Каталог

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эл.почта: bao@nt-rt.ru || сайт: https://bola.nt-rt.ru

BOLA Laboratory Flasks

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

Product description:

Flask made of borosilicate glass 3.3, thread GL45 or GLS80 with screw cap and pouring ring made of PP, outside with volume scale in 100 ml steps to estimate the volume. Using separately available BOLA Multiple Distributors GL45 or GLS80 and suitable tubing, you can simply fill or empty the flask.

	Capacity ml	Thread	Cat. No.:
A	500	GL45	D 300-43
В	1000	GL45	D 300-45
C	500	GLS80	D 300-79
D	1000	GLS80	D 300-80



BOLA Canisters GL45

Material: Temperature resistance: Chemical resistance: PE-HD from -50 to +80 °C +++ very good

UN

Product description:

Canister made of PE-HD with thread GL45 and tamper evident closure. Using separately available BOLA Multiple Distributors GL45 and suitable tubing, you can simply fill or empty the canister.

Cat. No.:	Dimensions L x W x H mm	Capacity (
D 305-02	150 x 110 x 210	2,5
D 305-05	195 x 150 x 270	5
D 305-10	225 x 190 x 300	10



BOLA Canisters S55

Material: Temperature resistance: Chemical resistance: PE-HD from -50 to +80 °C ++ very good

IIN

Product description:

Canister made of PE-HD with thread S55 and tamper evident closure. Using separately available BOLA Distributors for Canisters S55 and suitable tubing, you can simply fill or empty the canister.

Cat. No.:	Dimensions L x W x H mm	Capacity (
D 325-05	195 x 150 x 235	5
D 325-10	230 x 195 x 235	10



BOLA Canisters S60

Material: Temperature resistance: Chemical resistance:
PE-HD, PE-HD-EX from -50 to +80 °C ++ very good

UN

Product description:

Canister made of PE-HD or static dissipative PE-HD-EX with thread S60 and tamper evident closure. Using separately available BOLA Distributors for Canisters S60 and suitable tubing, you can simply fill or empty the canister.

	Capacity (Neck	Dimensions L x W x H mm	Material	Cat. No.:	
A	5	straight	190 x 150 x 255	PE-HD	D 330-05	
A	10	straight	220 x 190 x 340	PE-HD	D 330-10	
A	20	straight	300 x 230 x 450	PE-HD	D 330-20	
В	5	straight	195 x 165 x 230	PE-HD-EX	D 331-05	
В	10	straight	220 x 190 x 340	PE-HD-EX	D 331-10	
В	30	straight	360 x 235 x 450	PE-HD-EX	D 331-30	
C	10	inclined	295 x 200 x 255	PE-HD-EX	D 336-10	
C	20	inclined	295 x 200 x 495	PE-HD-EX	D 336-20	



Application:

For the handling of highly inflammable liquids, we recommend to use canisters made of static dissipative plastics. In order to avoid static charging, these canisters can be grounded by connecting them with separately available grounding cables (see Cat. No. D 387-01) to a suitable earth point.

BOLA Canisters with Level Indicator

Material:

Temperature resistance:

Chemical resistance:

PE-HD-EX

from -50 to +80 °C

++ very good

Product description:

Canister made of PE-HD or static dissipative PE-HD-EX with thread S60 and tamper evident closure. Integrated indicator to monitor the fill level. With increasing filling level, the red visual pin raises up. As soon as the visual pin fills the inspection glass completely, the canister is full and has to be exchanged. Using separately available BOLA Distributors for Canisters S60 and suitable tubing, you can simply fill or empty the canister.

Capacity	Dimensions L x W x H mm	Cat. No.:
10	295 x 200 x 255	D 337-10
20	295 x 200 x 495	D 337-20

Application:

For the handling of highly inflammable liquids, we recommend to use canisters made of static dissipative plastics. In order to avoid static charging, these canisters can be grounded by connecting them with separately available grounding cables (see Cat. No. D 387-01) to a suitable earth point.







BOLA Canisters S90

Material: Temperature resistance: Chemical resistance: PE-HD, PE-HD-EX from -50 to +80 °C ++ very good

UN

Product description:

Canister made of PE-HD or static dissipative PE-HD-EX with thread S90 and tamper evident closure. Using separately available BOLA Distributors for Canisters S90 and suitable tubing, you can simply fill or empty the canister.

	Capacity (Dimensions L x W x H mm	Material	Cat. No.:
A	10	195 x 195 x 370	PE-HD-EX	D 368-10
В	10	195 x 195 x 370	PE-HD	D 365-10

Application:

For the handling of highly inflammable liquids, we recommend to use canisters made of static dissipative plastics. In order to avoid static charging, these canisters can be grounded by connecting them with separately available grounding cables (see Cat. No. D 385-03) to a suitable earth point.



BOLA Grounding Cables

Product description:

For connection to earth of canisters and collecting trays made of static dissipative PE-HD-EX. Version of per below chart, the scope of delivery of the ring cable lug includes screw, nut and washer.

	Suitable for	Connection 1	Connection 2	Cable length m	Cat. No.:
A	Canisters Cat. No. D 331, D 336	clip	clip	1,5	D 386-01
В	Collecting Tray Cat. No. D 381	clip	ring cable lug M6	1,5	D 387-01
С	Canisters Cat. No. D 368-10	Stainless steel strap with tension lock for circumference 195 x 195 mm	clip	1,5	D 385-03







BOLA Collecting Trays

Material:

Temperature resistance:

Chemical resistance:

PE-HD, PE-HD-EX

from -50 to +80 °C

++ very good

Product description:

Practical collecting tray made of PE or static dissipative PE-EX. Place your canisters in a collecting tray: escaping liquids are collected in case of container exchange or leakages.

	Capacity (Dimensions inside L x W x H mm	Dimensions outside L x W x H mm	Material	With dip tray and grounding connection	Cat. No.:
A	12	335 x 235 x 160	390 x 290 x 165	PE-HD	No	D 380-01
A	25	385 x 290 x 200	460 x 340 x 220	PE-HD	No	D 380-02
В	10	325 x 220 x 156	333 x 238 x 175	PE-HD-EX	Yes	D 381-05
В	20	437 x 325 x 156	445 x 343 x 175	PE-HD-EX	Yes	D 381-10



Application:

When handling highly flammable liquids, we recommend containers made of dissipative plastics that can be connected to a suitable earthing point using a separately available earthing cable (see Cat. No. D 387-01) to avoid static charges.

BOLA Trolleys for Collecting Trays

Material:

Temperature resistance:

Chemical resistance:

AI, PA

from -40 to +100 °C + good

Product description:

Made of aluminium profiles and polyamide connectors, with 4 casters, two of them with brakes.

	Suitable for collecting trays Cat. No.:	Dimensions L x W x H mm	Cat. No. Trolley:
A	D 380-01	359 x 262 x 99	D 383-06
A	D 380-02	434 x 315 x 99	D 383-11
В	D 381-05	323 x 245 x 99	D 383-05
В	D 381-10	416 x 323 x 99	D 383-10



Application:

In combination with a suitable collecting tray for easy transport of full containers. Canisters placed into the tray can be placed flexibly under a work table using the trolley.

Configuration options for Canisters with Collecting Tray and Trolley





Configuration options for EX-Canisters with Collecting Tray and Trolley

Leakage tray

In the event of a leakage, the entire content of the canister is collected by the tray.

Splash guard tray

In the event of a leakage, the splash guard tray can only absorb part of the liquid.

2 x Canister 5 l (leakage tray)

2 x Canister S60 EX Cat. No.: D 331-05

OR

1 x Canister 10 l (leakage tray)

1 x Canister S60 EX Cat. No.: D 331-10

1x Canister S60 EX, inclined

Cat. No.: D 336-10

1x Canister S90 EX

Cat. No.: D 368-10

0R

1 x Canister 20 l (splash guard tray)

1 x Canister S60 EX, inclined Cat. No.: D 336-20

Collecting Tray EX with 10 l capacity:

Cat. No.: D 381-05

Suitable trolley:

Cat. No.: D 383-05







10 L 20 l

2 x Canistern 10 l (leakage tray)

2 x Canister S60 EX Cat. No.: D 331-10

2 x Canister S60 EX, inclined Cat. No.: D 336-10

2 x Canister S90 EX

Cat. No.: D 368-10

OR

2 x Canister 20 l (splash guard tray)

2 x Canister S60 EX, inclined Cat. No.: D 336-20



OR

1 x Canister 20 l (leakage tray)

1 x Canister S60 EX, inclined Cat. No.: D 336-20

0R

30 L



1 x Canister S60 EX Cat. No.: D 331-30



Suitable trolley:

Cat. No.: D 383-10



Professional HighPerformance Fluoroplastic

<u>Labware</u>

PTFE | PFA | FEP

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

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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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New products are shown with this icon.

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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..



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



Mechanical strength



Borosilicate glass



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



This article is a spare part.



These articles are very popular with our customers.

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Dear customers and friends of BOHLENDER,



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

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

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

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

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

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

Your

Volker Bohlender

Volker Bohlender

Managing Director

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THIS IS WHAT BOLA STANDS FOR

FIELD-PROVEN LABWARE MADE FROM HIGH-PERFORMANCE PLASTICS

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

COMPETENT ADVICE

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

HUGE VARIETY AND FLEXIBILITY

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

FAST AND RELIABLE DELIVERY

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

HIGHEST QUALITY AND PRECISION

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

SUSTAINABLE PRODUCTION

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

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

OUR FOUR PILLARS

1. Thinking ahead from the very beginning

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

2. Recovery in view

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

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

3. Natural energy in use

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

4. Safe use and waste disposal

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

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

A VERSATILE AND COMMITTED COMPANY





German Sterm Cell Donor Registry

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

Sports and youth promotion

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

Community Foundation Lauda-Königshofen

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







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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.

» Product: water





Suitable chucking diameter of stirrer shafts

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

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







BOLA Propeller Stirrer Shafts

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



Product description:

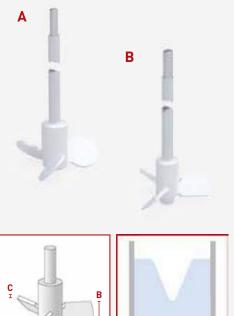
 ${\it PTFE-jacketed stainless steel shaft, propeller completely made of PTFE with three 45° angled}$ round or angular blades. Universal chemical resistance since the product is only exposed to

	Length	Shaft dia.	Chucking dia.	Dimension	ns according	•	Cat. No.:
	mm	mm	mm	Α	В	C mm	
A	250	6	4,0	50	18	1,5	C 378-04
	350	6	4,0	50	18	1,5	C 378-06
	450	6	4,0	50	18	1,5	C 378-08
В	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



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









BOLA Moon-Shaped Stirrer Shafts

Material:

Temperature resistance:

Chemical resistance: +++ universal

PTFE

from -200 °C to +250 °C

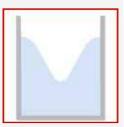
FDA conform

Product description:

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

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







Applications:

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



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



BOLA Double-Moon-Shaped Stirrer Shafts

Material: **PTFE** Temperature resistance:

Chemical resistance:

FE from -200 °C to +250 °C

+++ universal



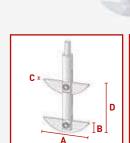
Product description:

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

Length	Shaft dia.	Chucking	Dir	nensions	Cat. No.:		
mm	mm	dia. mm	Α	В	C	D mm	
350	10	8,0	90	24	3,0	140	C 374-12
450	10	8,0	90	24	3,0	140	C 374-14
600	10	8,0	90	24	3,0	140	C 374-18



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









#SUITABLE PAGE 46 Stirrer bearings for BOLA stirrer shafts

BOLA INNOVATION



#1 Stirrer Shafts - solid and chemically resistant

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

see page 22

BOLA Stirrer Shafts with One Paddle

Material: Temperature resistance: Chemical resistance: Stirring effect: PTFE from -200 °C to +250 °C +++ universal bottom-up FDA conform Product description: PTFE-jacketed stainless steel shaft, paddle completely made of PTFE with two 45° angled blades. Universal chemical resistance since the product is only exposed to PTFE. Length Shaft dia. Chucking dia. Dimensions according to drawing Cat. No.: mm 450 8 6,5 80 18 4,0 C 379-02 600 8 6,5 80 18 4,0 C 379-04 800 8 6,5 80 18 4,0 C 379-06 600 10 8,0 110 20 5,0 C 379-08 800 10 8,0 110 20 5,0 C 379-10 1.000 10 8,0 110 20 5,0 C 379-12 1.000 14,0 140 25 12,0 C 379-18 16 Applications: The product is sucked bottom-up, very good axial flow with low shear force.



BOLA U-Shaped Stirrer Shafts

Material:

Temperature resistance:

Chemical resistance:

PTFE

from -200 °C to +250 °C

+++ universal

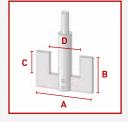


FDA conform

Product description:

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

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





Applications:

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



#SUITABLE PAGE 40

Additional stirrer blades

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

No problem if you use our tilting moonshaped or centrifugal stirrer shafts.

see page 24

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

NEW

NEW

NEW

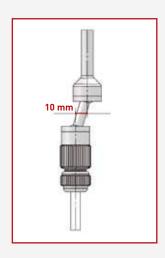
	Opening for stirrer shaft mm	Upper dia. mm	Total length mm	Cat. No.:
A	Ø 4,0	8	190	C 394-01
A	Ø 4,0	10	190	C 398-04
В	Ø 6,5 and 10,0	8	190	C 394-02
В	Ø 6,5 and 10,0	10	190	C 398-08
В	Ø 8,0 and 10,0	8	190	C 394-03
В	Ø 8,0 and 10,0	10	190	C 398-12
С	Inner-square SW6	SW8	180	C 399-12
D	GL 10	10	170	C 393-12

Benefits:

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

Applications

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









Spare Parts for Globe Stirrer Couplings

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

BOLA Maxi Propeller Stirrer Shafts

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

Chemical resistance: +++ universal

Stirring effect: bottom-up

BEST

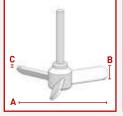
FDA conform

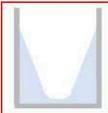
Product description:

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

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







Applications:

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





BOLA Impeller Stirrer Shafts

Material: **PTFE** Temperature resistance:

from -200 °C to +250 °C

Chemical resistance: +++ universal

FDA conform

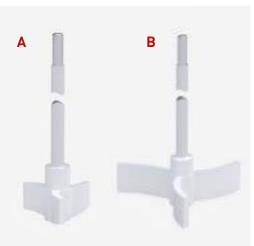
Product description:

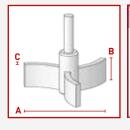
PTFE-jacketed stainless steel shaft, impeller completely made of PTFE with three blades bent backwards, lower side of impeller either even or 15° angled. Universal chemical resistance since the product is only exposed to PTFE.

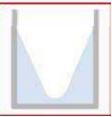
	Length mm	Shaft dia.	Chucking dia. mm	Angle	Dimension A	ıs accordinç B	to drawing C mm	Cat. No.:
A	350	10	8,0	15°	45	22	5	C 389-18
	350	10	8,0	15°	60	25	5	C 389-20
	450	10	8,0	15°	60	25	5	C 389-22
В	450	10	8,0	0°	100	25	5	C 389-28
	600	10	8,0	0°	100	25	5	C 389-32
	800	10	8,0	0°	100	25	5	C 389-36
	600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



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:

Temperature resistance:

Chemical resistance: +++ universal

PTFE

from -200 °C to +250 °C

TTT UIIIVEISA



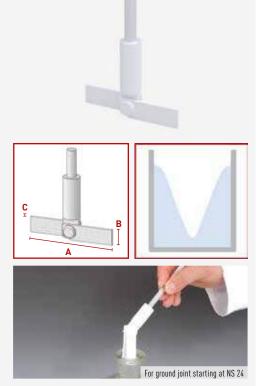
Product description:

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

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

Applications:

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





#SUITABLE PAGE 63 Additional stirrer paddles

32



BOLA Stirrer Shafts with Blade

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

FDA conform

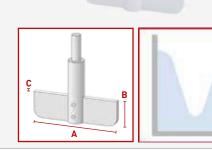
Product description:

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

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

Applications:

Tangential flow with little turbulence, gentle stirring.





#INFORMATIVE PAGE 357

Information on maximum revolutions per minute for BOLA stirrer shafts

BOLA Gassing Stirrer with 4 Blades

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

FDA conform

Product description:

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

Cat. No.	Dimensions according to drawing				Chucking	Shaft dia.	Length
	D mm	C	В	Α	dia.mm	mm	mm
C 488-08	187	20	12	72	8,0	10	484
C 488-14	272	20	12	72	8,0	10	559
C 488-20	387	20	12	72	8.0	10	657

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°

FDA conform

Product description:

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

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

Applications:

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







#SUITABLE PAGE 193

BOLA temperature probes for assembly of a baffle.

BOLA Stirrer Shafts with Two Paddles

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

FDA conform

Product description:

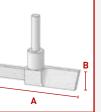
PTFE-jacketed stainless steel shaft, two PTFE paddles arranged crosswise at 90°. Upper paddle is fixed by means of clamp screws made of PEEK compound.

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

Applications

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











BOLA Fan-Shaped Stirrer Shafts

Material:

Temperature resistance:

Chemical resistance:

PTFE

from -200 °C to +250 °C

+++ universal

FDA conform

Product description:

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

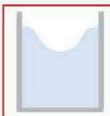
Length mm	Shaft dia. mm	Chucking dia. mm	•	Dimensions acco	rding to drawing B mm	Cat. No.:
300	8	6,5	29/32	24	35	C 382-02
300	8	6,5	45/40	38	45	C 382-06
450	8	6,5	45/40	38	45	C 382-08
600	10	8,0	60/46	53	55	C 382-14

Applications:

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











#SUITABLE PAGE 23 Globe stirrer couplings

BOLA Discs Stirrer Shafts

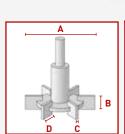
Material: Temperature resistance: Chemical resistance:
PTFE from -200 °C to +250 °C ++++ universal

FDA conform

Product description:

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

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





Applications:

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

BOLA Double Impulse Stirrer Shafts

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

FDA conform

Product description:

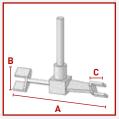
PTFE-jacketed stainless steel shaft, two paddles arranged crosswise at 90° completely made of PTFE. Upper paddle is fixed by means of clamp screws made of PEEK compound. Universal chemical resistance since the product is only exposed to PTFE.

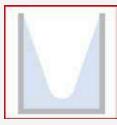
Length	Shaft dia.	Chucking	Distance of	Dimension	ns according	Cat. No.:	
mm	mm	dia. mm	blades mm	A	В	C mm	
600	10	8,0	150	140	34	19	C 391-18
800	16	14,0	150	140	34	19	C 391-28

Applications

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









BOLA Propeller Stirrer Shafts with 4 Blades

Material:

Temperature resistance:

Chemical resistance: +++ universal

PTFE

from -200 °C to +250 °C

bottom-up

FDA conform

Product description:

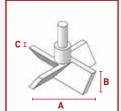
 ${\it PTFE-jacketed stainless steel shaft, propeller completely made of PTFE with four 45° angled}$ angular blades. Universal chemical resistance since the product is only exposed to PTFE.

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



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







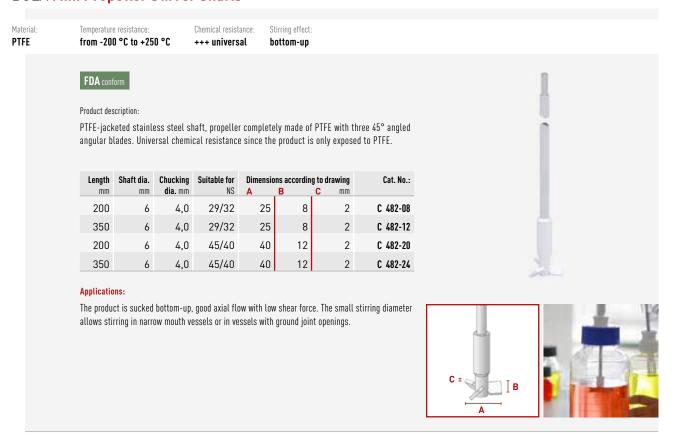


BOLA PRACTICAL-TIP Big effective circular diameter, but small vessel neck?

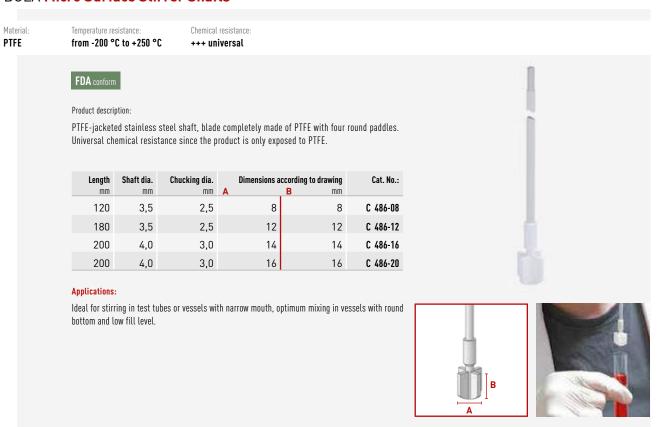
No problem if you use our tilting moonshaped or centrifugal stirrer shafts.

s. page 24

BOLA Mini Propeller Stirrer Shafts



BOLA Micro Surface Stirrer Shafts



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:

Temperature resistance:

Chemical resistance:

PTFE

from -100 °C to +240 °C

+++ universal

Type: BOLA Propeller Blades



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





Applications:

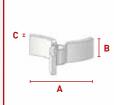
The product is sucked bottom-up, good axial flow with low shear force.

Type: BOLA Impeller Blades

FDA conform

Cat. No.:	ng to drawing	ions accordi	Dimens	Wrench size	Shaft dia.
	C mm	В	Α		mm
C 443-08	6	25	60	19	10
C 443-10	6	25	100	19	10
C 443-14	6	25	150	19	10





Applications:

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

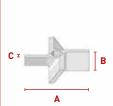
Type: BOLA Propeller with 4 Blades

FDA conform



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





Applications

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



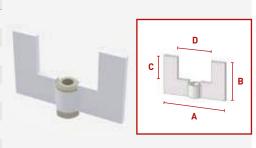
BOLA Stirrer Blades

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

Type: BOLA U-Shaped Blades

FDA conform

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

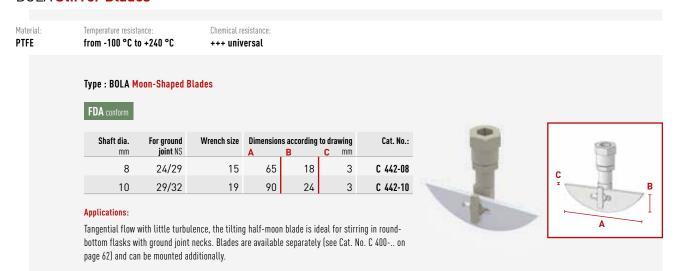


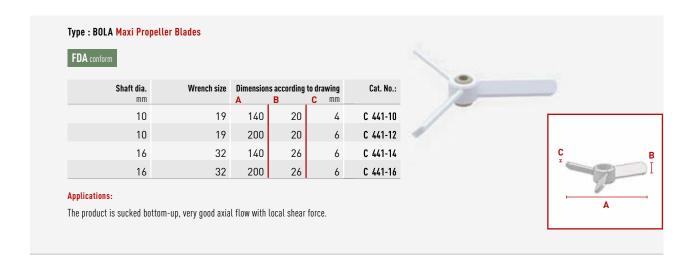
Applications:

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

Type: BOLA Paddle FDA conform Shaft dia. Wrench size Dimensions according to drawing Cat. No.: C 446-08 8 15 80 18 4 5 10 19 80 20 C 446-10 10 19 110 20 5 C 446-12 10 20 C 446-14 19 140 5 25 12 16 32 140 C 446-16 The product is sucked bottom-up, very good axial flow with shear force.

BOLA Stirrer Blades





BOLA PRACTICAL TIP
For an easier assembly of blades:

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

Spare Parts for: Stirrer Blades

Description	Material	Packing Unit	Shaft dia.	suitable for Cat. No.:	Cat. No.:	
Replacement clamp screws	PTFE-PEEK Compound	Pack size: 5 pieces	8 mm	all stirrer blades for shaft dia. 8 mm	C 950-01	
Replacement clamp screws	PTFE-PEEK Compound	Pack size: 5 pieces	10 mm	all stirrer blades for shaft dia. 10 mm	C 950-02	(1000)
Replacement clamp screws	PTFE-PEEK Compound	Pack size: 5 pieces	16 mm	all stirrer blades for shaft dia. 16 mm	C 950-03	((00)



BOLA Solo Stirrer Shafts

Material: **PTFE** Temperature resistance:

from -200 °C to +250 °C

Chemical resistance: +++ universal



Product description:

 $\label{ptfe} \mbox{PTFE-jacketed stainless steel shaft with fused lower end. Universal chemical resistance since the product is only exposed to PTFE. \\$

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



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







BOLA INNOVATION



#1 Stirrer shaft kit

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

BOLA Stirrer Shafts with Reduced Chucking Diameter (RCD)

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

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



Material: PTFE Temperature resistance:

Chemical resistance:

from -200 °C to +250 °C

+++ universal

Type: BOLA Stirrer Shafts with Blade RCD

FDA conform

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

Blade dimensions see Cat. No. C 381-.. on page 33.

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

Applications:

Tangential flow with little turbulence, gentle stirring.

Type: BOLA Moon-Shaped Stirrer Shafts RCD

FDA conform

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

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

Applications:

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

Type: BOLA Maxi Propeller Stirrer Shafts RCD

FDA conform

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

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

Applications:

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









Material: **PTFE**

Temperature resistance:

Chemical resistance:

from -200 °C to +250 °C

+++ universal

Type: 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 34.

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

Applications:

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



Type: BOLA U-Shaped Stirrer Shafts RCD



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

	Chucking dia. mm	Shaft dia. mm	Length mm
C 584-52	10	16	800
C 584-58	10	16	1.000
C 584-64	10	16	1.200



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



BOLA INNOVATION



#1 Stirrer Shafts – solid and chemically resistant

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

BOLA Stirrer Bearings

Chemical resistance:

PTFE, PPS

from -15 °C to +200 °C

+++ universal



FDA conform

Product description:

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

Cone NS European standard	For stirrer shaft dia.	Total length mm	Thread of screw cap	Cat. No.:
NS 19/26	6	63	18	C 424-04
NS 19/26	8	65	25	C 424-05
NS 24/29	8	69	25	C 424-08
NS 24/29	10	70	25	C 424-09
NS 29/32	6	72	18	C 424-12
NS 29/32	8	74	25	C 424-13
NS 29/32	10	72	25	C 424-14
NS 45/40	10	80	25	C 424-16
NS 45/40	16	86	32	C 424-18
Cone US standard	For stirrer shaft dia.	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.	For Thread of screw cap GL	suitable for Cat. No.	Cat. No.:	
Replacement Special Gaskets The gaskets provide sealing of the stirrer shafts.	PTFE and FKM-O-Ring	6 mm 8 mm 10 mm 16 mm		C 424-04 / C 424-12 C 424-05 / C 424-08 / C 424-13 C 424-09 / C 424-14 / C 424-16 C 424-18	C 425-70	0
Replacement Screw Caps Screw caps compress the o-ring of the special gasket and provide sealing of the stirrer shaft.	PPS	6 mm 8 mm 10 mm 16 mm		C 424-04 / C 424-12 C 424-05 / C 424-08 / C 424-13 C 424-09 / C 424-14 / C 424-16 C 424-18	C 425-84	



BOLA Glass Stirrer Bearings

Temperature resistance:

Chemical resistance:

PTFE, PPS from -15 °C to +200 °C +++ universal



FDA conform

Product description:

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

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

	Thread of screw cap GL	Total length mm	For stirrer shaft dia.	Cone US standard
C 428-08	25	103	8	24/40
C 428-12	25	103	10	24/40



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	ForThread of screw cap GL	suitable for Cat. No.	Cat. No.:	
Replacement Shaft Guides With integrated, exchangeable special gasket	PTFE and FKM-O-Ring	6 mm 8 mm 10 mm 16 mm		C 425-06 C 425-08/C 428-08/C 426-08 C 425-09/C 425-12/C 428-12/C 426-09 C 425-14	C 425-57 C 425-58 C 425-59 C 425-60	(0
Replacement Special Gaskets The special gaskets provide sealing against the stirrer shaft.	PTFE and FKM-O-Ring	6 mm 8 mm 10 mm 16 mm	GL 25 GL 25 GL 25 GL 32	C 425-06 C 425-08/C 428-08/C 426-08 C 425-09/C 425-12/C 428-12/C 426-09 C 425-14	C 425-69 C 425-70 C 425-71 C 425-72	0
Replacement Screw Caps	PPS	6 mm 8 mm 10 mm 16 mm	GL 25 GL 25 GL 25 GL 32	C 425-06 C 425-08/C 428-08 C 425-09/C 425-12/C 428-12 C 425-14	C 425-83 C 425-84 C 425-86 C 425-88	
Replacement Glass Parts Ground joint core and GL thread	Borosilicate glass		GL 25 GL 25 GL 25 GL 32	C 425-06 / C 425-08 / C 425-09 C 428-08 / C 428-12 C 425-12 C 425-14	C 425-50 C 425-51 C 425-53 C 425-55	



BOLA Ground Joint Distributor with Stirrer Bearing

Material:

Temperature resistance:

Chemical resistance:

autoclave:

PTFE

from -15 °C to +200 °C

+++ universal 121°

FDA conform

Product description:

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

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

Applications

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





BOLA PRACTICAL TIP Grease for ground joints?

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

see page 209



BOLA Special Stirrer Bearings

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



FDA conform

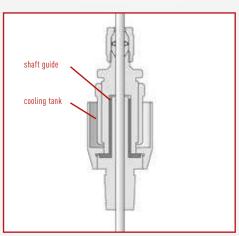
Product description:

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

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



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



Spare Parts for: Special Stirrer Bearings

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

BOLA Ground Joint Magnetic Stirrer Heads (MRK)

Material: PTFE, 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 INNOVATION



#1 Magnetic Stirrer Heads

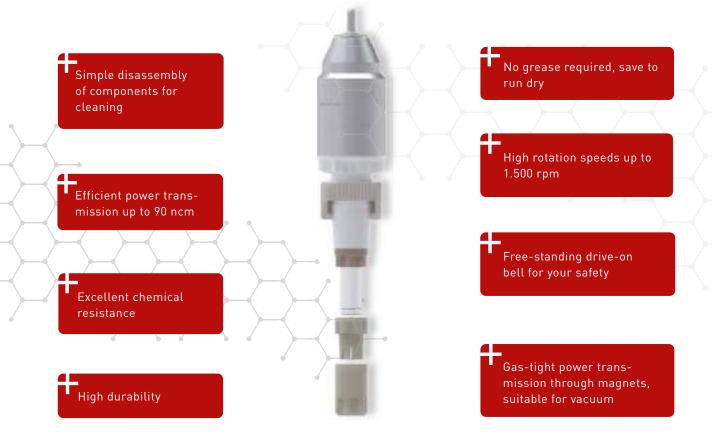
All wetted parts are metal-free. An almost universal chemical resistance is provided due to the use of fluoroplastics.



BOLA Magnetic stirrer couplings – what you should know about.

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

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





BOLA Magnetic Stirrer Heads (P-MRK)

Material

Temperature resistance:

Chemical resistance:

PTFE

from -100 °C to +240 °C

+++ universal









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

A Receiver made of borosilicate glass

» universal chemical resistance

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

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







B Receiver made of Hastelloy®

» robust construction

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

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

Applications:

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

















Loosen ground joint

Free ground joint

Loosen combi nut

Insert ground joint body

Fix ground joint body

BOLA PRACTICAL TIP

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

Protecting glass stirrer shafts effectively

see page 28



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

Temperature resistance:

Chemical resistance: +++ universal

PTFE, Glass

from -100 °C to +240 °C

GLAS FDA conform

Product description:

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

A Receiver made of borosilicate glass

» universal chemical resistance

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





B Receiver made of Hastelloy®

» robust construction

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

NEW

Product advantages:

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

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

BOLA INNOVATION



#1 Metal-free Magnetic Stirrer Heads

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



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

Description	Material	Packing Unit	size	suitable for Cat. No.	Cat. No.:	
Replacement Driving Bell P-MRK	Stainless steel	1 piece	NS 19/26 NS 29/32 NS 45/40	for all Magnetic Stirrer Heads P-MRK	C 932-03	
Replacement Guiding Assembly P-MRK	PTFE	1 piece	NS 29/32 NS 45/40 DN 40 DN 50	C 520-24 / C 520-28 C 530-08 / C 530-10 C 520-48 / C 530-15 C 522-40 / C 532-22 C 522-50 / C 532-32	C 921-01 C 921-02 C 921-03 C 921-04	1
Replacement "Safe-Lab" Nuts	PTFE,GF	1 piece	NS 29/32 NS 45/40	C 520-24 / C 520-28 C 530-08 / C 530-10 C 520-48 / C 530-15	K 1349-10 K 1349-16	
Replacement Rotor P-MRK	PTFE-PEEK Compound	1 piece		for all Magnetic Stirrer Heads P-MRK	C 935-01	
Replacement Set Screw P-MRK	PTFE-PEEK Compound	Pack size: 10 pieces		for all Magnetic Stirrer Heads P-MRK	C 934-01	
Replacement Wearing Disc P-MRK	PTFE-PDR	Pack size: 3 pieces		for all Magnetic Stirrer Heads P-MRK	C 931-01	
Replacement Guiding P-MRK	PTFE-PDR	1 piece		for all Magnetic Stirrer Heads P-MRK	C 922-01	
Replacement Receiver P-MRKP-MRK	Borosilicate glass Hastelloy®	1 piece 1 piece		C 520-24 / C 520-28 / C 520-48 C 522-40 / C 522-50 C 530-08 / C 530-10 / C 530-15 C 532-22 / C 532-32 C 540-08 / C 540-10	C 936-01	
Replacement Clamp Screw P-MRK	PTFE-PEEK Compound	Pack size: 3 pieces		for all Magnetic Stirrer Heads P-MRK	C 926-01	
Replacement O-Ring P-MRK	PFA/Silicone	Pack size: 3 pieces		C 520-24 / C 530-08 / C 540-08 C 520-08 / C520-48 / C 522-40 C 522-50 / C530-10 / C 530-15 C 532-22 / C 532-32 / C 540-10	C 937-01	0
Replacement Clamp Ring P-MRK	PTFE-PEEK Compound	Pack size: 5 pieces		C 520-24 / C 530-08 / C 540-08 C 520-28 / C520-48 / C 522-40 C 522-50 / C530-10 / C 530-15 C 532-22 / C 532-32 / C 540-10	C 927-01 C 927-02	
Replacement Clamp Nut P-MRK	PTFE-PEEK Compound	Pack size: 3 pieces		for all Magnetic Stirrer Heads P-MRK	C 925-01	
Replacement Reducing Bush P-MRK	PTFE	Pack size: 3 pieces		C 520-24 / C 530-08 / C 540-08	C 938-01	



BOLA Magnetic Stirrer Heads (P-MRK) Rodaviss

Temperature resistance:

Chemical resistance:

PTFE

from -100 °C to +240 °C

+++ 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 Hastelloy®. Requires little space due to compact construction. No leakage or memory effects due to non-porous, welded rotor. Compression fittings made of PEEK-Compound for safe fixing of stirrer shaft and optimum power transmission. Joint-Cone with Rodaviss® fixing system for easy locking and unlocking of ground joint connections with Rodaviss®-thread. Rodaviss® screw cap, sealing ring and expanding ring are included in the scope of delivery.

