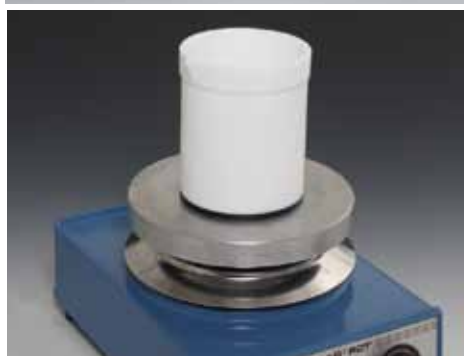
NEW

FDA conform

Capacity ml	Height mm	O. D. mm	I. D. mm	Cat. No.
100	74	56	50	A 135-02
250	94	75	67	A 135-04
400	112	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
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Product description:

Round bottom, transparent, non-porous, wall thickness 1 mm, with PTFE screw cap.

FDA conform

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 Test Tubes

Material: PFA	Temperature resistance: from -200°C to +250°C	Chemical resistance: +++ universal	Transparency: transparent	autoclave: 121°
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Product description:

Round bottom, transparent, non-porous, wall thickness 1 mm.

FDA conform

Capacity ml	Height mm	O.D. mm	Cat. No.:
10	140	12	A 183-01
15	110	16	A 183-02
20	160	16	A 183-03
25	150	19	A 183-04



BOLA Centrifuge Tubes

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

Round bottom.

FDA conform

Capacity ml	Height mm	O.D. mm	Wall thickness mm	Cat. No.:
12	100	16	1	A 193-02
50	100	34	2,5	A 193-04



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.



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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

BESTSELLER

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

Product description:

Conical opening with long outlet.

FDA conform

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: PTFE	Temperature resistance: from -200°C to +250°C	Chemical resistance: +++ universal	autoclave: 121°
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Product description:

With handle and holes in wall and bottom.

FDA conform

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: PFA	Temperature resistance: from -200°C to +250°C	Chemical resistance: +++ universal
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Product description:

Non-porous basket with a mesh size of approx. 1,0 x 1,0 mm in the bottom, with fixed stem.

FDA conform

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 Hydrolyzing and Digestion Vessels for Microwave Ovens

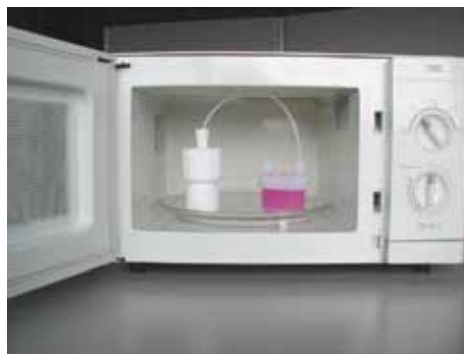
Microwave ovens are often used for making quick and easy digestions. The energy of a microwave oven penetrates the material of the vessel almost without any loss. It only heats the liquid within a few seconds over the boiling point.

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.

They are available in two versions:

- » Cat. No. A 240-...: consisting of basic vessel, screw cover and mounted sealing and rupture membrane.
- » Cat. No. A 250-...: consisting of basic vessel, screw cover, mounted sealing and rupture membrane and exchangeable liner which allows a more precise weighted sample and different digestions with only one basic vessel.

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 220).



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

BOLA Digestion Vessels

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.

FDA conform

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
10	16 x 52	50	60	25	160	A 240-04
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

BOLA Digestion Vessels with Liners

Product description:

Dimensionally stable basic vessel with exchangeable liner and screw cover made of TFM, homogenous, non-porous surface. The liner allows a more precise weighted sample and different digestions with only one basic vessel. 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.




FDA conform

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.:
10	24 x 63	50	60	25	160	A 250-04
20	30 x 63	50	60	20	150	A 250-06
50	43 x 77	69	95	20	150	A 250-08





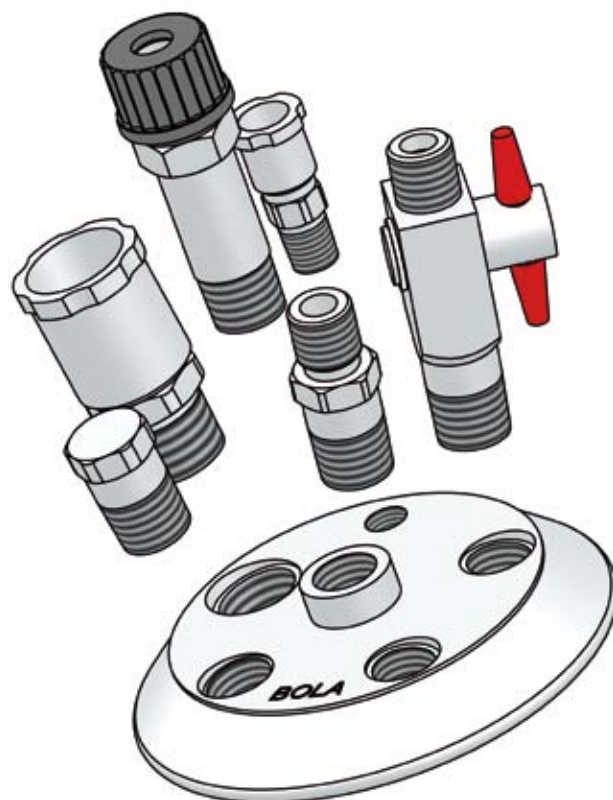
Spare Parts for: Hydrolyzing and Digestion Vessels

Description	Material	Packing Unit	Capacity	suitable for Cat. No.	Cat. No.:	
Replacement-Liners	PTFE	1 piece	10 ml 20 ml 50 ml	A 250-04 A 250-06 A 250-08	A 252-04 A 252-06 A 252-08	
Replacement-Sealing and Rupture Membranes	PFA / PTFE	pack size 10 pieces	5 ml 10 und 20 ml 50 und 100 ml	A 240-02 A 240-04/ A 240-06/ A 250-04/ A 250-06 A 240-08/ A 240-10/ A 250-08	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 Hydrolyzing and Digestion Vessels all Hydrolyzing and Digestion Vessels	A 131-12 A 131-14	



BOLA Modular System for Reactor Lids

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Worth knowing on the BOLA Modular System for Reactor Lids

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.



All features at a glance:

- » Easy assembly
- » Flexibly expandable
- » Compatible with glass reactors with SCHOTT®-flat flange
- » Completely made of PTFE, universal chemical resistance
- » With connectors for the use of existing equipment with ground joint or GL thread
- » Also as conductive version made of PTFE-EX (see page 134)

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 20

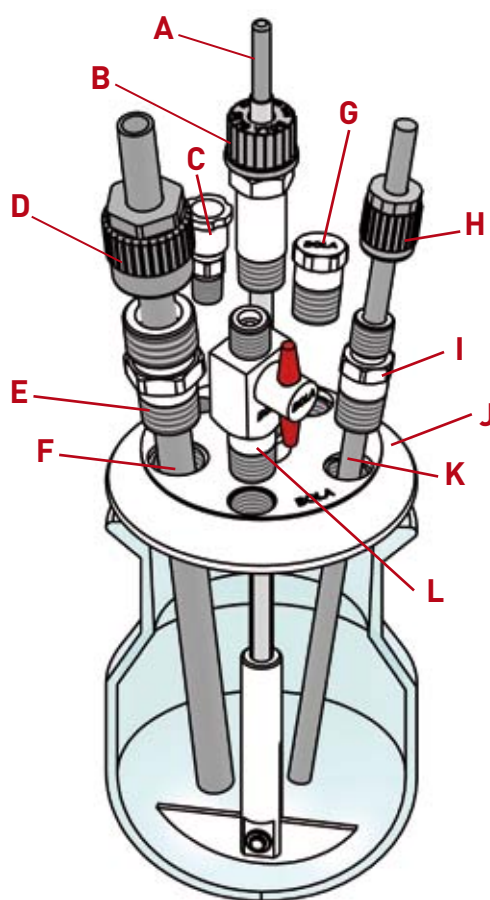
B Screw-in Stirrer Bearing
Cat. No.: B 155-08
see page 226

C Screw-in Connector with
Ground Joint
Cat. No.: B 154-02
see page 227

D Laboratory Screw Joint
Cat. No.: D 631-46
see page 77

E Screw-in Fitting GL
Cat. No.: B 152-32
see page 226

F PTFE Tubing
Cat. No.: S 1810-50
see page 159



G Screw-in Stopper
Cat. No.: B 153-04
see page 228

H Laboratory Screw Joint
Cat. No.: D 629-62
see page 77

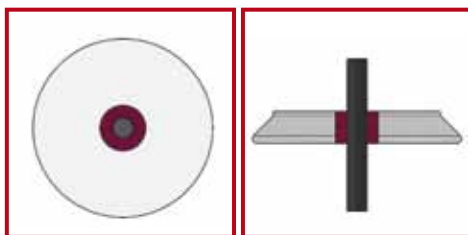
I Screw-in Fitting GL
Cat. No.: B 152-18
see page 226

J Reactor Lid DN100
Cat. No.: B 150-14
see page 225

K Temperature Probe Lemo
Cat. No.: P 1760-20
see page 195

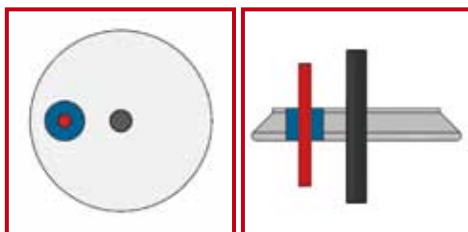
L Screw-in Stopcock
Cat. No.: B 156-02
see page 227

Thread connections in detail:



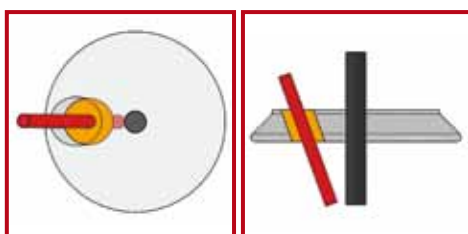
Centric thread connection (purple):

For insertion of the stirrer bearing (see page 226)



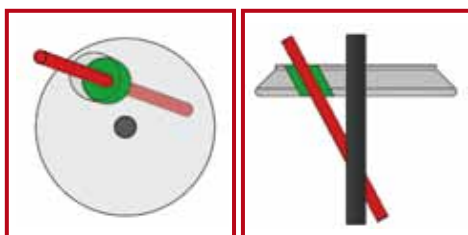
Vertical thread connection with parallel alignment to the stirrer shaft (blue):

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

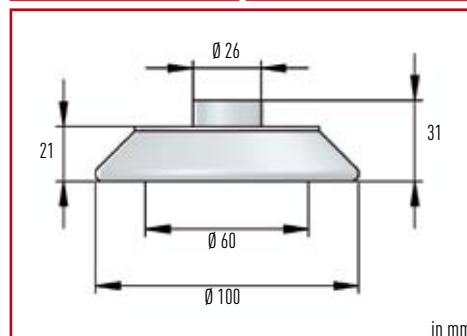
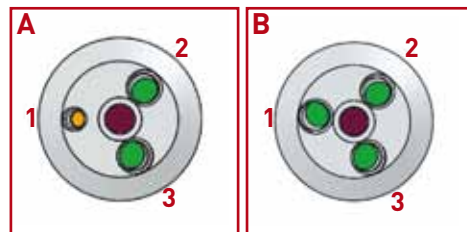
Material: PTFE
 Temperature resistance: from -200°C to +250°C
 Chemical resistance: +++ universal

Product description:

Suitable for glass reactors DN 60 with SCHOTT® flat flange. With screw-in threads for connection of transition fittings and a center neck NPT 1/2".

FDA conform

	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



BOLA Reactor Lid DN 100

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

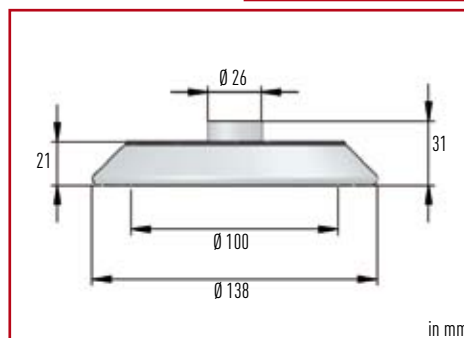
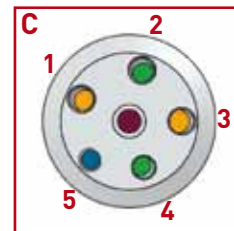
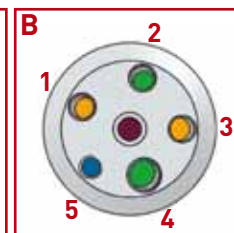
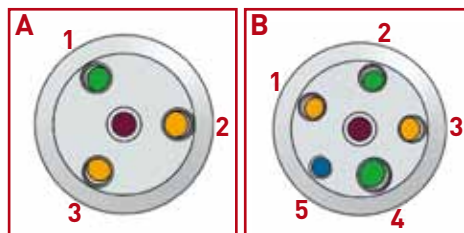
Product description:

Suitable for glass reactors DN 100 with SCHOTT® flat flange. With screw-in threads for connection of transition fittings and a center neck NPT 1/2".

FDA conform

	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" 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 150-14
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

Special Request?
 +49 (0) 93 46-92 86-0



BOLA Reactor Lid DN 150

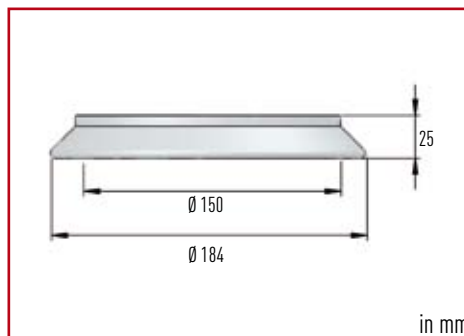
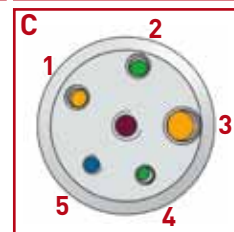
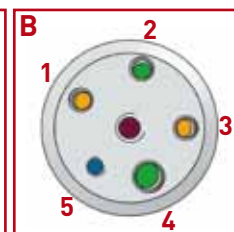
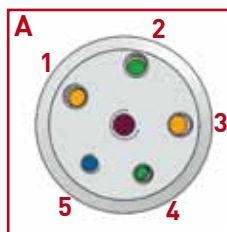
Material: PTFE
 Temperature resistance: from -200°C to +250°C
 Chemical resistance: +++ universal

Product description:

Suitable for glass reactors DN 150 with SCHOTT® flat flange. With screw-in threads for connection of transition fittings and a center neck NPT 1/2".

FDA conform

	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
C	NPT 1/2" connection directly to the shaft	NPT 1/2" connection aside the shaft	NPT 1" connection directly to the shaft	NPT 1/4" connection aside the shaft	NPT 1/4" vertical connection	B 150-26



BOLA Screw-in Stirrer Bearings

Material: PTFE Temperature resistance: from -15°C to +200°C Chemical resistance: +++ universal

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.

FDA conform

Screw-in thread NPT (male)	For stirrer shaft dia. mm	Thread of screw cap GL	Wrench size SW	Cat. No.:
1/2"	6	25	25	B 155-06
1/2"	8	25	25	B 155-08
1/2"	10	25	25	B 155-10

Applications:

For assembly on BOLA Reactor Lids, Cat. No. B 150-... from page 224. Perfect bearing for centric 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 39.



HELPFUL: page 134
Complete Modular System for Reactor Lids in PTFE-EX.

BOLA Screw-in Fittings GL

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

Product description:

For connection to BOLA Reactor Lids as GL necks. With hexagonal gripping surface in standard wrench size.

FDA conform

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 224. For connection of hard-walled tubes, tubing and probes by means of BOLA Laboratory Screw Joints.



BOLA Screw-in Stopcocks

Material: PTFE
 Temperature resistance: from 0°C to +110°C
 Chemical resistance: +++ universal

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.

FDA conform

	Screw-in Thread NPT (male)	Type	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	L	18	6	B 156-08

Applications:

For assembly on BOLA Reactor Lids, Cat. No. B 150-... from page 224. For inserting liquids and gases. Quick and easy disconnection of flow. Connection of tubing or tubes by means of BOLA Laboratory Screw Joints.



BOLA Screw-in Connector with Ground Joint

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

Product description:

For connection to BOLA Reactor Lids. Connector with ground socket. With hexagonal gripping surface in standard wrench size.

FDA conform

	Screw-in Thread NPT (male)	Ground Socket NS	Wrench Size SW	Cat. No.:
	1/4"	14/23	15	B 154-02
	1/2"	19/26	22	B 154-04
	1/2"	29/32	24	B 154-06
	3/4"	29/32	30	B 154-08
	1"	29/32	34	B 154-10
	1"	45/40	38	B 154-12

Applications:

For assembly on BOLA Reactor Lids, Cat. No. B 150-... from page 224. For connection to existing components with ground joint such as Liebig Condensers, Dropping Funnels etc.



BOLA Screw-in Stopper

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

Product description:

For connection to BOLA Reactor Lids. For closure of non-used connectors.
With hexagonal gripping surface in standard wrench size.

FDA conform

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 224.



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BOLA offers custom manufacture.

Every lab is different. By offering an extensive range of established and sophisticated standard solutions we take into account the varied requirements of the respective branches and sectors.

But maybe you are looking for something special? Something that is not included in our standard product range?

In that case we are able to offer an individual custom manufacture. This is easier and faster than you may expect. Discuss your idea with our professionals. They will give advise and support during design. Finally, your idea will become real: We produce as per your requirements and in compliance with the chosen raw materials – already from 1 piece.

We only need a drawing (a sketch is sufficient) and some further information.

» You have a special request?

Give us a call: +49 (0) 93 46-92 86-0.

BOLA Flat Flange Distillation Apparatus



Product description:

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°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 patented 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.



BOLA Flat Flange Distillation Apparatus

Material: PTFE Material: 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
Flat Flange Reaction Vessels	NW 100 B 281-03	NW 100 B 281-06	NW 100 B 281-09	NW 150 B 281-12	NW 150 B 281-15
Flat Flange Gaskets	NW 100 B 282-02	NW 100 B 282-02	NW 100 B 282-02	NW 150 B 282-04	NW 150 B 282-04
Flat Flange Lids	NW 100 B 283-02	NW 100 B 283-02	NW 100 B 283-02	NW 150 B 283-04	NW 150 B 283-04
Flat Flange Joining Pieces	NW 100 B 284-02	NW 100 B 284-02	NW 100 B 284-02	NW 150 B 284-04	NW 150 B 284-04
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
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
Distillation Thermometers 0/+250:1C°	B 290-03	B 290-03	B 290-03	B 290-03	B 290-03
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
Thermometers for Flask 0/+250:1C°	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
Thermometer Holders NS 29/32	B 286-03	B 286-03	B 286-03	B 286-03	B 286-03
Stirrer Bearings NS 29/32	B 288-02	B 288-02	B 288-02	B 288-02	B 288-02
Distillation Heads 2x NS 29/32	B 289-03	B 289-03	B 289-03	B 289-03	B 289-03
Receiver Adaptors	B 292-02	B 292-02	B 292-02	B 292-02	B 292-02
Vacuum Stopcocks	B 293-02	B 293-02	B 293-02	B 293-02	B 293-02
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 291 for further advice on the heating of fluoroplastics.



BOLA Flat Flange Reaction Vessels

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

Round bottom, thick wall, smooth interior surface. Can be heated by a thermostat or an electric heating mantle.

FDA conform

Capacity ml	Flange NW	O.D. of vessel mm	Total height mm	Cat. No.:
500	100	110	120	B 281-03
1.000	100	110	205	B 281-06
2.000	100	140	270	B 281-09
4.000	150	200	290	B 281-12
6.000	150	215	320	B 281-15



BOLA Flat Flange Reaction Vessels

Material: PFA	Temperature resistance: from -200°C to +200°C	Chemical resistance: +++ universal	Transparency: transparent
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Product description:

Flat bottom, translucent, non-porous, big opening. Can be heated by thermostats or an electric heating mantle or can be used with a heatable magnetic stirrer and a PTFE-encapsulated magnetic stirring bar for stirring.

FDA conform

Capacity ml	Flange NW	O.D. of vessel mm	Total height mm	Cat. No.:
2.400	170/146	150	150	B 320-01



BOLA Flat Flange Lids

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

One-piece, 3 declined lateral ground joint necks size 29 angled 15°.

FDA conform

For flange NW	Center neck NS	Cat. No.:
100	29/32	B 283-02
150	29/32	B 283-04
170/146	29/32	B 322-01



BOLA Flat Flange Gaskets

Material: PTFE	Temperature resistance: from -60°C to +230°C	Chemical resistance: +++ universal	Vacuum: suitable
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Product description:

Gasket with silicone inlet (thickness 0,5 mm). Universal chemical resistance since the product is only exposed to PTFE.

FDA conform

For flange NW	Cat. No.:
100	B 282-02
150	B 282-04
170/146	B 321-01



BOLA Flat Flange Joining Pieces

Material:
Stainless steel

Product description:
Made of stainless steel, connection between reaction vessel and lid. Locked by stainless steel screws with spring element and screw nuts.

For flange NW	Number of screws	Cat. No.:
100	6	B 284-02
150	6	B 284-04



BOLA Flat Flange Joining Pieces

Material:
Aluminium

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 Dropping Funnels

Material: PTFE, FEP
Temperature resistance: from 0°C to +110°C
Chemical resistance: +++ universal
Transparency: transparent

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.

FDA conform

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 Liebig Condensers "Vacuum"

Material:	Temperature resistance:	Chemical resistance:	Vacuum:
PTFE	from -20°C to +250°C	+++ universal	suitable

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.

FDA conform

Length mm	Cat. No.:
300	B 295-02
450	B 295-04
600	B 295-06



BOLA Liebig Condensers "Vertical"

Material:	Temperature resistance:	Chemical resistance:	Transparency:
PFA	from -20°C to +250°C	+++ universal	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. Suitable for vertical assembly. Integrated special nut (Safe-Lab) for easy locking and unlocking of the ground joint.

FDA conform

Length mm	Cat. No.:
300	B 301-02
450	B 301-04



BOLA Distillation Thermometers

Material:	Temperature resistance:	Chemical resistance:
PTFE	from 0°C to +250°C	+++ universal

Product description:

PTFE-jacketed glass thermometer, justified to an immersion depth of 50 mm. Length 300 mm, measuring range 0/+250: 1°C.

FDA conform

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

Product description:

PTFE-jacketed glass thermometer, measuring range 0/+250: 1°C

FDA conform

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



235

BOLA Temperature Probes

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 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.

FDA conform

Typical response times:

- » T 50: 7 - 12 s
- » T 90: 14 - 16 s

See page 290 for detailed explanation.

	Usable length mm	Total length mm ca.	Connection type	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 1750-15
	300	360	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 liquids
- » cable provides flexible connection from measuring device to medium



OTHER SIZES: see page 195
 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**

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.

FDA conform

Ground joint NS	For diameter mm	Angle	Cat. No.:
29/32	7 - 8	7 °	B 286-03



Thermometer Holders

- » The inclined bore inside prevents collisions with the stirrer shaft in a reactor. The thermometer can be adjusted and fixed in the defined angle. Clever! «

Dieter Waldhaus » Merck KGaA



BOLA Stirrer Bearings

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

Product description:

Guiding the stirrer shaft. With adjustable special gasket. Integrated special nut (Safe-Lab) for easy locking and unlocking of the ground joint.

FDA conform

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**

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 20.

FDA conform

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	16	600	C 376-20



BOLA Distillation Heads

Material: **PTFE** Temperature resistance: **from -20°C to +230°C** Chemical resistance: **+++ universal**

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.

FDA conform

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 -200°C to +250°C** Chemical resistance: **+++ universal**

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 238). Integrated special nut (Safe-Lab) for easy locking and unlocking of the ground joint.

FDA conform

Cone NS	Socket NS	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

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.

FDA conform

Cone NS	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

Product description:

For vertical positioning of the Liebig condenser (e.g. in a lid of a reaction vessel). Integrated special nut (Safe-Lab) for easy locking and unlocking of the ground joint.

FDA conform

Cone NS	Socket NS	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

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.

FDA conform

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**

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.

FDA conform

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
3 x 29/32	29/32	160 x 40 x 105	B 302-04

« »
Special Request?
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BOLA "SAFE LAB" Nuts

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

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.

FDA conform

Suitable for ground joint NS	Cat. No.:
19/26	K 1349-06
29/32	K 1349-10
45/40	K 1349-16



BOLA Cold Traps

Material:	Temperature resistance:	Chemical resistance:	Vacuum:	Transparency:
PFA, PTFE	from -200°C to +250°C	+++ universal	suitable	transparent

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 77). For soft, flexible tubing we recommend to use GL hose connectors (see page 118).

FDA conform

Collecting capacity ml	O.D. of column mm	Total height mm	Cat. No.:
320	60	400	B 317-60



BOLA Bottles Distillation Apparatus

Material:	Temperature resistance:	Chemical resistance:	Pressure:
PTFE, PFA	from -20°C to +250°C	+++ universal	no pressure

Product description:

Transparent, non-porous bottles made of PFA, pressure compensation by means of 2,5µm PTFE filtering membrane. Possibility to connect temperature probes or tubing.

Capacity ml	Thread S	Lateral thread GL	Cat. No.:
250	40	18	B 328-16
500	40	18	B 328-24
1.000	40	18	B 328-32

Applications:

Quick and easy distillations of small quantities.



BOLA Threaded Adaptors

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

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.

FDA conform

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

Transition from GL 40 / S 40 to GL 45

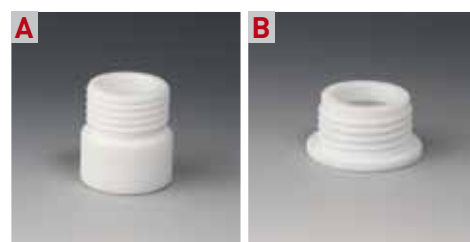
Suitable for Merck® bottles with GL 40 thread or for all PFA-, PTFE bottles and jars with thread GL 40 and S 40

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 Duran Group (formerly Schott AG)

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



Screw Joints for HPLC



Easy handling, sturdy design and pressure resistance up to 30 bar: also in HPLC applications BOLA Screw Joints are your first choice.

PRODUCT TIPS



Page 242:
Distributors for Bottles



Page 246:
Tubing with Mini Fittings



Page 245:
Distributors with UNF
Threads



BOLA HPLC Distributors for Bottles

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 159) 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.

BOLA HPLC Distributors for Bottles

BESTSELLER

Material:	Temperature resistance:	Chemical resistance:	autoclave:
PP, Silicone	from 0°C to + 110°C	++ very good	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 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 mm 6 mm	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 mm 2,1 - 4,0 mm 6 mm	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 Extender with Adaptor for Syringe Filters

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

Product description:

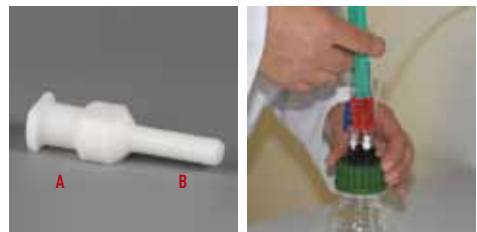
Made of PTFE, with female Luer cone for fixing syringe filters.

FDA conform

A Connection	B O.D. mm	Cat. No.:
Luer cone	3,5	D 610-50

Applications:

For sterile aeration by means of syringe filters.