A With receiver made of Hastelloy®

» for improved durability

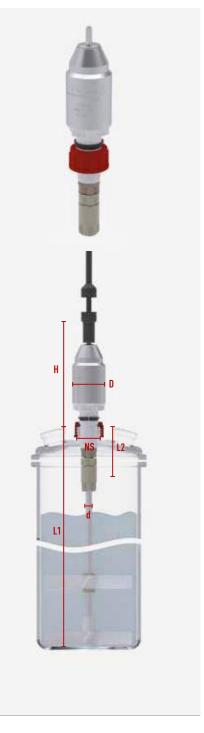
For stirrer shaft dia. d mm	Height H mm	For ground joint NS	L2 Insertion length of shaft max. mm	Drive shaft 0.D.	Cat.No.:
8	145	29/32	95	50	C 540-08
10	145	29/32	95	50	C 540-10

Product advantages:

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

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





Spare parts for : Magnetic Stirrer Heads P-MRK Rodaviss

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

BOLA Magnetic Stirrer Heads (G-MRK)

Material:

Temperature resistance:

Chemical resistance:

PTFE, Glass

from -100 °C to +240 °C

+++ universal







Product description:

Perfect combination of drive shaft with ball bearings, rotor and lower bearing made of PTFE/PEK 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	Height H mm	Conductor NS		•	Cat.No.
6	90	19/26	20	63	C 512-08
8	148	29/32	33	97	C 502-08
10	148	29/32	33	97	C 502-16

Product advantages:

- » powerful transmission for ground joint size 19/26: 15 Ncm for ground joint size 29/32 and 45/40: 50 Ncm
- » no grease required
- » all products which are exposed to the medium do not contain any metals
- » high speed of up to max. 1.500 rpm
- » high working temperatures up to +250°C are possible
- » excellent chemical resistance
- » safe to run dry
- » long durability
- » space-saving drive shaft 0.D.'s for ground joint size 19/26: 28 mm for ground joint size 29/32 and 45/40: 38 mm

Applications

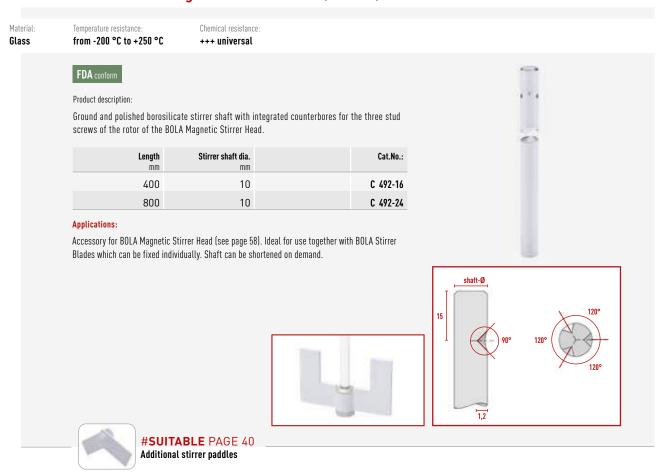
Ideal for reactor lids with a center ground joint, suitable for stirrer shafts made of glass or stainless steel with counterbores (see page 44) for a safe fixing into the rotor.

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





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



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

Description	Material	Packing Unit	size	suitable for Cat. No.	Cat. No.:	
Replacement Driving Bell	Stainless steel	1 piece	NS 19/26 NS 29/32	C 512-08 C 502-08 / C 502-16	C 932-01 C 932-02	
Replacement Conductors for Magnetic Stirrer Heads	Borosilicate glass	1 piece	NS 19/26 NS 29/32	C 512-08 C 502-08 / C 502-16	C 463-19 C 463-29	1
Replacement Rotor	PTFE-PEEK Compound	1 piece	NS 19/26 NS 29/32 NS 29/32	C 512-08 C 502-08 C 502-16	C 923-01 C 923-02 C 923-03	
Replacement Lower Bearing	PTFE-GF	1 piece	NS 19/26 NS 29/32 NS 29/32	C 512-08 C 502-08 C 502-16	C 928-01 C 928-02 C 928-03	-
Replacement Locking Ring	PTFE-PEEK Compound	Pack size: 5 pieces	NS 19/26 NS 29/32	C 512-08 C 502-08 / C 502-16	C 929-01 C 929-02	0
Replacement Wearing Disc	PTFE-Glimmer	Pack size: 5 pieces	NS 19/26 NS 29/32 NS 29/32	C 512-08 C 502-08 C 502-16	C 930-01 C 930-02 C 930-03	0
Replacement Clamping Nut	PTFE-Glimmer	Pack size: 3 pieces	NS 19/26	C 512-08	C 924-01	
Replacement Set Screw	PTFE-PEEK Compound	Pack size: 10 pieces	NS 29/32 NS 29/32	C 502-08 C 502-16	C 933-01 C 933-02	4

BOLA GT Glass Stirrer Shafts

Material: PTFE, Glass

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

Chemical resistance
+++ universal

FDA conform

Product description:

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

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

Applications:

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







BOLA KPG Glass Stirrer Shafts

Material:

Temperature resistance:

Chemical resistance:

PTFE, Glass

from -200 °C to +250 °C

+++ universal

FDA conform

Product description:

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

Cat.No.:	Blade dimensions mm	Shaft dia. mm	Chucking O.D. mm	Length mm
C 387-05	50 x 24 x 3,0	10	8	350
C 387-07	75 x 24 x 3,0	10	8	350
C 387-09	90 x 24 x 3,0	10	8	350
C 387-11	50 x 24 x 3,0	10	8	400
C 387-13	75 x 24 x 3,0	10	8	400
C 387-15	90 x 24 x 3.0	10	8	400

Applications:

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









BOLA Stirrer Blades

Why have stirrer blades to be "tiltable"?

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

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

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



BOLA Moon-Shaped Stirrer Blades

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

FDA conform

Product description:

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

sions Cat.No.	Blade dimensions mm	Bore dia.	Suitable for ml
3,0 C 401-02	50 x 24 x 3,0	5,8	100
3,0 C 401-0 4	68 x 24 x 3,0	5,8	250
3,0 C 401-08	90 x 24 x 3,0	5,8	1.000

Applications:

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



BOLA Moon-Shaped Stirrer Blades

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

Chemical resistance: +++ universal

FDA conform

Product description:

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

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



Applications:

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

BOLA Moon-Shaped Stirrer Blades

Material:

Temperature resistance:

Chemical resistance:

PTFE from -200 °C to +250 °C

+++ universal

FDA conform

Product description:

Completely made of PTFE, with double-sided groove.

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



Applications:

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





BOLA Centrifugal Stirrer Blades

Material:

Temperature resistance:

Chemical resistance:

PTFE

from -200 °C to +250 °C

+++ universal

FDA conform

Product description:

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

Cat	Blade dimensions	Stirring dia.
	mm	mm
C 40	2	50
C 40	2	70
C 40	2,5	90



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





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:

▲ Cylindrical shape

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

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

Bolt dia.	Usable length	For blades with bore dia.	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- \ldots on page 24).









SPECIAL REQUIREMENTS? CUSTOMIZED!



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

No problem:

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

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

Checklist for your customised product:

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







BOLA Stirring Bars





Magnetic stirring and mixing What you should know about

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



The choice of stirring bars - What you should know about

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

Cylindrical Magnetic Stirring Bars:

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

Power Magnetic Stirring Bars:

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

Magnetic Stirring Bars with Pivot Ring:

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

Square Magnetic Stirring Bars:

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

Egg-Shaped Magnetic Stirring Bars:

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

Triangular Magnetic Stirring Bars:

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

Glass Magnetic Stirring Bars:

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

Star Head Magnetic Stirring Bars:

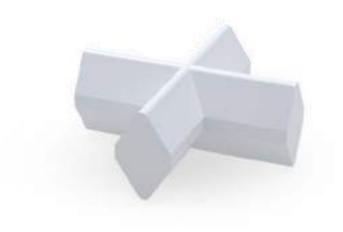
Optimum stirring in tall, narrow diameter vessels. Ideal stirring bar for cuvettes or test tubes.

Centre Magnetic Stirring Bars:

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







Tolerances of the magnetic stirring bars

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





Results of stirring - tested for you

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

» Speed: 500 rpm» Volume: 2.000 ml

» Temperature: 20°C

» Vessel: glass beaker

» Product: water





We "meliorate" your specific magnetic stirring bars

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





BOLA Cylindrical Magnetic Stirring Bars

Material:

Temperature resistance:

Chemical resistance: +++ universal

PTFE

from -200 °C to +250 °C



Product description:

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

Length mm	Dia. mm	Cat. No.:	1	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.



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Detailed information on magnetic stirring



BOLA Square Magnetic Stirring Bars

Material:

Temperature resistance:

Chemical resistance:

PTFE

from -200 °C to +250 °C

+++ universal



Product description:

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

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





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





BOLA PRACTICAL TIP Removing magnetic stirring bars

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

see page 72

BOLA Magnetic Stirring Bars with Pivot Ring

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

FDA conform

Product description:

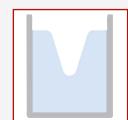
PTFE-encapsulated magnetic core (Alnico 5), cylindrical shape with pivot ring, universal chemical resistance.

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

Applications:

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





BOLA Triangular Magnetic Stirring Bars

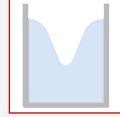
Material: Temperature resistance: Chemical resistance:
PTFE from -200 °C to +250 °C +++ universal

FDA conform

Product description:

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

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



Applications:

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

BOLA Egg-Shaped Magnetic Stirring Bars

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

FDA conform

Product description:

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

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





Applications:

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



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Detailed information on magnetic stirring



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.

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

Applications:

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





BOLA INNOVATION



#1 Power Magnetic Stirring Bars

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

BOLA Magnetic Stirring Bar Set

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

FDA conform

Product description:

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

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

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

Applications

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



BOLA Magnetic Stirring Bar Retrievers

PTFE

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

Chemical resistance: +++ universal





Product description:

 $\label{ptfe} \mbox{{\tt PTFE-encapsulated stirring bar retriever with strong permanent magnet (Alnico~5), universal chemical resistance.}$

Length mm	Lower end dia.	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:

Temperature resistance:

Chemical resistance:

PTFE

from -200 °C to +250 °C

+++ universal



Product description

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

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

Applications:

For the removal of stirring bars from aggressive liquids. Especially for big and heavy stirring bars up to $400\,\mathrm{g}.$



BOLA Glass Magnetic Stirring Bars

Material: Temperature resistance: Chemical resistance: Chemical resistance: +++ universal

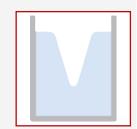




Product description:

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.

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: Temperature resistance: Chemical resistance: PTFE from -200 °C to +250 °C +++ universal FDA conform Product description: Magnetic core (Alnico 5) encapsulated with coloured PTFE, universal chemical resistance. Dia. Cat. No.: Length Colour mm mm 13 8 yellow C 368-08 25 8 yellow C 368-12 38 8 yellow C 368-16 50 8 C 368-20 yellow 13 8 blue C 368-28 8 25 C 368-32 blue 38 8 C 368-36 blue 8 50 blue C 368-40

red

red

red

red

C 368-48

C 368-52

C 368-56

C 368-60

Applications:

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

13

25

38

50

8

8

8

8

BOLA Star Head Magnetic Stirring Bars

Material:

Temperature resistance:

Chemical resistance: +++ universal

PTFE

from -200 °C to +250 °C

FDA conform

Product description:

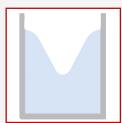
PTFE-encapsulated magnetic core (Alnico 5), universal chemical resistance.

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



Applications:

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



BOLA PRACTICAL-TIP Your magnetic stirring bar flutters?

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

BOLA Dumbbell-Shaped Magnetic Stirring Bars

Material: **PTFE**

Temperature resistance:

from -200 °C to +250 °C

Chemical resistance: +++ universal

FDA conform

Product description:

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

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





Applications:

Stable discs on both sides provide an excellent stirring.



BOLA Center Magnetic Stirring Bars

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





Product description:

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

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

Applications:

Extremely steady mixing due to small center seat.



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Detailed information on magnetic stirring

BOLA Crosshead Magnetic Stirring Bars

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

FDA conform

Product description:

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

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





Applications:

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

BOLA Chamfer Magnetic Stirring Bars

Material:

Temperature resistance:

Chemical resistance:

PTFE

from -200 °C to +250 °C

+++ universal



Product description:

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

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

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:

Temperature resistance:

Chemical resistance:

PTFE from -200 °C to +250 °C

+++ universal

FDA conform

Product description:

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

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

Applications:

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





BOLA Star Magnetic Stirring Bars

Material: **PTFE** Temperature resistance:

from -200 °C to +250 °C

Chemical resistance: +++ universal

FDA conform

Product description:

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

Height mm approx.	•	Length x width mm approx.
6	6	9 x 9
6	6	10 x 10
10	10	20 x 20
12	12	30 x 30

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:

amnaratura racietanca

Chemical resistance:

PTFE

from -200 °C to +250 °C

+++ universal

FDA conform

Product description:

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

Cat. No.:	For vessel I. D.	Height mm approx.	Length x width mm approx.
C 349-02	6 - 7	9	5,5 x 5,5
C 349-04	9 - 10	11	8,0 x 8,0
C 349-06	11 - 12	16	10.0 x 10.0

Applications:

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





BOLA Beakerliners

PTFE

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

Vacuum: suitable autoclave 121°



FDA conform

Product description:

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

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





Applications:

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

BOLA INNOVATION



#1 Beakerliner

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



BOLA Tandem Magnetic Stirring Bars

Material:

Temperature resistance:

Chemical resistance:

PTFE

from -200 °C to +250 °C

+++ universal

FDA conform

Product description:

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

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



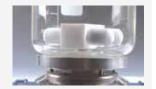
Applications:

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	7



BOLA Culture Bottles

Material:

Temperature resistance: from 0 °C to +250 °C

Chemical resistance:
++ very good

PTFE, PP

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)

ms Cat. No	Thread of sidearms	Thread of bottle	I.D. of center neck	Usable volume
GL	GL	GL	mm	ml
14 C 420-0	2 x 14	45	30	50
18 C 420-0	2 x 18	45	30	125

Applications:

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





BOLA Tweezers

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

Chemical resistance: +++ universal

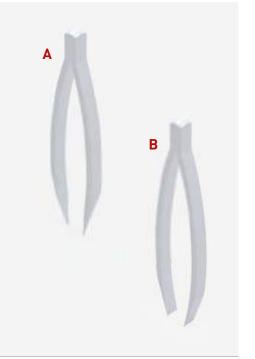
FDA conform

Product description:

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

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

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



BOLA Double Spatulas

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



Product description:

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

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

M

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.

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

Applications:

For a very gentle peeling of products.







SCREW FITTINGS / COMPONENTS WITH GL-THREADS JOINTS



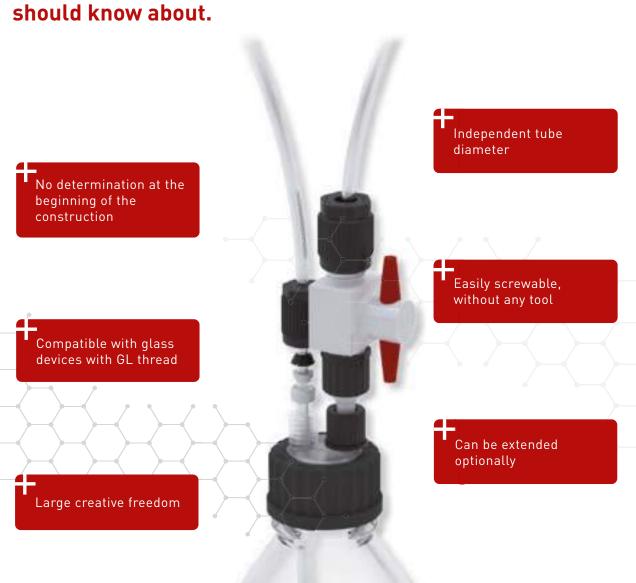


88 The GL-Screw Joint System

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BOLA Modular Construction System – what you should know about.





The Modular Construction System

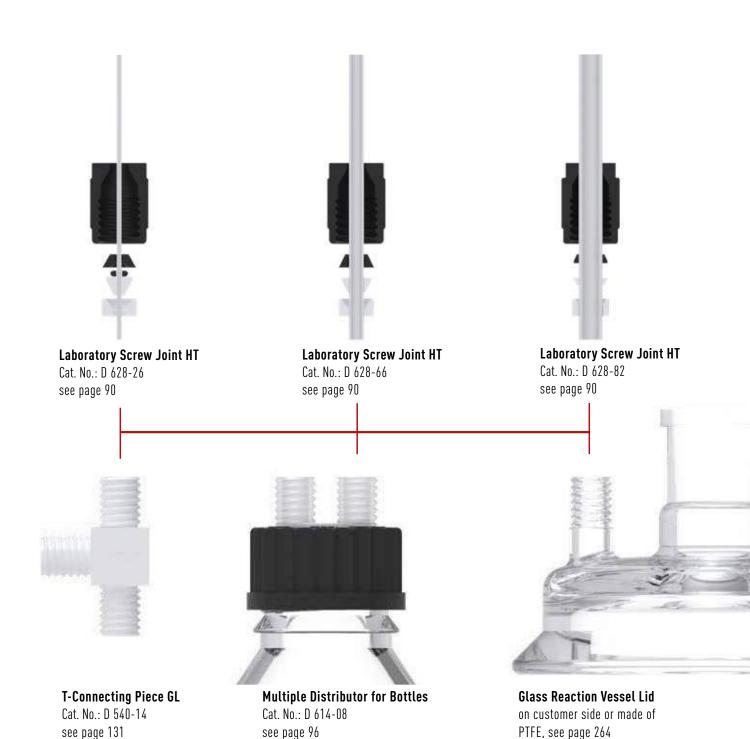
The GL thread is one of the most current thread for glass devices. From BOLA you can obtain a complete modular construction system with different components with GL threads, which can be combined and thus ensure a simple transition from glass to plastics.

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

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

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





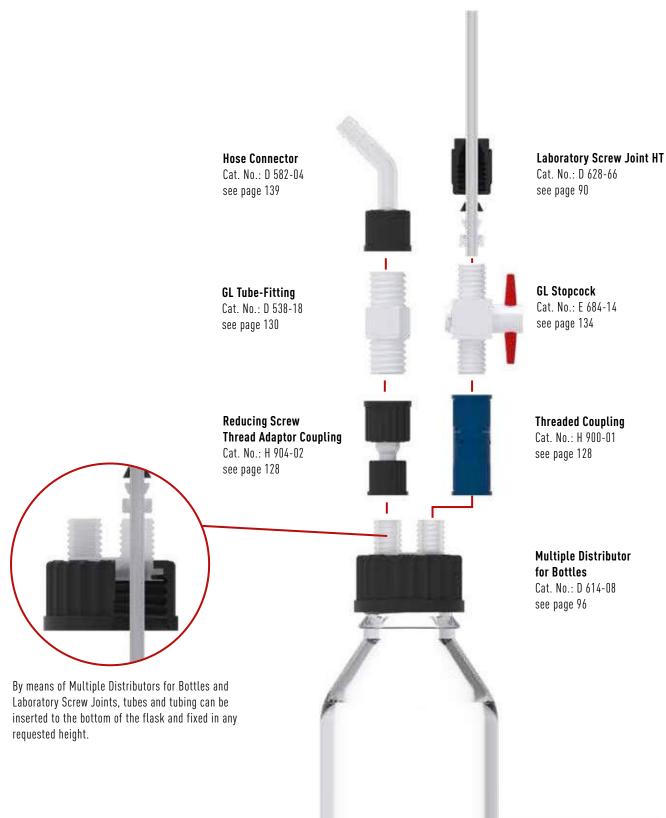
What you should know about the GL screw joint system:

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

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

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

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



SCREW JOINTS / COMPONENTS WITH GL THREAD







The GL Screw Joint System

Assembly made easy - how quickly you get to your goal

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





Assembly:

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

How to make your order:

A screw joint always consists of two elements

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

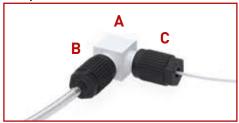
Example 1:



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

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

Example 2:



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

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

BOLA Laboratory Screw Joints

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

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

Assembly and function

Assembly can easily be made by hand:

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

Choice

It is easy to choose the suitable laboratory screw joint:

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

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

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

You will find suitable tubing on page 189.

BOLA Laboratory Screw Joints

PTFE, ETFE

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

Pressure:

10 har 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.

For tubing O.D.	Cat. No.: Thread GL 14	Cat. No.: Thread GL 18	Cat. No.: Thread GL 25
0,8	D 593-02	THICUL OF 10	1111000 GE 20
1,0	D 593-04		
		/	
1,6	D 593-06	D 593-26	
2,0	D 593-10	D 593-30	
2,4	D 593-12		
3,0	D 590-02	D 590-10	D 590-22
3,2	D 590-08	D 590-20	D 590-24
4,0	D 590-04	D 590-12	D 590-26
6,0	D 590-06	D 590-14	D 590-28
6,35	D 590-62		
8,0		D 590-16	D 590-30
10,0		D 590-18	D 590-32
12,0			D 590-34
14,0			D 590-36



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 ambiance (e.g. with aggressive vapours or evaporation)









BOLA Replacement Inner Parts

Material: PTFE, ETFE Temperature resistance:

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

10 bar

suitable



Product description:

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

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





#SUITABLE PAGE 189

Tubing for all screw joints.

BOLA Practical-TIP For an easier assembly of laboratory screw joints:

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

see page 361

BOLA Replacement Screw Cone Caps

Material: ETFE

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

Product description:

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

Thread GL	Tubing/tube O.D.	Cat. No).:
14	up to 6,35	D 600-0)4
18	up to 10,0	D 600-0	18
25	up to 10,0	D 600-1	12
25	bigger than 10,1	D 600-1	16







BOLA Laboratory Screw Joints HT (High Temp)

 Material:
 Temperature resistance:
 Chemical resistance:
 Pressure:
 Vacuum:

 PTFE, PPS
 from -50 °C to +150 °C
 +++ universal
 10 bar
 suitable

FDA conform

Product description:

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

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







Applications:

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

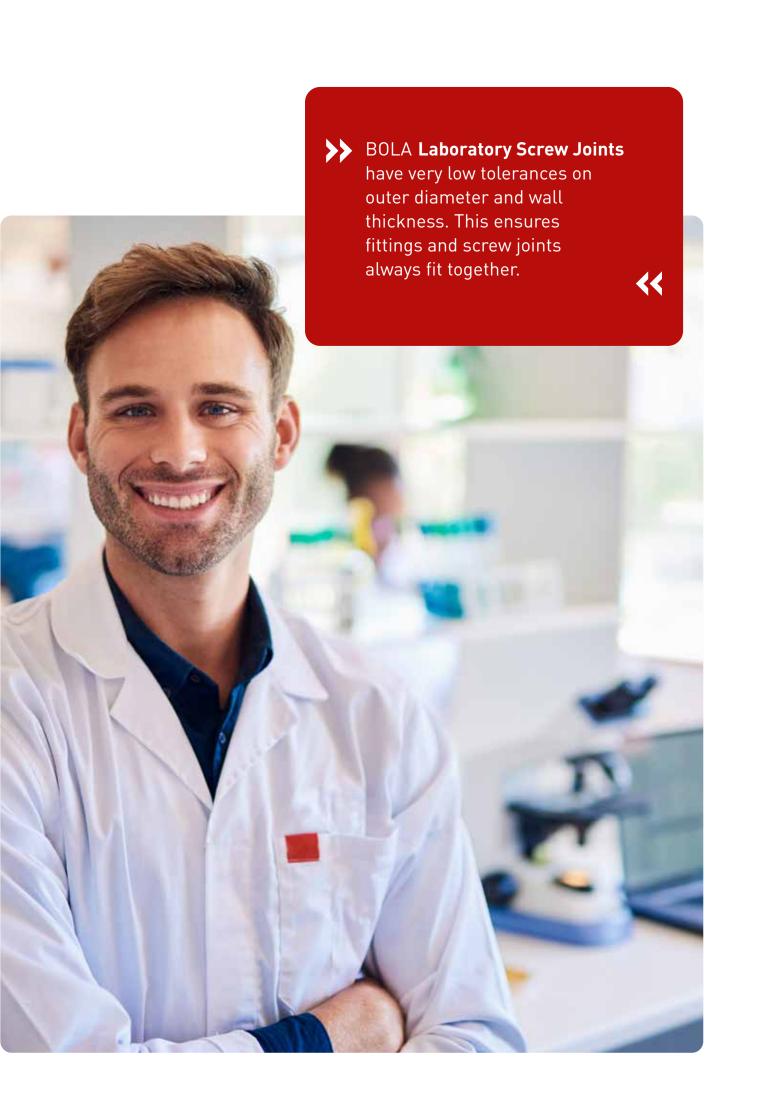
BOLA INNOVATION



Laboratory Screw Joints

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

see page 90



BOLA Replacement Inner Parts HT (High Temp)

Material: Temperature resistance: Chemical resistance: Pressure: Vacuum:

PTFE, PPS from -50 °C to +150 °C +++ universal 10 bar suitable

FDA conform

Product description:

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

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





BOLA Fork Wrenches

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

Product description:

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

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

Applications:

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





BOLA Replacement Screw Cone Caps HT (High Temp)

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

Product description:

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

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





BOLA Plugs for Screw Caps

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

FDA conform

Product description:

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

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



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







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

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

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



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

BOLA Multiple Distributors for Bottles

PTFE, PPS

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

Vacuum: **suitable** autoclave:



FDA conform

Product description:

Black screw cap made of PPS for bottle thread GL 45, body made of PTFE or PFA. Insertion of tubing with a max. 0.D. of 8,5 mm. Very good chemical resistance, for working temperatures up to $+200^{\circ}\text{C}$

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



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







#SUITABLE PAGE 90

Laboratory screw joints

BOLA Multiple Distributors for Bottles

Material:

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

Chemical resistance: ++ very good

Vacuum: suitable

1910

FDA conform

Product description:

Green screw cap made of PP for bottle thread GL 45 and body made of PP. Insertion of tubing with a max. 0.D. of 8,5 mm. Restricted chemical resistance, for working temperatures up to $+110^{\circ}$ C.

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

Applications:

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





BOLA Multiple Distributors with Stopcocks

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



FDA conform

Product description::

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

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



Applications:

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







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

BOLA Multiple Distributors with Stopcock

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

FDA conform

Product description::

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

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

Applications:

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



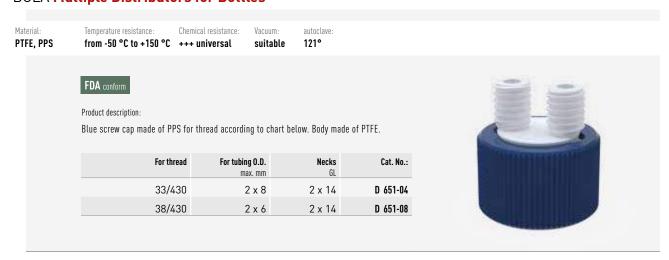




BOLA Multiple Distributors for Bottles

Temperature resistance: Chemical resistance: autoclave: PTFE, PPS from -50 °C to +150 °C +++ universal suitable 121° FDA conform Product description: Black screw cap made of PPS for thread according to chart below. Body made of PTFE For tubing O.D. For thread Necks Cat. No.: max. mm GL GL 25 2 x 6 2 x 14 D 619-04 3 x 14 GL 25 D 619-08 3 x 6 For thread For tubing O.D. Cat. No.: Necks max. mm В GL 32 D 621-04 2 x 8 2 x 14 GL 32 3 x 8 3 x 14 D 621-08 For tubing O.D. Necks Cat. No.: For thread max. mm S 40 2 x 8 2 x 14 D 624-04 S 40 D 624-08 3 x 8 3 x 14 For thread For tubing O.D. Necks Cat. No.: В GL 45 3 x 10 3 x 18 D 618-16 GL 45 2 x 6 /1 x 14 2 x 14 / 1 x 25 D 618-24 GL 45 2 x 14 2 x 25 D 618-44 GL 45 3 x 14 3 x 25 D 618-46 4 x 14 GL 45 D 618-48 4 x 25 **#SUITABLE** PAGE 90 Laboratory screw joints

BOLA Multiple Distributors for Bottles





BOLA Threaded Adaptors

Material:

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

PTFE

+++ universal

FDA conform

Product description:

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

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

Transition from GL 32 to GL 45

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

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

Transition from GL40/S40 to GL 45

Suitable for $\mathrm{Merck}^{\circledR}$ bottles with GL 40 thread or for all PFA-, PTFE bottles and jars with thread GL 40 and S 40

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











BOLA Flexible Distributors - what you should know about.

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

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





BOLA Flexible Distributors

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

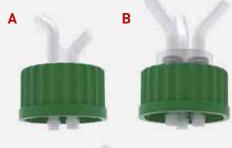




Product description:

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.

	Number of hose connectors	0.D. of hose connector mm	Bore of hose connectors mm	Cat. No.:
A	2	8,8	6	D 800-24
В	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°

FDA conform

Product description:

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

Number of hose connectors	2-step ho 0.D. 1	2-step hose connectors 0.D. 1 0.D. 2 mm		Cat. No.:
3	9	12	6	D 802-24

Applications:

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

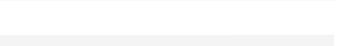






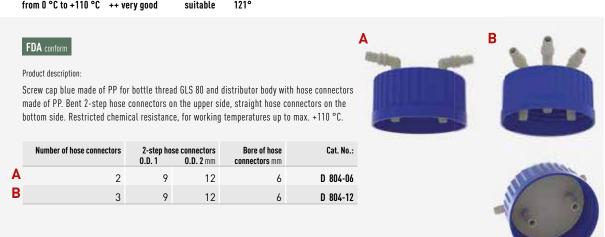
BOLA Flexible Distributors

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











BOLA Wrench for Screw Caps

down

Material: Temperature resistance: Chemical resistance: -10 °C to +100 °C PA ++ good Product description: NEW Made of polyamide reinforced with glass fibers. Suitable for knurled screw caps with thread GL 45 or GLS 80. For opening and closing of screw caps. for thread Cat. No.: Α GL 45 D 646-45 В GLS 80 D 646-80 **Applications:** For tightening and loosing of BOLA screw caps and multiple distributors. Its

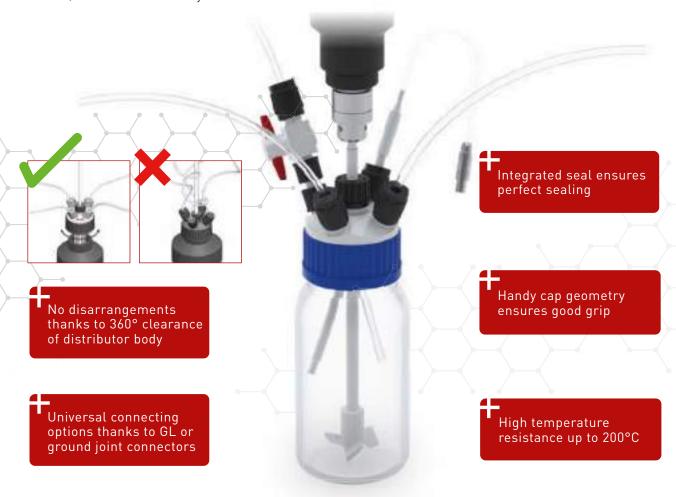
low weight reduces the risk of damages on equipment when it slips of or falls



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

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

Temperature resistance: Chemical resistance:

PTFE, PP

from 0 °C to +110 °C +++ universel

suitable

121°

FDA conform

Product description:

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

	For tubing O.D. max.	Center neck NS	Lateral necks	(
D 748-16	4x 10	1x 29/32		4x 18
D 748-40	2x 14	1x 29/32	2x 29/32	2x 18
D 748-60		1x 29/32	2x 29/32 2x 14/23	



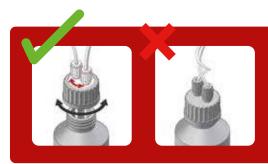
Drawing or inserting aggressive or pure liquids. Inserting tubing, tubes and probes into vessels. Use of a stirrer bearing in center neck for centrical position of a stirrer shaft.





#SUITABLE PAGE 90

Laboratory screw joints



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



BOLA Distributors for Reaction Vessels (R)

PTFE, PP

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

Chemical resistance: +++ universal

Vacuum: suitable autoclave 121°

FDA conform

Product description:

Blue screw cap made of PP with GLS 80 thread, body made of PTFE. Center neck with GL 25 thread for connecting tubing or tube up to a max. 0.D. of 15 mm, four lateral necks with GL 18 thread. Exchangeable shaft guide (PTFE page 47) with screw cap (PPS page 47) for inserting and fixing a stirrer shaft in the center neck included. Very good chemical resistance, for working temperatures up to max. +200°C (PP screw cap max. +110°C)

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

Applications:

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

BOLA Screw Caps High Chem

Material: **PTFE, PP**

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

Vacuum: **suitable** autoclave:

FDA conform

Product description:

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

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

Applications:

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







BOLA Multiple Distributors for Bottles

Laboratory screw joints

Material: Temperature resistance: Chemical resistance: PTFE, PP from 0 °C to +110 °C +++ universal suitable 121° FDA conform Product description: Blue screw cap made of PP with GLS 80 thread, body made of PTFE. For tubing O. D. Cat. No.: Necks D 754-08 C A 6x 8,0 6x GL14 В 4x 12,7 4x GL18 D 754-16 C 3x 12,7 / 1x 14 3x GL18 / 1x GL25 D 754-24 D 2x 12,7 / 1x 21 2x GL18 / 1x GL32 D 754-36 FDA conform F Ε Product description: Blue screw cap made of PP with GLS 80 thread, body made of PP. For tubing O. D. Cat. No.: Necks E 4x GL18 D 750-16 4x 12,7 F 3x 12,7 / 1x 14 3x GL18 / 1x GL25 D 750-24 **#SUITABLE** PAGE 90





BOLA GLS Reductions

Material:

Temperature resistance:

Chemical resistance:

PTFE, PPS

from 0°C to +110 °C ++ very good

-

FDA conform

Product description:

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

ring thread For tubing GLS m	Reducing thread GLS	Cap GLS
14 0,8 - 8	14	80
18 1,6 - 10,	18	80
25 1,6 - 14	25	80
45 3,2 - 32,	45	80



Material:

PTFE, PP

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

Vacuum: **suitable** autoclave: 121°

FDA conform

Product description:

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

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







BOLA GL Reductions

Material:

Temperature resistance:

Chemical resistance:

PTFE, PPS

from -20°C to +250°C +++ universal

FDA conform

Product description:

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

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





Material:

Temperature resistance:

Chemical resistance:

PP, PBTP

from -20 °C to +110 °C ++ very good

FDA conform

Product description:

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

	For tubing-Ø mm	Reducing thread GL	Cap GL
O D 782-08	0,8 - 8,0	14	45
O D 782-16	1,6 - 10,0	18	45
O D 782-24	1,6 - 14,0	25	45



Applications:

For connecting or inserting tubing, tubes or probes.







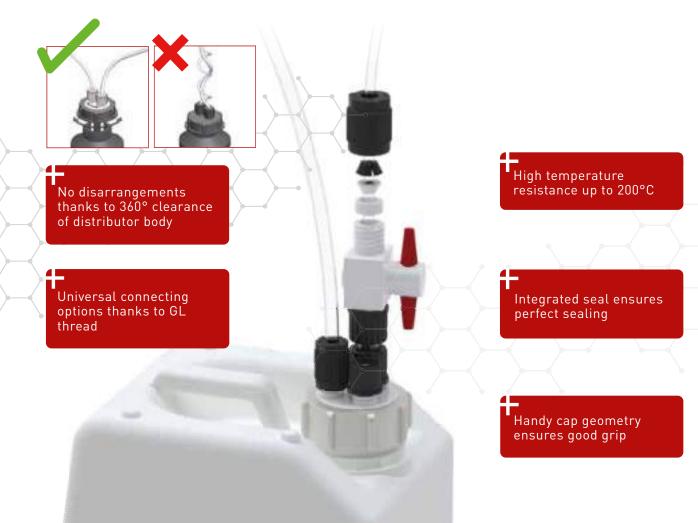
BOLA Distributors for Canisters – what you should know about.

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

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

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

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





BOLA Distributors for Canisters

Material: PTFE

Temperature resistance:

Chemical resistance:

autoclave:

from -20°C to +200°C +++ universal

121°

FDA conform

Product description:

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

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

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



Material: PP, PTFE Temperature resistance:

Chemical resistance:

autoclave:

from -50°C to +80°C

++ very good

121°

FDA conform

Product description:

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

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







#SUITABLE PAGE 90

Laboratory screw joints



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





BOLA Multiple Distributors for Barrels

Material:

Temperature resistance:

Chemical resistance:

PTFE

from -20°C to +200°C +++ universal

FDA conform

Product description:

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

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



Applications:

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





Material:

Temperature resistance:

Chemical resistance:

PP

from 0°C to +110°C

++ very good

Product description:

Ring wrench made of PP.

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



Applications:

For opening and closing BOLA Multiple Distributors for Barrels.







BOLA Barrel Aeration

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

FDA conform

Product description:

Consisting of a body made of PTFE for female thread R 3/4" with a

GL 32 thread, a PTFE/silicone gasket, an exchangeable filtering membrane (2,5µm) made of PTFE and a screw cap made of PPS. Very good chemical resistance, the product is only exposed to PTFE.

Pressure compensation at 0,1 bar differential pressure.

Max. flow rate:

- » at 0,5 bar differential pressure: 80 l/h
- » at 1,0 bar differential pressure: 320 l/h

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



Applications:

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





BOLA Sets for Pressure Compensation

 Material:
 Temperature resistance:
 Chemical resistance:
 Vacuum:
 autoclave:

 PTFE
 from -20°C to +230°C
 +++ universal
 suitable
 121°

FDA conform

Product description:

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

For thread GL	Dia. of mem-brane	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 114).

Spare parts for Pressure Compensation-kit

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



BOLA Barrel-GL-Adaptors

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

FDA conform

Product description:

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

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

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



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

Chemical resistance: ++ very good

Vacuum: **suitable**

autoclave 121°

Product description

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

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





Applications:

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

BOLA GL-Aeration

Material: PTFE, PPS Temperature resistance: from 0°C to +70°C

Chemical resistance: ++ very good

autoclave:

Product description:

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

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

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

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

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

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

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

BOLA Screw Caps "PPS"

PPS

from -200°C to +250°C +++ universal



Product description:

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

>> Screw Caps with Aperture

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

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

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









#SUITABLE PAGE 123

Gaskets for screw caps are available separately



BOLA Screw Caps HT (High Temp)

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



Product description:

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

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



BOLA Screw Caps "PTFE"

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

FDA conform

Product description:

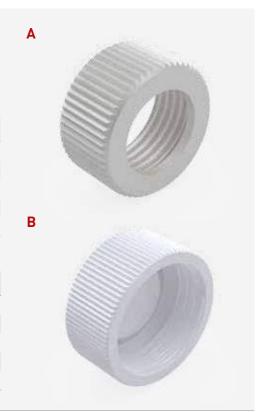
Screw cap with handy knurl, suitable for GL threads, made of PTFE, glass-fibre reinforced PTFE.

>> Screw Caps with Aperture

	For thread	Dia. of aperture	Material	Cat. No.:
A	GL 14	9,2	PTFE-GF	H 983-01
	GL 18	11,0	PTFE-GF	H 983-02
	GL 25	15,0	PTFE-GF	H 983-03
	GL 32	20,0	PTFE-GF	H 983-04
	GL 45	34.0	PTFE-GF	H 983-05



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







BOLA Screw Caps "PBTP"

Material: PBTP from -50°C to +120°C + good Product description: Screw cap with handy knurl, suitable for GL threads, A made of PBTP. >> Screw Caps with Aperture Dia. of aperture For thread Cat. No.: mm GL 14 9,2 H 984-01 GL 18 H 984-02 11,0 GL 25 15,0 H 984-03 H 984-04 GL 32 20,0 GL 45 34,0 H 984-05 FDA conform В » Screw caps with integrated PTFE/silicone gasket for compensation of unevenness on the sealing surface For thread Cat. No.: GL 14 H 987-01 GL 18 H 987-02 GL 25 H 987-03 GL 32 H 987-04 GL 45 H 987-05

BOLA Screw Caps with Aperture

Product description:

Screw cap made of PP with handy knurl. The cap provides a good chemical and thermal resistance (up to max +110 $^{\circ}$ C).

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





BOLA One-Sided Gaskets

Material:

Temperature resistance:

Chemical resistance:

PTFE

from -60°C to +230°C +++ universal

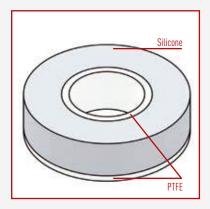


Product description:

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





Applications:

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

BOLA Double-Sided Gaskets

Material:

Temperature resistance:

Chemical resistance:

PTFE

from -60°C to +230°C +++ universal



Product description:

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

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



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







BOLA Gaskets for Screw Caps

Material:

Temperature resistance:

Chemical resistance:

PTFE

from -60°C to +230°C +++ universal

FDA conform

Product description:

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

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



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







BOLA SVL Gaskets

Material:

Temperature resistance:

Chemical resistance:

PTFE

from -60°C to +230°C +++ universal

FDA conform

Product description:

Silicone ring with double-sided washer made of PTFE. Suitable for

Torion-/SVL threads. Universal chemical resistance, the product is only exposed to PTFE.

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

Applications:

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











BOLA GL Dispensers

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

FDA conform

Product description:

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

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

Applications

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







BOLA GL Funnels

Material:

Temperature resistance:

Chemical resistance:

PTFE, PPS

from -20°C to +200°C +++ universal

FDA conform

Product description:

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

» Insertion for reaction vessels with GL-threaded necks.

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

» Insertion for reaction vessels with ground joint sockets.

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

Applications:

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





BOLA INNOVATION



#1 GL-Funnel

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



BOLA Swivelling Screw Fittings with Ground Joint

PTFE, PPS

Temperature resistance:

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

suitable



FDA conform

Product description:

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

Ground joint size NS	For probe/tube O.D mm	Max. angle	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



- » 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



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









BOLA INNOVATION



#1 **Swivelling Screw Fittings**

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



BOLA Swivelling Screw Fittings

Material: PTFE, PPS

Temperature resistance: from -20°C to +200°C

Chemical resistance: +++ universal

Pressure: Vacuum: **5 bar suitable**

FDA conform

Product description:

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

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





Applications:

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

BOLA Threaded Couplings

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

Chemical resistance: +++ universal

FDA conform

Product description:

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

Typ: BOLA Threaded Couplings

For thread GL	Length from sealing lip to sealing lip mm	 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





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







BOLA Rigid Threaded Couplings

PTFE,PPS

Temperature resistance::

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



FDA conform

Product description:

Sturdy coupling with female GL threads made of PPS and internal connecting tube made of PTFE. Its special design allows to turn the two halfs of the coupling independently from each other and to adjust connected components. Furthermore this design provides high stability. A sealing lip on the connecting tube with integrated FKM-o-ring

provides good sealing on the GL thread. Universal chemical resistance, the flowing product is only exposed to PTFE.



Applications:

For connecting two GL threads of the same size.







BOLA Reducing Screw Thread Adaptor Couplings

Material:

Temperature resistance:

Chemical resistance

PTFE

from -20°C to +200°C +++ 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.

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







BOLA GL Bellows

Material: PTFE

Temperature resistance:

Chemical resistance:

from -20°C to +200°C +++ universal

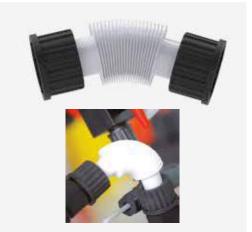
suitable

FDA conform

Product description:

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

	Max. length of bellow	Min. length of bellow mm	For thread GL
H 902-03	40	28	14
H 902-04	90	42	18
H 902-05	104	58	25
H 902-10	90	58	32
H 902-15	115	67	45



BOLA Dirt Traps

Material: PTFE

Temperature resistance:

Chemical resistance:

Pressure: Vacuum:

suitable

from -200°C to +250°C +++ universal 10 bar

FDA conform

Product description:

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

Cat. No.:	Total height	Bore dia.	Dia. of filtering	Connecting thread
	mm	mm	membrane mm	GL
N 1474-08	QQ	Q	25	10





Applications:

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



BOLA Adaptors for Prominent®-Pumps

Material:

Temperature resistance:

Chemical resistance:

PTFE-GF from -200°C to +250°C +++ universal

10 bar

FDA conform

Product description:

Adaptor made of glass-fibre reinforced PTFE, transition from pump thread M20x1,5 to GL thread. Pressure resistant connection (max. 10 bar) of hard-walled tubing with Prominent $^{\scriptsize \textcircled{8}}$ pumps by using BOLA Laboratory Screw Joints. Universal chemical resistance, the product is only exposed to PTFE.

Cat. No.:	Bore dia.	Connecting thread GL
D 730-12	3,0	14
D 730-24	10.5	18











BOLA GL Tube Fittings - what you should know about

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

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

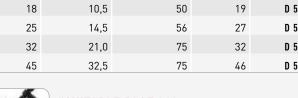
Together with these BOLA Laboratory Screw Joints (from page 88), the connection is absolutely tight and even suitable for vacuum; the screw joints for GL 14, GL 18 and GL 25 even resist pressures up to max. 10 bar at room temperature.

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

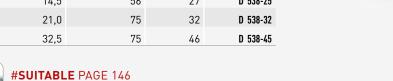
BOLA GL Tube Fittings

Material -Temperature resistance: Chemical resistance: Pressure: Vacuum: PTFE from -200°C to +250°C +++ universal suitable FDA conform Product description: Straight tube fitting made of PTFE, two connections with GL thread. Universal chemical resistance, the product is only exposed to PTFE.

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



Fittings and laboratory screw joints made of static dissipative PTFE-EX.



BOLA PRACTICAL-TIP Don't fear blocked passage bores:

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



BOLA GL Tube Fittings T

Material: PTFE

Temperature resistance:

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

10 bar

suitable

FDA conform

Product description:

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

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



Application:

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



#SUITABLE PAGE 90

Laboratory screw joints

BOLA PRACTICAL-TIP Protection from buckling

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

BOLA GL Tube Fittings Elbow

Material: PTFE

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

Chemical resistance:

Pressure: 10 bar

Vacuum: suitable

FDA conform

Product description:

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

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



Application:

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



BOLA GL Tube Fittings Cross

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

FDA conform

Product description:

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

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



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



BOLA INNOVATION



#1 GL-Fittings

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

BOLA GL Quick Connectors

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



FDA conform

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

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



Applications:

Ideal for conducting highly pure or aggressive products.



BOLA Thread Adaptors GL

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



FDA conform

Product description:

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

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





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



BOLA GL-Screw-in Tube Fittings

Material: Temperature resistance: Chemical resistance: Pressure: Vacuum:

PTFE from -200 °C to +250 °C +++ universal 10 bar suitable

FDA conform

Product description:

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

Screw-in thread NPT	Thread GL	Bore dia.	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



18,0

34

D 517-74







1"

#SUITABLE PAGE 90

32

Laboratory screw joints

BOLA GL Stopcocks

PTFE

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

Chemical resistance:

6 bar

suitable



FDA conform

Product description:

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

» Two-way stopcock with straight bore

	Туре	Bore shape Stopcock	Bore dia.	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

» Three-way stopcock with L-shaped bore

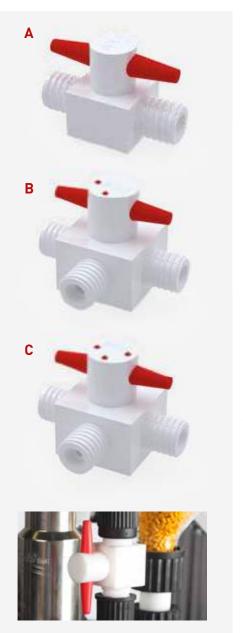
	Туре	Bore shape Stopcock	Bore dia. mm	Connecting thread GL	External dimensions L / D / H mm	Cat. No.:
В	3-Way	9	4	14	64 x 47 x 43	E 686-14
	3-Way	9	6	18	74 x 57 x 57	E 686-18
	3-Way		6	25	78 x 59 x 57	E 686-25

» Three-way stopcock with T-shaped bore

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

Applications:

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





#SUITABLE PAGE 90

Laboratory screw joints

BOLA PRACTICAL-TIP

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

Our scale thread illustrations help to make an optical comparison.

see page 366

BOLA Ground Joint GL 2-Way Stopcocks

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

FDA conform

Product description:

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

>> Two-way stopcock with straight bore

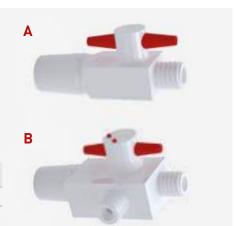
	Туре	Bore shape Stopcock	Bore dia. mm	Connecting thread GL		External dimensi- ons L / D / H mm	Cat. No.:
1	2-Way		6	18	29/32	100 x 40 x 57	E 689-18

» Three-way stopcock with L-shaped bore

	Туре	Bore shape Stopcock	Bore dia. mm	Connecting thread GL	For ground joint NS	External dimensi- ons L / D / H mm	Cat. No.:
В	3-Way	9	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 my means of BOLA Laboratory Screw Joints.





BOLA GL Distributors with Stopcock

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

FDA conform

Product description:

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

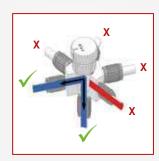
» GL-Distributor with L-shaped bore

Cat. No.	Outer dimensions	For tubing O.D.	Supply / Drain	Bore dia.	Bore shape
	Dia. x H mm	mm	GL-neck	mm	Stopcock
E 661-14	84 x 80	7x 8.0	6x 14 / 1x 14	4	1

Applications:

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







BOLA GL Stopcocks

Material: PTFE, PPS

from -20°C to +200°C +++ universal

Chemical resistance:

12 bar

suitable

FDA conform

Product description:

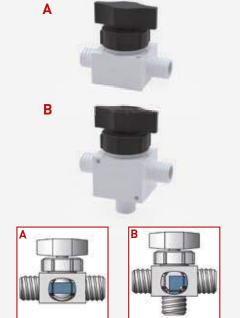
Two-way valve with straight bore and two connections with GL thread or three-way valve with L-shaped bore and three connections with GL thread. Ball-shaped stopcock plug for excellent tightness, free-moving stop valve. Suitable for pressure up to max. 12 bar, or for vacuum. Universal chemical resistance,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

>> Two-way stopcock with straight bore

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

» Three-way stopcock with L-shaped bore

		•	•			
	Туре	Bore shape Stopcock	Bore dia. mm	Connecting thread GL	External dimensions L/D/H mm	Cat. No.:
В	3-Way	1	3	14	50 x 20 x 52	E 667-10
	3-Way	9	4	18	80 x 40 x 90	E 667-20
	3-Way	9	8	25	90 x 50 x 98	E 667-30
	3-Way	9	12	32	100 x 50 x 106	E 667-40



Applications:

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



#SUITABLE PAGE 90

Laboratory screw joints

BOLA Pressure-Relief Valves with Manual Ventilation

Chemical resistance:

PTFE, PPS

from -20°C to +250°C +++ universal

10 bar

FDA conform

Product description:

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

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

Applications:

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









BOLA GL Control Valves

Material:

Temperature resistance:

Chemical resistance:

Pressure

PTFE, PPS

from -20°C to +250°C +++ universal

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.

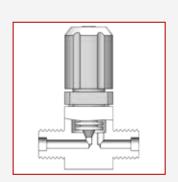
Connecting thread GL	Bore dia.	External dimensions L x D x H mm	Cat. No.:
14	4	62 x 30 x 73	E 694-14
18	6	80 x 44 x 83	E 694-18

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 90

Laboratory screw joints



BOLA Hose Connectors (with Nut)

PFA, PPS

Temperature resistance:

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

suitable



FDA conform

Product description:

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

» Straight type

	Thread GL	O.D.of hose connector	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	I.D. of hose connector mm	Length with nut	Cat. No.:
В	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



#1 Hose Connectors with Sealing Lip

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



Spare Parts for Hose Connectors (PFA)

Description	Material	Packing Unit	for Thread	suitable for Cat.No.:	Cat. No.:	
Replacement Hose Connectors Straight type	PFA	1 piece	GL 14 GL 18 GL 25 GL 32	D 581-02 D 581-04 D 581-06 D 581-08	D 568-14 D 568-18 D 568-25 D 568-32	C
Replacement Hose Connectors Bent type	PFA	1 piece	GL 14 GL 18	D 582-02 D 582-04	D 569-14 D 569-18	0
Replacement Screw Caps	PPS	1 piece	GL 14 GL 18 GL 25 GL 32	D 581-02 / D 582-02 D 581-04 / D 582-04 D 581-06 D 581-08	H 995-14 H 995-18 C 425-90 C 425-92	

BOLA Hose Connectors (with Nut)

Material: Vacuum: Temperature resistance: Chemical resistance: PP from 0°C to +110°C ++ very good suitable FDA conform A Product description: Hose connectors made of PP, with elastic sealing lip, FKM o-ring and nut made of PBTP. Available as straight or bent type. Restricted chemical resistance, for working temperatures up to max. +110°C. The flowing product is only exposed to PP. » Straight type Thread O.D.of hose connector I.D. of hose Length with nut Cat. No.: mm connector mm 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 O.D.of hose connector I.D. of hose Length with nut Cat. No.: В 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	C
Replacement Hose Connectors Bent type	рр	1 piece	GL 14 GL 18	D 586-14 D 586-18	D 584-14 D 584-18	C
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	



SPECIAL REQUIREMENTS? CUSTOMIZED!





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

No problem:

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

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

Checklist for your customised product:

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







COMPONENTS FOR **EX-PROTECTION**







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BOLA Screw Joints / Components for Ex-Protection – what you should know about.





Screw Joints / Components for Ex-Protection A safe protection against electrostatic charging







EX

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 electrographitated 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 10⁶ 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 proofs 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
 106 0hm

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.	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







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





#HELPFUL PAGE 85

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

BOLA Replacement Inner Parts EX

Material: PTFE-EX	Temperature resistance: from -200°C to +250°C	Chemical resistance: ++ very good	acuum: Conductiv uitable 10 ⁶ Ohn
	Product description:		
	Made of conductive PTFE-EX.		
	For tubing O.D.	Thread GL	Cat. N
	4	14	D 848-
	6	14	D 848-
	4	18	D 849-
	6	18	D 849-
	8	18	D 849-
	10	18	D 849-
	8	25	D 850-
	10	25	D 850-
	12	25	D 850-
	14	25	D 850-



BOLA Replacement Caps EX

Material: Temperature resistance: Chemical resistance: Conductivity:
PPS-EX from -20°C to +250°C ++ very good 106 0hm

Product description:

Black screw cap made of glass-fibre PPS-EX, with handy knurl and hexagon.

Thread GL	From tubing O.D. to tubing O.D. mm	Cat. No.:
14	0,8 - 6,0	D 846-10
18	0,8 - 10,0	D 846-20
25	0,8 - 10,0	D 846-30
25	0,8 - 14,0	D 846-34









BOLA GL Tube Fittings EX

Material: Temperature resistance: Chemical resistance: Pressure: Vacuum: Conductivity:

PTFE-EX from -200°C to +250°C ++ very good 10 bar suitable 106 0hm

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.

Cat. No.:	Wrench size hexagon mm	Length without screw joint mm	Bore dia. mm	Thread GL
D 856-14	15	50	6,5	14
D 856-18	19	50	10,5	18
D 856-25	27	56	14,5	25



Applications:

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

BOLA GL Tube Fittings T EX

 Material:
 Temperature resistance:
 Chemical resistance:
 Pressure:
 Vacuum:
 Conductivity:

 PTFE-EX
 from -200°C to +250°C
 ++ very good
 10 bar
 suitable
 106 0hm

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.

Cat. No.:	Wrench size square mm	Length without screw joint mm	Bore dia.	Thread GL
D 857-14	20	50	6,5	14
D 857-18	20	56	10,5	18
D 857-25	27	70	14,5	25



Applications:

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



BOLA GL Tube Fittings Elbow EX

Material: Temperature resistance: Chemical resistance: Pressure: Vacuum: Conductivity: PTFE-EX from -200°C to +250°C ++ very good 10 bar suitable 106 0hm

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.

Cat. No.:	Wrench size square mm	Length without screw joint mm	Bore dia. mm	Thread GL
D 858-14	20	37	6,5	14
D 858-18	20	39	10,5	18
D 858-25	27	51	14,5	25

Applications:

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



BOLA GL Tube Fittings Cross EX

Material: Temperature resistance: Chemical resistance: Pressure: Vacuum: Conductivity: PTFE-EX from -200°C to +250°C ++ very good 10 bar suitable 106 0hm

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.

Cat. No.:	Wrench size square mm	Length without screw joint mm	Bore dia.	Thread GL
D 859-14	20	54	6,5	14
D 859-18	20	56	10,5	18
D 859-25	27	70	14,5	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
 106 0hm

Product description:

Two-way stopcock made of conductive PTFE-EX with straight bore and two connections with GL thread or three-way stopcock with L-shaped or T-shaped bore and three connections with GL thread. Cylindrical stopcock plug made of conductive PTFE-EX for good tightness, stop valve with mark of flow direction. Grip made of red PP. Suitable for pressure up to max. 6 bar, suitable for vacuum. Connection of tubing or tube with BOLA Laboratory Screw Joints EX..

» GL thread with straight bore

	Туре	Bore shape	Bore dia. mm	Connecting thread GL	External dimensions	Cat. No.:
A	2-Way		4	14	54 x 20 x 38	E 712-14
	2-Way		6	18	64 x 30 x 45	E 712-18
	2-Way		8	25	78 x 40 x 57	E 712-25

» GL thread with L-shaped

	Туре	Bore shape	Bore dia.	Connecting thread	External dimensions	Cat. No.:
			mm	GL	L/D/H mm	
В	3-Way	1	4	14	64 x 47 x 43	E 714-14
	3-Way	1	6	18	74 x 57 x 57	E 714-18
	3-Way	9	6	25	78 x 59 x 57	E 714-25

» GL thread with T-shaped bore

	Туре	Bore shape	Bore dia. mm	Connecting thread GL	External dimensions L/D/H mm	Cat. No.:
C	3-Way	-	4	14	74 x 57 x 57	E 716-14
	3-Way	-	4	18	74 x 57 x 57	E 716-18
	3-Way	-	6	25	88 x 69 x 57	E 716-25

Applications:

For distributing liquids or gases. Quick and easy disconnection of flow.











BOLA Multiple Distributors for Bottles EX

Material: Temperature resistance: Chemical resistance: Vacuum: Conductivity:
PTFE-, PPS-EX from -20°C to +200°C ++ very good suitable 106 0hm

Product description:

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

Detailed information in the product description of the identical Multiple Distributors for Bottles on page 95.

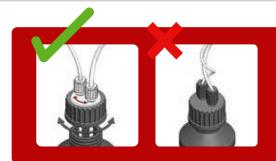
	Necks GL	For tubing O. D.	Cat. No.:
A	2 x 14	2 x 8,0	D 864-08
В	3 x 14	3 x 8,0	D 865-08
C	3 x 25	3 x 14,0	D 866-08

Applications:

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







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

BOLA Multiple Distributors for Barrels EX

Material: Temperature resistance: Chemical resistance: Vacuum: Conductivity:
PTFE-EX from -20 °C to +200 °C ++ very good suitable 106 0hm

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. 0.D. of 14 mm. Connection of tubing or tubes by means of BOLA Laboratory Screw Joints EX.

Detailed information in the product description of the identical Multiple Distributors for Barrels on page 113.

Cat.No.	For tubing O.D.	Necks	For female barrel thread
	max. mm	GL	
D 693-14	2x 10 / 1x 14	2x 18 / 1x 25	G2" / BSP2"
D 695-14	2x 10 / 1x 14	2x 18 / 1x 25	Tri-Sure 2"

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 106 0hm

Product description:

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

Detailed information in the product description of the identical Multiple Distributors for Barrels on page 111.

Canister Thread	Necks GL	For tubing O.D. max. mm	Cat. No.
55	2x 14 /1x 18	2x 8 / 1x 10	D 772-08
60	3 x 18	3x 10	D 772-20
65	3 x 18	3x 10	D 772-32



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





BOLA Screw Caps with Aperture EX

Material: Temperature resistance: Chemical resistance: Conductivity: PPS-EX from -20 °C to +250 °C ++ very good 106 0hm

Product description:

Screw cap with handy knurl, suitable for GL threads, with aperture, made of conductive PPS-EX.

Cat. No.:	Bore dia.	For thread GL
D 898-14	9,2	14
D 898-18	11,0	18
D 898-25	15,0	25
D 898-45	34,0	45





BOLA GL Reductions EX

Material: Temperature resistance:

Chemical resistance: Conductivity:

PTFE-, PPS-EX from -20 °C to +250 °C ++ very good

106 Ohm

Product description:

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

Cat. No.:	max. tubing O.D.	to thread GL	From screw cap
D 872-10	0,8 - 10,0	14	25
D 872-15	1,6 - 10,0	18	25
D 872-20	0,8 - 8,0	14	45
D 872-25	1,6 - 10,0	18	45



Applications:

For connecting or inserting tubing, tubes or probes. Static charges can be dissipated through earthing the connected components.

BOLA Hose Connectors EX (with Nut)

Material: Temperature resistance: Chemical resistance: Conductivity:

PTFE-, PPS-EX from -20 °C to +200 °C ++ very good 106 0 hm

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.

Cat. No.	Length with nut	I. D. of Hose Connector mm	O. D. of Hose Connector mm	Thread GL
D 874-02	45	6,0	8,7	14
D 874-04	51	7,0	10,4	18
D 874-06	68	10.0	16.0	25

Applications:

For connecting elastic tubing to GL-threaded equipment. Static charges can be dissipated through earthing the connected components.











BOLA Flexible Tubing EX

Material:

Temperature resistance: from -200°C to +260°C

Chemical resistance: +++ universal

Conductivity: 10⁶ Ohm

PFA-EX

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.

Tu 1.D.	bing end 0.D.	Bending radius ¹	Burst pressure ² bar	Cat.No.: Length 0,5 m	Cat.No.: Length 1,0 m	Cat.No.: Length 2,5 m
4	6	18	11	S 1824-24	S 1824-54	S 1824-74
6	8	18	11	S 1824-27	S 1824-57	S 1824-77
8	10	18	11	S 1824-30	S 1824-60	S 1824-80
10	12	18	11	S 1824-33	S 1824-63	S 1824-83
12	14	18	11	S 1824-35	S 1824-65	S 1824-85



Product advantages:

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

Applications:

- » antistatic applications
- » in explosive ambiance (explosion protection)
- » for easy handling of liquids and gases
- » for transport of solvents or alcohols
- » ideal for connections under vibrations
- » usable with a small bending radius
- » for compensation of thermal expansions



#SUITABLE PAGE 146 Conductive fittings and stopcocks made of PTFE-EX

BOLA PRACTICAL TIP Easy tubing assembly

Before assembling the tubing on a hose connector, heat it in an oven or with a hot air gun to approx. 60°C. All BOLA products can be heated for easier assembly or disassembly.



 $^{{\}rm 1\!\!\! 1}$ Bending radius: minimum bending radius in mm at a room temperature of 23°C

² Burst pressure: computed value in bar at a room temperature of 23°C. It is recommended to restrict the maximum working pressure to 25% of the burst pressure. For higher temperatures, this value has to be multiplied by the reduction factor shown on page 359. It is the user's responsibility to check if the used tubing fulfils the respective requirements.



BOLA Antistatic Explosion-Proof Tubing EX

Material: **PTFE-EX**

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

Chemical resistance: +++ universal

106 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

	g radius mi	ıs ¹ nm	Burst pres	ssure ² bar		Cat. No.:
		7		140	S	1827-10
,	1;	3		140	S	1827-26
•	18	8		70	S	1827-30
,	1	6		140	S	1827-32
3	3	32		46	S	1827-34
3	3	36		70	S	1827-40
4	41	0		64	S	1827-42
ć	6	4		46	S	1827-50
10	100	00		35	S	1827-60
14	14	4		28	S	1827-64
19	19	6		23	S	1827-68
25	25	56		20	S	1827-74



Product advantages:

- » extensive chemical resistance due to PTFE parts
- » resistance of less than 10⁶ Ohm according to EN 12115 directive
- » ideal for light-sensitive substances

Applications:

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



BOLA INFORMATIVE-



#1 Antistatic Explosion-Proof Tubing made of PTFE-EX are matching the sizes of the BOLA Screw Joint System.