BOLA Screw Joints for HPLC



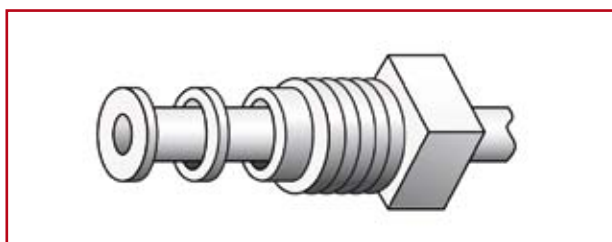
What you should know about the BOLA HPLC Screw Joint System

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 254). 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 252) 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 246).

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 250.

BOLA Distributors for Bottles

BESTSELLER

Material: PTFE, PPS
 Temperature resistance: from -15°C to +200°C
 Chemical resistance: +++ universal

Product description:

Black screw cap made of PPS for bottle thread GL 45. Without stopcocks: body made of PTFE with 2 or 4 ports with female thread UNF 1/4" 28 G on upper and lower sides. With stopcocks: body made of PTFE with 2 or 3 ports with female thread UNF 1/4" 28 G on upper and lower sides and stopcock made of FEP for each port. 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 body of the distributor can be turned independently from the screw cap. This means, that the assembled distributor can be removed completely and fixed on another bottle without the risk of disarranging the tubing. Very good chemical resistance, for working temperatures up to +200°C. Suitable flanged tubing can be found on page 246.

FDA conform

	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

	For tubing I.D. x O.D. mm	Number of stopcocks	Bore dia. mm	Connections	Cat. No.:
C	0,8 x 1,6	2	0,8	2 x UNF 1/4" 28G	F 746-02
D	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.:
C	1,6 x 3,2	2	1,6	2 x UNF 1/4" 28G	F 746-04
D	1,6 x 3,2	3	1,6	3 x UNF 1/4" 28G	F 746-12



Special Request?
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BOLA Chromatography Adaptors

Material: PTFE, PPS
 Temperature resistance: from -15°C to +200°C
 Chemical resistance: +++ universal

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 248). 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.

FDA conform

Thread of screw cap GL	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 GL	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

BESTSELLER

Material: PTFE, PA
 Temperature resistance: from 0°C to +100°C
 Chemical resistance: +++ universal
 Pressure: 30 bar

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.



FDA conform

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.



« »
 Special Request?
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BOLA Miniature Couplings

Material: PTFE, POM
 Temperature resistance: from -30°C to +100°C
 Chemical resistance: +++ universal

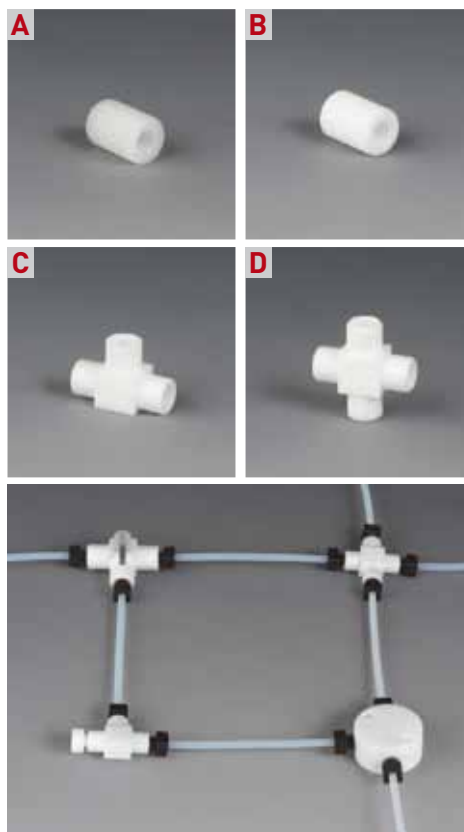
Product description:

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 252) to a female thread UNF 1/4" 28 G.

FDA conform

	Type	Material	For tubing I.D x O.D. mm	Connections	Total length mm	Cat. No.:
A	straight	POM	(1/32" x 1/16") 0,8 x 1,6	2	17	F 707-02
B	straight	PTFE	(1/32" x 1/16") 0,8 x 1,6	2	17	F 707-06
C	T	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	straight	POM	(1/16" x 1/8") 1,6 x 3,2	2	17	F 707-04
B	straight	PTFE	(1/16" x 1/8") 1,6 x 3,2	2	17	F 707-08
C	T	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: PTFE
 Temperature resistance: from -200°C to +250°C
 Chemical resistance: +++ universal
 Pressure: 30 bar

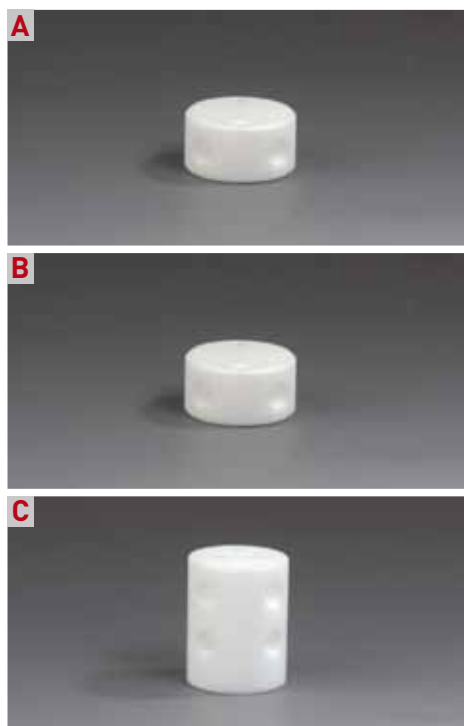
Product description:

Blocks with up to nine connections. The tubing is connected by means of tube end fittings (see page 252) to a female thread UNF 1/4" 28 G. With two mounting holes dia. 3,5 mm for fixing.

FDA conform

	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

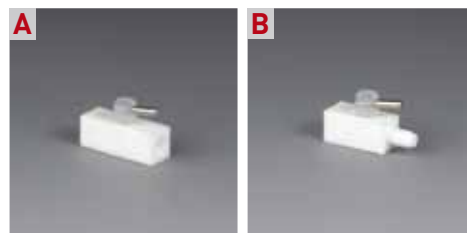
Product description:

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.

FDA conform

	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

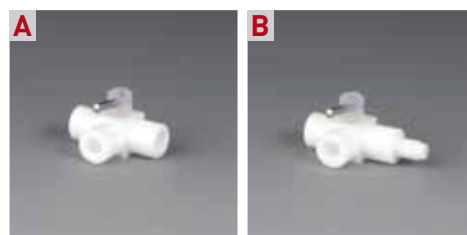
Product description:

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.

FDA conform

	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		L	32	F 731-02
	(1/32" x 1/16") 0,8 x 1,6	3		T	32	F 731-06
B	(1/32" x 1/16") 0,8 x 1,6	2	1	L	42	F 731-10
	(1/32" x 1/16") 0,8 x 1,6	2	1	T	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		L	32	F 731-04
	(1/16" x 1/8") 1,6 x 3,2	3		T	32	F 731-08
B	(1/16" x 1/8") 1,6 x 3,2	2	1	L	42	F 731-12
	(1/16" x 1/8") 1,6 x 3,2	2	1	T	42	F 731-16



Special Request?
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BOLA Miniature Manifold Blocks

Material: PTFE, FEP Temperature resistance: from -200°C to +205°C Chemical resistance: +++ universal Pressure: 8 bar

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 246.

FDA conform

	For tubing I.D. x O.D. mm	Number of stopcocks	Bore dia. mm	Inlet	Outlet	Cat. No.:
A	(1/32" x 1/16") 0,8 x 1,6		0,8	1	4	F 712-01
B	(1/32" x 1/16") 0,8 x 1,6	4	0,8	1	4	F 712-10

	For tubing I.D. x O.D. mm	Number of stopcocks	Bore dia. mm	Inlet	Outlet	Cat. No.:
A	(1/16" x 1/8") 1,6 x 3,2		1,6	1	4	F 712-03
B	(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

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 246.

FDA conform

	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

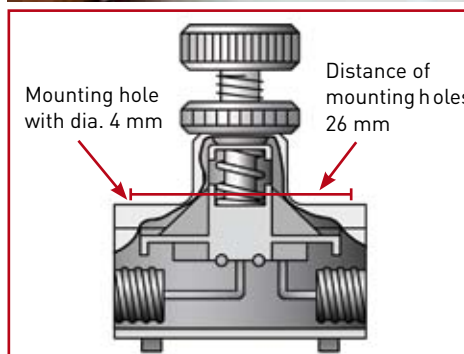
	For tubing I.D. x O.D. mm	O.D. mm	Total height mm	Cat. No.:
	(1/16" x 1/8") 1,6 x 3,2	32	50	F 738-16

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
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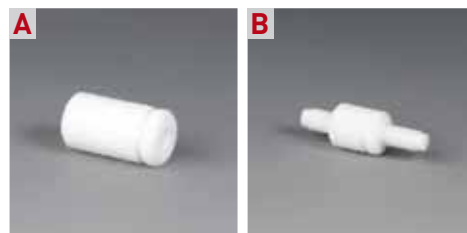
Product description:

Coupling made of PTFE for transition from M6 thread to UNF 1/4" 28 G thread. The M6 thread is marked by a groove.

FDA conform

	Female thread	Female thread	Bore dia. mm	Cat. No.:
A	M 6	UNF 1/4" 28 G	0,8	F 770-08

	Male thread	Male thread	Bore dia. mm	Cat. No.:
B	M 6	UNF 1/4" 28 G	0,8	F 772-08



BOLA Miniature Screw-in Adaptors

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

FDA conform

	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" 28 G	NPT 1/8"	0,8	F 716-02
	(1/32" x 1/16") 0,8 x 1,6	UNF 1/4" 28 G	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" 28 G	NPT 1/8"	1,6	F 716-04
	(1/32" x 1/16") 1,6 x 3,2	UNF 1/4" 28 G	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
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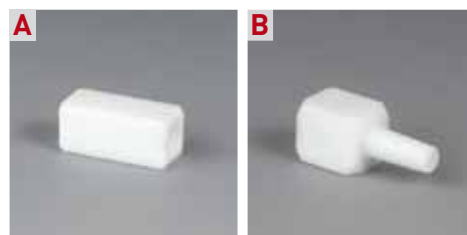
Product description:

Connector made of PTFE for transition from Luer connection to female thread UNF 1/4" 28 G.

FDA conform

	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" 28 G	female	1,0	F 717-02
B	(1/32" x 1/16") 0,8 x 1,6	UNF 1/4" 28 G	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" 28 G	female	1,6	F 717-04
B	(1/16" x 1/8") 1,6 x 3,2	UNF 1/4" 28 G	male	1,6	F 717-08



BOLA Miniature Luer-Lock Connectors

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

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.

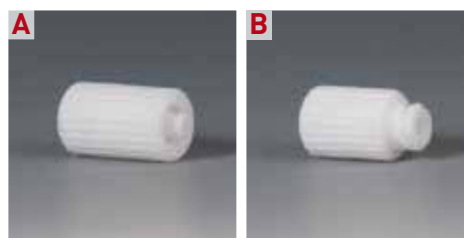
The tubing is connected by means of tube end fittings (see page 252) to a female thread UNF 1/4" 28 G.

FDA conform

	For tubing I.D. x O.D. mm	Female thread	Luer Lock	Bore dia. mm	Cat.No.:
A	(1/32" x 1/16") 0,8 x 1,6	UNF 1/4" 28 G	female	0,8	F 718-02
B	(1/32" x 1/16") 0,8 x 1,6	UNF 1/4" 28 G	male	0,8	F 718-06
	For tubing I.D. x O.D. mm	Female thread	Luer Lock	Bore dia. mm	Cat.No.:
A	(1/16" x 1/8") 1,6 x 3,2	UNF 1/4" 28 G	female	1,6	F 718-04
B	(1/16" x 1/8") 1,6 x 3,2	UNF 1/4" 28 G	male	1,6	F 718-08

Applications:

Connection of components with Luer Lock such as syringes or cannulas to a tubing system.



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SCREW JOINTS FOR HPLC

BOLA Double Tube End Fittings

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

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.

FDA conform

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

BESTSELLER

Material: PTFE, PA	Temperature resistance: from -40°C to +100°C	Chemical resistance: +++ universal
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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.

FDA conform

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
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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.

FDA conform

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	blue	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	blue	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



SUITABLE: page 254
Tubing for all screw joints

Applications:

Different colours for better distinction.



BOLA Plugs

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

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.

FDA conform

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

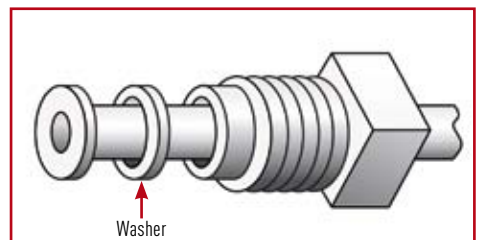
Material: **PA** Temperature resistance: **from -40°C to +100°C**

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: **PP** Temperature resistance: **from 0°C to +100°C** Chemical resistance: **++ very good**

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

FDA conform

Dimensions I.D. x O.D. mm	Cat. No.:
(1/32" x 1/16") 0,8 x 1,6	F 704-02

Dimensions 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

Product description:

Tubing especially suitable for making flanges with BOLA Thermoelectric Flanging Tool (see page 254).

Choose suitable tubing for your application:

- » 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

FDA conform

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		



BOLA Thermoelectric Flanging Tools

Product description:

For making flanges at the ends of plastic tubing (e.g. PTFE, PFA or FEP see page 254)

CE

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	230 V 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	230 V 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 and (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 Thermo-electric Flanging Tools see page 254.

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 254)



Following sets are available	For tubing I.D. mm	Version	Cat. No.:
1 piece BOLA Thermolectric 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 Thermolectric 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	230 V 50 HZ	F 700-04



BOLA Joining Fittings

Material: PTFE, ETFE	Temperature resistance: from -50°C to +150°C	Chemical resistance: +++ universal	Pressure: 5 bar	Vacuum: suitable
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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 254).