Nominal outer diameter:

from Ø 1,6 mm to Ø 3,2 mm from Ø 3,3 mm to Ø 6,35mm from Ø 8,0 mm to Ø 14,0 mm at Ø 16,0 mm

- » tolerance outer diameter: +/-0,10 mm
- » tolerance outer diameter: +/-0,25 mm
- » tolerance outer diameter: +/-0,30 mm
- » tolerance outer diameter: +/-0,40 mm







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

² Burst pressure: computed value in bar at a room temperature of 23°C. It is recommended to restrict the maximum working pressure to 25% of the burst pressure. For higher temperatures, this value has to be multiplied by the reduction factor shown on page 359. It is the user's responsibility to check if the used tubing fulfils the respective requirements.

BOLA Zebra Explosion-Proof Tubing EX

PFA-EX

Temperature resistance: from -200°C to +260°C

Chemical resistance: +++ universal

Conductivit



FDA conform

Product description:

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

Cat. No.:	Burst pressure ²	Bending radius ¹	Wall thickness mm	0.D. mm	I.D. mm
S 1855-30	57	15	0,5	3,0	2,0
S 1855-40	57	25	1,0	6,0	4,0
S 1855-50	41	50	1,0	8,0	6,0
S 1855-60	32	80	1,0	10,0	8,0
S 1855-64	27	130	1,0	12,0	10,0

Product advantages:

- » the flowing product is only exposed to PFA
- » no chemical restrictions due to the outer conducting stripes
- » resistance less than 10⁶ Ohm
- » smooth, non-porous interior surface
- » clear visibility of the flowing product
- » no corrosion unlike metal lines or metal meshes
- » almost universal chemical resistance

Applications:

- » antistatic applications
- » in explosive ambiance (explosion protection)
- » for transport of highly flammable solvents or alcohols
- » for transport of highly pure chemicals and gases







BOLA INNOVATION



#1 Zebra Tubing

Especially made for antistatic applications: Transparent tubing made of PFA with black longitudinal conductive stripes on the outer surface. Provides high chemical resistance and can be used in explosive ambiance.

 $¹_{\, Bending \, radius: \, minimum \, bending \, radius \, in \, mm \, at \, a \, room \, temperature \, of \, 23^{\circ}C}$

² Burst pressure: computed value in bar at a room temperature of 23°C. It is recommended to restrict the maximum working pressure to 25% of the burst pressure. For higher temperatures, this value has to be multiplied by the reduction factor shown on page 359. It is the user's responsibility to check if the used tubing fulfils the respective requirements.



BOLA PTFE Explosion-Proof Tube Reels EX

Material: **PTFE-EX**

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

Chemical resistance: +++ universal

Conductivit

NEW

FDA conform

Product description:

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

Reel length mm	I.D. mm	0.D. mm	Wall thickness mm	Bending radius 1 mm	Burst pressure ² bar	Cat. No.:
5	2,0	4,0	1,00	16	140	S 2040-32
5	4,0	6,0	1,00	36	70	S 2040-40
5	6,0	8,0	1,00	64	46	S 2040-50
5	8,0	10,0	1,00	100	35	S 2040-60
5	10,0	12,0	1,00	144	28	S 2040-64





#SUITABLE PAGE 155

You need BOLA tubing in longer length in one piece? No problem! You can also get our fluoroplastic tubes by the metre.

BOLA INFORMATIVE-



#1 Antistatic Explosion-Proof Tubing made of PTFE-EX are matching the sizes of the BOLA Screw Joint System.

Nominal outer diameter:

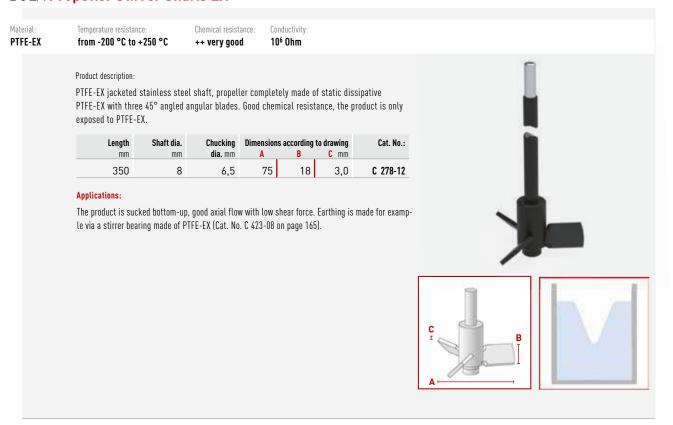
from \emptyset 1,6 mm to \emptyset 3,2 mm from \emptyset 3,3 mm to \emptyset 6,35mm from \emptyset 8,0 mm to \emptyset 14,0 mm at \emptyset 16,0 mm

- » tolerance outer diameter: +/-0,10 mm
- » tolerance outer diameter: +/-0,25 mm
- » tolerance outer diameter: +/-0,30 mm
- » tolerance outer diameter: +/-0,40 mm

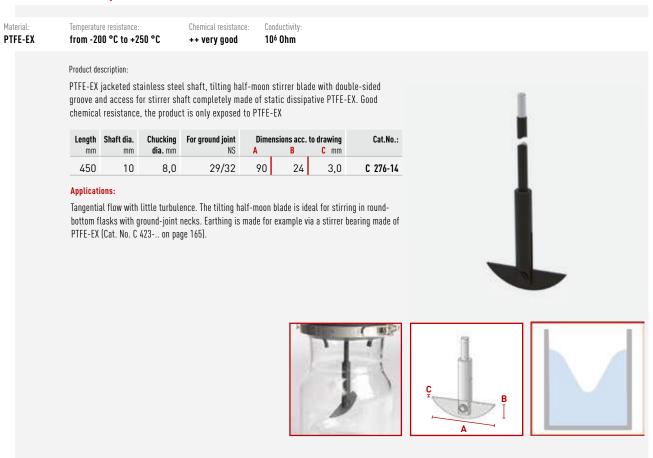
 $^{^{1}}$ Bending radius: minimum bending radius in mm at a room temperature of 23°C

² Burst pressure: computed value in bar at a room temperature of 23°C. It is recommended to restrict the maximum working pressure to 25% of the burst pressure. For higher temperatures, this value has to be multiplied by the reduction factor shown on page 359. It is the user's responsibility to check if the used tubing fulfils the respective requirements.

BOLA Propeller Stirrer Shafts EX



BOLA Moon-Shaped Stirrer Shafts EX





BOLA Double Temperature Probes PT 100 Lemo® Compact EX

Material: **PTFE-EX**

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

Temperature range from -50°C to +250°C

Chemical resistance: ++ very good

Conductivity: 10⁶ Ohm

C€

Product description:

Two independent sensors PT 100 in a stainless steel tube (1.4571) encapsulated with static dissipative PTFE-EX. Collar ring Ø 12mm, bore dia. 5 mm for earthing connection. The electric circuits are locally separated complying with European Standard EN 61010-2-010:2013. Connection by two couplings (type Lemo®, socket size 1, 4-wire-system) fixed directly at the end of the probe.

Typical response times:

» T 50: 20 - 24 s
» T 90: 30 s

See page 352 for detailed explanation.

Usable length mm	Probe dia.	Total length mm	Number of sensors	Width of coupling mm approx.	Cat. No.:
300	8	400	2 x PT 100	27	P 1744-20
400	8	400	2 x PT 100	27	P 1744-23
500	8	400	2 x PT 100	27	P 1744-30

Applications:

- » avoiding of electric charging
- » parallel temperature measurement in aggressive liquids
- » double safety due to redundant systems
- » control function due to two independent sensors
- » Suitable for simultaneous temperature measurement and safety circuit as per the specifications of the standard DIN EN 61010-2-010 but only one NS/GL socket will be occupied, separately switched sensors.
- » ideal for built-in measurement cables











BOLA Temperature Probes PT 100 Lemo® Compact EX

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

e: Temperature range 250 °C from -50 °C to +250 °C

Chemical resistance: ++ very good Conductivity 10⁶ Ohm

C€

Product description:

One measuring sensor PT 100 in a stainless steel tube (1.4571)

encapsulated with static dissipative PTFE-EX. Temperature probe \emptyset 8 mm, tip \emptyset 6 mm, collar ring \emptyset 12 mm. Electrostatic charges can be discharged by a grounding clamp (not included in the scope of delivery). Connection by a coupling (type Lemo®, socket size 1, 4-wire-system) fixed directly at the end of the probe.

Typical response times:

» T 50: 20 - 24 s
» T 90: 30 s

See page 352 for detailed explanation.

Usable length mm	Total length mm	Connector	Cat. No.:
200	270	socket, 4-wire-system	P 1734-10
300	370	socket, 4-wire-system	P 1734-15
400	470	socket, 4-wire-system	P 1734-20
500	570	socket, 4-wire-system	P 1734-25

Applications:

- » Avoiding electrostatic charging
- » temperature measurement in aggressive liquids
- » ideal for built-in measurement cables







BOLA Modular System for Reactor Lids EX – what you should know about



For a short-term realisation of projects in Mini plant installations or in the production of small quantities in chemical and pharmaceutical industry and research, special components are required that help to start up existing reactors flexibly. The components should have a very good chemical resistance, a permanent durability and should be easily cleanable at the same time.

All these requirements are met by the BOLA Modular System for Reactor Lids EX adapted for standard glass reactors with flat flange from SCHOTT $^{\circledR}$ for sizes DN 60 and DN 100.

The Modular System consists of Reactor Lids with different screw-in threads as well as different connections for transition to ground joint components, as stirrer bearings, for connection of probes or tubes and tubing, and stoppers, all with NPT screw-in thread.

By means of the screw-in connections, the Reactor Lid can be arranged to the requirements of your application and project. Thus, a lid can be used most versatile and economic.

All components are made of static dissipative PTFE-EX. This allows to ground the complete system by connecting an earthing cable to the bore M 5x6 on the Reactor Lid EX.

All Reactor Lids EX dispose of a centric screw-in thread NPT for connection of a stirrer bearing. The lateral necks, that even dispose of NPT screw-in threads, are arranged round the centric connector. The special clou is that the angles of lateral necks are made for an insertion of probes and tubes aside the centre in order to avoid collisions with the stirrer shaft and further inserted components.

The large choice of different inserts allows to connect existing equipment with ground joint such as Liebig condensers and dropping funnels as well as GL thread such as lead-in for sensors. The already existing equipment can be further used.



All features at a glance:

- » Easy assembly
- » Flexibly expandable
- » Compatible with glass reactors with SCHOTT®-flat flange
- » Completely made of static dissipative PTFE-EX, universal chemical resistance
- » With connectors for the use of existing equipment with ground joint or GL thread
- » Also available in virgin PTFE (see page 267)

Selection and Assembly:

- » Choose a lid that fits onto the flange of your glass reactor, as well as the number of connectors needed.
- » Choose the necessary transition fittings according to NPT threads in the chosen lid.
- » Mount the transition fittings into the connectors of the reactor lid. The lid is now ready for service.
- » All fittings can be acquired separately and can be exchanged amongst each other depending on the NPT thread.
- » Ground the assembled lid by connecting an earthing cable to the bore M5x6 on the reactor lid.

Custom Manufacture - Lid and Fitting

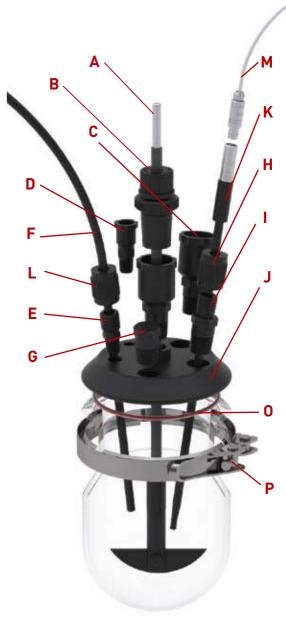
If we do not even have the correct reactor lid in our wide range, we are pleased to offer you a modified reactor lid or modified components accordingly. Just give us a call: +49 (0) 9346 9286-0 or send us a little sketch with the requested component by e-mail to

Example: Reactor Lid DN 100 EX

- A Moon-shaped Stirrer Shaft EX Cat. No.: C 276-14 see page 158
- B Stirrer Bearing EX Cat. No.: C 423-10 see page 165
- C Screw-in Connector with Ground Joint EX Cat. No.: B 174-06 see page 164
- D Screw-in Connector with Ground Joint EX

Cat. No.: B 174-02 see page 164

- E Screw-in Connector GL EX Cat. No.: B 172-32 see page 164
- F Antistatic Tubing Cat. No.: S 1827-50 see page 130



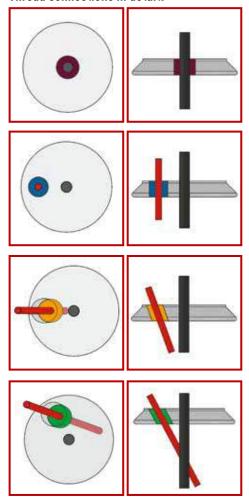
- G Screw-in Stopper EX Cat. No.: B 173-04 see page 164
- H Laboratory Screw Joints EX Cat. No.: D 841-62 see page 146
- Screw-in Connector EX Cat. No.: B 172-18 see page 164
- J Reactor Lid DN100 EX Cat. No.: B 170-16 see page 163
- K Temperature Probe Lemo Compact EX Cat. No.: P 1734-20 see page 159
- Laboratory Screw Joint EX Cat. No.: D 841-62 see page 146
- M Extension Cable Cat. No.: P 1724-38 see page 241
- O -Ring Cat. No.: H 969-25 see page 270
- P Quick Release Clamps Cat. No.: B 277-03 see page 270







Thread connections in detail:



Centric thread connection (purple):

For insertion of the stirrer bearing (see page 160).

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

Components such as probes can be led into the reactor parallel to the stirrer shaft.

Inclined thread connection with direction straight to the stirrer shaft (yellow):

Components such as tubes and tubing can be led directly to the stirrer shaft to achieve an optimal mixing of the medium.

Inclined thread connection with direction aside the shaft (green):

Collisions of long components such as temperature probes are avoided as they are led aside the stirrer shaft by means of this thread connection.



BOLA Reactor Lids DN 60 EX

 Material:
 Temperature resistance:
 Chemical resistance:
 Conductivity:

 PTFE-EX
 from -200 °C to +250 °C
 ++ very good
 106 0hm

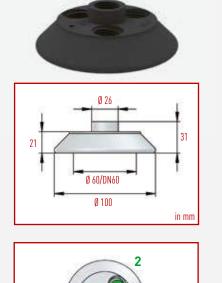
Product description:

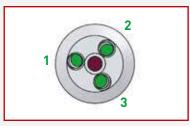
Made of static dissipative PTFE-EX. Suitable for glass reactors DN 60 with SCHOTT flat flange. With screw-in threads for connection of transition fittings. Bore with female thread M5x6 for earthing connection on the upper side of the lid.

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

Applications:

For assembly of reactor lids using transition fittings made of static dissipative PTFE-EX from page 164 to 165.





BOLA Reactor Lids DN 100 EX

 Material:
 Temperature resistance:
 Chemical resistance:
 Conductivity:

 PTFE-EX
 from -200 °C to +250 °C
 ++ very good
 106 0hm

Product description:

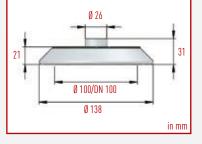
Made of static dissipative PTFE-EX. Suitable for glass reactors DN 100 with SCHOTT flat flange. With screw-in threads for connection of transition fittings. Bore with female thread M5x6 for earthing connection on the upper side of the lid.

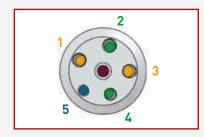
Connection 1	Connection 2	Connection 3	Connection 4	Connection 5	Cat. No.:
NPT 1/2"		NPT 1/2"	NPT 1/4"	NPT 1/4"	B 170-16
to the shaft	the shaft		the shaft	connection	

Applications

For assembly of reactor lids using transition fittings made of static dissipative PTFE-EX from page $164\ to\ 165$.













BOLA Screw-In Connectors EX with Ground Joint

 Material:
 Temperature resistance:
 Chemical resistance:
 Conductivit

 PTFE-EX
 from -200 °C to +250 °C
 ++ very good
 106 0hm

Product description:

Made of static dissipative PTFE-EX. For connection to BOLA Reactor Lids. Connection with ground socket. With hexagonal gripping surface in standard wrench size. Earthing is made via a connection on the reactor lid.

Screw-In Thread NPT (male)	Ground socket NS	Wrench Size SW	Cat. No.:
1/4"	14/23	15	B 174-02
1/2"	29/32	24	B 174-06

Applications:

For assembly on BOLA Reactor Lids made of PTFE-EX. Cat.No.: B 170-.. from page 163. For connection to BOLA Reactor Lids Cat.No. C 423-.. Connection with ground socket. With hexagonal gripping surface in standard wrench size. Earthing is made via a connection on the reactor lid.



BOLA Screw-In Connectors GL EX

 Material:
 Temperature resistance:
 Chemical resistance:
 Conductivity

 PTFE-EX
 from -200 °C to +250 °C
 ++ very good
 106 0hm

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.

Cat. No.:	Wrench size SW	Neck GL (male)	Screw-In Thread NPT (male
B 172-16	15	18	1/4"
B 172-18	22	18	1/2"
B 172-20	22	25	1/2"

Applications:

For assembly on BOLA Reactor Lids made of PTFE-EX, Cat. No. B 170-... on page 163. As adapter for Stirrer Bearings EX, Cat. No. C 423-... for centric insertion of stirrer shafts. For connection to existing components with ground joint such as Liebing Condensers, dropping funnels etc.



BOLA Screw-In Stoppers EX

Material: Temperature resistance: Chemical resistance: Conductivity:
PTFE-EX from -200 °C to +250 °C ++ very good 106 0hm

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.

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



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





BOLA Stirrer Bearings EX

 Material:
 Temperature resistance:
 Chemical resistance:
 Conductivity:

 PTFE-EX
 from -15 °C to +200 °C
 ++ very good
 106 0hm

Product description:

Grount joint cone made of static dissipative PTFE-EX with sealing rings on the outside to prevent sticking of the connection and to reduce the danger of breaking glass. A special gasket made of PTFE-EX and an FKM o-ring which is compressed by GL screw cap provide a good sealing of the stirrer shaft. Bore with female thread M5 on the knurl for earth connection.

Cone NS European standard	For stirrer shaft dia.	Total length mm ca.	Thread of screw cap	Cat. No.:
29/32	8	71	18	C 423-08
29/32	10	72	25	C 423-10

Applications:

Perfect bearing for stainless steel, glass and BOLA stirrer shafts EX.



Spare Parts for : Sirrer Bearings EX

Description	Material	Packing Unit	Packing Unit	Cat. No.:	
Replacement Special Gaskets EX	PTFE-EX	1 piece	C 423-08 C 423-10	C 432-08 C 432-10	
Replacement Screw Caps EX	PTFE-EX	1 piece	C 423-08 C 423-10	C 433-08 C 433-10	



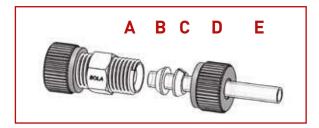




BOLA Screw Joints for Pressures up to 5 Bar

Assembly made easy -how to reach your goal quickly.

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



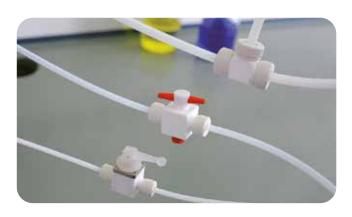
Assembly:

- 1. Push the nut on the tubing/tube
- 2. Push V-ring and then the tapered ring on the tubing/tube
- 3. Tighten the nut on the threaded neck ready

The screw joint system up to 5 bar - what you should know about.

This economic screw joint system was developed especially for tubing made of PTFE, PFA or FEP, but it can also be used with tubes made of glass or steel. Its function is based on compression rings which provide a pressure resistance of up to 5 bar at room temperature. All parts which are exposed to the medium are made of PTFE. Only the nut which is not in contact with the medium is made of glass-fibre reinforced PTFE for better stability. The fittings and nuts have metric threads.

All components of this system have a universal chemical resistance, since the product is only exposed to PTFE.



BOLA Tube Fittings

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



FDA conform

Product description:

Straight tube fitting made of PTFE with nuts made of glass-fibre reinforced PTFE. Universal chemical resistance, the product is only exposed to PTFE.

Thread of fitting M	Bore dia. mm	Total length mm	For tubing O.D.	Cat. No.:
14 x 2	6	49	4	D 503-02
14 x 2	6	49	6	D 503-04
14 x 2	6	49	(1/4")6,35	D 503-06
18 x 2	8	54	8	D 503-08
18 x 2	8	54	10	D 503-12
28 x 2	14	58	12	D 503-14
28 x 2	14	58	14	D 503-16
28 x 2	14	58	16	D 503-18







BOLA Tube Fittings Elbow

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



FDA conform

Product description:

Tube fitting elbow-shaped made of PTFE, two connections with nuts made of glass-fibre reinforced PTFE. Universal chemical resistance, the product is only exposed to PTFE.

ubing O.D. mm	For tu	Dimensions (L x H) mm	-	Bore dia. mm	Thread of fitting M
4		39 x 39	4	4	14 x 2
6		39 x 39	4	4	14 x 2
8		43 x 43	3	8	18 x 2
10		43 x 43	3	8	18 x 2
12		54 x 54	4	14	28 x 2
14		54 x 54	4	14	28 x 2
16		54 x 54	4	14	28 x 2



BOLA PRACTICAL TIP Protection from buckling

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

BOLA Tube Fittings T

 Material:
 Temperature resistance:
 Chemical resistance:
 Pressure:
 Vacuum:

 PTFE
 from -200°C to +250°C
 +++ universal
 5 bar
 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.

	For tubing O.D.	Dimensions (L x H) mm	Bore dia.	Thread of fitting M
D 505-02	4	56 x 39	4	14 x 2
D 505-04	6	56 x 39	4	14 x 2
D 505-06	(1/4")6,35	56 x 39	4	14 x 2
D 505-08	8	60 x 43	8	18 x 2
D 505-12	10	60 x 43	8	18 x 2
D 505-14	12	71 x 54	14	28 x 2
D 505-16	14	71 x 54	14	28 x 2
D 505-18	16	71 x 54	14	28 x 2





#SUITABLE page 189

Tubing for all fittings

BOLA Reducing Unions

 Material:
 Temperature resistance:
 Chemical resistance:
 Pressure:
 Vacuum:

 PTFE
 from -200°C to +250°C
 +++ universal
 5 bar
 suitable

FDA conform

Product description:

Straight tube fitting made of PTFE with nuts made of glass-fibre reinforced PTFE. For connecting tubing or tube with different outer diameters. Universal chemical resistance, the product is only exposed to PTFE.

A Thread of fitting	For tubing O.D. mm	Bore dia.	B Thread of fitting	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:
 Temperature resistance:
 Chemical resistance:
 Pressure:
 Vacuum:

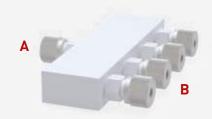
 PTFE
 from -200°C to +250°C
 +++ universal
 5 bar
 suitable

FDA conform

Product description:

Body made of PTFE with nuts made of glass-fibre reinforced PTFE. One inlet and three or four outlets, bore diameter 6 mm. Universal chemical resistance, the product is only exposed to PTFE.

Thread of fitting	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: Temperature resistance: Chemical resistance: Pressure: Vacuum:

PTFE from -200°C to +250°C +++ universal 5 bar suitable



FDA konform

Product description:

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

A Thread of fitting	For tubing O.D. mm	Bore dia.	B Screw- in thread	Total length mm	Cat. No.:
14 x 2	4	4	NPT 1/8"	38	D 518-02
14 x 2	4	4	G 1/8"	38	D 518-04
14 x 2	4	4	NPT 1/4"	40	D 518-06
14 x 2	4	4	G 1/4"	38	D 518-08
14 x 2	6	4	NPT 1/4"	40	D 518-12
14 x 2	6	4	G 1/4"	38	D 518-14
14 x 2	6	4	NPT 3/8"	46	D 518-16
14 x 2	6	4	G 3/8"	46	D 518-18
18 x 2	8	8	NPT 1/4"	46	D 518-24
18 x 2	8	8	G 1/4"	46	D 518-26
18 x 2	8	8	NPT 3/8"	46	D 518-28
18 x 2	8	8	G 3/8"	46	D 518-30
18 x 2	10	8	NPT 1/4"	46	D 518-36
18 x 2	10	8	G 1/4"	46	D 518-38
18 x 2	10	8	NPT 3/8"	46	D 518-40
18 x 2	10	8	G 3/8"	46	D 518-42
28 x 2	12	12	G 3/8"	56	D 518-50
28 x 2	12	12	NPT 1/2"	56	D 518-52
28 x 2	12	12	G 1/2"	56	D 518-54
28 x 2	14	12	G 1/2"	56	D 518-62
28 x 2	16	12	NPT 1/2"	56	D 518-68
28 x 2	16	12	G 1/2"	56	D 518-70







#SUITABLE page 189

Tubing for all fittings

BOLA PRACTICAL TIP

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

Our scale thread illustrations help to make an optical comparison.

see page 366

BOLA Snap Valves

PTFE, PPS

from -20°C to +250°C

Chemical resistance: +++ universal

6 bar

suitable

FDA conform

Product description:

Valve body made of PTFE with bore dia. 6 mm. Holding plate with bulkhead thread, lever and bulkhead ring made of PPS. Two connectors for tubing and tubes including compression rings (PTFE) and screw nut (PTFE with glass fibres). Gastight closing of the passage by means of a PTFE-bellow with flat cone point, lever locks into place in open position. An engraved arrow on the valve body marks the flow direction which has to be taken into account during installation. Universal chemical resistance, the flowing product is only exposed to PTFE.

	Outer dimensions L x D x H mm	For tubing O.D.	Thread of fitting M
E 674-54	85 x 44 x 93	8	18 x 2
E 674-56	85 x 44 x 93	10	18 x 2

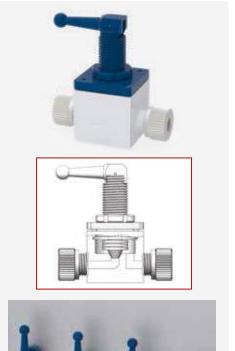






Applications:

Fast opening/closing of the passage. Lever with integrated bulkhead union for panel mounting.





BOLA Control Valves

Material:

PTFE, PPS

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

Pressure 6 bar

Vacuum: suitable



Product description:

Valve body made of PTFE with bore dia. 6 mm. Holding plate and adjusting screw made of PPS. Two connectors for tubing and tubes including compression rings (PTFE) and screw nut (PTFE with glass fibres). By turning the adjusting screw the passage is closed and thus the volume flow can be manually regulated (without regulation scale), the opening degree of the passage is indicated by a protruding pin in the center of the adjusting screw. An engraved arrow on the valve body marks the flow direction which has to be taken into account during installation. Universal chemical resistance, the flowing product is only exposed to PTFE.

Thread of fitting M	For tubing O. D.	Outer dimensions L x D x H mm	Cat. No.:
18 x 2	8	89 x 44 x 83	E 672-54
18 x 2	10	89 x 44 x 83	E 672-56

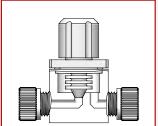
Applications:

For distributing liquids or gases. Manual regulation of the flow rate by turning the adjusting screw.











BOLA (2-Way/3-Way) Stopcocks

Material: **PTFE, PP**

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

Chemical resistance:

Pressui

+++ universal

2 bar

FDA conform

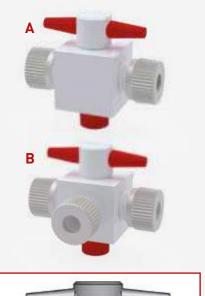
Product description:

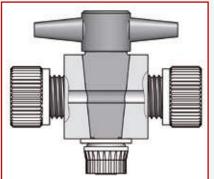
2-way stopcock with straight bore and two connections or 3-way stopcock with T-shaped bore and three connections, with nuts made of glass-fibre reinforced PTFE for connecting tubing or tube. Conical stopcock plug, tightness is increased by turning the nut on the lower side. 3-way stopcock plug with T-shaped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

	Тур	Bore shape stopcock	Bore dia.	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
В	3-Way	-	1,5	4	14 x 2	59 x 41 x 53	E 654-02
	3-Way	-	1,5	6	14 x 2	59 x 41 x 53	E 654-04
	3-Way	-	3,5	8	18 x 2	74 x 54 x 69	E 654-06
	3-Way	-	3,5	10	18 x 2	74 x 54 x 69	E 654-08

Applications:

For distributing liquids or gases. Quick and easy disconnection of flow.















BOLA Stopcocks with Hose Connectors

PTFE, PP

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

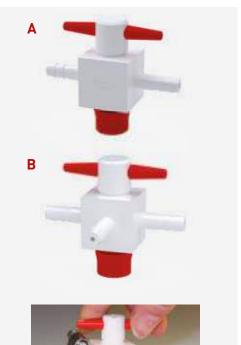
2 bar

FDA conform

Product description:

2-way stopcock with straight bore and two hose connectors or 3-way stopcock with T-shaped bore and three hose connectors for connecting elastic tubing (e.g. Viton®, Tygon®, silicone). Conical stopcock plug, tightness is increased by turning the nut on the lower side. 3-way stopcock plug with T-shaped mark of flow direction. Universal chemical resistance, the flowing product is only exposed to PTFE.

	Туре	Bore shape stopcock	Bore dia.	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
В	3-Way	-	1,0	4	4,5	60 x 41 x 53	E 650-50
	3-Way	-	2,0	6	6,8	60 x 41 x 53	E 650-53
	3-Way	-	3,0	8	9,0	60 x 41 x 53	E 650-56
	3-Way	-	4,0	10	11,0	85 x 60 x 69	E 650-59





For distributing liquids or gases. Quick and easy disconnection of flow.

BOLA Non-Return Valves

PTFE

Temperature resistance:

Chemical resistance:

from -200°C to +250°C +++ universal

FDA conform

Product description:

Made of PTFE, with nuts made of glass-fibre reinforced PTFE for connecting tubing or tube. Opening pressure adjustable between 0,1 bar and 2 bar (factory setting 0,1 bar). The built-in lock function only allows flow in one direction, the flow direction is marked by an arrow, any fitting position is possible. All parts are easy to disassemble by hand for cleaning. Universal chemical resistance, the flowing product is only exposed to PTFE or PFA.

Cat. No.:	0.D. mm	Total length mm	For tubing O.D.	Thread of fitting M
E 680-21	38	110	4	14 x 2
E 680-23	38	110	6	14 x 2
E 680-27	38	110	8	18 x 2
E 680-31	38	110	10	18 x 2







#SUITABLE page 189

Tubing for all fittings



BOLA Ground Joint Tube Fittings

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



FDA conform

Product description:

Fitting made of PTFE for transition from ground joints to metric threads for connecting hardwalled tubing (e.g. PTFE, PFA or FEP). With nuts made of glass-fibre reinforced PTFE, body with rings and knurled grip for opening. The product is only exposed to PTFE.

Ground Joint NS	For tubing O.D.	Thread of fitting M	Bore dia.	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



For connecting tubes or tubing to vessels with ground joint. For inserting and fixing probes, thermometers, dip tubes or cables.



Spare Parts for: Components with metric thread

Description	Material	Packing Unit	For tubing O.D. mm	suitable for	Cat. No.:	
Replacement Nuts	PTFE-GF	1 piece	4 - 6,35 8 - 10,0 12 - 16,0	all components with thread M 14 x 2 all components with thread M 18 x 2 all components with thread M 28 x 2	D 501-01 D 501-04 D 501-07	000
Replacement Compression Rings	PTFE	1 piece	4 6 6,35 8 9,52 10 12 12,7 14	all components with thread M 14 x 2 all components with thread M 14 x 2 all components with thread M 18 x 2 all components with thread M 28 x 2	D 502-01 D 502-02 D 502-03 D 502-04 D 502-05 D 502-06 D 502-07 D 502-51 D 502-08 D 502-09	02

BOLA Plugs

 Material:
 Temperature resistance:
 Chemical resistance:
 Pressure:
 Vacuum:

 PTFE
 from -200°C to +250°C
 +++ universal
 5 bar
 suitable

FDA conform

Product description:

Made of PTFE, for closing unused fitting connections (a suitable glass-fibre reinforced PTFE nut has to be ordered separately (Cat. No. D 501-.. see page 177).

Connection for O.D.	Cat. No.:
4 / 6 / (1/4") 6,35	D 648-02
8 / (3/8") 9,52 / 10	D 648-08
12 / (1/2") 12,7 / 14 / 16	D 648-14





BOLA Tubing Connectors

Material:

PTFE

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

FDA conform

Product description

Straight fitting made of PTFE with two connectors for elastic tubing (e.g. Viton®, Tygon®, silicone). Universal chemical resistance, the product is only exposed to PTFE.

Total length mm	Bore dia.	0.D. of connectors	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: Temperature resistance: Chemical resistance: Vacuum:
PTFE from -200°C to +250°C +++ universal suitable

FDA conform

Product description:

T-shaped fitting made of PTFE with three connectors for elastic tubing (e.g. Viton®, Tygon®, silicone). Universal chemical resistance, the product is only exposed to PTFE.

al length Bore dia. mm mr		Cat. No.:
19,5	4,5	D 577-02
22,5	6,8	D 577-04
25,5	9,0	D 577-06
28,5	11,0	D 577-08





BOLA Tubing Connectors Elbow

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





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.

	O.D. of connectors	Bore dia. mm	Total length mm
D 574-02	4,5	2	19,5
D 574-04	6,8	3	22,5
D 574-06	9,0	5	25,5
D 574-08	11,0	6	28,5





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. $Viton^{\odot}$, Tygon $^{\odot}$, silicone). Universal chemical resistance, the product is only exposed to PTFE.