FDA conform

From tubing I.D. x O.D. mm	To tubing I.D. x O.D. mm	O.D. mm	Total length mm	Cat. No.:
(1/32" x 1/16") 0,8 x 1,6	4 and 6	25	76	F 762-04
(1/32" x 1/16") 0,8 x 1,6	8 and 10	25	76	F 762-08
From tubing I.D. x O.D. mm	To tubing I.D. x 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	74	F 762-14
(1/16" x 1/8") 1,6 x 3,2	8 and 10	25	74	F 762-18



SUITABLE: page 254
Tubing for all screw joints



BOLA offers custom manufacture.

Every lab is different. By offering an extensive range of established and sophisticated standard solutions we take into account the varied requirements of the respective branches and sectors.

But maybe you are looking for something special? Something that is not included in our standard product range?

In that case we are able to offer an individual custom manufacture. This is easier and faster than you may expect. Discuss your idea with our professionals. They will give advise and support during design. Finally, your idea will become real: We produce as per your requirements and in compliance with the chosen raw materials – already from 1 piece.

We only need a drawing (a sketch is sufficient) and some further information.

» You have a special request?

Give us a call: +49 (0) 93 46-92 86-0.

BOLA Transition Fittings

Material:	Temperature resistance:	Chemical resistance:	Pressure:
PTFE	from -200°C to +250°C	+++ universal	5 bar

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 252).

FDA conform

From tubing I.D. x O.D. mm	To tubing I.D. x 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 I.D. x 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:	Temperature resistance	Chemical resistance:	Pressure:	autoclave:
PVDF	from -30°C to +150°C	++ very good	3 bar	121°C

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 246) is connected to a female thread UNF 1/4" 28 G.

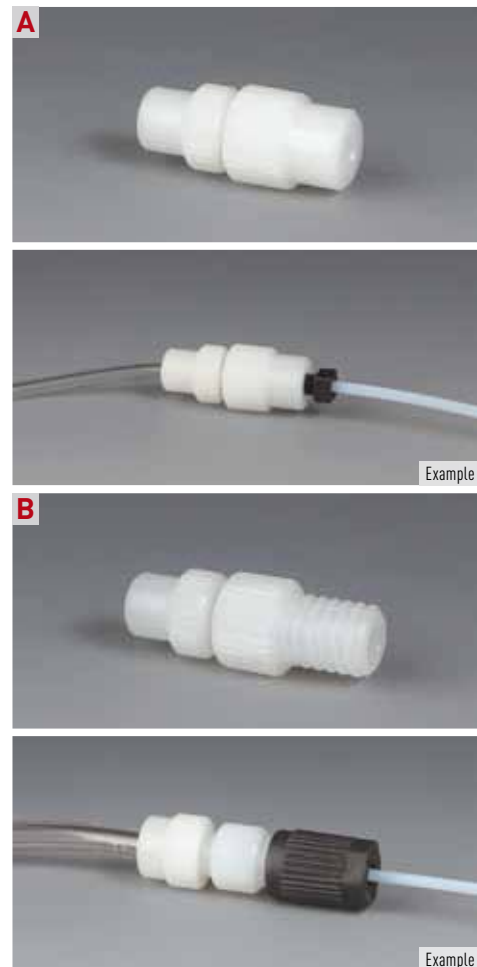
Hard-walled tubing up to a maximum O.D. of 10 mm is connected to a GL thread by means of laboratory screw joints (see page 77). Restricted chemical resistance, working temperatures up to max. +150°C.

FDA conform

	For tubing I.D. mm	For tubing wall thickness mm	Bore dia. mm	Connecting thread UNF	Cat. No.:
A	0,8	0,8 and 1,6	0,8	1/4" 28G	F 778-08
	1,6	0,8 and 1,6	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 and 1,6	0,8	14	D 681-08
	1,6	0,8 and 1,6	1,6	14	D 681-16
	3,2	1,6	3,2	14	D 681-24
	4,0 and 4,8	1,6	4,0	14	D 681-32
	6,4	1,6	6,4	18	D 681-40
	8 and 9,5	1,6 and 2,4	8,0	18	D 681-48

Applications:

Peristaltic pumps.



BOLA GL Transition Fittings

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

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.

FDA conform

For tubing I.D. x O.D. mm	Bore dia. mm	Fitting Thread GL	Female Thread UNF	Total length mm	Cat.No.:
0,8 x 1,6	0,8	14	1/4" 28G	39	F 761-08
1,6 x 3,2	1,6	14	1/4" 28G	39	F 761-16



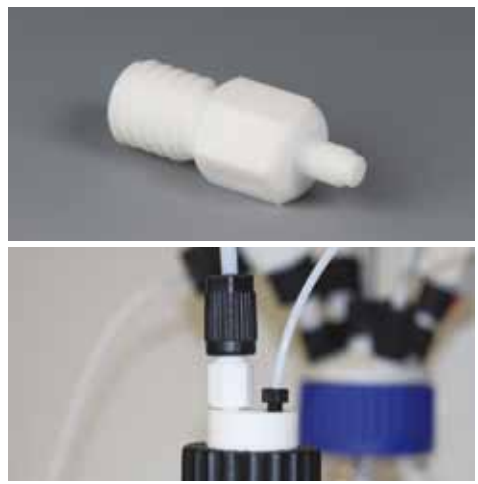
BOLA UNF Screw-in Tube Fittings

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

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.

FDA conform

For tubing I.D. x O.D. mm	Bore dia. mm	Fitting thread GL	Male thread UNF	Total length mm	Cat. No.
0,8 x 1,6	0,8	14	1/4" 28G	39	F 763-08
1,6 x 3,2	1,6	14	1/4" 28G	39	F 763-16



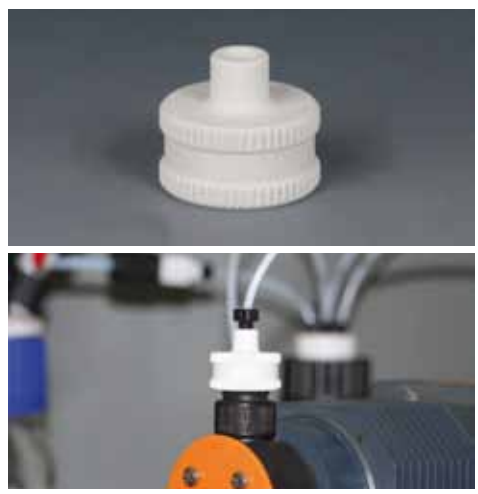
BOLA Adaptors for Prominent® Pumps

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

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.

FDA conform

For tubing GL	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



Special Request?
 +49 (0) 93 46-92 86-0

BOLA Connection Bolts

Material: PEEK	Temperature resistance: from -50°C to +250°C	Chemical resistance: ++ very good	Pressure: 450 bar
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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.

FDA conform

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: 450 bar
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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

FDA conform

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
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Product description:

Replacement sealing cone made of PEEK, suitable for connection bolts (Cat. No. F 833-10).

FDA conform

For tubing/tube O.D. mm	Cat. No.:
(1/16") 1,6	F 834-10



BOLA Connection Bolts

Material:	Temperature resistance:	Chemical resistance:	Pressure:
PEEK	from -50°C to +250°C	++ very good	450 bar

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.

FDA conform

For tubing/tube O.D. mm	Cat. No.:
(1/16") 1,6	F 836-10



BOLA Double Sealing Cones for Connection Bolts

Material:	Temperature resistance:	Chemical resistance:	Pressure:
PEEK	from -50°C to +250°C	++ very good	450 bar

Product description:

Replacement double sided sealing cone made of PEEK, suitable for connection bolts (Cat. No. F 836-10).

FDA conform

For tubing/tube O.D. mm	Cat. No.:
(1/16") 1,6	F 837-10



Filtration



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FILTRATION

Proved and tested, durable, optimally resistant against acids, caustic solutions and other aggressive chemicals: our solutions for efficient and safe filtration.

PRODUCT TIPS



Page 263:
Scrubber Adaptors for Bottles



Page 271:
HPLC Suction Filter



Page 267:
Vacuum Filters

BOLA Filtration



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

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.

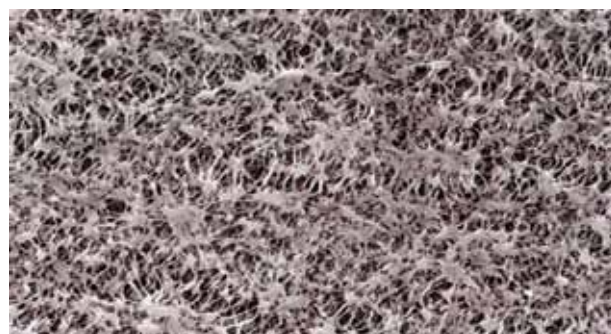
Due to the non-adhesive surface, filtering devices made of fluoroplastics (PTFE/PFA) are easy to clean and have a long durability.

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 $+250^{\circ}\text{C}$ (temporarily even $+300^{\circ}\text{C}$)
- » autoclavable

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 Scrubber Adaptors for Bottles

Material: PTFE, PP
 Chemical resistance: +++ universal
 autoclave: 121°

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 77). Elastic tubing can be connected by means of hose connectors (page 118). 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.

FDA conform

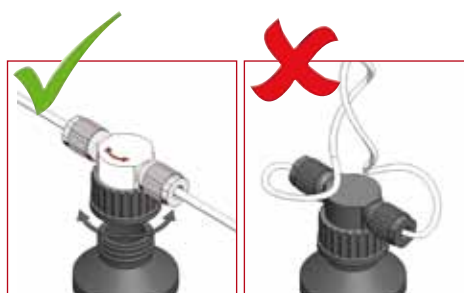
	For bottle thread	Gas inlet tube mm	Width incl. threaded necks mm	Cat. No.:
A	GL 45	300	76	N 1660-14
B	GLS 80	300	76	N 1660-24

« »
 Special Request?
 +49 (0) 93 46-92 86-0

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	465 l/h
N 1660-24	500 l/h	1000 l/h	1500 l/h



BOLA INNOVATION

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).



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 1662-34 / 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 Scrubber Bottles Vitrum

Material: PTFE, PP
 Chemical resistance: +++ universal
 autoclave: 121°

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.

FDA conform

	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 Gas Distributors

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

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 200) with M 8x1 thread and for gas inlet tubes (page 265).

FDA conform

O.D. mm	Height mm	Receiver M	Suitable for Cat. No.:	Cat. No.:
28	24	8 x 1	A 117-.. / A 118-..	N 1501-16



BOLA Gas Frits

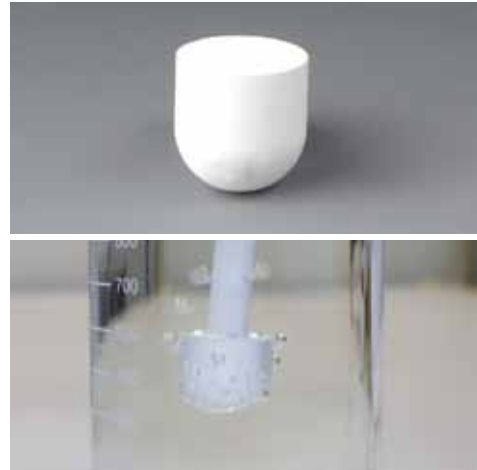
Material: PTFE
 Temperature resistance: from -200°C to +250°C
 Chemical resistance: +++ universal

Product description:

Microporous PTFE with pore size 5 µm for steady sparkling of the flowing gas. Suitable for scrubber bottles and columns (page 200) with M 8x1 thread and for gas inlet tubes (page 265).

FDA conform

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 Inlet Tubes

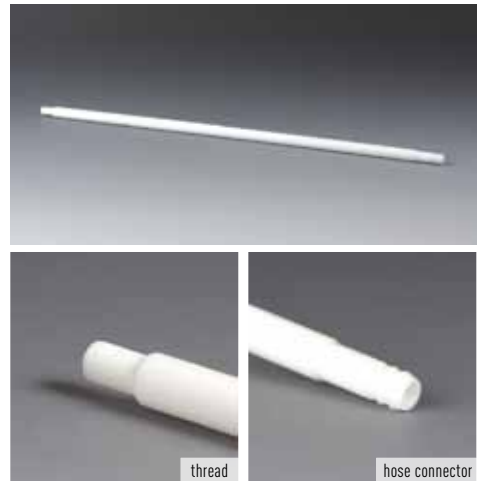
Material: PTFE
 Temperature resistance: from -200°C to +250°C
 Chemical resistance: +++ universal

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.

FDA conform

Length mm	Cat. No.:
200	N 1502-02
400	N 1502-04
600	N 1502-06



BOLA Pressure Pre-Filters

Material: PTFE
 Temperature resistance: from -200°C to +250°C
 Chemical resistance: +++ universal
 Pressure: 10 bar
 autoclave: 121°

Product description:

For direct fine filtration in front of HPLC columns. For filtering membranes (available optionally – page 272) 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 246.

FDA conform

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



BESTSELLER**BOLA Flow Filters**

Material: PTFE, PPS	Temperature resistance: from -20°C to +160°C	Chemical resistance: +++ universal	Vacuum: suitable	autoclave: 121°
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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 272) 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.

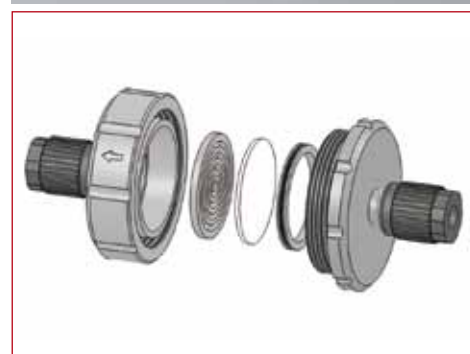
FDA conform

For membrane dia. mm	Filtration surface cm 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

**Spare parts for: Flow Filters**

Description	Material	Packing Unit	For membrane dia.	suitable for: Cat. No.:	Cat. No.:
Replacement Gasket with O-Ring	PTFE/ FKM	pack size: 3 pieces	25 mm 47 mm 90 mm	N 1670-08 N 1670-16 N 1670-24	N 912-01 N 912-02 N 912-03

BOLA Vacuum Filters

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

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 272). 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.

FDA conform

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.
47	1,00	55
47	0,45	20
47	0,20	11
90	1,00	199
90	0,45	72
90	0,20	42

« »
Special Request?
+49 (0) 93 46-92 86-0



SUITABLE: page 272
Dimensionally coordinated
filtering membranes

BOLA Vacuum Filter Funnels

Material: PTFE, PFA Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal Transparency: transparent autoclave: 121°

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 272). Filling vessel made of PFA with PTFE lid for protection against contaminations.

FDA conform

Capacity of filling vessel ml	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:	Temperature resistance:	Chemical resistance:	autoclave:	Vacuum:
PTFE	from -15 °C to +200 °C	+++ universal	121°	suitable

Product description:

NEW

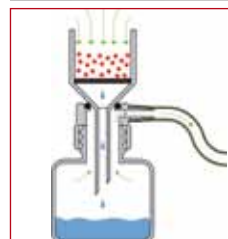
Made of PTFE. Pass-through with o-ring made of FKM for safe assembly of standard filter funnels made of glass or plastic on flasks with thread GL 45. Lateral 2-step hose connector made of PTFE for connection to a vacuum pump by means of suitable tubing.

FDA conform

For thread GL	For funnel outlet max. Ø mm	2-Step hose connector		Cat. No.:
		O.D. 1 mm	O.D. 2 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.



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FILTRATION

BOLA Vacuum Adaptor with Ground Joint

Material:	Temperature resistance:	Chemical resistance:	autoclave:	Vacuum:
PTFE	from -15 °C to +200 °C	+++ universal	121°	suitable

Product description:

NEW

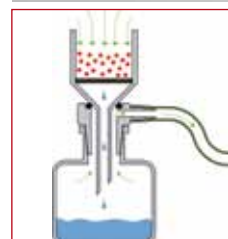
Made of PTFE. Pass-through with o-ring made of FKM for safe assembly of standard filter funnels made of glass or plastic on vessels and round-bottom flasks with ground joint. Lateral 2-step hose connector made of PTFE for connection to a vacuum pump by means of suitable tubing.

FDA conform

Cone size NS	For funnel outlet max. Ø mm	2-Step hose connector		Cat. No.:
		O.D. 1 mm	O.D. 2 mm	
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 Funnel

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

Product description:

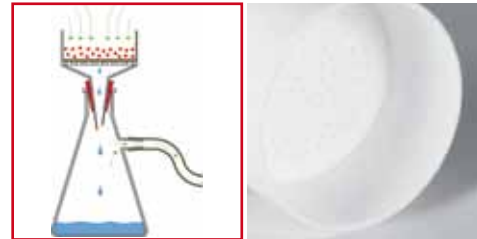
Made of PTFE. Two-part version demountable in upper and lower part for easy cleaning and removal of filter cake. Suitable for vacuum filtration. Nominal sizes and dimensions as per DIN 12 905. Suitable for commercial filter papers (not included in the scope of delivery). Universal chemical resistance, the medium is only exposed to PTFE.

FDA conform

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 Trap

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

Product description:

Consisting of a screw cap red made of PBTB 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.

FDA conform

2-Step hose connector		Length gas inlet tube mm	Width including necks mm	Cat. No.
O.D. 1	O.D. 2 mm			
9	12	150	80	D 810-05

Applications:

Protection of pumps or vacuum systems from damages through vapour or condensate.



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

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.

FDA conform

2-Step hose connector		Length gas inlet tube mm	Width including necks mm	Cat. No.
O.D. 1	O.D. 2 mm			
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°
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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 272).

FDA conform

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 Three-Stage Flow Filter

Material: PFA	Temperature resistance: from -200°C to +250°C	Chemical resistance: +++ universal	Vacuum: suitable	autoclave: 121°
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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 272). Couplings for connecting tubing (page 159) with O.D. 6,35 mm (1/4") are included.

FDA conform

For membrane dia. mm	For tubing O.D. mm	Filtration surface cm ²	O.D. mm	Cat. No.:
47	(1/4") 6,35	3 x 14,1	62	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 Single-Stage Flow Filter

Material: PFA	Temperature resistance: from -200°C to +250°C	Chemical resistance: +++ universal	Vacuum: suitable	autoclave: 121°
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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 272). Couplings for connecting tubing (page 159) with O.D. 6,35 mm (1/4") are included.

FDA conform

For membrane dia. mm	For tubing O.D. mm	Filtration surface cm ²	O.D. mm	Cat. No.:
47	(1/4") 6,35	14,1	62	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 Suction Filters

Material: PTFE	Temperature resistance: from -200°C to +250°C	Chemical resistance: +++ universal	autoclave: 121°
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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 246.

FDA conform

Pore size µm	For tubing I.D. mm	Dia. of filter mm	Length of filter cm	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	PTFA	1 piece	2 µm 10 µm	F 765-08 / F 765-16 F 765-48 / F 765-56	F 766-08 F 766-48



BOLA Filtering Membranes

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

Product description:

Made of microporous PTFE, thickness 0,2 mm, packing unit: 10 pieces

NEW

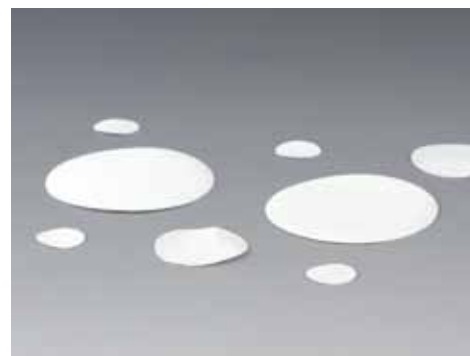
FDA conform

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

Product description:

Made of porous PTFE, thickness 1,0 mm, packing unit: 10 pieces.

NEW

FDA conform

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
90	1,0	6.362	N 1565-42
90	5,0	6.362	N 1565-48

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.
1,0	air	101
1,0	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



273

FILTRATION

BOLA Filtering Discs

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

Product description:

Made of microporous PTFE, thickness 1 mm, packing unit: 10 pieces

FDA conform

Pore size µm	Dia. of membrane mm	Filtration surface mm ²	Cat. No.:
7	47	1.735	N 1564-10



BOLA Filtering Tiles

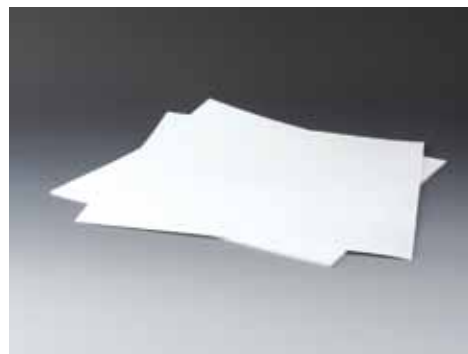
Material: PTFE Temperature resistance: from -200°C to +250°C Chemical resistance: +++ universal

Product description:

Made of microporous PTFE, standard tiles with dimensions of 320 x 320 mm for cutting or stamping.

FDA conform

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

Product description:

Made of porous PTFE, width approx. 150 mm x length 300 mm.

NEW

FDA conform

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 Rods

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

Product description:

Made of microporous PTFE for further treatment and processing. Diameter and length are nominal dimensions and can contain a machining tolerance.

FDA conform

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

Product description:

Made of porous PTFE, roundly machined cylinder with approximate dia. 40 mm and height approx. 115 mm. Round shape for easier treatment.

NEW

FDA conform

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 Filtering Blocks

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

Product description:

Made of porous PTFE, cuboid with edge length approx. 40 mm and height approx. 125 mm (unmachined sizes). The skin layer (approx. 3 mm) probably has a deviant maximum pore size due to production.

NEW

FDA conform

Pore size µm			Cat. No.:
1,00			N 1540-05
2,50			N 1540-10
5,00			N 1540-15
10,00			N 1540-20
25,00			N 1540-25
50,00			N 1540-30
100,00			N 1540-35

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.



Pumps



277

PUMPS

For versatile use, easy handling, compact:
BOLA pumps are made to meet almost all requirements in practice and allow safe transfer of liquids.

PRODUCT TIPS



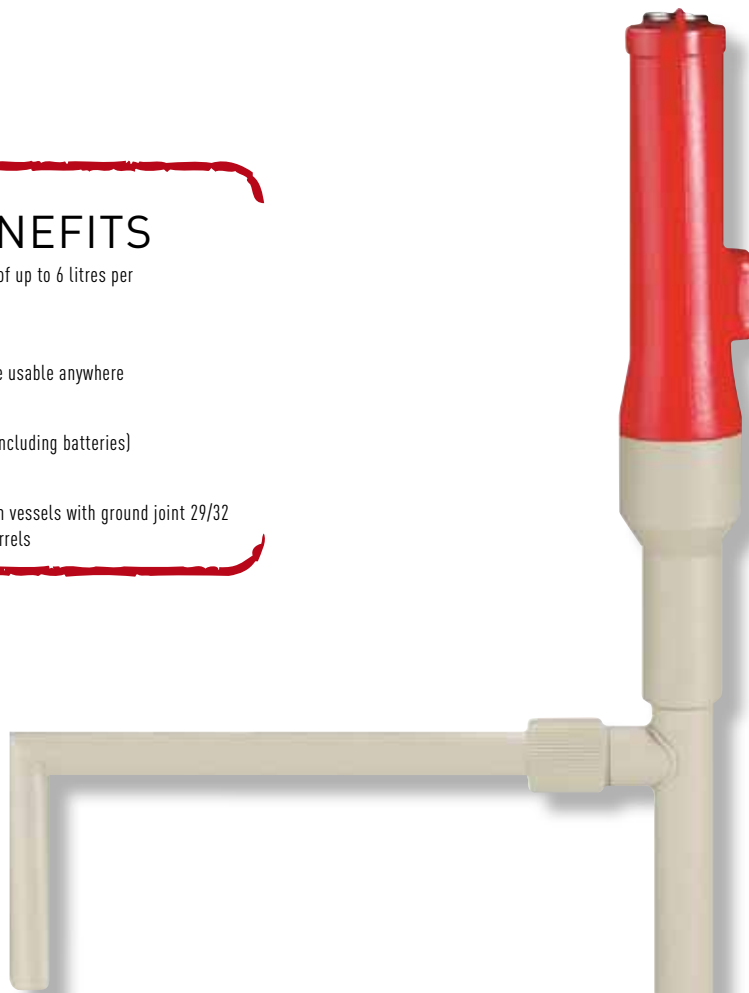
Page 278:
Battery-operated Pump



Page 279:
Sampling Pump

BOLA BENEFITS

- » 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



BESTSELLER

BOLA Cordless Pumps for Acids and Caustic Solutions

Material: **PP** Temperature resistance: **from +5°C to +60°C** Chemical resistance: **++ very good**

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 870-11

Applications:

For pumping low viscous liquids (e.g. acids, bases etc.)

« »
Special Request?
+49 (0) 93 46-92 86-0



For ground joint 29/32



For thread GL 45



SUITABLE: page 159
Tubing for all screw joints



BOLA BENEFITS

- » 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

BESTSELLER

BOLA Sampling Pump

Material: PTFE	Material: PP	Temperature resistance: from -10°C to +90°C	Chemical resistance: ++ very good
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Product description:

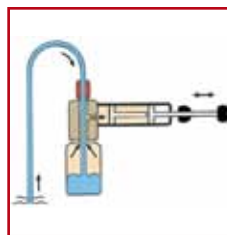
Made of polypropylene and PTFE. A pull on the ball handle produces a slight vacuum in the sampling bottle. Due to this vacuum, the sample is sucked into the sampling bottle. Both glass bottles and plastic bottles with a GL 45 thread can be used as sampling bottles. The pump provides universal chemical resistance since the sample is only exposed to PTFE.

FDA conform

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

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 Membranes	Silicone	Pack size: 5 pieces	A 124-16	A 910-01



BOLA Micro Magnet for Glass Pumps

Material: **PTFE** Temperature resistance: **from 0°C to +150°C** Chemical resistance: **+++ universal** Pressure: **1 bar**

Product description:

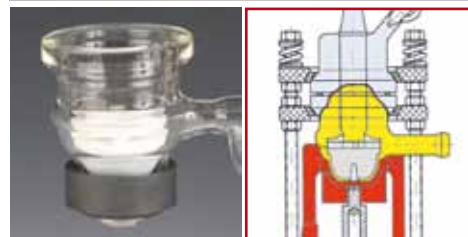
Made of PTFE, the magnet can be adjusted in height by means of the integrated screw. The strong magnet provides good power transmission.

FDA conform

Suitable for DN	Bore dia. mm	O.D. mm	Height mm	Cat. No.:
50	6	36	29	G 876-14

Applications:

Suitable for all common laboratory glass pumps, e.g. from company NORMAG®.



We build your pump!

Besides the pumps shown on these pages we also construct and produce custom-made pumps. Those pumps are used in a multitude of appliances and plants.



Membrane pump with PTFE bellow piston, compressed-air drive.



Metering unit with inspection glass, sensor mount and compressed-air driven PTFE bellow piston.

Technical Information



Materials » Chemical resistance » Information about fluoroplastics, stirrer shafts and tubing » Determination of threads

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.

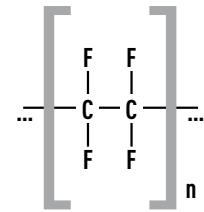
The chart below gives some general advice on the choice of the best suitable fluoropolymers:

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 γ -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

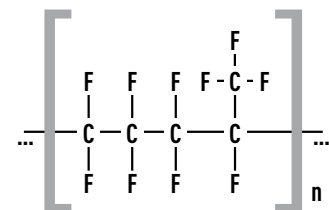
3M™ Dyneon™ PTFE
by Dyneon
Teflon® by Chemours
Fluon® by AGC
Chemicals Europe

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.