Cat. No.:	O.D. of connectors	Bore dia. mm	Total length mm
D 573-08	11,0	6	28,5



BOLA Tubing Connectors Y

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

FDA conform

Product description:

Y-shaped fitting made of PTFE with three connectors for elastic tubing (e.g. Viton®, Tygon®, silicone). Universal chemical resistance, the product is only exposed to PTFE.

Bore dia. mm	O.D. of connectors	Cat. No.:
2	4,5	D 576-02
3	6,8	D 576-04
5	9,0	D 576-06
6	11,0	D 576-08



BOLA Reducing Tubing Connectors

Temperature resistance: Chemical resistance:

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.

Cat. No.:	To O.D. of connector mm	From O.D. of connector mm	Bore dia.	Total length mm
D 572-02	4,5	6,8	2	45
D 572-04	6,8	9,0	3	55
D 572-06	9,0	11,0	5	75



BOLA Screw-In Tubing Connectors

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

FDA conform

Product description:

Straight fitting made of PTFE with one connector for elastic tubing (e.g. Viton®, Tygon®, silicone) and one screw-in thread (either NPT or G). Universal chemical resistance, the product is only exposed to PTFE.

Cat. No.:	Wrench size mm	Thread G	NPT	O.D. of connector mm	Bore dia.	Total length mm
D 579-02	14		1/8"	4,5	2,5	20
D 579-04	15		1/4"	6,8	5,0	22
D 579-06	15		1/4"	9,0	5,8	22
D 579-22	15	1/4"		6,8	4,0	22
D 579-24	15	1/4"		9,0	5,0	22
D 579-26	18	3/8"		11,0	8,0	25







SPECIAL **REQUIREMENTS? CUSTOMIZED!**











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

No problem:

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

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

Checklist for your customised product:

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

205















189	Tubing		202	Sealing Material	
	PTFE Tubing	189		Sealing Tape	202
	FEP Tubing	190		Flat Sealing Tapes	202
	PFA Tubing	192		Fluoroplastic Spray	203
	PTFE Tubing Reels	193		Fluorslide Paste	203
	FEP Tubing Reels	194		Fluoroplastic Grease Tubes	203
	PFA Tubing Reels	194			
	PFA Corrugated Tubing	195	204	Screws, Balls and Boiling S	tone
	Flexible Corrugated Tubing	196			tone.
	Flanged Corrugated Tubing	197		Screws with Countersunk	
	Heat Shrinkable Tubing	197		Head	204
	Colour Tubing	198		Screws with Cylindrical Head	204
	Spiral Tubing	198		Hexagon Nuts	204
	PEEK Capillary Tubing	199		Washers	205
	Tubing Cutter	199		Boiling Stones	205

Balls

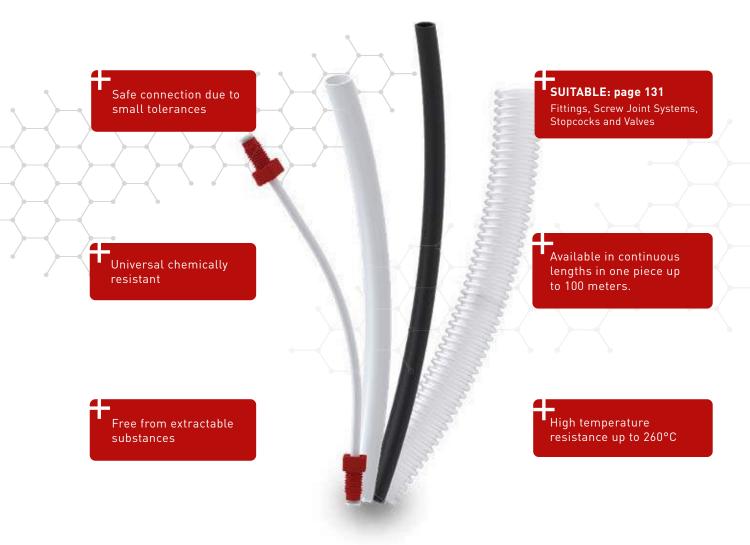
200 Rods, Tiles and Sheets

Rods	200
Tiles	200
Sheets	201



BOLA Tubing - what you should know about.

BOLA Tubing is dimensionally perfectly suited for the use with all BOLA Screw Joint Systems. You can be sure that all fittings and screw joints fit together with the tubing. The production of tubing always involves certain tolerances in outer diameter and wall thickness. We always supply the ordered quantity in full metres in one piece, as far as this is not longer than the maximum production length of 100 m. A confection of several rolls of the same length is possible on demand. We check our tubing multiple times on the basis of our strict BOLA internal standards. These are by far stricter than the tolerances customary in the market.







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

rree choice of requested length between minimum length a maximum production length.

» Longer lengths in one piece possible

For tubing up to 0.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 0.D. +/- 0,05 mm

over 3.3 mm to 10.0 mm

 \rightarrow tolerance of 0.D. +/- 0.10 mm

over 10,1 mm to 16,0 mm

» tolerance of 0.D. +/- 0,15 mm

over 16,1 mm to 22,0 mm

» tolerance of 0.D. +/- 0,20 mm

over 22.1 mm

» tolerance of O.D. +/- 0,25 mm







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 (at moderate charge)	+260°C	+260°C	+205°C
Minimum temperature (at moderate charge)	-200°C	-270°C	-270°C
Chemical resistance	+++	+++	++(+)
Transparency	+	++(+)	+++
Surface quality	++	+++	+++
Gas proofness (in limit range)	++	+++	+++
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



















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
- » What is the lead time for tubing?

contact you to find a solution.

The lead time depends on many factors such as dimension, quantity, material, tolerances and running length. The typical lead time for customized tubing is between 3 and 6 weeks.

» How do I get a quotation?

Send us your enquiry by fax or e-mail stating all relevant dimensions such as diameter, length, etc. We will do our utmost to get our offer to you as soon as possible. Please do not forget to indicate the required quantity. It is also important to include in your enquiry whether the requested tubing is a one-time or a repeating need.



Cleaning and reuse of tubing

In general, cleaned fluoroplastic tubing should only be reused if the transported product is known and rated with "+" in the chemical resistance chart (page 347).

It is not recommended to reuse the tubing with unknown products and mixtures of chemicals. For all water-soluble substances (e.g. salts, acids, bases etc) you can use water as cleaning agent.

Volatile solvents such as alcohols, esters, ketones, low-boiling hydrocarbons, chlorinated hydrocarbons are given off reversibly by storing under aeration (only if they have not been absorbed by the interior surface of the tubing).

If you are using substances which can only be eliminated by organic solvents or if you are using toxic and dangerous products, the tubing should be disposed appropriately after use. A visual inspection or, in case of unclarity an inspection according to EN 12115, has to be made before reusing cleaned tubing.

You haven't found anything suitable? - No problem

We would be glad to send you a quotation. For quick processing, we need some information:

- » Outer diameter in mm (e.g. 16 mm)
- » Inner diameter in mm (e.g. 12 mm)
- » Which quantity in one length do you need?
- » Which total quantity do you need?
- » Which material shall be used?

Further information - not obligatory, but often making sense.

- » Do you need special tolerances for outer or inner diameter (e.g. Ø 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 PTFE Tubing

Material:

Temperature resistance:

Chemical resistance:

PTFE

from -200°C to +250°C +++ 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



I.D. mm	0.D. mm	Wall thick- ness mm	Bending radius 1 mm	Burst pressure ² bar	Cat. No.:	I.D. mm	0.D. mm	Wall thick- ness mm	Bending radius ¹ mm	Burst pressure ² bar	Cat. No.:
0,2	1,6	0,70	6	960	S 1810-01	Continuat	ion of tubi	ng diameters			
0,2	0,4	0,10	2	960	S 1810-02	3,175	6,35	1,58	26	140	S 1810-39
0,3	0,6	0,15	3	140	S 1810-04	4,0	6,0	1,00	36	70	S 1810-40
0,3	1,6	0,65	4	606	S 1810-05	3,96	6,35	1,19	34	84	S 1810-41
0,4	0,9	0,25	3	175	S 1810-06	4,35	6,35	1,00	40	64	S 1810-42
0,5	1,0	0,25	4	140	S 1810-08	4,78	6,35	0,79	51	46	S 1810-43
0,5	1,6	0,55	5	308	S 1810-09	5,0	6,0	0,5	72	28	S 1810-44
0,8	1,6	0,40	7	140	S 1810-10	5,0	7,0	1,00	49	56	S 1810-46
1,0	1,6	0,30	8	84	S 1810-12	6,0	7,0	0,5	98	23	S 1810-48
1,0	2,0	0,50	8	140	S 1810-14	6,0	8,0	1,00	64	46	S 1810-50
1,0	3,0	1,00	9	280	S 1810-16	7,0	8,0	0,50	128	20	S 1810-52
1,2	1,8	0,30	8	70	S 1810-18	7,0	9,0	1,00	81	40	S 1810-54
1,4	2,2	0,40	12	80	S 1810-19	7,5	10,0	1,25	80	46	S 1810-56
1,5	2,1	0,30	14	56	S 1810-20	8,0	9,52	0,75	120	26	S 1810-58
1,5	2,5	0,50	13	93	S 1810-22	8,0	10,0	1,00	100	35	S 1810-60
1,5	3,0	0,75	12	140	S 1810-23	8,0	11,0	1,50	80	52	S 1810-61
1,5	3,5	1,00	12	186	S 1810-21	8,0	12,0	2,00	72	70	S 1810-62
1,6	3,2	0,80	13	140	S 1810-26	9,0	11,0	1,00	121	31	S 1810-63
1,6	2,4	0,40	14	70	S 1810-24	10,0	12,0	1,00	144	28	S 1810-64
1,9	2,5	0,30	20	44	S 1810-28	9,52	12,7	1,59	102	46	S 1810-65
2,0	3,0	0,50	18	70	S 1810-30	10,0	14,0	2,00	98	56	S 1810-66
2,0	4,0	1,00	16	140	S 1810-32	12,0	14,0	1,00	196	23	S 1810-68
2,4	3,2	0,40	25	46	S 1810-33	12,0	16,0	2,00	128	46	S 1810-70
3,0	4,0	0,50	32	46	S 1810-34	13,0	16,0	1,50	170	32	S 1810-72
3,0	5,0	1,00	25	93	S 1810-36	14,0	16,0	1,00	256	20	S 1810-74
3,0	6,0	1,50	24	140	S 1810-37	16,0	18,0	1,00	324	17	S 1810-78
4,0	5,0	0,50	50	35	S 1810-38	18,0	20,0	1,00	400	16	S 1810-84
You will fin	nd further t	tubing diamete	ers in the adjo	ining chart ——		20,0	22,0	1,00	490	14	S 1810-88

Applications:

» Perfect tubing for aggressive and pure liquids or gases



#HELPFUL page 155 Tubing made of static dissipative PTFE-EX











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

² Burst pressure: computed value in bar at a room temperature of 23°C. It is recommended to restrict the maximum working pressure to 25% of the burst pressure. For higher temperatures, this value has to be multiplied by the reduction factor shown on page 359. It is the user's responsibility to check if the used tubing fulfils the respective requirements.

BOLA FEP Tubing

Material:

Temperature resistance:

Chemical resistance:

Transparenc

FEP

from -200°C to +205°C

+++ universal

transparent





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





Perfect tubing for aggressive and pure liquids or gases





BOLA PRACTICAL-TIP How can you calculate the maximum bending radius?

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

page 362

 $¹_{\,Bending\ radius:\ minimum\ bending\ radius\ in\ mm\ at\ a\ room\ temperature\ of\ 23^{\circ}C}$

² Burst pressure: computed value in bar at a room temperature of 23°C. It is recommended to restrict the maximum working pressure to 25% of the burst pressure. For higher temperatures, this value has to be multiplied by the reduction factor shown on page 359. It is the user's responsibility to check if the used tubing fulfils the respective requirements.

BOLA PFA Tubing

Material:

Chemical resistance:

PFA

from -200°C to +260°C +++ universal

transparent





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	0.D. mm	Wall thickness mm	Bending radius ¹ mm	Burst pressure ² bar	Cat. No.:
0,8	1,6	0,40	7	140	S 1811-02
1,5	3,0	0,75	12	140	S 1811-03
1,6	3,2	0,80	13	140	S 1811-04
2,0	3,0	0,50	18	70	S 1811-05
2,0	4,0	1,00	16	140	S 1811-06
3,175	6,35	1,58	26	140	S 1811-07
3,6	6,0	1,20	30	96	S 1811-08
3,96	6,35	1,20	34	84	S 1811-12
4,0	6,0	1,00	36	70	S 1811-10
4,35	6,35	1,00	52	64	S 1811-14
4,78	6,35	0,79	51	46	S 1811-15
5,6	8,0	1,20	53	60	S 1811-16
6,0	8,0	1,00	64	46	S 1811-18
6,35	9,52	1,59	58	70	S 1811-20
6,8	10,0	1,60	63	66	S 1811-22
8,0	10,0	1,00	100	35	S 1811-24
8,8	12,0	1,60	90	51	S 1811-26
9,52	12,7	1,59	101	47	S 1811-28
10,0	12,0	1,00	144	28	S 1811-30
12,0	14,0	1,00	196	23	S 1811-40
14,0	16,0	1,00	256	20	S 1811-50

Applications:

Perfect tubing for aggressive and pure liquids or gases

 $[\]mathbf{1}_{\rm Bending\ radius:\ minimum\ bending\ radius\ in\ mm\ at\ a\ room\ temperature\ of\ 23°C}$

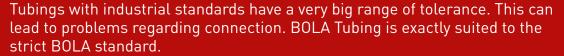
² Burst pressure: computed value in bar at a room temperature of 23°C. It is recommended to restrict the maximum working pressure to 25% of the burst pressure. For higher temperatures, this value has to be multiplied by the reduction factor shown on page 359. It is the user's responsibility to check if the used tubing fulfils the respective requirements.



BOLA INNOVATION



#1 Perfect connection



page 131





BOLA PTFE Tubing Reels

Material:

Temperature resistance:

Chemical resistance:

PTFE

from -200°C to +260°C

+++ universal



FDA conform

Product description:

Transparent to milky white

Cat. No.:	Burst pressure ²	Bending radius ¹ mm	Wall thick- ness mm	0.D. mm	I.D. mm	Roll length m
S 2010-41	56	34	1,19	6,35	3,96	5
S 2010-42	64	40	1,00	6,35	4,35	5
S 2010-50	46	64	1,00	8,0	6,0	5
S 2010-60	35	100	1,00	10,0	8,0	5
S 2010-65	32	102	1,59	12,7	9,52	5
S 2010-64	28	144	1,00	12,0	10,0	5

Roll length m	I.D. mm	0.D. mm	Wall thick- ness mm	Bending radius 1 mm	Burst pressure ²	Cat. No.:
10	0,8	1,6	0,40	7	140	S 2012-10
10	1,6	3,2	0,80	13	140	S 2012-26
10	2,0	3,0	0,50	18	70	S 2012-30
10	2,0	4,0	1,00	16	140	S 2012-32
10	4.0	6,0	1,00	36	70	S 2012-40



Please find further tube diameters under Cat. No. S 1810-... on page 189 by the metre.



#HELPFUL page 157
Tubing made of static dissipative PFA-EX

 $^{1\,{\}rm Bending\ radius:}\,{\rm minimum\ bending\ radius}$ in mm at a room temperature of 23°C

Burst pressure: computed value in bar at a room temperature of 23°C. It is recommended to restrict the maximum working pressure to 25% of the burst pressure. For higher temperatures, this value has to be multiplied by the reduction factor shown on page 359. It is the user's responsibility to check if the used tubing fulfils the respective requirements.

BOLA FEP Tubing Reels

Material:

Temperature resistance:

Chemical resistance

FEP

from -200 °C to +205 °C +++ universal

NEW

FDA conform

Product description:

Transparent, gas-tight tubes.

Roll length m	I.D. mm	0.D. mm	Wall thick- ness mm	Bending radius ¹ mm	Burst pressure bar	Cat. No.:
5	3,96	6,35	1,19	34	56	S 2020-24
5	4,35	6,35	1,00	52	51	S 2020-28
5	6,0	8,0	1,00	64	37	S 2020-36
5	8,0	10,0	1,00	100	28	S 2020-48
5	9,52	12,7	1,59	101	37	S 2020-56
5	10,0	12,0	1,00	144	22	S 2020-60
Roll length m	I.D.	0.D. mm	Wall thick- ness mm	Bending radius ¹ mm	Burst pressure ²	Cat. No.:

Roll length m	I.D. mm	0.D. mm	Wall thick- ness mm	Bending radius 1 mm	Burst pressure ² bar	Cat. No.:
10	0,8	1,6	0,40	7	112	S 2022-04
10	1,6	3,2	0,80	13	112	S 2022-08
10	2,0	3,0	0,50	18	56	S 2022-07
10	2,0	4,0	1,00	16	112	S 2022-12
10	4,0	6,0	1,00	36	56	S 2022-20

Applications:

Please find further tube diameters under Cat. No. S 1815-... on page 190 by the metre.

BOLA PFA Tubing Reels

Material:

Temperature resistance:

Chemical resistance:

PFA

from -200 °C to +260 °C +++ universal



FDA conform

Product description:

Transparent, gas-tight tubes.

Cat. No.:	Burst pressure ² bar	Bending radius ¹ mm	Wall thick- ness mm	0.D. mm	I.D. mm	Roll length m
S 2030-12	84	34	1,19	6,35	3,96	5
S 2030-14	64	52	1,00	6,35	4,35	5
S 2030-18	46	64	1,00	8,0	6,0	5
S 2030-24	35	100	1,00	10,0	8,0	5
S 2030-28	47	101	1,59	12,7	9,52	5
S 2030-30	28	144	1,00	12,0	10,0	5
Cat No ·	Ruret nrassura ²	Ronding	Wall thick-	0 D	I D	Roll length

Cat. No.:	Burst pressure ² bar	Bending radius ¹ mm	Wall thick- ness mm	0.D. mm	I.D. mm	Roll length m
S 2032-02	140	7	0,40	1,6	0,8	10
S 2032-04	140	13	0,80	3,2	1,6	10
S 2032-05	70	18	0,50	3,0	2,0	10
S 2032-06	140	16	1,00	4,0	2,0	10
S 2032-10	70	36	1.00	6.0	4.0	10

Applications:

Please find further tube diameters under Cat. No. S 1811-... on page 192 by the metre.



 $[\]mathbf{1}_{\rm Bending\ radius:\ minimum\ bending\ radius\ in\ mm\ at\ a\ room\ temperature\ of\ 23°C}$

² Burst pressure: computed value in bar at a room temperature of 23°C. It is recommended to restrict the maximum working pressure to 25% of the burst pressure. For higher temperatures, this value has to be multiplied by the reduction factor shown on page 359. It is the user's responsibility to check if the used tubing fulfils the respective requirements.



BOLA PFA Corrugated Tubing

Material: **PFA**

Temperature resistance: from -200°C to +260°C

Chemical resistance: +++ universal

transparency:

Vacuum: suitable

FDA conform

Product description:

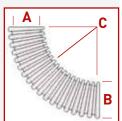
Circular corrugations around the longitudinal axis. Can be shortened easily by means of a tubing cutter (see page 199).

Product advantages:

- » flexible to highly flexible
- » tight bending radius only causes little cross-section reduction
- » non-porous
- » translucent
- » resistant to irradiation and weather
- » almost universal chemical resistance

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





Applications:

Perfect tubing for aggressive and pure liquids or gases



#HELPFUL page 154

Flexible tubing made of static dissipative PFA-EX











 $^{1\,{\}rm Bending}$ radius: minimum bending radius in mm at a room temperature of 23°C

² Burst pressure: computed value in bar at a room temperature of 23°C. It is recommended to restrict the maximum working pressure to 25% of the burst pressure. For higher temperatures, this value has to be multiplied by the reduction factor shown on page 359. It is the user's responsibility to check if the used tubing fulfils the respective requirements.

BOLA Flexible Corrugated Tubing

PFA

Temperature resistance:

Chemical resistance: from -200°C to +260°C +++ universal

transparent

suitable







Product description:

Corrugated tubing with circular corrugations around the longitudinal axis and cylindrical tubing ends with a length of 40 mm which can for example be connected directly to fittings, stopcocks or hose connectors. Together with BOLA Laboratory Screw Joints, the connection is absolutely tight and suitable for vacuum.

Product advantages:

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



Nominal width	Cor Innen-Ø mm	nnecting Pieces Außen-Ø mm	Bending radius ¹ mm	Burst pressure bar	Cat. No.: Length 0,25 m	Cat. No.: Length 0,50 m	Cat. No.: Length 1,00 m	Cat. No.: Length 2,50 m
4,5	2	4	5	1,7		S 1822-01	S 1822-19	S 1822-52
8	6	8	15	2,0	S 1822-92	S 1822-02	S 1822-20	S 1822-56
10	8	10	18	2,0	S 1822-93	S 1822-04	S 1822-22	S 1822-60
13	10	12	23	2,0	S 1822-94	S 1822-06	S 1822-24	S 1822-64
14	12	14	25	2,0		S 1822-08	S 1822-26	S 1822-68
16	14	16	28	2,0		S 1822-10	S 1822-28	S 1822-72
19	16	18	32	2,0	S 1822-98	S 1822-14	S 1822-32	S 1822-76
21	17,5	20	35	2,0		S 1822-16	S 1822-34	S 1822-80
23	20,9	25,4	40	1,2		S 1822-18	S 1822-36	S 1822-84

Applications:

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



#SUITABLE page 90

Laboratory screw joints



#HELPFUL page 154

Flexible tubing made of static dissipative PFA-EX

BOLA Customized Flexible Tubing

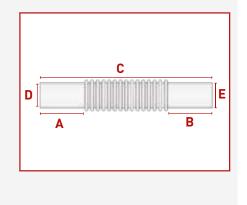
BOLA Flexible Tubing

Flexible tubing made of PFA can be manufactured individually according to your specifications. We would be glad to send you a quotation.

Please complete the list below and send us a copy by fax to

+49 (0)9346-928651. Thank you.

Quantity:	
Tubing size NW:	
A Tubing end length:	
B Tubing end length:	
C Total length:	
D Tubing end I. D.:	
E Tubing end O.D.:	



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



BOLA Flanged Corrugated Tubing

Material: PFA, PBTP

Temperature resistance: from -50 °C to +140 °C Chemical resistance: +++ universal

transparent

suitable

FDA conform

Product description:

Corrugated tubing with circular corrugations around the longitudinal axis and flanged end pieces made of PFA, with two preassembled screw caps with GL thread made of PBTP and washers made of silicone for direct connection to components and devices with GL screw neck. The connection is absolutely tight and suitable for vacuum.

Applications:

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

Tubing size NW	I.D. mm	0.D. mm	For thread GL	Bending radius 1 mm	Pressure load max. bar	Cat. No.: Lenght 0,50 m	Cat. No.: Lenght 1,00 m
4,5	4,3	6,8	14	5	1,7	S 1880-05	S 1880-35
8	7,7	10,7	18	15	3,4	S 1880-10	S 1880-40
10	9,7	13,0	18	18	2,8	S 1880-15	S 1880-45
13	12,4	16,1	25	23	2,6	S 1880-20	S 1880-50





BOLA Heat Shrinkable Tubing

Material: PTFE

Temperature resistance:

Chemical resistance:

Transparency:

Shrink rate:

from -200°C to +250°C +++ universal transparent 4:1

FDA konform

Product description:

For protection of probes, cables, electric components etc. against chemical disturbance. The shrink rate of 4:1 means that the inner diameter of the tubing shrinks to approx. 1/4 of the original inner diameter and that the length shrinks to approx. 15%. Good heat transmission due to low wall thickness.

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

Product advantages:

- » transparent
- » incombustible (ASTM D876)
- » insulation resistance $10^{18} \, \Omega/cm$ (ASTM D 876)
- » good dielectric strengtht
- » flame retardant



#HELPFUL page 361 **Detailed instructions for processing**











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

BOLA Colour Tubing

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

Product description:

The completely coloured tubes are lightfast and assure a high security against possible mixups. The colour pigments may possibly influence the chemical resistance.

I.D. mm	0.D. mm	Bending radius ¹	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: Temperature resistance: Chemical resistance: Transparency:
PFA from -200°C to +260°C +++ universal transparent

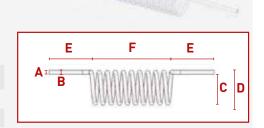
FDA conform

Product description:

Spiral tubing made of PFA is manufactured individually according to your specifications. Please take the possible tubing dimensions from the list on page 192. We would be glad to send you a quotation.

Please complete the list below and send us a copy by fax to +49 (0)9346-928651. Thank you.

A Tubing I.D.: B Tubing O.D.:
R Tubing O.D.
rabing o.b
C Spiral I.D.:
D Spiral O.D.:
E Length of tubing ends:
F Length of spiral:







BOLA PEEK Capillary Tubing

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

PEEK

FDA conform

Product description:

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

Cat. No.:	Pressure resistant up to bar	Bending radius ¹ mm	0.D. mm	I.D. mm
S 1817-08	350	4	1,6	0,25
S 1817-12	350	4	1,6	0,50
S 1817-16	280	4	1,6	0,80
S 1817-20	280	7	3,2	1,60



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.

Cat. No.:	Up to tubing O.D. mm
S 1852-28	28



Spare Parts for Replacement Blades

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

 $^{1\,{\}rm Bending}$ radius: minimum bending radius in mm at a room temperature of 23°C

BOLA Rods

Material:

Chemical resistance:

PTFE

from -200°C to +250°C +++ 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.

0.D. mm		Cat. No.:
6		S 1800-06
8		S 1800-08
10		S 1800-10
12		S 1800-12
15		S 1800-15
16		S 1800-16
20		S 1800-20
25		S 1800-25
30		S 1800-30
40		S 1800-40





BOLA Tiles

Material: PTFE

Temperature resistance:

Chemical resistance:

from -200°C to +250°C +++ universal



Product description:

Standard sizes with different thicknesses.

Length x width x height		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



Ideal for using as table pad. Also suitable for using as slideway or for insulation.









BOLA Sheets

Material:

Temperature resistance:

Chemical resistance:

PTFE from -200°C to +250°C

+++ universal



FDA conform

Product description:

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

Thickness mm	Cat. No.: width 300 mm	Cat. No.: width 600 mm
0,05	S 1803-02	S 1803-21
0,12	S 1803-04	S 1803-23
0,25	S 1803-06	S 1803-25
0,50	S 1803-08	S 1803-27
0,75	S 1803-10	S 1803-29
1,00	S 1803-12	S 1803-31
1,50	S 1803-14	S 1803-33



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:

Chemical resistance:

from -200°C to +205°C

+++ universal

Product description:

Transparent, gastight and non-porous rolls with a length of 1000 mm.

Thickness mm	Width mm	Length mm	Cat. No.:
0,025	150	1000	S 1833-04
0,05	150	1000	S 1833-08
0,25	150	1000	S 1833-16
0,025	300	1000	S 1833-34
0,05	300	1000	S 1833-38
0,25	300	1000	S 1833-46

Applications:

Ideal for using as table pad or for lining drawers. Also suitable for using as slideway or for insulation.











BOLA Sealing Tape

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

Product description:

For sealing threads, checked according to DIN / DVGW and KTW.

Cat. No.:	Length m	Thickness mm	Width mm
H 960-01	12	0,1	12

Product advantages:

- » does not embrittle, swell and agglutinate
- » does not contain oil or grease
- » prevents rusting and sticking
- $\ensuremath{\text{\textbf{y}}}$ easy removal even after years





BOLA Flat Sealing Tapes

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



Product description:

Deformable, virginal PTFE flat tape with expanded fibre structure.

Cat. No.:	Length m	Width mm	Thickness mm
Н 959-16	25	5	2
H 959-22	25	10	3
H 959-28	10	14	4
H 959-34	5	22	7



Product advantages:

- » tasteless
- » odourless up to +270°C
- » self-adhesive
- » physiologically safe
- » not ageing
- » good sealing also on uneven surfaces
- » almost universal chemical resistance
- $\ensuremath{\text{\textit{\upshape}}}$ quick and easy assembly

Applications:

For making customized gaskets "on-site".





BOLA Fluoroplastic Spray

Material:

PTFE



Release and anti-blocking agent as well as lubricant for laboratory.

Capacity ml	Cat. No).:
400	H 958-0]4

Product advantages:

- » dry and greaseless
- » CFC and silicone-free
- » heat resistant up to +260°C
- » non-adhesive and dirt-repellent
- » physiologically safe
- » excellent gliding and separating effects



BOLA Fluorslide Paste

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



Product description:

Extremely stable, synthetic high-temperature paste in resealable tube.

Cat. No.:	Capacity g
S 1870-16	56

Product advantages:

- » exceptionally low friction coefficient
- » extremely long-lasting
- $\textcolor{red}{\triangleright}$ 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

O Krytox-

TELE CONTROL OF THE PARTY OF TH

BOLA Fluoroplastic Grease Tubes

Material: Temperature resistance: Chemical resistance:
PTFE from -20 °C to +260 °C +++ 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: Temperature resistance: Chemical resistance: PTFE from -200°C to +250°C +++ universal

FDA conform

Product description:

Similar to DIN 963/DIN EN ISO 2009

Thread M	Pitch mm	Usable length mm	Dia. of head	Cat. No.:
4	0,7	30	8,4	H 1124-14
5	0,8	30	9,3	H 1124-18
6	1,0	30	11,3	H 1124-22
8	1,25	40	15,8	H 1124-26



BOLA Screws with Cylindrical Head

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

FDA conform

Product description:

Similar to DIN 84/DIN EN ISO 1207

Thread	Pitch	Usable length	Dia. of head	Cat. No.:
M	mm	mm	mm	
4	0,7	30	7,0 x 4,0	H 1128-14
5	0,8	30	8,5 x 4,5	H 1128-18
6	1,0	30	10,0 x 5,0	H 1128-22
8	1,25	40	13,0 x 6,0	H 1128-26



BOLA Hexagon Nuts

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

FDA conform

Product description:

Similar to DIN 934 / DIN EN ISO 4032

Thread M	Pitch mm	Usable length mm	Dia. of head	Cat. No.:
4	0,7	7	5,0	H 1132-14
5	0,8	8	6,0	H 1132-18
6	1,0	10	7,5	H 1132-22
8	1,25	13	9,0	H 1132-26



BOLA Washers

Material: PTFE

Temperature resistance:

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



Product description:

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

Thread M	0.D. mm	I.D. mm	Height mm	Cat. No.:
4	9,0	4,3	0,9	H 1126-14
5	10,0	5,3	1,1	H 1126-18
6	12,0	6,4	1,8	H 1126-22
8	16,0	8,4	1,8	H 1126-26



BOLA Boiling Stones

Material:

Temperature resistance:

Chemical resistance:

PTFE from -200°C to +250°C +++ universal

FDA conform

Product description:

Prevent splashes and production of bubbles during boiling.

Packed in resealable bag.

Cat. No.:	Packing unit	Grain size
	g	mm
H 972-02	500	4
H 972-04	500	6



Product advantages:

» durable

» almost universal chemical resistance

BOLA Balls

Material: PTFE

Temperature resistance:

Chemical resistance:

from -200°C to +250°C

+++ universal



Product description:

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

Cat. No.:	Packing unit	Dia. of ball mm
H 964-03	1 pack of 100 pieces	3
H 964-06	1 pack of 100 pieces	6
H 964-09	1 pack of 100 pieces	9
H 964-15	1 pack of 50 pieces	15
H 964-18	1 pack of 50 pieces	20
H 964-21	1 pack of 25 pieces	25



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



















GROUND JOINT COMPONENTS













209	Ground Joint Componen	ts	219	0-Rings	
	Sleeves with Ribs Sleeves with Gripping Ring	209 210		O-Rings O-Rings for Laboratory	219
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Glass Flange Metal Adaptors 218



BOLA Sleeves – what you should know about.



111

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 qastiqht, 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.







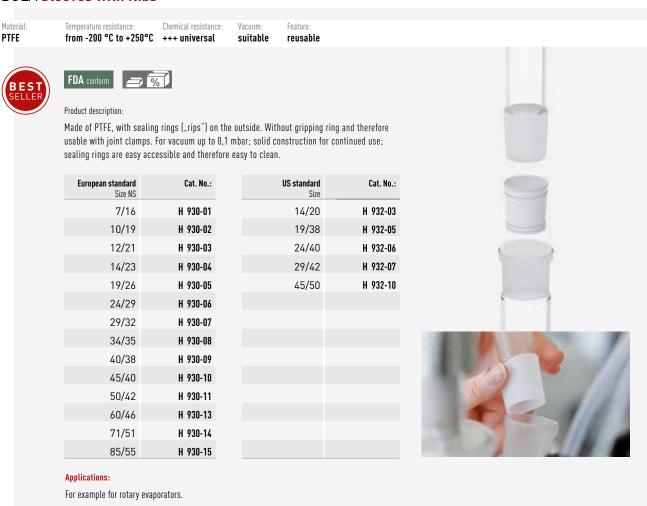








BOLA Sleeves with Ribs



BOLA Sleeves with Gripping Ring

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

Cat. No.:	European standard Size NS
H 933-01	10/19
H 933-02	12/21
H 933-03	14/23
H 933-04	19/26
H 933-05	24/29
H 933-06	29/32
H 933-07	34/35
H 933-09	45/40
H 933-10	50/42
H 933-11	55/44
H 933-12	60/46
H 933-13	71/51
H 933-14	85/55
H 933-15	100/60

US standard Size	Cat. No.:
14/20	H 935-01
19/22	H 935-03
24/40	H 935-05
29/42	H 935-06
45/50	H 935-09



BOLA Spherical Ground Joint Sleeves

Material: Temperature resistance: Feature: Chemical resistance: Vacuum: PTFE from -200 °C to +250°C +++ universal suitable reusable FDA conform Product description: Made of PTFE, with gripping ring and sealing rings on the outside, high-vacuum tight sealing; low leak rate: <1x0,01 mbar x l x s/1;solid construction for continued use. European standard Cat. No.: **US** standard Cat. No.: Size S 13 H 934-02 18 H 931-01 19 H 934-04 28 H 931-06 H 931-10 29 H 934-06 35 H 934-08 35 40 H 934-12 51 H 934-16 64 H 934-18



BOLA Joint Clamps

Material: PTFE

from -50 °C to +250°C +++ universal

Chemical resistance:

Feature: reusable

FDA conform

Product description:

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

Size NS		Cat. No.:
14/23		H 942-14
19/26		H 942-19
29/32		H 942-32
45/40		H 942-45



For connecting ground joint parts, especially if highly aggressive liquids are involved; high recovery even at high temperatures.









BOLA INNOVATION



#1 **Sleeves**

BOLA Sleeves for gastight, liquid-tight connections have sealing rings on the outside which provide a punctal sealing. This prevents sticking and allows easy removal.

BOLA Bellows

Material: Temperature resistance:

PTFE

Chemical resistance:

from -200 °C to +250°C +++ universal

suitable

FDA conform

Product description:

Made of PTFE, with round folds and sealing rings on the outside;

maximum deflection: 40°.

Socket NS	Cone NS	Total minimum length min. mm	Total maximum lengt max. mm	Cat. No.:
29/32	29/32	106	114	H 907-10
45/40	45/40	128	144	H 907-15



Applications:

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

BOLA Ground Joint Connector

Material:

Temperature resistance:

Chemical resistance:

PTFE

from -200 °C to +250°C +++ universal



FDA conform

Product description:

Adaptor made of PTFE to connect two components with ground joint socket. With knurled grip. The product is only exposed to PTFE.

Cat.No.:	Length mm	Bore dia.	Cone size
B 306-03	92		2x NS 29/32



Applications:

For loss- and contamination-free transfer from e. g. a round bottom flask via a ground joint neck into a reactor.

BOLA Bellows

Material: PTFE

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

suitable

FDA conform

Product description:

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

European Standard Socket NS	Cone NS	Total minimum length min. mm	Total maximum lengt max. mm	Cat. No.:
14/23	14/23	82	90	H 906-02
19/26	19/26	93	105	H 906-04
24/29	24/29	110	124	H 906-06
29/32	29/32	100	120	H 906-12
45/40	45/40	130	170	H 906-14





Applications:

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



BOLA Stoppers

Material: PTFE

Chemical resistance:

from -200 °C to +250°C +++ universal

FDA conform

Product description:

 $\label{partial made of PTFE, with ground joint and sealing rings on the outside; knurled or hexagonal grip.$ 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.

Α	Size NS	Knurled grip Cat. No.:
	10/19	H 936-02
	12/21	H 936-03
	14/23	H 936-04
	19/26	H 936-05
	24/29	H 936-06
	29/32	H 936-07
	34/35	H 936-08
	45/40	H 936-10

Hexagonal Cat. No.:	Wrench size (SW) mm	Size NS	3
H 937-04	19	14/23	
H 937-05	26	19/26	
H 937-07	35	29/32	
H 937-10	52	/5//n	





Applications:

For closing ground joint parts.













BOLA Ground Joint Adaptors

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

FDA conform

Product description:

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

Socket NS	Cone NS	Knurled grip dia. mm	Cat. No.:
14/23	19/26	30	H 980-03
14/23	29/32	40	H 980-06
19/26	29/32	40	H 980-09
29/32	45/40	55	H 980-12



For connecting different ground joint sizes.



BOLA Ground Joint GL Tube Fittings

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

FDA conform

Product description:

Fitting made of PTFE, for transition from ground joints to GL threads. For connection of hard-walled tubing (e.g. PTFE, PFA, FEP) with BOLA Laboratory Screw Joints (see page 75). Ground joint body with turned rings and knurled grip for opening. The product is only exposed to PTFE.

Cone size NS	Bore dia. mm	Thread GL	Cat. No.:
14/23	6,5	14	D 570-08
19/26	10,5	18	D 570-16
29/32	14,5	25	D 570-32
29/32	20,0	45	D 570-45

Applications:

For connecting tubes or tubing to vessels with ground joint. For inserting and fixing probes, thermometers, dip tubes or cables.





BOLA Socket GL Tube Fittings

Material: Temperature resistance
PTFE from -200°C to +29

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

Vacuum: **suitable**

M

FDA conform

Product description:

Fitting made of PTFE, with socket for tubes with ground joint and GL thread for connection of hard-walled tubing (e.g. PTFE, PFA, FEP) with BOLA Laboratory Screw Joints (see page 90). The product is only exposed to PTFE.

Cat. No.:	Thread GL	Bore dia. mm	Socket size
D 571-08	14	6,5	14/23
D 571-16	18	10,5	19/26
D 571-32	25	12,5	29/32





BOLA Spherical Ground Joint GL Tube Fittings

Material: **PTFE** Temperature resistance

Chemical resistance:

Vacuum:

from -200°C to +250°C +++

+++ universal

suitable



FDA conform

Product description:

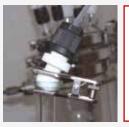
Fitting made of PTFE, for transition from spherical ground joints to GL threads. For connection of hard-walled tubing (e.g. PTFE, PFA, FEP) with BOLA Laboratory Screw Joints (see page 90). The product is only exposed to PTFE.

Cat. No.:	Angle A	Thread GL	Bore dia. mm	Spherical ground joint size S
D 790-24	25°	18	10,5	19
D 790-36	20°	25	14,5	29
D 790-48	10°	25	14,5	35



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

FDA conform

Product description:

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

Cat. No.:	Necks	For tubing O.D.	For ground joint
	GL	mm	NS
D 620-08	2 x 14	2 x 8	29/32

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.







removed

BOLA Reactor Multiple Distributor with Ground Joint

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



FDA conform

Product description:

Completely made of PTFE. Cone with elevated sealing rings on the outside and knurled grip for easy removal and three GL-threaded necks for connection of hard-walled tubing and tubes made of glass, plastic or metal by means of BOLA Laboratory Screw Joints. Universal chemical resistance. The product is only exposed to PTFE.

For ground joint NS	For tubing O. D. max. mm	Necks GL	Cat. No.:
14/23	3 x 8	3 x 14	D 623-14
19/26	3 x 8	3 x 14	D 623-19
29/32	3 x 10	3 x 18	D 623-29
45/40	3 x 10	3 x 18	D 623-45

Applications

Easy extension of connections on glass lids with ground joint. For leading in and removal of liquids in glass reactors without contamination of the media through the ambient air.







BOLA Ground Joint GL Adaptors

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

Chemical resistance:

suitable

FDA conform

Product description:

Black screw cap made of PPS with GL 45 thread or blue screw cap made of PP with GLS 80 thread, movable insert with ground joint made of PTFE. Transition from a ground joint to a glass thread. The body can be turned independently from the screw cap. The completely assembled adaptor can be removed and fixed on another bottle without the risk of disarranging the tubing. Very good chemical resistance.

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

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



Material:

Temperature resistance

Chemical resistance:

Vacuum:

PTFE, PP from 0°C to +110°C

+++ universal suitable

C	For bottle thread GLS	Socket NS	Cat. No.:
	80	29/32	D 734-50
	80	45/40	D 734-54

Applications:

Assembly of components with ground joint (condensers, stirrer bearings etc.) on glass bottles or GL-threaded necks.





BOLA **PRACTICAL TIP**

You have a ground joint, but you don't know exactly its size?

Take our ground joint reducing set which allows bridging different cone and socket sizes.

see pege 218













BOLA Ground Joint Reduction Set

PTFE

Temperature resistance:

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

suitable



FDA conform

Product description:

Made of PTFE, consisting of reducing rings graduated as follows: NS 14 - NS 19 - NS 24 - NS 29 - NS 34 - NS 45 and NS 60.

Cat. No.:	Height/length of ground joint mm	Dimensions NS
H 981-14	20	14-20

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

PTFE, Silicone

Temperature resistance: from -60°C to +230°C

Chemical resistance: +++ universal

Pressure:

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.

Cat. No.:	Sealing height mm	Bore dia. mm	0.D. mm	Nominal width
D 720-10	2	14	25	10
D 720-15	3	16	32	15
D 720-25	3	27	47	25

For HWS $^{\scriptsize\textcircled{\tiny{1}}}$ "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.

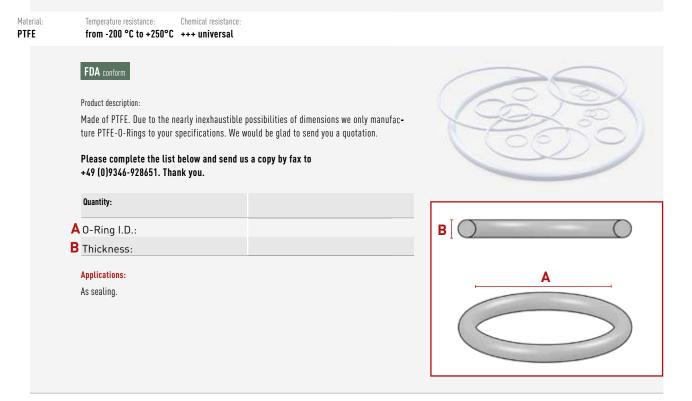








BOLA O-Rings



BOLA O-Rings for Laboratory Flat Flanges

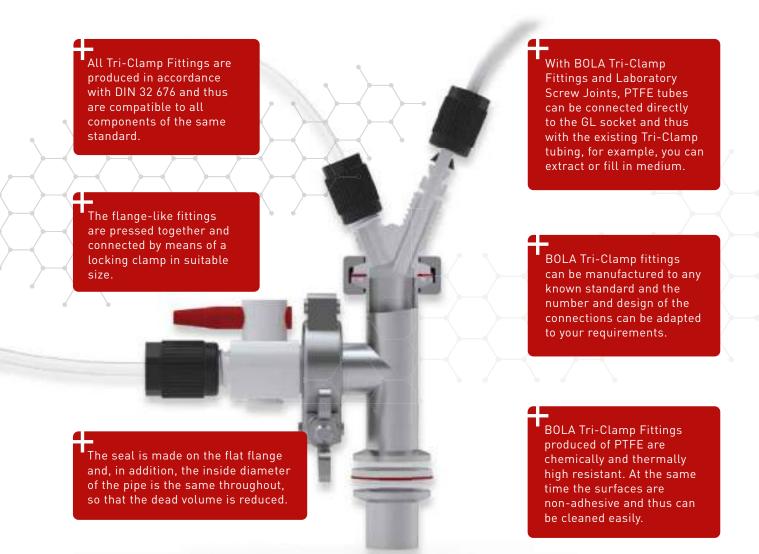




BOLA Tri-Clamp Fittings – what you should know about.

Tri-Clamp is a standardized screwing system which is used in chemical, pharmaceutical and food industry everywhere where great importance on cleanliness and reliability is attached and thus components that can be cleaned easily and assembled safely are required.

All BOLA components with Tri-Clamp are produced in accordance with the relevant standard DIN 32 676. Other dimensions and further adaptors for the transition to other threads are always available on demand.



BOLA Tri-Clamp GL-Adaptor

Material:

Temperature resistance:

Chemical resistance:

PTFE

from -200 °C to + 250 °C +++ 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.

Cat. No.:	Threaded Neck GL	For tube I.D.	Nominal size as per DIN	Plate-Ø
D 901-02	14	8,0	DN 08	25,5
D 901-04	18	10,0	DN 10	25,5
D 901-06	25	10,0	DN 10	25,5
D 901-22	14	10,0	DN 10	34,0
D 901-24	18	16,0	DN 15	34,0
D 901-26	25	20,0	DN 20	34,0
D 901-42	14	26,0	DN 25	50,5
D 901-44	18	26,0	DN 25	50,5
D 901-46	25	32,0	DN 32	50,5
D 901-48	45	38,0	DN 40	50,5



Applications:

For connection of hard-walled tubing (such as glass, stainless steel) or fluoroplastic tubes (such as PTFE, PFA, FEP) with BOLA Laboratory Screw Joints to Tri-Clamp components as per DIN 32 676.



#SUITABLE page 90

Laboratory screw joints

BOLA Tri-Clamp Multiple Distributor

Material:

Temperature resistance:

Chemical resistance:

PTFE

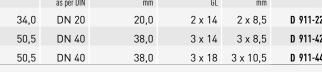
from -200 °C to +250 °C +++ universal



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.

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



Applications:

For connection of hard-walled tubing (such as glass, stainless steel) or fluoroplastic tubes (such as PTFE, PFA, FEP) with BOLA Laboratory Screw Joints to Tri-Clamp components as per DIN 32 676.















BOLA Tri-Clamp GL-Stopcocks

Chemical resistance:

PTFE, PP

from 0 °C to +110 °C

+++ universal

FDA conform

Product description:

2-Way stopcock made of PTFE with straight bore, one Tri-Clamp neck as per DIN 32 676 and one GL-threaded neck. Cylindrical stopcock made of PTFE for reliable tightness and grip made of PP for marking the flow direction. Universal chemical resistance, the flowing product is only exposed to PTFE.

Cat. No.:	bore dia. mm	connecting thread GL	For tube I.D.	Nominal size as per DIN	Plate-Ø
D 917-02	6	18	8,0	DN 08	25,0
D 917-24	8	25	16,0	DN 15	34,0
D 917-42	8	25	26,0	DN 25	50,5



Quick and easy disconnection of flow. For connection of hard-walled tubing (such as glass, stainless steel) or fluoroplastic tubes (such as PTFE, PFA and FEP) with BOLA Laboratory Screw Joints to Tri-Clamp components as per DIN 32 676.





BOLA Tri-Clamp Gaskets

Material:

Temperature resistance:

Chemical resistance:

PTFE, Silikon

from -60 °C to +230 °C +++ 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.

Plate-Ø	Nominal size as per DIN	For tube I.D.	Cat. No.:
25,5	DN 08	8,0	D 930-02
25,5	DN 10	10,0	D 930-04
34,0	DN 10	10,0	D 930-22
34,0	DN 15	16,0	D 930-24
34,0	DN 20	20,0	D 930-26
50,5	DN 25	26,0	D 930-42
50,5	DN 32	32,0	D 930-44
50,5	DN 40	38,0	D 930-46
64,0	DN 50	50,0	D 930-62
91,0	DN 65	66,0	D 930-72





Applications:

Chemical inert, reusable gasket for Tri-Clamp connections as per DIN 32 676.



BOLA Adaptor Tri-Clamp Hose Connector

Material:

Temperature resistance:

Chemical resistance:

PTFE

from -200 °C to + 250 °C +++ universal

FDA conform

Product description:

Fitting made of PTFE for transition of Tri-Clamp as per DIN 32 676 to a hose connector. Universal chemical resistance, the flowing product is only exposed to PTFE.

Cat. No.:	Hose Connector O.D.	For tube I.D.	Nominal size as per DIN	Plate-Ø mm
D 915-02	10,4	8,0	DN 08	25,0
D 915-22	10,4	10,0	DN 10	34,0
D 915-42	16,0	26,0	DN 25	50,5



For connection of elastic tubing (such as silicone, Viton®, Tygon®) to Tri-Clamp components as per DIN 32 676.









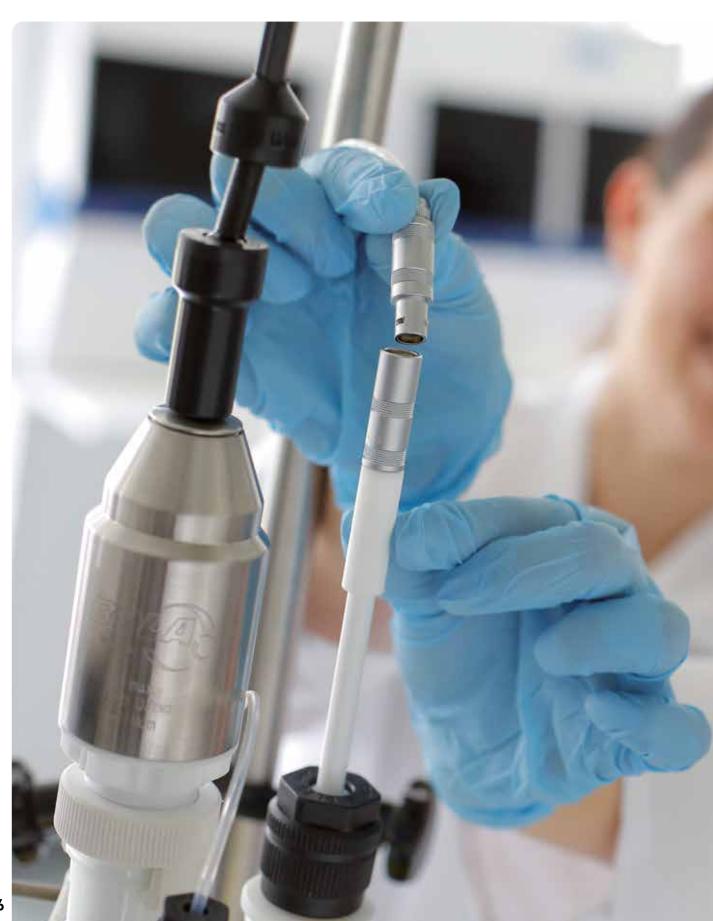








Precise and reliable measurements even in aggressive liquids – all probes are encapsulated with PTFE for maximum chemical resistance.







TEMPERATURE MEASUREMENT

241















232 Temperature Probes PT100

Double Temperature Probes	
PT 100 Lemo® Compact	232
Temperature Probes PT 100	233
Temperature Probes PT 100	
Lemo [®]	233
Temperature Probes PT 100	
Lemo® Compact	234
Temperature Probes PT 100	
Lemo®	235
Total Immersion Probes	
PT 100	236
Total Immersion Probes	
PT 100 Lemo®	237
Total Immersion Probes	
PT 100 Lemo®	237

242 Temperature Probes K

Temperature Probes K Temperature Probes K with SMP plug	242 242
Adaptors / Accessories	
Extension Cable for Tempera Probe Lemo®	ature 241

Probe Lemo® 241 Adaptors for Temperature Probes 241 Probe Insertion 243

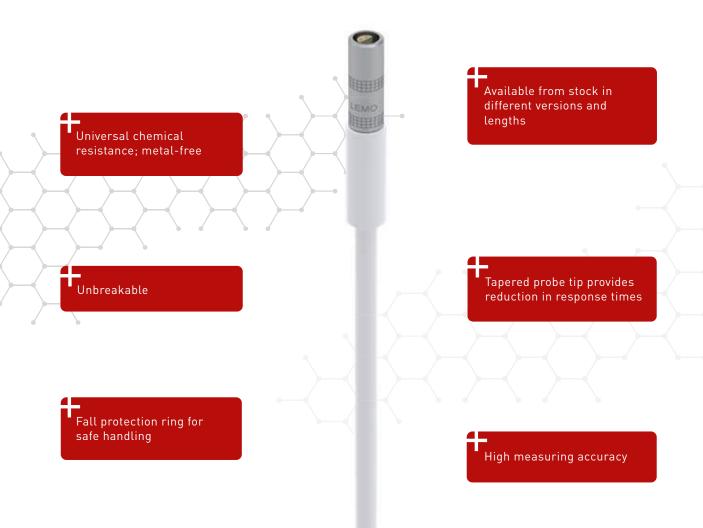
238 Temperature Probes PT1000

Temperature Probes PT1000	238
Temperature Probes	
PT1000 Lemo®	238
Total Immersion Probes	
PT1000	239
Total Immersion Probes	
PT1000 Lemo®	239



BOLA Temperature Measurement – what you should know about.

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

























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

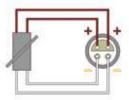
The four-wire system of the PT 100 probes eliminates nearly completely the influence of the resistivity and the transition resistance (failure: approx. 0,002-0,004 % / 0hm). Normally, a calibration is not necessary. Long connecting cables can be used with the four-wire system.

PT 1000 probes use the two-wire system. At 0 °C, PT 100 probes have a resistance of 100 0hm whereas PT 1000 probes have a resistance of 1000 0hm. 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:

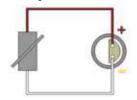
Tolerance: 0,15 + (0,002 x (t)) Typical aberrations: at 0° C: +/-0,15 $^{\circ}$ C at 100° C: +/- 0,35 $^{\circ}$ C



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

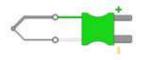
Class:

 Tolerance:
 0.15 + (0.002 x (t))

 Typical aberrations:
 at 0°C : +/-0.15°C

at 100°C: +/- 0,35°C

Pin configuration of the Temperature Probe K



Temperature Probe K

Temperature range:from 0°C to + 300°CSpecification:IEC60584.3:2007Type:Type K Thermoelement

Tolerance: $+/- 0.15^{\circ}C$ Dimension of panel: $38 \times 38 \times 2.5 \text{ mm}$

Difference between PT 100 and PT 1000

Both, PT 100 and PT 1000 probes are resistance thermometers but have a different coefficient of temperature. Depending on the platinum used, PT 1000 probes have a coefficient of temperature of 3,85 Ohm/°C and PT 1000 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!











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.



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 electrographitated carbon, the electrically isolating PTFE becomes static dissipative.

The construction and performance data are identical with the known BOLA Temperature Probes.

You will find BOLA Temperatures Probes Compact EX on page 159. Please see also page 145 for additional information on BOLA products in static dissipative materials.

Plugs and sockets

Our temperature probes are normally supplied with plugs or sockets type LEMO® size 1. Should you need a different LEMO® size, we can offer corresponding adaptors (see page 241).

We can also supply temperature probes with your specific plug or socket. You can find below the most important dimensions for determination of LEMO® plugs and sockets.



Easy identification of plug and socket size!

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



Plug Lemo Size 0 0.D. 7 mm



Plug Lemo Size 1 0.D. 9 mm



Socket Lemo Size 0 0.D. 9 mm



Socket Lemo Size 1



BOLA Double Temperature Probes PT 100 Lemo® Compact

Temperature resistance:

Chemical resistance:

PTFE

from -200°C to +250°C +++ universal

from -50°C to +250°C







Product description:

Two independent measuring sensors PT 100 in one PTFE-encapsulated stainless steel tube (1.4571). Collar ring Ø 12 mm. Connection by two couplings (type Lemo®, socket size 1, 4-wire system) fixed directly at the end of the probe.

Typical response times:

» T 50: 20 - 24 s » T 90: 30 s

See page 352 for detailed explanation.

Usable length mm	Probe dia.	Total length mm	Number of sensors	Width of coupling A mm ca.	Cat. No.:
300	8	400	2x PT 100	27	P 1740-20
400	8	500	2x PT 100	27	P 1740-23
500	8	600	2x PT 100	27	P 1740-30
300	6	400	2x PT 100	27	P 1740-40

Applications:

- » parallel temperature measurement in aggressive liquids
- » double safety due to redundant systems
- » control function due to two independent measuring sensors
- » suitable for simultaneous temperature measurement and safety circuit as per the specifications of the standard DIN EN 61010-2-010 but only one NS/GL socket will be occupied, separately switched sensors.
- » ideal for built-in measurement cables
- » identical versions also available in static dissipative PTFE-EX (see page 159)













#SUITABLE page 126

Swivelling screw fittings

BOLA INNOVATION



#1 Double Temperature Probes Lemo® Compact

Two PT 100 elements in one PTFE-encapsulated stainless steel tube combine several functions: for example measuring temperature in aggressive liquids or making measurements in safety circuit.



BOLA Temperature Probes PT 100

Material: PTFE

Temperature resistance:

from -200°C to +250°C

Chemical resistance: +++ universal

Temperature range: from -50°C to +250°C





Product description:

One measuring sensor PT 100 in a PTFE-encapsulated stainless steel tube (1.471). Temperature probe ∅ 8mm, tip ∅ 6mm, collar ring ∅ 12mm. With white PFA-coated cable (length: 1,5m, 4 strands).

Typical response times:

» T 50: 7 - 12 s » T 90: 14 - 16 s

Usable length mm	Total length mm	Connector	Cat. No.:
100	135	strands, 4-wire-system	P 1750-10
200	240	strands, 4-wire-system	P 1750-15
300	340	strands, 4-wire-system	P 1750-20
500	560	strands, 4-wire-system	P 1750-25
600	660	strands, 4-wire-system	P 1750-30

Applications:

- » temperature measurement in aggressive liqu
- » cable provides flexible connection from measuring device to medium



#SUITABLE page 34

Slip-on Baffles to transform temperature probes to baffles.

See page 352 for detailed explanation.





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



Product description:

One measuring sensor PT 100 in a PTFE-encapsulated stainless steel tube (1.471). Temperature probe ∅ 8mm, tip ∅ 6mm, collar ring ∅ 12mm. With white PFA-coated cable (length: 1,5m) and coupling (type Lemo® socket size 1, 4-wire-system).

Typical response times:

» T 50: 7 - 12 s » T 90: 14 - 16 s

See page 352 for detailed explanation.

Usable length mm	Total length mm	Connector	Cat. No.:
100	135	socket, 4-wire-system	P 1760-10
200	240	socket, 4-wire-system	P 1760-15
300	340	socket, 4-wire-system	P 1760-20
500	560	socket, 4-wire-system	P 1760-25
600	660	socket, 4-wire-system	P 1760-30

Applications:

- » temperature measurement in aggressive liquids
- » cable provides flexible connection from measuring device to medium





















BOLA Temperature Probes PT 100 Lemo® Compact

Temperature resistance:

Chemical resistance:

PTFE

from -200°C to +250°C +++ universal

from -50°C to +250°C







Product description:

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

Typical response times:

» T 50: 7 - 12 s » T 90: 14 - 16 s

See page 352 for detailed explanation.

Cat. No.:	Connector	Total length mm	Usable length mm
P 1730-10	socket, 4-wire-system	170	100
P 1730-20	socket, 4-wire-system	370	300
P 1730-23	socket, 4-wire-system	470	400
P 1730-25	socket, 4-wire-system	570	500

Applications:

- » temperature measurement in aggressive liquids
- » ideal for built-in measurement cables
- » identical versions also available in static dissipative PTFE-EX (see page 159)









#SUITABLE page 126 Swivelling screw fittings

BOLA INNOVATION



#1 **Temperature Probes Lemo® Compact**

Many measuring sensors are connected directly to the cable. The Lemo® connector of BOLA Temperature Probes Compact is connected to the sensor so that the temperature probe can be exchanged easily.



BOLA Temperature Probes PT 100 Lemo®

Material: PTFE

Temperature resistance:

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

Temperature range: from -50°C to +250°C



Product description:

One measuring sensor PT 100 in a PTFE encapsulated stainless steel tube (1.4571). Temperature probe Ø 8 mm, tip Ø 6 mm, collar ring Ø 12 mm. With white PFA-coated cable (length: 1,5 m) and mounted Lemo® plug size 1, 4-wire system.

Typical response times:

» T 50: 7 - 12 s » T 90: 14 - 16 s

See page 352 for detailed explanation.

Usable length mm	Total length mm	Connector	Cat. No.:
100	135	plug, 4-wire-system	P 1762-10
200	240	plug, 4-wire-system	P 1762-15
300	340	plug, 4-wire-system	P 1762-20
500	560	plug, 4-wire-system	P 1762-25
600	660	plug, 4-wire-system	P 1762-30

Applications:

- » temperature measurement in aggressive liquids
- » cable provides flexible connection from measuring device to medium















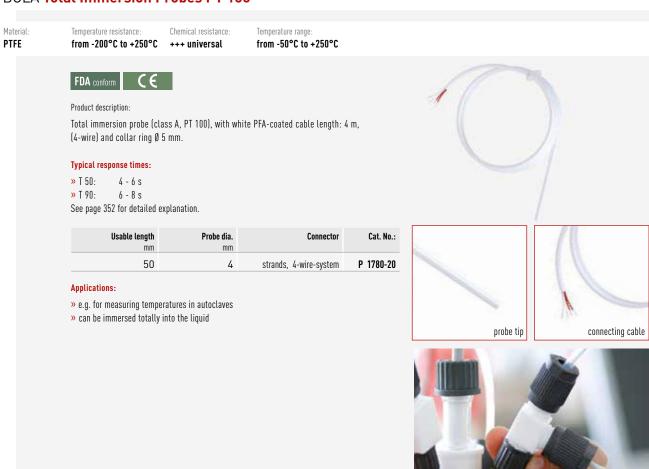






BOLA Total Immersion Probes PT 100

#SUITABLE page 90 Laboratory screw joints



BOLA Total Immersion Probes PT 100 Lemo®

Material: PTFE

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

Chemical resistance:

Temperature range: from -50°C to +250°C



Product description:

Total immersion probe (class A, PT 100), with white PFA-coated cable (length: 4 m), coupling (type Lemo®, socket size 1, 4-wire) and collar ring Ø 5 mm.

Typical response times:

4 - 6 s » T 50: » T 90: 6 - 8 s

See page 352 for detailed explanation.

Cat. No.:	Connector	Probe dia.	Usable length mm
P 1790-20	socket, 4-wire-system	4	50

Applications:

- » e.g. for measuring temperatures in autoclaves
- » can be immersed totally into the liquid











BOLA Total Immersion Probes PT 100 Lemo®

Material: PTFE

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

Chemical resistance: +++ universal

Temperature range: from -50°C to +250°C



Product description:

Total immersion probe (class A, PT 100), with white PFA-coated cable (length: 4 m), coupling (type Lemo $^{\circledR}$, plug size 1, 4-wire) and collar ring \emptyset 5 mm.

Typical response times:

» T 50: 4 - 6 s 6-8s » T 90:

See page 352 for detailed explanation.

Probe	Usable length mm	Probe dia.	Connector	Cat. No.:
	50	4	plug, 4-wire-system	P 1792-20

Applications:

- » e.g. for measuring temperatures in autoclaves
- » can be immersed totally into the liquid





















BOLA Temperature Probes PT 1000

PTFE

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

Chemical resistance:

from -50°C to +250°C



Product description:

One measuring sensor PT 1000 in a PTFE encapsulated stainless steel tube (1.4571). Temperature probe ∅ 8 mm, tip ∅ 6 mm, collar ring ∅ 12 mm. With white PFA-coated cable (length: 1,5 m, 2-wire system).

Typical response times:

» T 50: 16 - 18 s 47 - 50 s » T 90:

See page 352 for detailed explanation.

Cat. No.	Connector	Total length mm ca.	Usable length mm
P 1950-15	strands, 2-wire system	260	200
P 1950-20	strands, 2-wire system	360	300
P 1950-25	strands, 2-wire system	560	500
P 1950-30	strands, 2-wire system	660	600







#SUITABLE page 34

Slip-on Baffles to transform temperature probes to baffles

BOLA Temperature Probes PT 1000 Lemo®

Material: PTFE

Temperature resistance:

Chemical resistance:

Temperature range:

from -200°C to +250°C +++ universal

from -50°C to +250°C





Product description:

One measuring sensor PT 1000 in a PTFE encapsulated stainless steel tube (1.4571). Temperature probe \emptyset 8 mm, tip \emptyset 6 mm, collar ring \emptyset 12 mm. With white PFA-coated cable (length: 1,5 m) and mounted Lemo® plug size 1, 2-wire system.

Typical response times:

» T 50: 16 - 18 s » T 90: 47 - 50 s

See page 352 for detailed explanation.

Cat. No.:	Connector	Total length mm ca.	Usable length mm
P 1962-15	plug, 2-wire system	260	200
P 1962-20	plug, 2-wire system	360	300
P 1962-25	plug, 2-wire system	560	500
P 1962-30	plug, 2-wire system	660	600

Applications:

- » temperature measurement in aggressive liquids
- » cable provides flexible connection from measuring device to medium









BOLA Total Immersion Probes PT 1000

Material: Temperature resistance: Chemical resistance: Temperature range:

FDA conform **C E**

from -200°C to +250°C

Product description:

PTFE, PFA

PTFE, PFA

Total immersion probe PT 1000, collar ring \emptyset 5mm. With white PFA-coated cable (length: 4 m, 2-wire system).

+++ universal

Typical response times:

» T 50: 16 - 18 s » T 90: 47 - 50 s

See page 352 for detailed explanation.

Cat. No.:	Connector	Probe dia. mm	Usable length mm
P 1980-20	strands, 2-wire system	4	50

from -50°C to +250°C

Applications:

- » e.g. for measuring temperatures in autoclaves
- » vollständig ins Medium eintauchbar





BOLA Total Immersion Probes PT 1000 Lemo®

Material: Temperature resistance: Chemical resistance: Tempera

Temperature resistance: Chemical resistance: Temperature range:

from -200°C to +250°C +++ universal from -50°C to +250°C

FDA conform (E

Product description:

Total immersion probe PT 1000, collar ring Ø 5 mm. With white PFA-coated cable (length: 4 m), mounted Lemo $^{\circledcirc}$ plug size 1, 2-wire system.

Typical response times:

» T 50: 16 - 18 s
» T 90: 47 - 50 s

See page 352 for detailed explanation.