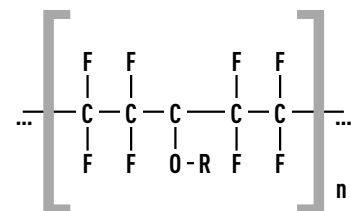
Trade names

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.



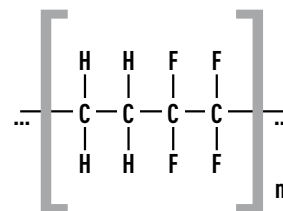
Trade names

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.

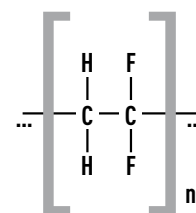


Trade names

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.

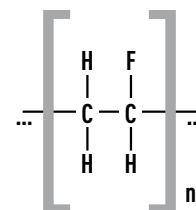


Trade names

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 of 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.

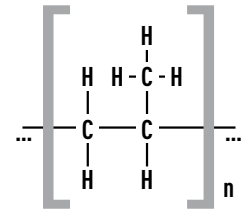
The permanent operating temperature is defined as the maximum temperature with which the material can be operated for 20.000 hours but without losing more than 50 % of its original rigidity and ductility. This means, a plastic material having a rigidity of 40 MPa in new condition has to show a rigidity of minimum 20 MPa after having been stored at its maximum permanent operating temperature for 20.000 hours.

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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.

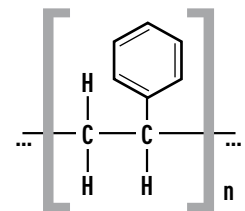


Trade names

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).



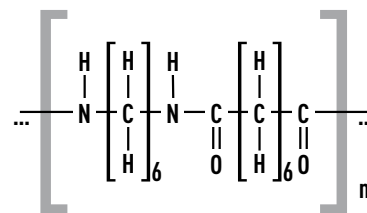
Trade names

Lacqrene® by ATO
Vestyron® 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 = polycapronic lactam or PA 12 = polydodecanedioic acid. 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.

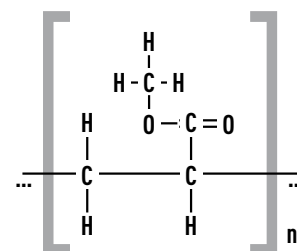


Trade names

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.



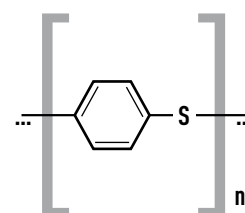
Trade names

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.

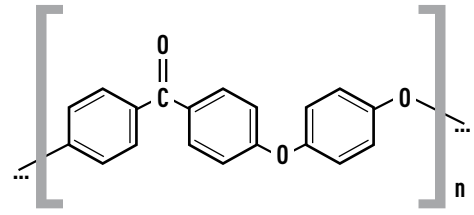


Trade names

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

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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.
- o **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.

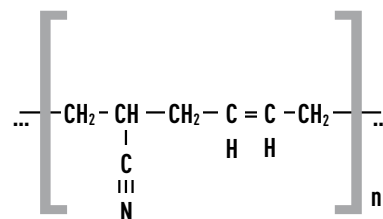
Hotline +49 (0) 93 46-92 86-0

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.

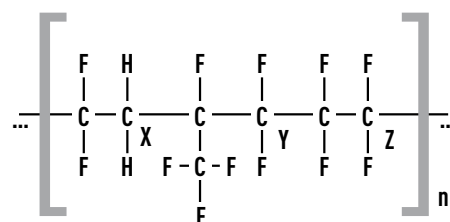
NBR – Acrylonitrile-Butadiene-Caoutchouc

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.



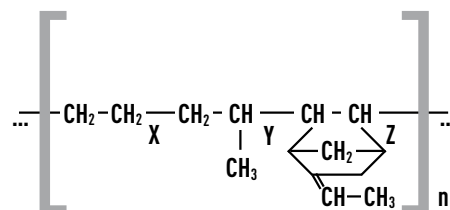
FKM – Fluorocaoutchouc

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.



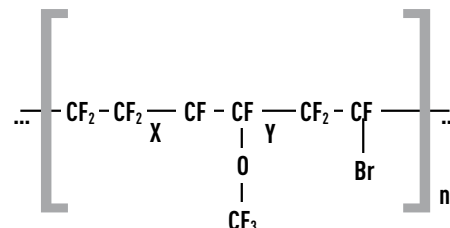
EPDM

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	+	+	o	++
Oils and fats	+	++	++	-
Fuels	+	++	++	-
Ozone	o	++	++	++
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
 o 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.
³ Tested partially by methods other than those stated; upon request additional physical characteristics available based on the actual test methods used.

All information stated without engagement.

Fluoroplastics - Cleaning and Worth Knowing



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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 dispersed 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 shafts - Maximum Revolutions per Minute

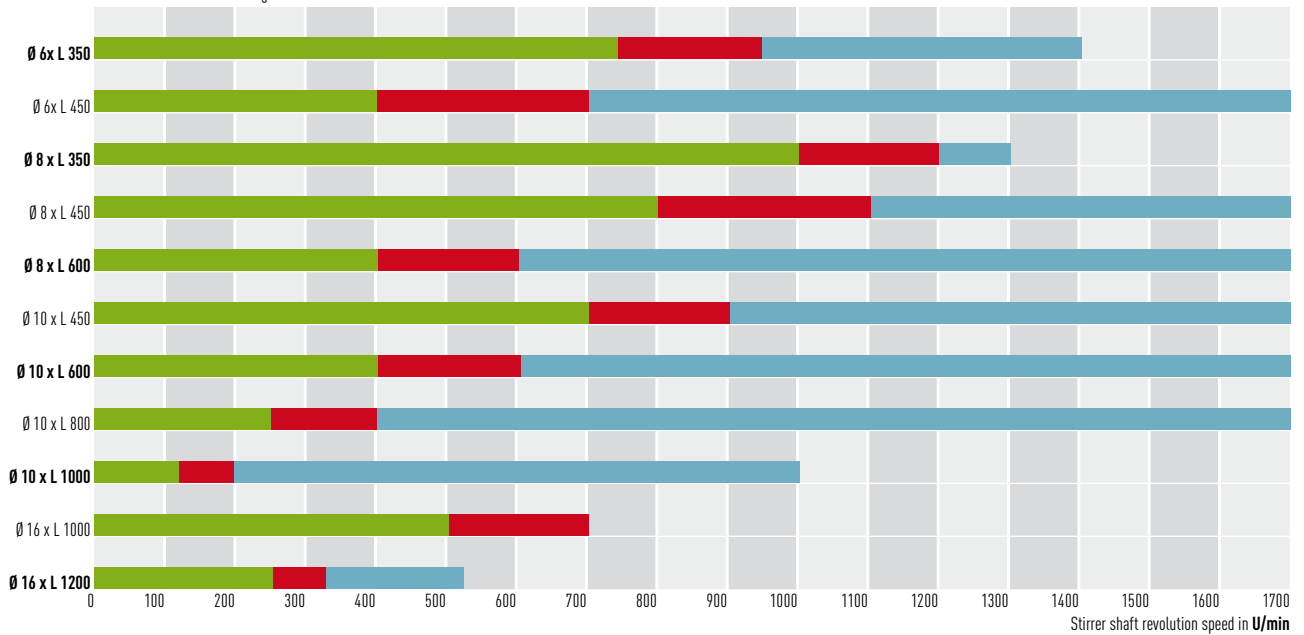
We would like to give advice on the appropriate RPMs, but unfortunately this question is not easy to answer. The following data are based on field-experience tests done with BOLA stirrer shafts.

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.

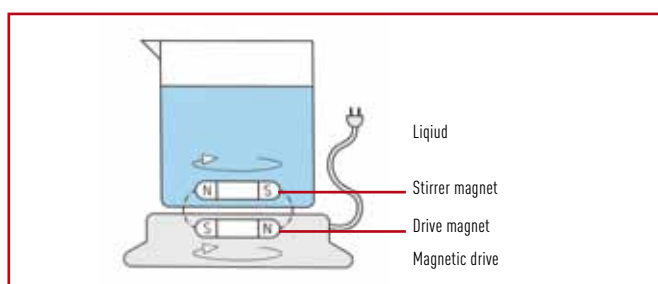
- » **Green Area** – indicates up to which rpm the shaft will not be affected by vibration
- » **Red Area** – marks the critical RPM range. These rpms should be avoided whenever possible.
- » **Blue Area** – is reached after quick skipping of the critical RPM range, vibration seldom occurs, however, agitators and stirrer shafts are extremely stressed by high RPMs. Therefore we recommend to use stirrer shafts only in the green range – if possible.

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:

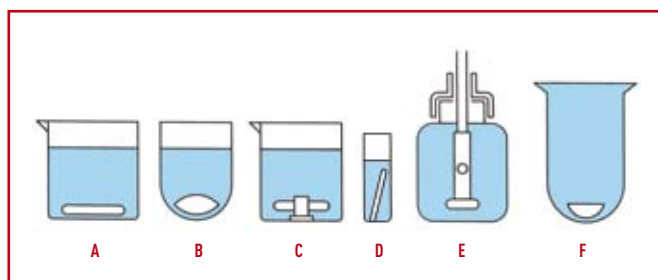
A stirrer magnet placed in the liquid and a magnetic drive located outside the vessel. Both, stirrer magnet and magnetic drive form a magnetic circuit. For trouble-free stirring in liquids with different viscosities the magnetic drive shall have a wide range of different speeds. That is why the strength 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.

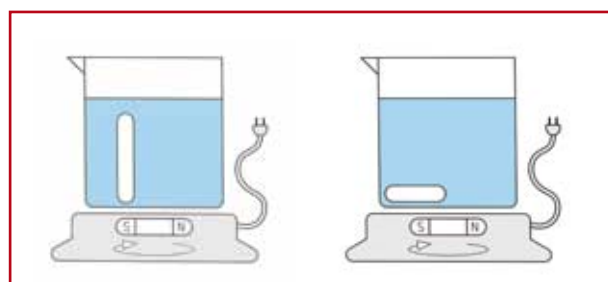


A Cylindrical magnetic stirring bar » B Oval or Egg-shaped magnetic stirring bar » C Magnetic stirring bar with bearing neck » D Magnetic stirring bar for cuvettes » E Magnetic stirring bar for culture bottles » F Custom manufacture for flanged reactors

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:

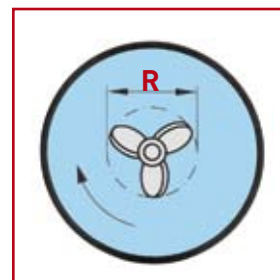
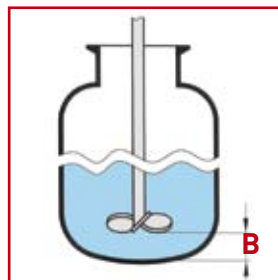
- D** Inner diameter of the vessel
- R** Outer diameter of the stirring element (stirring diameter)
- B** Distance of the stirrer to the bottom
- H** Height of the stirring element

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.

$$R = (0.2 \text{ to } 0.4) \times D$$

$$B = (1.0 \text{ to } 1.5) \times R$$



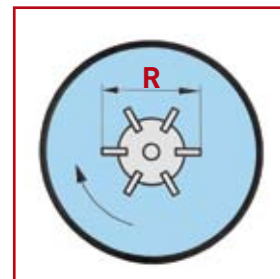
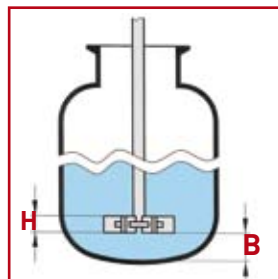
Discoidal stirrer shafts

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.

$$R = (0.3 \text{ to } 0.4) \times D$$

$$H = 0.2 \times R$$

$$B = R$$



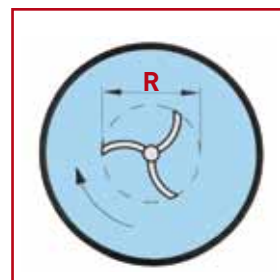
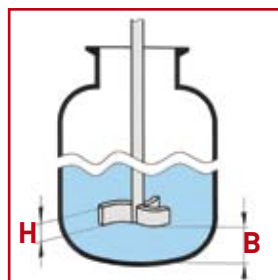
Impeller stirrer shafts

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.

$$R = (0.50 \text{ to } 0.70) \times D$$

$$H = (0.12 \text{ to } 0.17) \times R$$

$$B = (0.08 \text{ to } 0.18) \times R$$



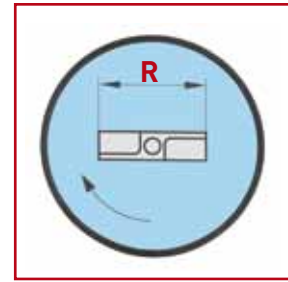
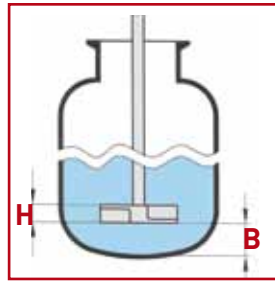
Stirrer Shafts with rigid paddle

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.

$$R = (0.70 \text{ to } 0.9) \times D$$

$$H = (0.05 \text{ to } 0.1) \times R$$

$$B = (0.10 \text{ to } 0.2) \times R$$



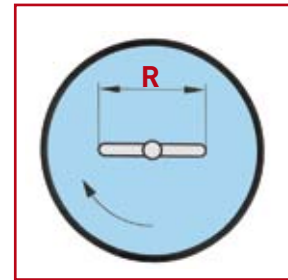
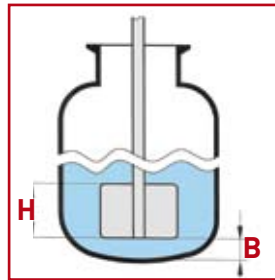
Stirrer Shafts with rigid blade