Cat. No.:	Connector	Probe dia.	Usable length
		mm	mm
P 1992-20	nlug. 2-wire system	4	50

Annlications:

- » e.g. for measuring temperatures in autoclaves
- » can be immersed totally into the liquid











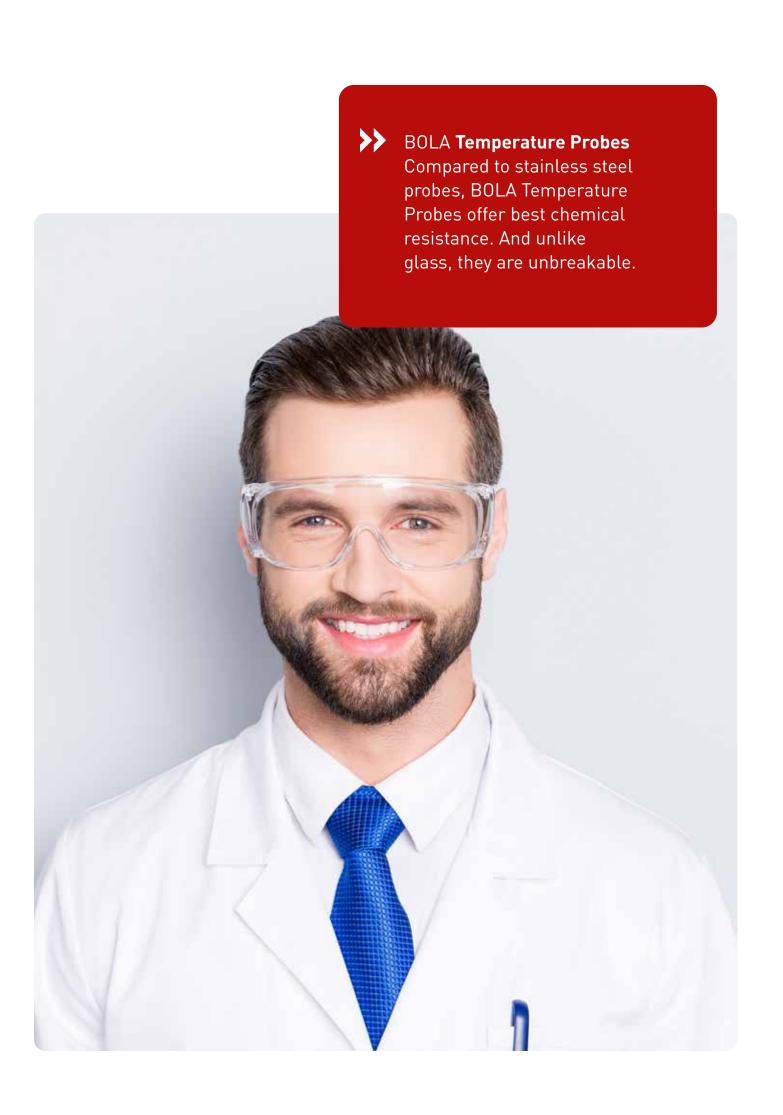












BOLA Extension Cable for Temperature Probe Lemo®

FDA conform

Product description:

PTFE-coated, 4-wire measuring cable with coupling (type Lemo®). Due to the 4-wire system there is no need to compare with a measuring apparatus. Suitable for all BOLA Temperature Probes with coupling type Lemo®.

	Cable length mm	Size first side	Size second side	Transition from Size	Cat. No.
A	1.500	Plug 1	Plug 1	Socket size 1 to socket size 1	P 1724-08
	3.000	Plug 1	Plug 1	Socket size 1 to socket size 1	P 1724-16

	Cable length mm	Size first side	Size second side	Transition from Size	Cat. No.
В	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

A B

Applications:

- » for the extension of existing measuring cables
- » for fix installation e.g. in extractor hoods

BOLA Adaptors for Temperature Probes

Product description:

4-wire adaptors.

	Size first side	Size second side	Length mm	Transition from size	Cat. No.:
A	Plug 1	Plug 1	72	Socket size 1 to Socket size 1	P 1720-16
В	Plug 1	Plug O	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 $^{\circledR}$



















BOLA Temperature Probes K

Material: Temperature resistance: Chemical resistance: Temperature range:
PTFE from -200°C to +250°C +++ universal from -50°C to +250°C

FDA conform

Product description:

Thermocouple K (Ni Cr + Ni) in a PTFE-encapsulated stainless steel tube (1.4571). Temperature probe \emptyset 8 mm, pointed tip, collar ring \emptyset 12 mm. With green PFA-coated cable (length: 1,5m, 2-wire-system)

Typical response times:

» T 50: 25 s
» T 90: 59 s

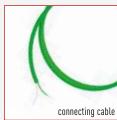
See page 352 for detailed explanation.

Usable length Total l	ength Connect	or Cat. No.:
200	240 strands, 2-wire-syste	m P 1850-15
300	340 strands, 2-wire-syste	m P 1850-20
500	560 strands, 2-wire-syste	m P 1850-25

Applications:

- » temperature measurement in aggressive liquids
- » cable provides flexible connection from measuring device to medium





BOLA Temperature Probes K with SMP-Connector

Material: Temperature resistance: Chemical resistance: Temperature range:
PTFE from -200°C to +250°C +++ universal from -50°C to +250°C

FDA conform

Product description:

Thermocouple K (Ni Cr + Ni) in a PTFE-encapsulated stainless steel tube (1.4571). Temperature probe \emptyset 8 mm, pointed tip, collar ring \emptyset 12 mm. With green PFA-coated cable (length: 1,5m) and SMP-plug.

Typical response times:

» T 50: 25 s » T 90: 59 s

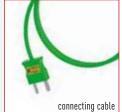
See page 352 for detailed explanation.

Usable length mm	Total length mm	Connector	Cat. No.:
200	240	SMP plug, 2-wire-system	P 1860-15
300	340	SMP plug, 2-wire-system	P 1860-20
500	560	SMP plug, 2-wire-system	P 1860-25

Applications:

- » temperature measurement in aggressive liquids
- » cable provides flexible connection from measuring device to medium







#SUITEBLE page 34

Slip-on Baffles to transform temperature probes to baffles.



BOLA Probe Insertion

Material:

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

Chemical resistance: +++ universal

PTFE, PPS

FDA conform

Product description:

Black screw cap made of PPS with GL 45 thread, movable body made of PTFE with adjusting screw for fixing and sealing sensors. The product is only exposed to PTFE.

Cat. No.:	For sensor dia.	For thread GL
D 780-14	12 (+/- 0,5)	45

Applications:

For contamination-free insertion of sensors into bottles with GL 45 thread.























VESSELS AND DISTILLATION EQUIPMENT



















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BOLA Scrubber Columns

 Material:
 Temperature resistance:
 Chemical resistance:
 Pressure:
 Transparency:

 FEP, PTFE
 from -200°C to +205°C
 +++ universal
 no pressure
 transparent



Product description:

Tall, slim scrubber column made of FEP. Inlet and outlet tube as well as riser tube are made of FEP [5,6 x 8 mm], bottom and top are made of pure PTFE. The standard PTFE frit has a pore size of approx. 3 µm and is screwed on the riser tube with an M8x1 thread. It can be exchanged with the PTFE gas distributor with fine bores (Cat. No. N 1501-16 - page 327) which needs a lower primary pressure.

Capacity ml	Total height mm	Connection for tubing O.D. mm	O.D. of column mm	Cat. No.:
500	400	2 x 8	54	A 117-04
1.000	700	2 x 8	54	A 117-08

Product advantages:

- » transparent
- » unbreakable
- » intense mixing of gas due to tall riser tube
- » frit easily exchangeable

Flow rate:

Using the standard gas distributor and at the stated system pressure.

Cat. No.:	System pressure		
	0,1 bar	0,3 bar	0,6 bar
A 117-04	15,0 l/h	62,5 l/h	130,0 l/h
A 117-08	5,0 l/h	50,0 l/h	117,5 l/h





#SUITABLE page 328 Scrubber Adaptor for Bottles with GL 45 and GLS 80



BOLA Scrubber Bottles

 Material:
 Temperature resistance:
 Chemical resistance:
 Pressure:
 Transparency:

 PFA, PTFE
 from -200°C to +250°C
 +++ universal
 no pressure
 transparent

Product description:

Bottle made of PFA. PTFE top with two threaded connections. The standard PTFE frit has a pore size of approx. 3 µm and is screwed on the riser tube with an M8x1 thread. It can be exchanged with the PTFE gas distributor with fine bores (Cat. No. N 1501-16 – page 327) which needs a lower primary pressure.

Cat. No.:	Connection for tubing O.D. mm	Total height mm	Capacity ml
A 118-01	2 x 6	175	250
A 118-02	2 x 6	200	500
A 118-03	2 x 8	240	1.000

Product advantages:

- » transparent
- » unbreakable
- » frit easily exchangeable

Flow rate

Using the standard gas distributor and at the stated system pressure.

Cat. No.:	System pressure		
	0,1 bar	0,3 bar	0,6 bar
A 118-01	12,5 l/h	67,5 l/h	140,0 l/h
A 118-02	7,5 l/h	30,0 l/h	80,0 l/h
A 118-03	7,5 l/h	37,5 l/h	80,0 l/h













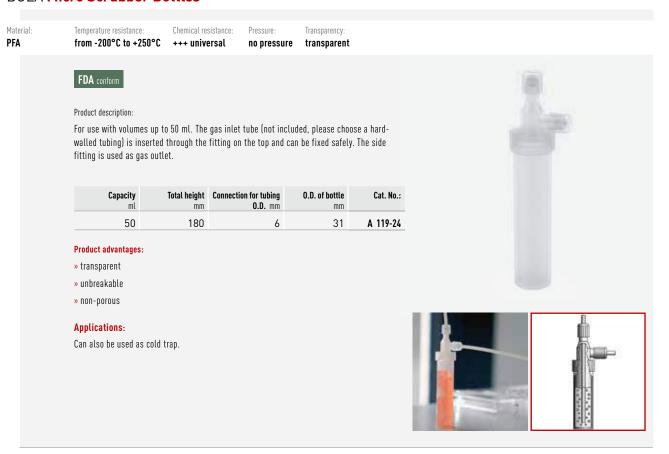




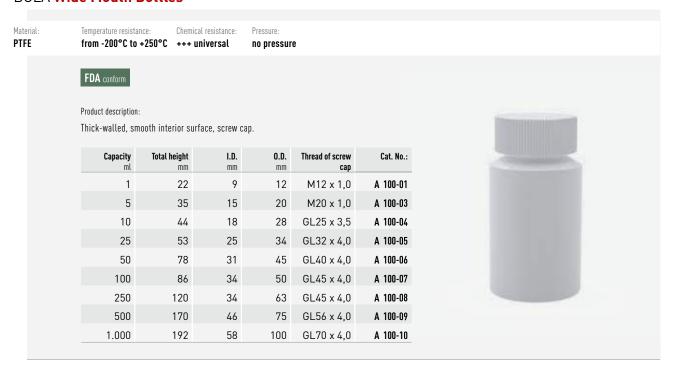




BOLA Micro Scrubber Bottles



BOLA Wide Mouth Bottles





BOLA Wide Mouth Bottles with Conical Neck

Material: Temperature resistance: Chemical resistance: PFA from -200°C to +250°C +++ universal no pressure transparent Product description: Transparent, non-porous, conical neck, screw cap. Cat. No.: Capacity Total height 0.D. **Buttress thread** mm 50 94 20 38 28 A 103-03 100 117 45 28 A 103-06 20 250 153 32 61 40 A 103-09 500 181 76 40 32 A 103-12 1.000 221 32 94 40 A 103-15 **#SUITABLE** page 95 #SUITABLE page 99 Distributors for different bottle threads Threaded adaptors for connecting and tubing diameters

BOLA Wide-Mouth Bottles with Conical Neck

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

FDA conform

Product description:

Thick-walled, smooth interior surface, ergonomic grips on bottle and screw cap.

Cat. No.:	Thread M	0.D. mm	I.D. of neck	Total height mm	Capacity ml
A 111-16	25 x 2,0	33	19	62	25
A 111-24	30 x 2,0	43	25	77	50
A 111-32	42 x 2,5	52	33	87	100
A 111-40	48 x 2,5	67	41	112	250



multiple distributors GL45









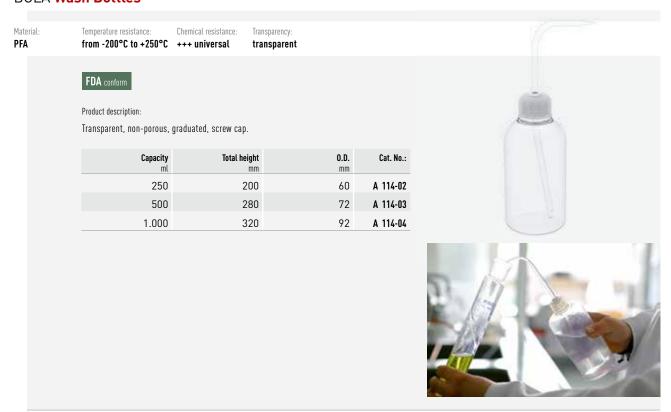








BOLA Wash Bottles



BOLA Round Bottom Flasks

Product description:

Transparent, non-porous, with ground joint neck size 29.

Cat. No.:	O.D. of ball	Total height	Capacity ml
A 158-06	67	117	100
A 158-08	88	149	250
A 158-09	107	177	500

Applications:

For rotary evaporators.





#SUITABLE page 213 Different types of stoppers



BOLA Round Bottom Flasks with Two or Three Ground Joint Necks

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

Product description:

Transparent, non-porous, central ground joint neck size 29 and lateral ground joint necks.

A	Capacity ml	Total height mm	O.D. of ball mm	Lateral necks NS	Cat. No.:
	100	117	67	1 x 14/23	A 155-12
	250	149	88	1 x 29/32	A 155-20
	500	177	107	1 x 29/32	A 155-36

Cat. No.:	Lateral necks NS	O.D. of ball mm	Total height mm	Capacity ml	В
A 156-12	2 x 14/23	67	117	100	
A 156-20	2 x 29/32	88	149	250	
A 156-36	2 x 29/32	107	177	500	



















BOLA Round Bottom Flasks with Threaded GL Necks

 Material:
 Temperature resistance:
 Chemical resistance:
 Transparency:

 PFA
 from -200°C to +250°C
 +++ universal
 transparent

Product description:

Transparent, non-porous, central ground joint neck size 29 and 2 lateral GL 18 threaded necks (suitable laboratory screw joints with Cat. No. D 629-.. can be found on page 90).

Cat. No.:	0.D. of ball mm	Total height mm	Capacity ml
A 149-20	88	149	250
A 149-36	107	177	500





BOLA INNOVATION



#1 Round Bottom Flasks with Lateral Necks

A standard product in glassware but not a given made of PFA: round-bottom flanks with lateral necks. BOLA offers two versions: Central ground joint with either lateral ground joint sockets or lateral necks with GL18.



BOLA Jars

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





Product description:

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

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



BOLA Jars

 Material:
 Temperature resistance:
 Chemical resistance:
 Pressure:
 Transparency:

 PFA
 from -200°C to +250°C
 +++ universal
 no pressure
 transparent



Product description:

Translucent, non-porous, sturdy design, screw cap with 2 connections for tubing 0.D. 6,35 mm (1/4"). Suitable PTFE, PFA and FEP tubing can be found on page 189.

Capacity	Total height	0.D.	I.D.	Cat. No.:
ml	mm	mm	mm	
120	74	66	60	A 131-12
240	116	66	60	A 131-14





Stubbornly dirty? Put in alcohol or wipe with a soft cloth soaked with ethyl alcohol, window cleaner or a detergent solution.



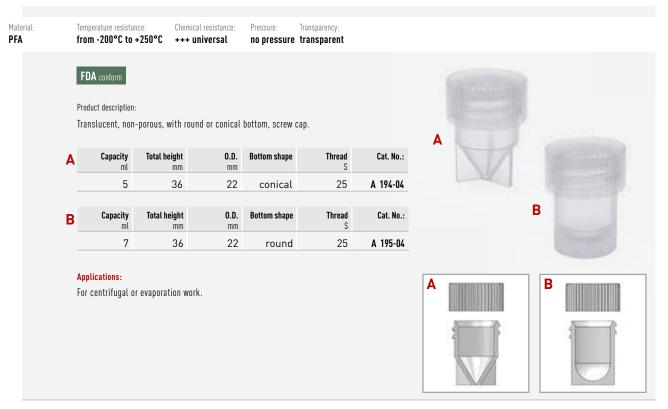
Security Advice

Beakers and vessels made of fluoroplastics cannot be heated on a hotplate. Due to overheating, harmful gases can be released. See also page 353 for further advice on the heating of fluoroplastics.

BOLA Micro Reaction Vessels

Material: Temperature resistance: Chemical resistance: Transparency: Transparenz: PFA,PTFE from -200°C to +250°C +++ universal no pressure transparent transparent FDA conform Product description: Vessel made of translucent, non-porous PFA, screw cap made of PTFE with threaded necks for connection of e. g. thermometers, probes or sensors. Capacity Total height 0.D. Threaded necks Cat. No.: 90 96 50 45,5 2x GL14 / 1x GL18 B 318-40 240 130 66 60,0 2x GL18 / 1x GL25 B 318-64 500 158 85 80,0 3x GL25 B 318-80 **#SUITABLE** page 90 **Laboratory Screw Joints**

BOLA Vials



BOLA Beakers

Material: PTFE

Temperature resistance:

Chemical resistance:

from -200°C to +250°C +++ universal

FDA conform

Product description:

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

Capacity ml	Height O.D. mm	Height I.D. mm	0.D. mm	I.D. mm	Cat. No.:
3	22	20	17	15	A 136-02
5	24	22	21	19	A 136-03
10	36	32	26	23	A 136-04
25	47	45	31	28	A 136-05
50	57	52,5	41	35	A 136-06
100	78,5	71	51	44	A 136-07
150	90,5	82	56	48	A 136-08
250	97,5	90	65	58	A 136-09
500	119	114	81	76	A 136-11
1.000	152,5	147,5	105	97	A 136-13
2.000	197	192	142	136	A 136-14
3.000	232	226	156	148	A 136-15



BOLA Lids

Material: PTFE

Temperature resistance:

Chemical resistance:

from -200°C to +250°C +++ universal



Product description:

Lid with centering shoulder.

0.D. mm	Suitable for Cat. No.:	Cat. No.:	0.D. mm	Suitable for Cat. No.:	Cat. No.:
27	A 136-03	H 927-03	82	A 136-09	H 927-09
35	A 136-04	H 927-04	94	A 136-11	H 927-11
40	A 136-05	H 927-05	125	A 136-13	H 927-13
50	A 136-06	H 927-06	166	A 136-14	H 927-14
60	A 136-07	H 927-07	185	A 136-15	H 927-15
66	A 136-08	H 927-08			





#SUITABLE page 259

Thermo Beakers for hot-plates

BOLA Beakers

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

Product description:

Translucent, non-porous, graduated, with spout.

Cat. No.:	0.D. mm	Total height I.D. mm	Total height O.D. mm	Capacity ml
A 137-01	36	48	50	25
A 137-02	44	57	59	50
A 137-03	56	69	71	100
A 137-05	76	93	96	250
A 137-07	83	118	121	500
A 137-09	105	138	142	1.000



BOLA Measuring Cylinders

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

FDA conform

Product description:

Translucent and non-porous. Design based on ISO 4788. With graduation (uncalibrated), spout and reinforcing ring. Universal chemical resistance, the product is only exposed to PTFE.

Capacity ml	Graduation divisions ml	Total height mm	I. D. mm	Cat. No.
25	1	172	24	A 164-12
50	2	202	30	A 164-16
100	2,5	268	40	A 164-20

Product advantages:

- » hexagonal base prevents the cylinder from rolling
- » permanent, recessed graduation

Application:

Volume measurement of agressive or pure liquids





BOLA Watch Dishes

Material: Temperature resistance: Chemical resistance: PTFE from -200°C to +250°C +++ universal FDA conform Product description: Convex shape 0.D. Cat. No.: Height mm A 200-01 50 8 75 A 200-02 8 100 A 200-03 11 12 A 200-04 125

BOLA Evaporating Dishes

Applications:

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

For blends or for covering vessels



Product description:

Cylindrical shape, without spout.

Capacity ml	Height O.D. mm	Height I.D. mm	0.D. mm	I.D. mm	Cat. No.:
25	27	25	43	40	A 170-01
50	25	22	66	62	A 170-02
100	29	27	80	75	A 170-03
250	56	53	100	94	A 170-04



Security Advice

Beakers and vessels made of fluoroplastics cannot be heated on a hotplate. Due to overheating, harmful gases can be released. See also page 353 for further advice on the heating of fluoroplastics.

BOLA Evaporating Dishes, Conical Shape

Material: Chemical resistance: Temperature resistance: PTFE from -200°C to +250°C +++ universal FDA conform Product description: Conical shape, with spout. Cat. No.: Capacity Height Height O.D. top O.D. bottom $\textbf{0.D.}\,\mathsf{mm}$ I.D. mm 25 36 33 38 34 A 169-01 50 40 38 49 A 169-02 46 100 54 51 A 169-03 64 60 250 47 44 97 90 A 169-04

















BOLA Evaporating Dishes

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

FDA conform

Product description:

Cylindrical shape, with spout.

Capacity ml	Height O.D. mm	Height I.D. mm	0.D. mm	I.D. mm	Cat. No.:
100	18	15,50	105	100	A 176-02
250	36	33	130	125	A 176-03







#SUITABLE page 80

Spatula and tweezers

BOLA Evaporating Dishes

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

FDA conform

Product description:

Cylindrical shape, without spout, transparent, non-porous, stackable.

Cat. No.:	I.D. mm	0.D. mm	Height I.D. mm	Height O.D. mm	Capacity ml
A 177-01	50	56	10	13,5	25
A 177-03	99	105	14,5	19,5	100



BOLA Evaporating Dishes

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

FDA conform

Product description:

Conical shape, with spout, transparent, non-porous.

Capacity ml	Height O.D. mm	Height I.D. mm	O.D. top mm	0.D. botton mm	Cat. No.:
100	30	27	90	60	A 171-01



BOLA Erlenmeyer Flasks

Material: PTFE

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

Chemical resistance: +++ universal

suitable

FDA conform

Product description:

Thick-walled, with ground joint.

Cat. No.:	Ground Joint NS	O.D. bottom mm	Height I.D. mm	Height O.D. mm	Capacity ml
A 151-01	19/26	54	81	86	50
A 151-02	19/26	63	121,7	128	100
A 151-03	29/32	85	139	144	250
A 151-04	29/32	107	181	190	500





#SUITABLE page 213 ideally coordinated stoppers

BOLA Thermo Beakers

Material: PTFE

Temperature resistance:

Chemical resistance:

from -200°C to + 250°C

+++ universal

FDA conform

Product description:

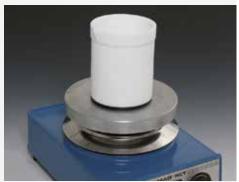
Thick-walled beaker made of PTFE, reinforced upper rim with spout. The base is made of heat resistant PTFE-carbon, thus the beaker can be heated on a hot plate up to max. +270 °C. The inside of the beaker is made of pure PTFE and provides universal chemical resistance.

Capacity ml	Height O.D. mm	Height I.D. mm	0. D. mm	I. D. mm	Cat. No.
100	74	69,5	56	50	A 135-02
250	93	88,5	75	67	A 135-04
500	110	104,5	85	77	A 135-06



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.













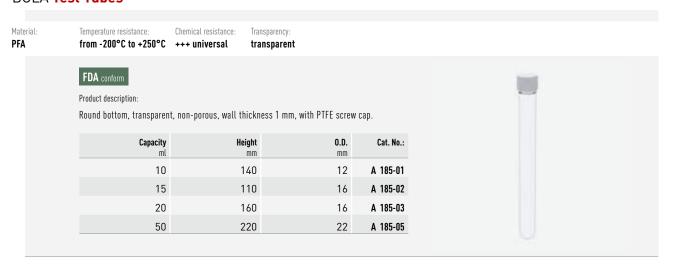




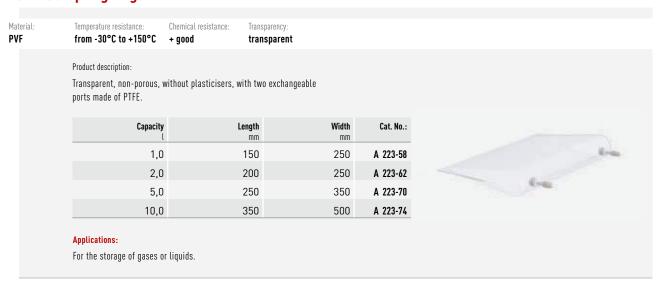




BOLA Test Tubes



BOLA Sampling Bags



Spare Parts for: Sampling Bags

Description	Material	Packing Unit	suitable for Cat. No.	Cat. No.:	
Replacement Connector with tube	PTFE	1 piece	A 223-58 / A 223-62 A 223-70 / A 223-74	A 226-06	
Replacement Stopcock with tube	PTFE	1 piece	A 223-58 / A 223-62 A 223-70 / A 223-74	A 226-12	



BOLA Funnels

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



FDA conform

Product description:

Conical opening with long outlet.

Cat. No.:	Total height mm	O.D. outlet	I.D. outlet	O.D. inlet	I.D. inlet
H 920-02	50	7	4	33	30
H 920-04	84	10	6	52	50
H 920-06	116	11	6	78	74
H 920-08	150	15	10	104	99
H 920-10	200	18	11	158	152



BOLA Dipper Vessels

 Material:
 Temperature resistance:
 Chemical resistance:
 autoclave:

 PVF
 from -200°C to +250°C
 +++ universal
 121°

FDA conform

Product description:

With handle and holes in wall and bottom.

Cat. No.:	Total height mm	Dia. of bores	Depth of vessel mm	O.D. of vessel	I.D. of vessel
H 1138-08	100	6	60	38	35
H 1138-16	175	8	100	60	57
H 1138-24	230	12	140	100	95

Applications:

For washing, rinsing or dipping solids in aggressive or pure substances.



















BOLA Dipper Baskets



BOLA Dipping Sieves

Temperature resistance: -200 °C to +250 °C Chemical resistance: Material: PTFE +++ universal NEW FDA conform Product description: Stable sieve bottom with evenly distributed bores with dia. 8 mm, fixed $\,$ handle in the middle. Basket O.D. Depth of basket Height incl. handle Basket I.D. Cat. No.: mm mm 144 150 22 250 H 1140-08 Applications: For washing, rinsing or dipping solids in aggressive or pure substances.

000

BOLA Hydrolysing and Digestion Vessels for Microwave Ovens

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

BOLA Digestion Vessels are made of TFM, a modified PTFE with thermoplastic parts for a homogenous, non-porous surface which avoids contamination and memory effects.

As soon as the pressure exceeds the maximum limit, the rupture membrane bursts and the released liquid will be drained through an optional tubing (0.D. 6,35 mm / 1/4") into a separately available collecting vessel (Cat. No. A 131-.., see page 253).









BOLA Digestion Vessels

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



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.

Cat. No.:	Temperature max.C°	Pressure max.bar	O.D. of cover mm	O.D. of body mm	Internal dimensions Ø x Height mm	Capacity ml
A 240-02	160	25	40	30	15 x 32	5
A 240-06	150	20	60	50	22 x 60	20
A 240-08	150	20	95	69	33 x 62	50
A 240-10	140	15	95	70	35 x 110	100











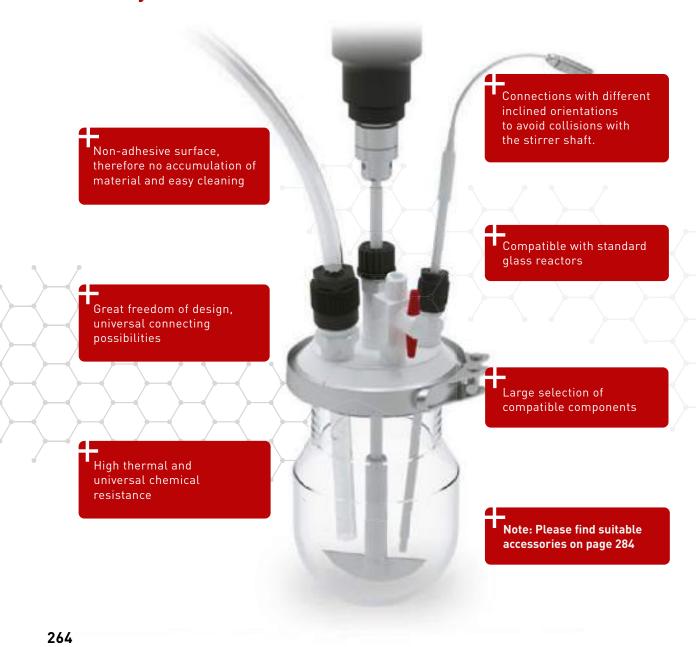


Spare Parts for: Hydrolysing and Digestion Vessels

Description	Material	Packing Unit	Capacity	suitable for Cat. No.	Cat. No.:	
Replacement Sealing and Rupture Membranes	PFA / PTFE	pack size 10 pieces	5 ml 20 ml 50 and 100 ml	A 240-02 A 240-06 A 240-08 / A 240-10	A 244-02 A 244-04 A 244-06	10
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	7



BOLA PTFE Flat Flange Reactor Lids with NPT threads – what you should know about.



000

For a short-term realisation of projects in Mini plant installations or in the production of small quantities in chemical and pharmaceutical industry and research, special components are required that help to start up existing reactors flexibly. The components should have a very good chemical resistance, a permanent durability and should be easily cleanable at the same time.

All these requirements are met by the BOLA Modular System for Reactor Lids adapted for standard glass reactors with flat flange from SCHOTT® for sizes DN 60, DN 100 and DN 150.

The Modular System consists of Reactor Lids with different screw-in threads as well as different connections for transition to ground joint components, as stirrer bearings, for connection of probes or tubes and tubing, and stoppers, all with NPT screw-in thread.

By means of the screw-in connections, the Reactor Lid can be arranged to the requirements of your application and project. Thus, a lid can be used most versatile and economic.

All Reactor Lids dispose of a centric screw-in thread NPT for connection of a stirrer bearing. The lateral necks, that even dispose of NPT screw-in threads, are arranged round the centric connector. The special clou is that the angles of lateral necks are made for an insertion of probes and tubes aside the centre in order to avoid collisions with the stirrer shaft and further inserted components.

The large choice of different inserts allows to connect existing equipment with ground joint such as Liebig condensers and dropping funnels as well as GL thread such as lead-in for sensors. The already existing equipment can be further used.

















Selection and Assembly:

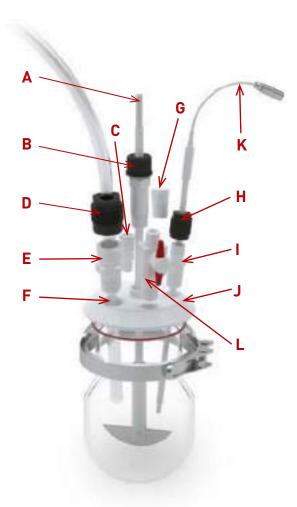
- » Choose a lid that fits onto the flange of your glass reactor, as well as the number of connectors needed.
- » Choose the necessary transition fittings according to NPT threads in the chosen lid.
- » Mount the transition fittings into the connectors of the reactor lid. The lid is now ready for service.
- » All fittings can be acquired separately and can be exchanged amongst each other depending on the NPT thread.

Custom Manufacture - Lid and Fitting

If we do not even have the correct reactor lid in our wide range, we are pleased to offer you a modified reactor lid or modified components accordingly.

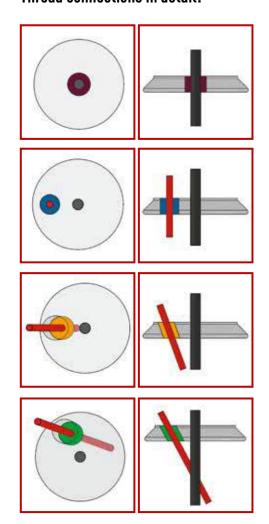
Example: Reactor Lid DN 100

- A Moon-Shaped Stirrer Shaft Cat. No.: C 376-14 see page 24
- B Screw-in Stirrer Bearing Cat. No.: B 155-08 see page 271
- C Screw-in Connector with Ground Joint Cat. No.: B 154-02 see page 271
- D Laboratory Screw Joint Cat. No.: D 631-46 see page 90
- E Screw-in Fitting GL Cat. No.: B 152-32 see page 273
- F PTFE Tubing Cat. No.: S 1810-74 see page 189



- G Screw-in Stopper Cat. No.: B 153-04 see page 273
- H Laboratory Screw Joint Cat. No.: D 629-62 see page 90
- Screw-in Fitting GL Cat. No.: B 152-18 see page 273
- J Reactor Lid DN100 Cat. No.: B 150-14 see page 268
- K Temperature Probe Lemo Cat. No.: P 1760-20 see page 233
- Cat. No.: B 156-02 see page 272

Thread connections in detail:



Centric thread connection (purple):

For insertion of the stirrer bearing (see page 271)

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

Components such as probes can be led into the reactor parallel to the stirrer shaft.

Inclined thread connection with direction straight to the stirrer shaft (yellow):

Components such as tubes and tubing can be led directly to the stirrer shaft to achieve an optimal mixing of the medium.

Inclined thread connection with direction aside the shaft (green):

Collisions of long components such as temperature probes are avoided as they are led aside the stirrer shaft by means of this thread connection.

BOLA Reactor Lid DN 60

Material:

Temperature resistance:

Chemical resistance:

PTFE

from -200°C to +250°C +++ universal

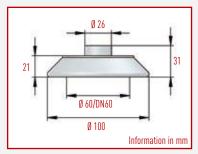
FDA conform

Product description:

Suitable for current glass reactors DN 60 with flat flange according to DIN 12214 with screwin threads for the connection of adaptor fittings and a centre neck NPT 1/2".