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.

$$R = (0.4 \text{ to } 0.5) \times D$$

$$H = (0.9 \text{ to } 1) \times R$$

$$B = 0.3 \times R$$



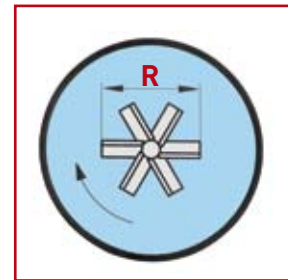
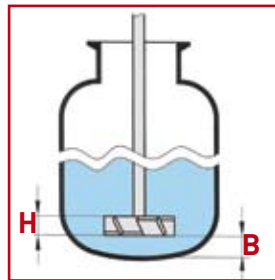
Stirrer Shafts with angular blades

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.

$$R = (0.30 \text{ to } 0.40) \times D$$

$$H = (0.15 \text{ to } 0.25) \times R$$

$$B = (0.50 \text{ to } 1.00) \times R$$



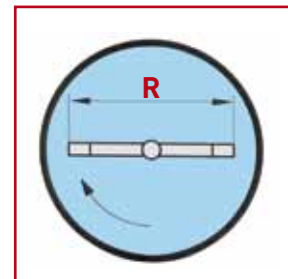
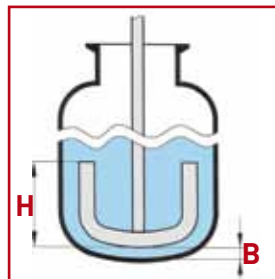
U-shaped stirrer shafts

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.

$$R = (0.90 \text{ to } 0.95) \times D$$

$$H = (0.50 \text{ to } 1.00) \times R$$

$$B = (0.003 \text{ to } 0.005) \times R$$



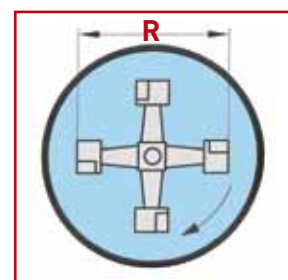
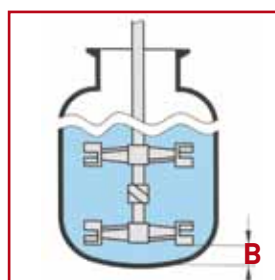
Double impulse stirrer shafts

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.

$$R = 0.70 \times D$$

$$H = 0.20 \times R$$

$$B = 0.28 \times R$$



Tubing - Pressure Resistance

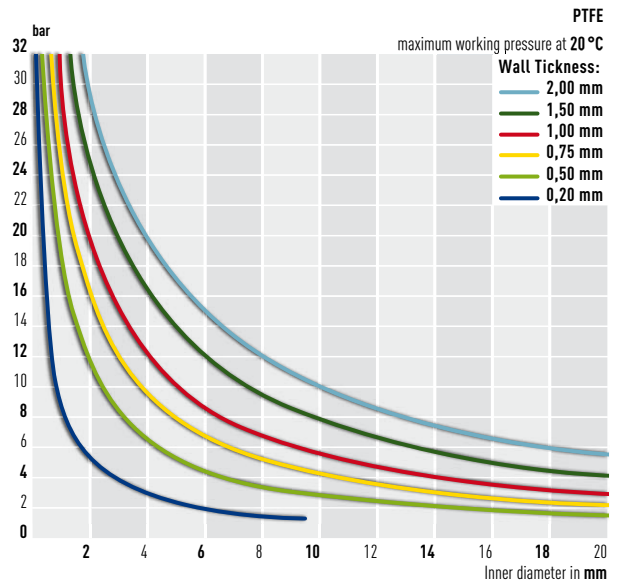
PTFE Tubing

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



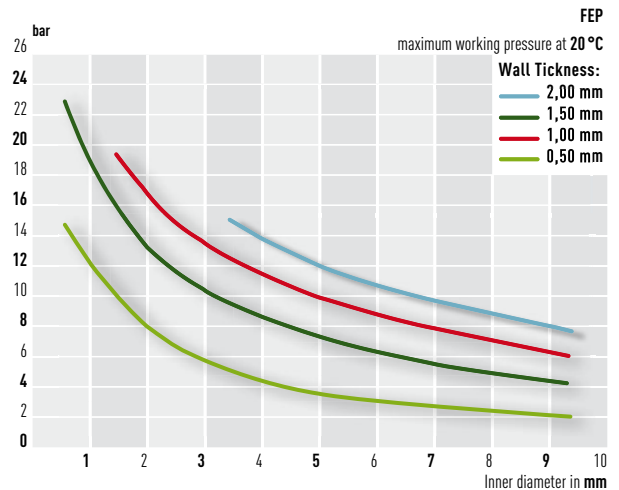
FEP Tubing

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



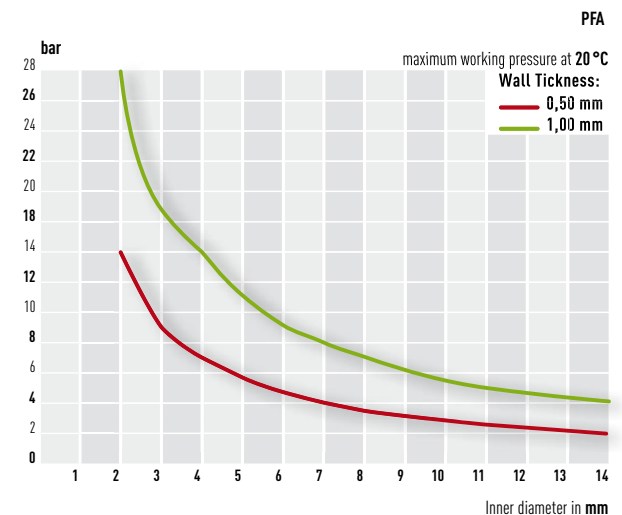
PFA Tubing

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	$\pm 0,25$

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.



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 - Assembly

BOLA Laboratory Screw Joints

Application

BOLA Laboratory Screw Joints are the perfect choice to connect hard-walled tubing (e. g. PTFE, PFA, FEP) or tubes in different materials (such as glass, metall, plastics) with devices with GL-threads.

Components

Each laboratory screw joint consists of a cap with female GL-thread, bore and internal cone as well as a set of three inner parts: v-ring, tapered ring and sealing ring. For laboratory screw joints for tubing O. D. smaller than 3 mm, the sealing ring additionally includes a FPM-o-ring which is protected by a PTFE sealing lip.

The special clou of BOLA's Laboratory Screw Joint System: You can connect different tubing diameters to the same GL thread by simply exchanging the inner spare parts. It is not necessary to adapt the GL thread or fitting. A reduction is made by exchanging the inner spare parts instead of adapting the GL thread.

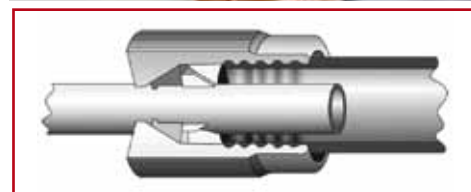
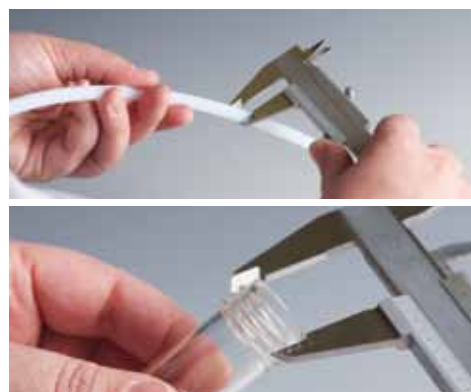
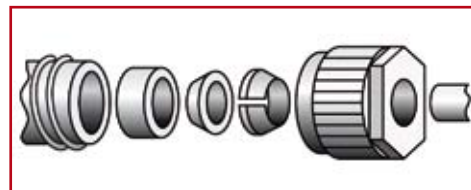
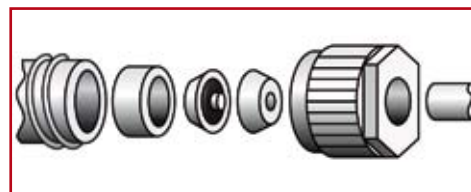
Choice

A suitable laboratory screw joint for your connection can be easily found. 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. Further assistance on the determination of threads can be found in our technical appendix (page 298).

Also the application is decisive: Will there be temperatures of more than +150 °C? If so, the BOLA Laboratory Screw Joints HT in PPS (black) are the right choice (see page 73). PPS provides besides at once a good thermal and chemical resistance. Or is a high chemical resistance more important? Then you have to choose BOLA Laboratory Screw Joints in ETFE (red) on page 71. In comparison to PPS, they provide a better chemical resistance but can only be used up to max. +150 °C. For more flexibility, all screw caps and sets of inner spare parts can also be ordered separately.

Assembly and Function

Assembly can easily made by hand. First, the screw cap has to be put on the tubing end, that shall be mounted to the GL socket. After that, the inner parts are pushed on the tubing. Please pay attention to the right order: slotted v-ring, tapered ring and o-ring for O.D. smaller than 3 mm, sealing ring as well as on the correct mounting orientation. A schematic drawing on our labels repeats this information. Push the tubing through the GL socket, place the inner parts on the sealing surface of the GL-thread and finally fix the connection by tightening the screw cap. The screw cap presses firmly the sealing ring and the tapered ring on the GL-threaded counter piece. At the same time, the v-ring is compressed and the tubing is fixed tightly as well. The complete connection is tight. Provided the laboratory screw joint is exposed to changing working temperatures, it might be necessary to tighten the screw joints once more due to different expansion coefficients of the used materials PTFE and PPS/ETFE.



Tubing - Useful Hints

Thin tubing at vacuum and high temperatures

At high temperatures, under vacuum or with thin wall thickness we recommend to support the tubing in the laboratory screw joint. This can for example be made by using a short piece of glass or metal tube. Consequently, the tubing cannot turn off to the inside and become leaky. This trick allows also to connect elastic, gummy tubing to GL threads by means of BOLA Laboratory Screw Joints.



Dimensional tolerances of PTFE, PFA and FEP tubing

All tubing listed herein match the sizes of the BOLA screw joint system. Therefore you can be sure that all fittings and connectors fit together. Practice has proved that all kinds of tubing have certain tolerances in both outer diameter and wall thickness. All tubing stated herein have been checked several times. This inspection based on strict rules stipulated by BOLA that exceed the demands for dimensions or quality control usually applied on the market.

In addition to the outer diameter, the wall thickness is important to evaluate the quality of tubing. We, at BOLA have stipulated stricter limits for the tolerances of the wall thickness than usually applied. Above all, we do not allow cumulative tolerances of the tubing dimensions to result in incorrect wall thickness. Thus, the wall thickness may only vary according to the outer diameter as stated in the chart on the right.

In addition, all tubing is carefully tested whether they show any faults in material (e. g. inclusion of impurities), any longitudinal or horizontal nerves or any reliefs at the outer and inner diameter.

Processing of heat shrinkable PTFE tubing

Shrinking should be done at a temperature of $+340\text{ }^{\circ}\text{C} \pm 10\text{ }^{\circ}\text{C}$. (At approx. $+327\text{ }^{\circ}\text{C}$ 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 $+350\text{ }^{\circ}\text{C}$ 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 %.

Nominal outer- \emptyset mm	0.4–2.9	3.0–10.0	10.1–16.0	16.1–22.0	> 22.1
Tolerance outer- \emptyset 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	> 2.1
Tolerance mm	± 0.025	± 0.05	± 0.10	± 0.20

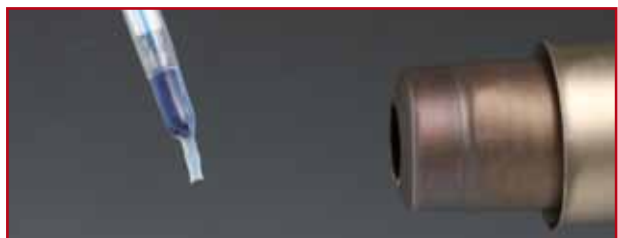
Example:

Nominal outer- \emptyset 16 mm ; min.- \emptyset 15.85 mm; max.- \emptyset 16.15 mm
Wall thickness 1 mm ; min. wall. 0.95 mm; max. wall. 1.05 mm

Both tolerances must not be added so that an even bigger discrepancy of outer or inner diameter would be possible!

Safety instructions:

Use adequate ventilation to assure removal of toxic vapours which may be produced by overheating!



Tubing - Useful Hints

Bending radius of PTFE, PFA and FEP tubing

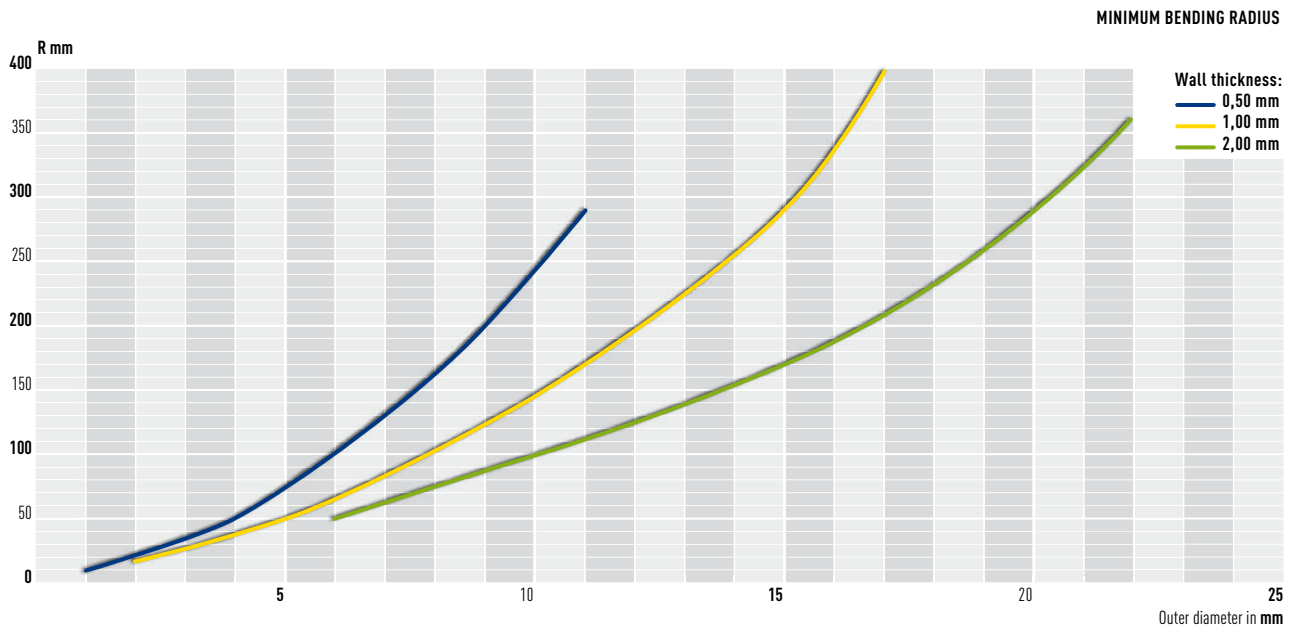
During the assembly of devices with fluoroplastic tubing we are often confronted with the problem of how to create the smallest bending radius when the space is limited. To avoid buckling of the tubing with all its negative aspects, the following graph will be helpful to determine the smallest possible 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:

$$\frac{\text{outer}^2 - \emptyset}{\text{wall thickness}} = \text{min. bending radius}$$

As reference value, the smallest possible bending radius can be determined by the square of the outer diameter divided by the wall thickness.



Example: A PTFE tubing with outer diameter 10 mm and a wall thickness of 2 mm has a minimum bending radius of 100 mm.

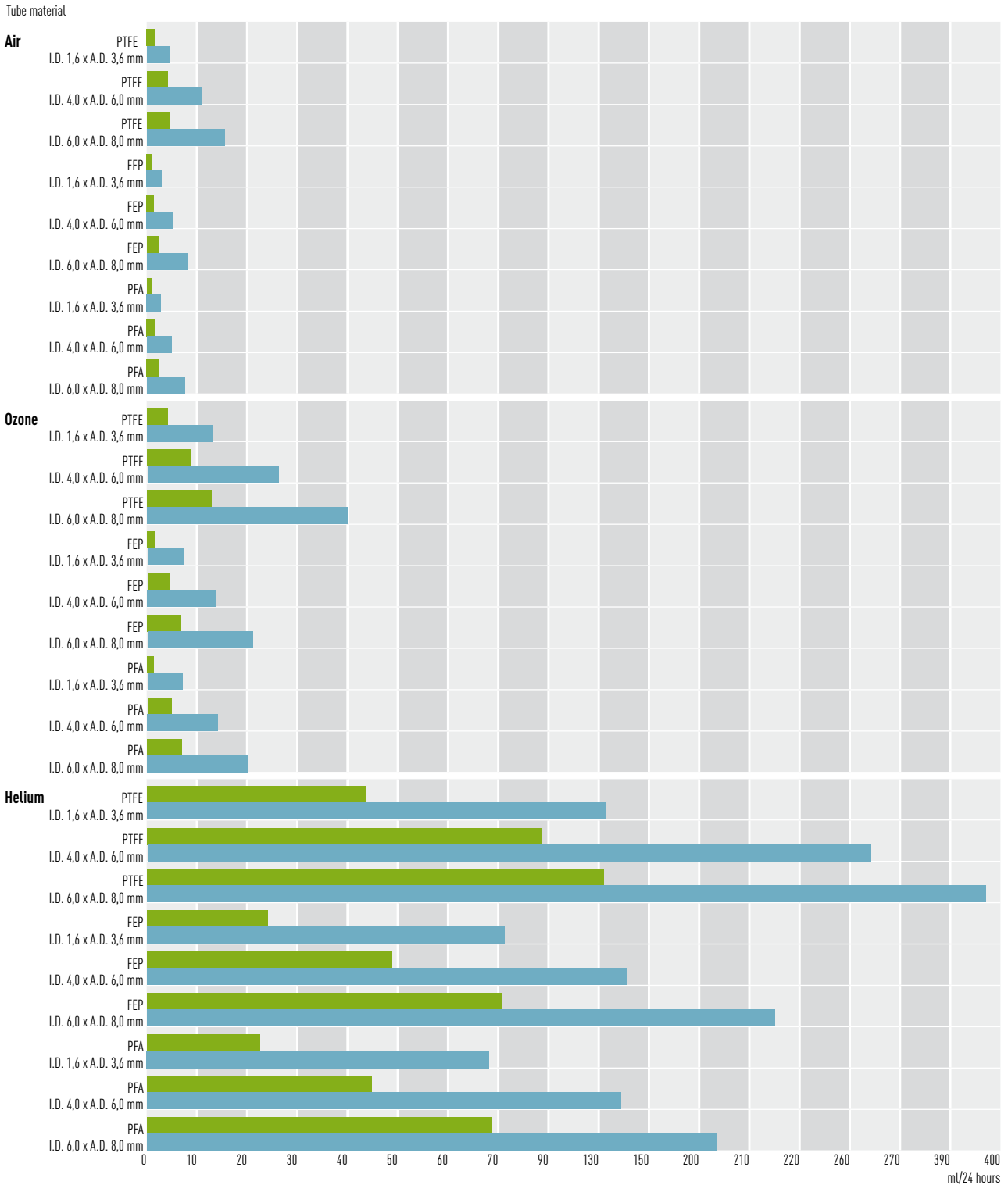
Permeation values in a diagramm

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 ■



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.

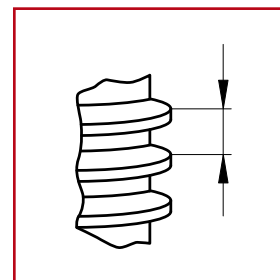
Determination – Thread Types

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. But please understand that we are not able to determine threads on faxed or scanned copies or pictures.



Determination – Thread Types

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

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

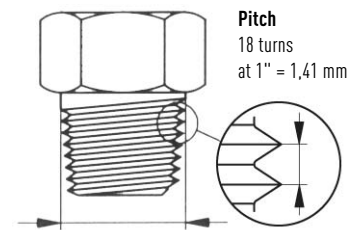
M thread (metric ISO-thread) – standard in Europe

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

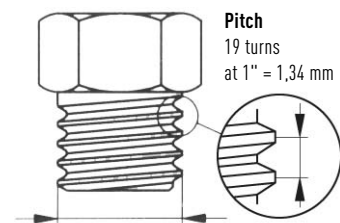
Example:

NPT 3/8" – O. D. = 16,6 mm



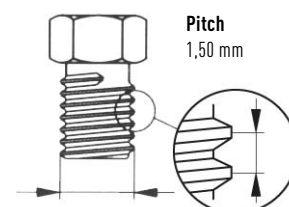
Example:

G 3/8" – O. D. = 16,5 mm



Example:

M 10 – O. D. = 10 mm



Determination – Thread Types

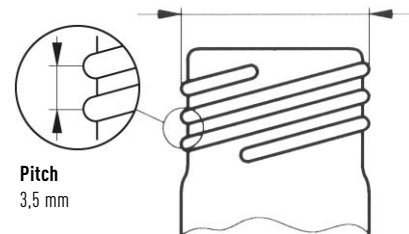
GL Threads

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



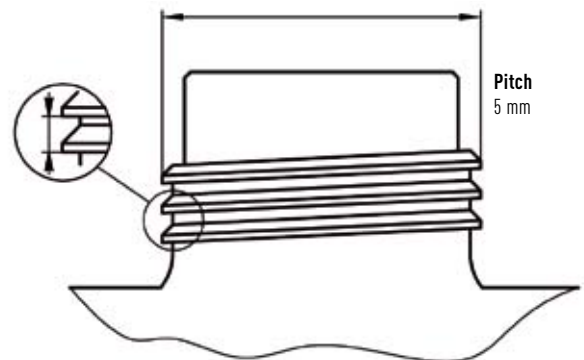
Nalgene Threads

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



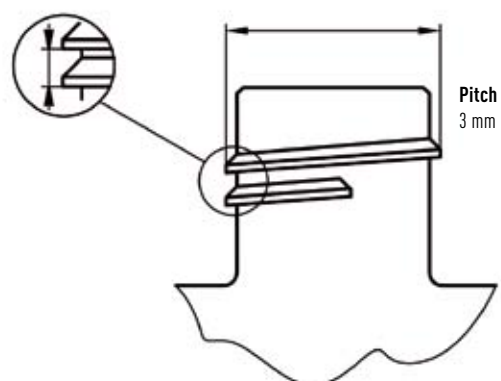
GPI Threads

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



Determination – Thread Types

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

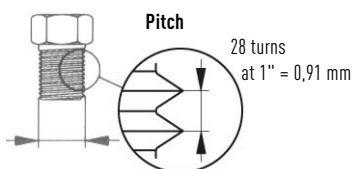
Without exception all BOLA HPLC Fittings come with the most common HPLC thread UNF 1/4" 28G. In addition, fittings and distributors with the very similar thread M 6 are used.

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.

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

Example:

UNF 1/4"-28G – O. D. = 6,2 mm



Canister Thread S

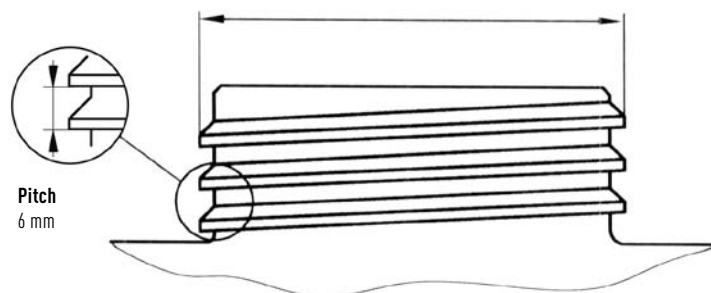
Coarse buttress thread commonly used for many plastic containers and flasks.

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



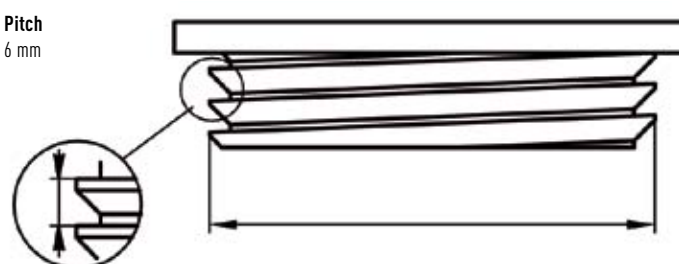
Barrel Threads Mauser 2", G 2"/R 2" and Tri Sure 2"

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

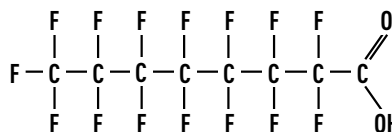
Formerly, perfluorooctanoic acid (PFOA) respectively sal ammoniac (APFO) have been used as additives in the polymerisation process during the production of polytetrafluorethylene (PTFE).

The use of these additives was obligatory in the emission polymerization process but has also partly been used in the suspension polymerisation process.

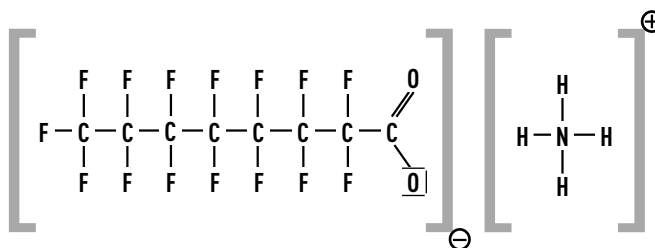
Although PFOA respectively APFO are almost completely removed from the final product and can mostly be regained during the production process, the well-known manufacturers of PTFE have committed themselves by self-declaration to waive the use of PFOA and APFO in any production process as of the production 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:





For the German Stem Cell Donor File

BOHLENDER does not only support the activities of the German Stem Cell Donor File for the typing of stem cells financially. Through the personal typing and registration as a stem cell donor, we would like to give hope to people suffering from leukemia or other disfunctions of haematosi. Nowadays, we can help concerned people through a stem cell donation. If a suitable donor cannot be found within the own family, patients have to rely on an unknown donor. The more typings and registrations, the higher the chance for the patients to get a suitable donation. Saving life through a little blood donation – BOHLENDER supports this activity from the bottom of the heart!

For promotion of sports and youth

The work with children and the youth in local sports clubs contributes to the advancement of physical, personal and social competences of the children and young adults and supports the competence to take actively part in the social life. As a matter of course, BOHLENDER has supported the local clubs (amongst them soccer and handball clubs) through the sponsoring of their sportswear for several years now. Only the ones who are healthy and fit can cope with the daily challenges in private and professional life.

For the Civic Foundation Lauda-Koenigshofen

The Civic Foundation Lauda-Koenigshofen was found end of 2013 by dedicated citizens and companies. The targets of this foundation are the development, advancement and appreciation of sustainable and innovative ideas and concepts in Lauda-Koenigshofen and its districts. These targets are reached by the strengthening of the civic engagement and the advancement of a sustainable development of the local community in the fields of family, education, sciences, environmental protection, health, heritage and international understanding. The family company BOHLENDER has its roots in Lauda and has had a deep connection to the city of Lauda-Koenigshofen for a long time now. We at BOHLENDER perfectly identify with the idea and targets of the civic foundation. As an initial founder we respectively engage ourselves.

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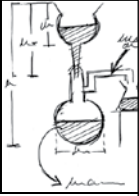
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