	1 Connection	2 Connection	3 Connection	Cat. No.:
A	NPT 1/4" connection directly to the shaft	NPT 1/2" connection aside the shaft	NPT 1/2" connection aside the shaft	B 150-02
В	NPT 1/2" connection aside the shaft	NPT 1/2" connection aside the shaft	NPT 1/2" connection aside the shaft	B 150-04





Material:

Temperature resistance:

Chemical resistance:

PTFE

from -200°C to +250°C +++ universal

NEW

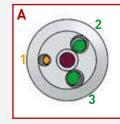
FDA conform

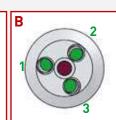
BOLA Reactor Lid DN 60 with Center Ground Joint Neck

Suitable for current reactors with flat flange DN 60 according to DIN 12214 with centre neck sleeve NS 29/32 and lateral internal thread NPT for the connection of screw-in connectors. .

	1 Connection	2 Connection	3 Connection	Cat. No.:
В	NPT 1/2" connection aside the shaft	NPT 1/2" connection aside the shaft	NPT 1/2" connection aside the shaft	B 120-04









#INFORMATIVE page 266

Threads and connectors in details.

















BOLA Reactor Lid DN 100

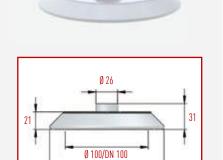
Material: Temperature resistance: Chemical resistance: PTFE from -200°C to +250°C +++ universal

FDA conform

Product description:

Suitable for current glass reactors DN 100, with flat flange according to DIN 12224. With screw-in thread for the connection of transition fittings and a centre neck NPT 1/2".

	1 Connection	2 Connection	3 Connection	4 Connection	5 Connection	Cat. No.:
A	NPT 1/2" connection aside the shaft	NPT 1/2" connection directly to the shaft	NPT 1/2" connection directly to the shaft			B 150-12
В	NPT 1/2" connection directly to the shaft	NPT 1/2"	NPT 1/2" connection directly to the shaft	NPT 3/4" connection aside the shaft	NPT 1/4" vertical connection	B 150-14
C	NPT 1/2" connection directly to the shaft	NPT 1/2" connection aside the shaft	NPT 1/2" connection directly to the shaft	NPT 1/4" connection aside the shaft	NPT 1/4" vertical connection	B 150-16



Ø 138

mm

Material:

Temperature resistance:

Chemical resistance:

PTFE

from -200°C to +250°C +++ universal



FDA conform

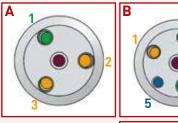
BOLA Reactor Lid DN 100 with Center Ground Joint Neck

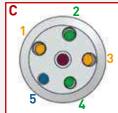
Product description:

Suitable for current reactors with flat flange DN 100 according to DIN 12214, with centre neck sleeve NS 29/32 and lateral internal thread NPT for the connection of screw-in connectors.

	1 Connection	2 Connection	3 Connection	4 Connection	5 Connection	Cat. No.:
C	NPT 1/2" connection directly	NPT 1/2"	NPT 1/2" connection directly	NPT 1/4" connection aside	NPT 1/4" vertical connection	B 120-14









#INFORMATIVE page 266 Threads and connectors in detail.

BOLA Reactor Lid DN 150

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

FDA conform

Product description:

Suitable for current glass reactors DN 150 with flat flange according to DIN 12214. With screw-in threads for the connection of transition fittings and a centre neck NPT 1/2".

	1 Connection	2 Connection	3 Connection	4 Connection	5 Connection	Cat. No.:
A	NPT 1/2" connection directly to the shaft	NPT 1/2" connection aside the shaft	NPT 1/2" connection directly to the shaft	NPT 1/4" connection aside the shaft	NPT 1/4" vertical connection	B 150-22
В	NPT 1/2" connection directly	NPT 1/2" connection aside	NPT 1/2" connection directly	NPT 3/4" connection aside	NPT 1/4" vertical connection	B 150-24



Material:

Temperature resistance:

Chemical resistance:

PTFE from -200°C to +250°C

+++ universal



FDA conform

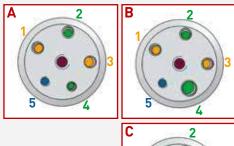
BOLA Reactor Lid DN 150 with NS Centre Neck

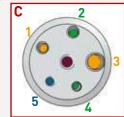
Product description:

Suitable for current reactor vessels with flat flange DN 150 according to DIN 12214, with centre neck sleeve NS 29/32 and lateral screw-in thread NPT for the connection of screw-in connectors.

	1 Connection	2 Connection	3 Connection	4 Connection	5 Connection	Cat. No.:
В	NPT 1/2" connection directly to the shaft	NPT 1/2" connection aside the shaft	NPT 1/2" connection directly to the shaft	NPT 3/4" connection aside the shaft	NPT 1/4" vertical connection	B 120-22









#INFORMATIVE page 266 Threads and connectors in detail.

















BOLA Flat Flange Reaction Vessel

 Material:
 Temperature resistance:
 Chemical resistance:
 Vacuum:

 PTFE
 from -200°C to +250°C
 +++ universal
 suitable





Product description:

Made of PTFE, thick wall with round bottom and smooth interiour surface. flat flange with circular groove as per DIN 12 214. Can be heated by a thermostat or an electrical heating mantle.

Flat flange DN	Capacity mm	O.D. of vessel	Total height mm	Cat. No.:
60	250	100	125	B 271-01
100	500	110	120	B 271-03
100	1000	110	205	B 271-06
100	2000	140	270	B 271-09
150	4000	200	290	B 271-12
150	6000	215	320	B 271-15



Suitable 0-ring seal with silicone core and seamless FEP-coating is separately available, Cat. No. H $\,969\text{-}..\,$

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

:: Chemical resistance: 5°C ++ very good



BOLA O-Rings for Laboratory Flat Flanges

Product description:

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

Cat. No.:	Dimensions mm	For flat flange NW
H 969-18	75 x 4	60
H 969-25	110 x 4	100
H 969-55	155 x 5	150



As sealing for flat flange with groove.





Material: Stainless steel

NEW

BOLA Quick Release Clamps for Flat Flange Vessels

Product description:

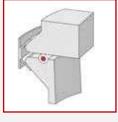
Made of stainless steel, readjustable clamp with three retaining segments.

Flat Flange NW	Cat. No.:
60	B 277-01
100	В 277-03
150	B 277-05

Applications:

For safe connection of vessel and lid with flat flange.











111

BOLA Screw-in Stirrer Bearings

Material:

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

Chemical resistance: +++ universal

PTFE

FDA conform

Product description:

For centric guidance of stirrer shafts in the center screw-in thread of BOLA Reactor Lids. A special gasket made of PTFE and a FKM o-ring which is compressed by a GL screw cap made of PPS provide a good sealing of the stirrer shaft. With hexagonal gripping surface in standard wrench size. Universal chemical resistance, the medium is only exposed to PTFE.

Screw-in thread NPT (male)	For stirrer shaft mm	Thread of screw cap GL	0.D. mm	Wrench size SW	Cat. No.:
1/2"	6	25	33	25	B 155-06
1/2"	8	25	33	25	B 155-08
1/2"	10	25	33	25	B 155-10

Applications:

For assembly on BOLA Reactor Lids, Cat. No. B 150-... from page 268. Perfect bearing for entric guidance of glass, stainless steel and PTFE-coated stirrer shafts. Suitable spare parts for the stirrer bearing see BOLA Special Gaskets and BOLA Replacement Screw Caps on page 47.





BOLA Screw-in Connector with Ground Joint

Material:

Temperature resistance:

Chemical resistance:

PTFE

from -200°C to +250°C +

+++ universal



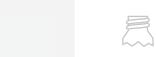
Product description:

For connection to BOLA Reactor Lids. Connector with ground socket. With hexagonal gripping surface in standard wrench size.

Screw-in Thread NPT (male)	Ground Socket GL (male)	0.D. mm	Wrench Size SW	Cat. No.:
1/4"	14/23	22	15	B 154-02
1/2"	19/26	25	22	B 154-04
1/2"	29/32	37	24	B 154-06
3/4"	29/32	37	30	B 154-08
1"	29/32	38	34	B 154-10

Applications:

For assembly on BOLA Reactor Lids, Cat. No. B 150-... from page 268. For connection to existing components with ground joint such as Liebig Condensers, Dropping Funnels etc.















BOLA Screw-in Stopcocks

Material:

Temperature resistance:

Chemical resistance:

PTFE

from 0°C to +110°C +++ universal

FDA conform

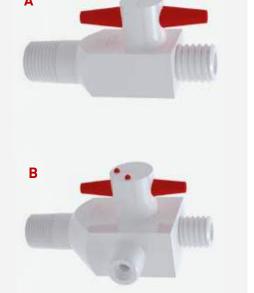
Product description:

For connection to screw-in threads on BOLA Reactor Lids to interrupt the flow of connected tubes. Available as two-way stopcock with straight bore and one GL-threaded connection or as three-way stopcock with L-bore and two GL-threaded connections. Cylindrical stopcock plug with grip made of PP for good tightness, stop valve with mark of flow direction. Universal chemical resistance, the flowing product is only exposed to PTFE.

	Screw-in Thread NPT (male)	Тур	Bore shape stopcock	Connecting thread GL	Bore dia. mm	Cat. No.:
A	1/2"	2-Way		18	6	B 156-02
В	1/2"	3-Way	9	18	6	B 156-08



For assembly on BOLA Reactor Lids, Cat. No. B 150-... from page 268. For inserting liquids and gases. Quick and easy disconnection of flow. Connection of tubing or tubes by means of BOLA Laboratory Screw Joints.





#SUITABLE page 90

Laboratory Screw Joints

BOLA Screw-In Fittings PG

Material:

Temperature resistance:

Chemical resistance:

PTFE

from -200 °C to +250 °C +++ universal



FDA conform

Product description:

For connection of sensors with male thread PG to BOLA reactor lids. With hexagonal gripping surface in standard wrench size.

Screw-in thread NPT (male)	PG thread (female)	Bore dia. mm	0.D. mm	Wrench Size SW	Cat. No.:
1/2"	13,5	ø 12,5	24	24	B 151-03

Application:

For tight and safe insertion of sensors with male thread PG.





BOLA Screw-in Fittings GL

Material:

Temperature resistance:

Chemical resistance:

PTFE

from -200°C to +250°C +++ universal

FDA conform

Product description:

For connection to BOLA Reactor Lids as GL necks. With hexagonal gripping surface in standard

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

For assembly on BOLA Reactor Lids, Cat. No. B 150-... from page 268. For connection of hardwalled tubes, tubing and probes by means of BOLA Laboratory Screw Joints.



BOLA Screw-in Stopper

Material: PTFE

Temperature resistance:

Chemical resistance:

from -200°C to +250°C +++ universal



Product description:

For connection to BOLA Reactor Lids. For closure of non-used connectors. With hexagonal gripping surface in standard wrench size.

Screw-in thread NPT (male)	Wrench size SW	Cat. No.:
1/4"	15	B 153-02
1/2"	22	B 153-04
3/4"	32	B 153-06
1"	45	B 153-08



Applications:

For assembly on BOLA Reactor Lids, Cat. No. B 150-... from page 268.

















SPECIAL REQUIREMENTS? CUSTOMIZED!



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

No problem:

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

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

Checklist for your customised product:

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



BOLA PFA Flat Flange Reactor Vessels – what you should know about.

M

Perfectly suited for the distillation of strong alkaline or acid products as well as very aggressive solvents when the resistance of other materials, such as glass, is not sufficient. All parts exposed to the medium are either made completely of PTFE/PFA or are coated with PTFE, such as the thermometers. The distillate in the Liebig Condenser is conducted to the collection vessel through a PFA pipe.

For heating we recommend either a thermostat or an electric heating mantle. However, a temperature of +200°C should not be exceeded.

The PFA reaction vessel with flat bottom is an alternative to the PTFE reaction vessel with round bottom. It is translucent, non-porous and can be used for mixing the material with a hotplate magnetic stirrer and a PTFE coated magnetic stirring bar.

The Special Clou - the Safe-Lab Principle

For safety reasons, our distillation apparatus is equipped with the Safe-Lab Principle. This system allows a tight and safe connection as well as an easy disconnection of the cone and socket. This can be realised by a combi-nut which is held on an external thread above the cone and holds and locks the socket. For disconnection this special nut has to be turned clockwise. The power of the fingers is enforced by the thread pitch, transferred axially to the socket. The ground joint is released





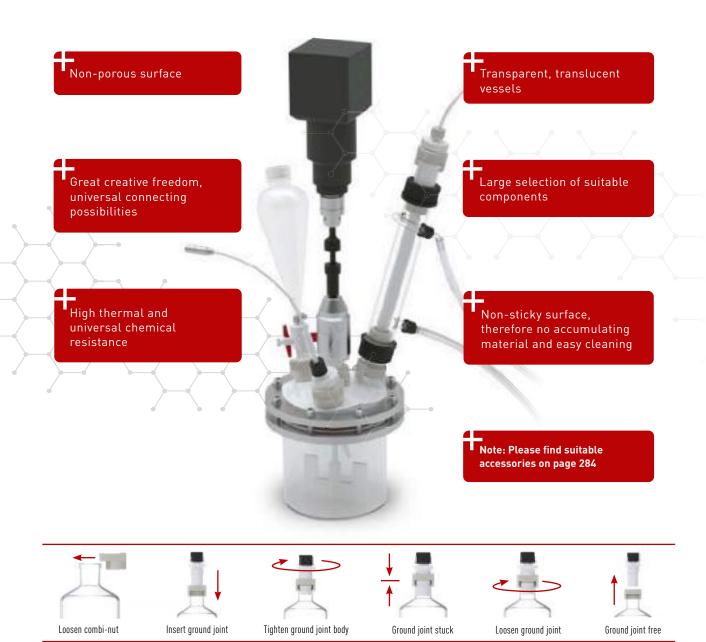










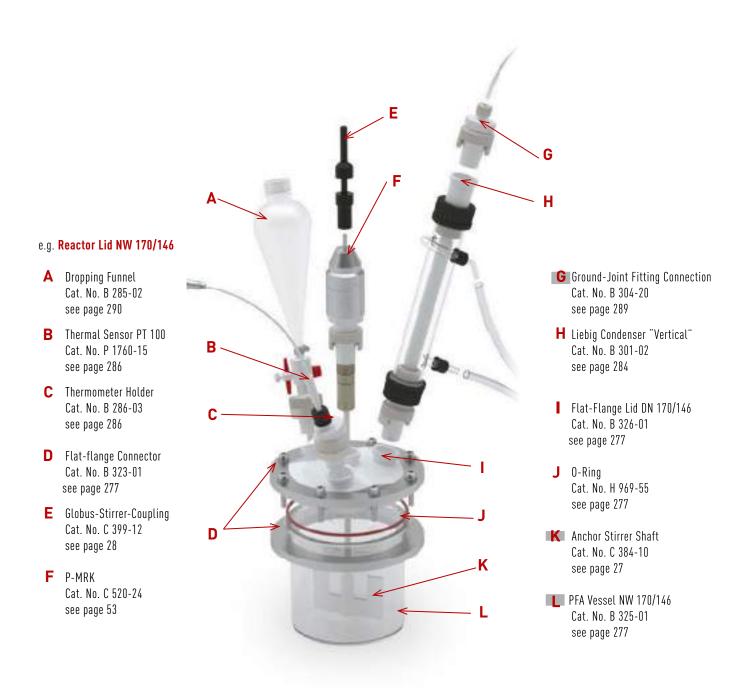


Selection and assembly:

- » Choose a vessel with flat flange in the required size
- » Choose lid and joint suitable to the vessel and the required connectors
- » If required you will find further accessories in our catalogue: stirring shafts, magnetic stirrer heads, laboratory fittings, swivel fittings; bellows and ground joint fittings.

Customised Manufacturing - Lid and Fitting Made to Measure

Your flat-flange reactor vessel needs a bottom outlet? You are in need of further or differently designed connectors on the lid? We produce



BOLA Flat Flange Vessels

Material: PFA

Temperature resistance:

from -200 °C to +250 °C +++ universal

transparent



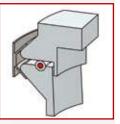
FDA conform

Product description:

Made of transparent PFA; model with flat bottom and pore-free surface. Flange with circular groove. Heatable with thermostats or in a heating hood.

Flange	Volume	Vessel	Total height	Cat. No.:
NW	ml	0.D. mm	mm	
170/146	2400	150	150	B 325-01





Material: PTFE

Temperature resistance:

Chemical resistance:

Suitable FEP-coated silicone o-ring see Cat. No. H 969-55.

from -200 °C to +250 °C +++ universal



FDA conform

Applications:

BOLA Flat Flange Lids

Product description:

Suitable for reactor made of PFA (Cat. No. B 325-01), with socket center neck NS 29/32 and three lateral necks with ground joint sockets. Bottom side with centring collar for nonslipping alignment on the reactor. All lateral connectors are made for an insertion of tubes and probes aside the centre in order to avoid collisions.

Cat. No.:	Lateral Necks NS	Flange NW
B 326-01	3x 29/32 aside the shaft	170/146



Material: FEP

Temperature resistance::

Chemical resistance:

from -60°C to +205°C

++ very good

FDA conform

BOLA O-Rings for Laboratory Flat Flanges

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

For flat flange NW	Dimensions mm	Cat. No.:
170/146 and 150	155 x 5	H 969-55



Applications:

As sealing for flat flange with groove.

Material:

Aluminium

BOLA Flat Flange Joining Pieces

Product description:

Made of aluminium, connection between reaction vessel and lid. Locked by zinc-plated steel screws.

For flange NW	Number of screws	Cat. No.:
170/146	8	B 323-01



















BOLA PTFE Flat Flange Reactor Vessels – what you should know about.

Perfectly suited for the distillation of strong alkaline or acid products as well as very aggressive solvents when the resistance of other materials, such as glass, is not sufficient. All parts exposed to the medium are either made completely of PTFE/PFA or are coated with PTFE, such as the thermometers. The distillate in the Liebig Condenser is conducted to the collection vessel through a PFA pipe.

For heating we recommend either a thermostat or an electric heating mantle. However, a temperature of +200°C should not be exceeded.

The Special Clou - the Safe-Lab Principle

For safety reasons, our distillations apparatus is equipped with the Safe-Lab Principle. This system allows a tight and safe connection as well as an easy disconnection of the cone and socket. This can be realised by a combi-nut which is held on an external thread above the cone and holds and locks the socket. For disconnection this special nut has to be turned clockwise. The power of the fingers is enforced by the thread pitch, transferred axially to the socket. The ground joint is released.





Selection and assembly:

- » Choose a vessel with flat flange in the required size
- » Choose lid and joint suitable to the vessel and the required connectors
- » If required you will find further accessories in our catalogue: stirring shafts, magnetic stirrer heads, laboratory fittings, swivel fittings; bellows and ground joint fittings.

Customised Manufacturing - Lid and Fitting Made to Measure

Your flat-flange reactor vessel needs a bottom outlet? You are in need of further or differently designed connectors on the lid? We produce modified lids and vessels made to measure according to your requirements.









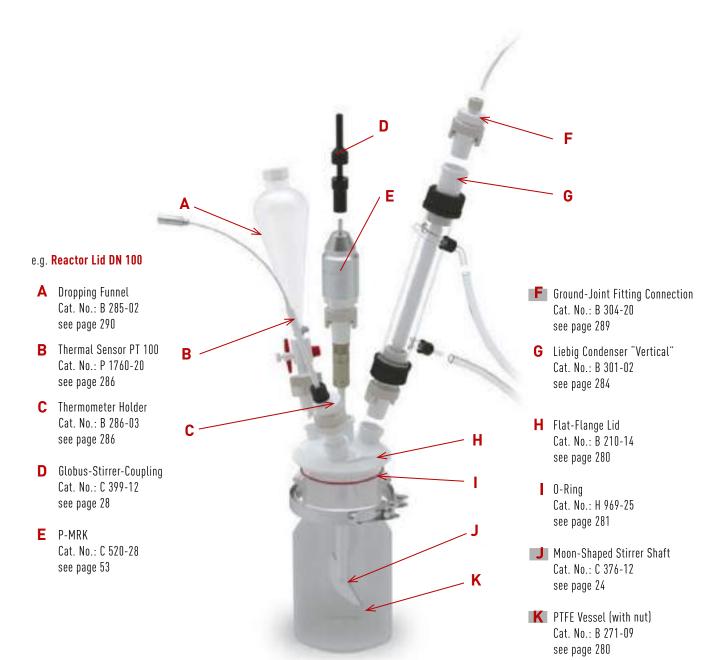












BOLA Flat Flange Reaction Vessel

PTFE

Temperature resistance::

from -200 °C to +200 °C +++ universal

suitable

NEW

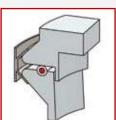
FDA conform

Product description:

Made of PTFE, thick wall with round bottom and smooth interiour surface. flat flange with circular groove as per DIN 12 214. Can be heated by a thermostat or an electrical heating

Flat flange NW	Capacity ml	O.D. of vessel	Total height mm	Cat. No.:
60	250	100	125	B 271-01
100	500	110	120	B 271-03
100	1000	110	205	B 271-06
100	2000	140	270	B 271-09
150	4000	200	290	B 271-12
150	6000	215	320	B 271-15





Suitable O-ring seal with silicone core and seamless FEP-coating is separately available, Cat. No. H 969-.. .see page 281.

BOLA Flat Flange Lids

Material:

Temperature resistance::

Chemical resistance:

PTFE

from -200 °C to +200 °C +++ universal

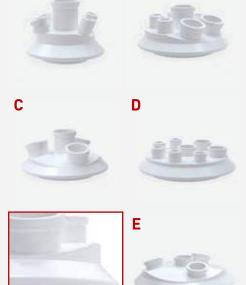


FDA conform

Product description:

Suitable for current reactor vessels with flat flange according to DIN 12214, with centre neck sleeve NS 29/22 and lateral necks with ground joint sleeves or GL threads. Bottom side with centring collar for non-slip alignment on the vessel. All lateral connections are aligned that tubes, pipes or probes can be introduced collusion-free diagonally past the centre or vertically (parallel to the stirrer shaft).

	Flat Flange DN	Side Necks NS	Side Necks GL	Cat. No.:
A	60	2x 14/23 connection aside the shaft	2x 18 connection aside the shaft	B 210-02
В	100	2x 29/32 connection aside the shaft 1x 19/26 vertical connection	3x 25 vertical connection	B 210-12
С	100	3x 29/32 connection aside the shaft		B 210-14
D	150	2x 29/32 vertical connection 1x 19/26 vertical connection	4x 25 vertical connection	B 210-22
Ε	150	3x 29/32 connection aside the shaft		B 210-24



bottom view

В

Applications:

Extension of the distillation apparatus with suitable accessories. By means of laboratory fittings tubes, pipes or probes can be fixed at the required position with the GL threated sockets.

BOLA O-Rings for Laboratory Flat Flanges

Material:

Temperature resistance: Chemical resistance:

FEP/PTFE

from -60°C to +205°C ++ very good



BOLA O-Rings for Laboratory Flat Flanges

Product description:

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

For flat flange NW	Dimensions mm	Cat. No.:
60	75 x 4	H 969-18
100	110 x 4	H 969-25
120	132 x 4	H 969-45
150	155 x 4	H 969-55
200	214 x 4	Н 969-75



As sealing for flat flange with groove.



Stainless steel

BOLA Quick Release Clamps for Flat Flange Vessels

Product description:

Made of stainless steel, readjustable clamp with three retaining segments.

Flat Flange DN		Cat. No.:
60		B 277-01
100		B 277-03
150		B 277-05

Applications:

For safe connection of vessel and lid with flat flange.



















BOLA Flat Flange Distillation Apparatus – what you should know about.

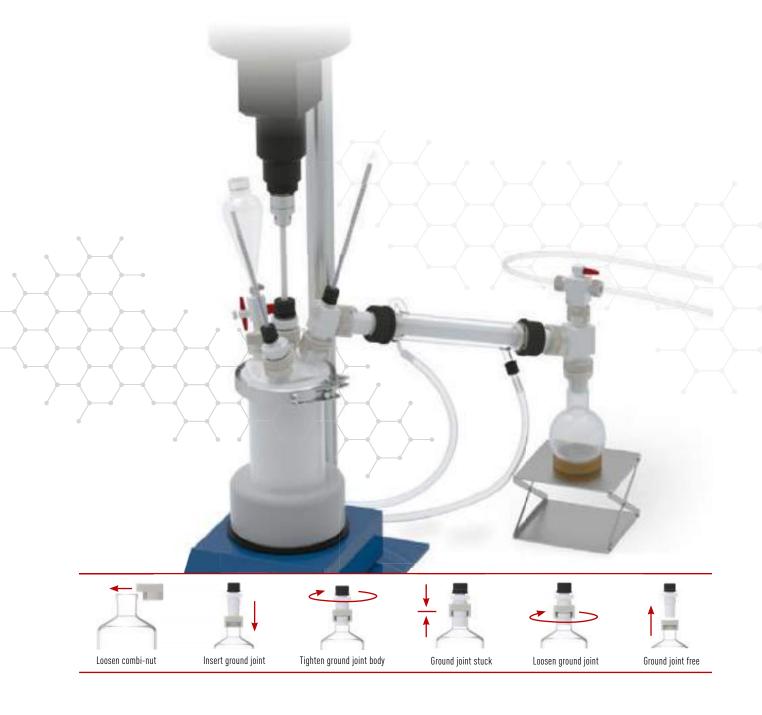
Suitable for the distillation of strong alkaline or acid products as well as very aggressive solvents when the resistance of other materials, e.g. glass, is not sufficient. All parts exposed to the medium are either made completely of PTFE/PFA or, like the thermometers, jacketed with PTFE. The distillate in the Liebig Condenser is conducted to the collecting vessel through a PFA pipe.

For heating, we recommend to either use a thermostat or an electric heating mantle. A temperature of +200°C should not be exceeded.

As alternative to the reaction vessel made of PTFE with round bottom, you can also use the reaction vessel made of PFA with flat bottom. It is translucent, non-porous and can be used with a hotplate magnetic stirrer and a PTFE-encapsulated magnetic stirring bar for stirring.

The Safe-Lab principle:

For security reasons, our distillation apparatus are equipped with the Safe-Lab system. This system allows a tight and safe connection as well as an easy disconnection of cone and socket. A special nut which is held on an external thread above the cone holds and locks the socket. For disconnection, this special nut has to be turned clockwise. The power is enforced by the thread pitch and is transferred axially to the socket. The ground joint is released.





BOLA Flat Flange Distillation Apparatus

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

TFE, PFA		from -200°C to +200°C +++		itable				
		Сарас		1.000 ml	2.000 ml	4.000 ml	6.000 ml	
		Cat. N Total dimensions H x L m		B 280-06 550 x 700	B 280-09 700 x 750	B 280-12 750 x 980	B 280-15 790 x 1000	
	A	Flat Flange Reaction Vesse	els NW 100 B 271-03	NW 100 B 271-06	NW 100 B 271-09	NW 150 B 271-12	NW 150 B 271-15	
	В	O-Rings for Laboratory Flat Flang	es NW 100 H 969-25	NW 100 H 969-25	NW 100 H 969-25	NW 150 H 969-55	NW 150 H 969-55	
	C	Flat Flange Li	ds NW 100 B 210-14	NW 100 B 210-14	NW 100 B 210-14	NW 150 B 210-24	NW 150 B 210-24	
	D	Quick Release Clamps for Fl Flange Vesse	at NW 100	NW 100 B 277-03	NW 100 B 277-03	NW 150 B 277-05	NW 150 B 277-05	
	Ε	Dropping Funnels with Cone I 29/	NS 125 ml	125 ml B 285-01	250 ml B 285-02	500 ml B 285-03	500 ml B 285-03	
	F	Liebig Condense	rs 300 mm	450 mm	450 mm	600 mm	600 mm	
	G	Distillation Thermomete		B 291-04 B 290-03	B 291-04 B 290-03	B 291-06 B 290-03	B 291-06 B 290-03	
	Н	0/+250:1 Moon-Shaped Stirrer Shat	2	Ø 10 x 450 mm	Ø 10 x 510 mm	Ø 10 x 600 mm	Ø 10 x 600 mm	
		Thermometers for Flask 0/+250:1	C 376-12 C° Ø 7 x 450 mm	C 376-14 Ø 7 x 450 mm	C 376-16 Ø 7 x 530 mm	C 376-18 Ø 7 x 600 mm	C 376-18 Ø 7 x 600 mm	
	J	Thermometer Holde	B 287-03 rs B 286-03	B 287-03 B 286-03	B 287-06 B 286-03	B 287-09 B 286-03	B 287-09 B 286-03	
	K	Stirrer Bearin NS 29/	gs page 22	B 288-02	B 288-02	B 288-02	B 288-02	
	L	Distillation Hea	ds B and an	B 289-03	B 289-03	B 289-03	B 289-03	
	M	2x NS 29/ Receiver Adapto	0L	B 292-02	B 292-02	B 292-02	B 292-02	
	N	Vacuum Stopcoc		B 293-02	B 293-02	B 293-02	B 293-02	
	0	Round Bottom Flasks with Grou Joint NS 29/		250 ml A 158-08	500 ml A 158-09	500 ml A 158-09	500 ml A 158-09	
			G, K	L C B C H A)		Security Beakers and	N M Advice Vessels made of fluoroplastics cannot be
							can be relea	hotplate. Due to overheating, harmful gases ised. See also page 353 for further advice on of fluoroplastics.















BOLA Flat Flange Reaction Vessels

ACCESSORIES +



BOLA Liebig Condensers "Vacuum"

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

FDA conform

Product description:

One-piece cooling tube with ground joint socket and cone size 29 made of PTFE, cooling jacket made of borosilicate glass with hose connectors made of PP and nuts for connection of cooling water. The distillate is only exposed to PFA/PTFE. Integrated special nut (Safe-Lab) for easy locking and unlocking of the ground joint.

Cat. No.:	Length
	mm
B 295-02	300
B 295-04	450



BOLA Liebig Condensers "Vertical"

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

FDA conform

Product description:

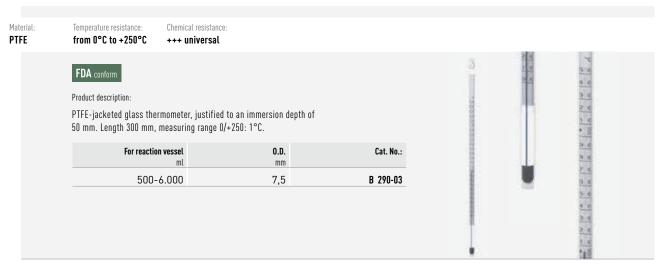
Thin-walled cooling tube made of translucent and gastight PFA, cooling jacket made of borosilicate glass with hose connectors made of PP and nuts for connection of cooling water, ground joint cone and socket size 29 made of PTFE. The distillate is only exposed to PFA/PTFE. Integrated special nut (Safe-Lab) for easy locking and unlocking of the ground joint.

Length	Cat. No.:
mm	
300	B 301-02
450	B 301-04

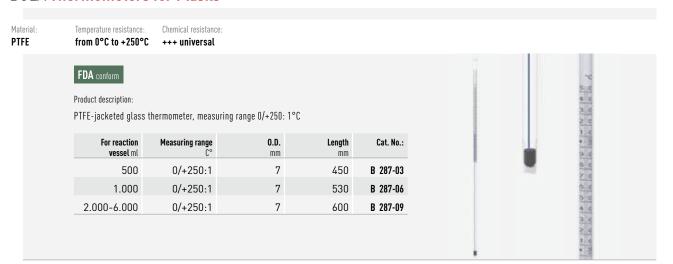




BOLA Distillation Thermometers



BOLA Thermometers for Flasks



















BOLA Temperature Probes

Material:

Temperature resistance:

Temperature range:

PTFE

from -200°C to +250°C +++ universal

from -50°C to +250°C

FDA conform

Product description:

One measuring sensor PT 100 in a PTFE-encapsulated stainless steel tube (1.4571). Temperature probe Ø 8mm, tip Ø 6mm, collar ring Ø 12mm.

Connection is made either directly to the white PFA-coated cable (length: 1,5m, 4 strands) or alternatively to a coupling type Lemo® socket size 1, 4-wire-system.

Typical response times:

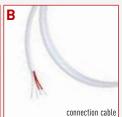
» T 50: 7 - 12 s 14 - 16 s » T 90:

See page 352 for detailed explanation.

	Usable length ml	Total length mm	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
В	200	260	strands, 4-wire-system	P 1760-15
	300	360	strands, 4-wire-system	P 1760-20
	500	560	strands, 4-wire-system	P 1760-25
	600	660	strands, 4-wire-system	P 1760-30







Applications:

- » temperature measurement in aggressive liquids
- » cable provides flexible connection from measuring device to medium



#OTHER SIZES page 227 PT 100 temperature probes in different versions and sizes.

BOLA Thermometer Holders

Material:

Temperature resistance:

Chemical resistance:

PTFE

from -20°C to +230°C

+++ 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.

Cat. No.:	Angle	For diameter mm	Ground joint NS
B 286-03	7°	7-8	29/32





BOLA Stirrer Bearings

Material:

Temperature resistance:

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

PTFE

FDA conform

Product description:

Guiding the stirrer shaft. With adjustable special gasket. Integrated special nut (Safe-Lab) for easy locking and unlocking of the ground joint.

Cat. No.:	For stirrer shaft dia.	Cone NS
B 288-02	10	29/32



BOLA Moon-Shaped Stirrer Shafts

Material: PTFE

Temperature resistance:

Chemical resistance:

from -200°C to +250°C

+++ universal



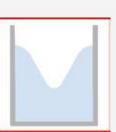
Product description:

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 24.

Cat. No.:	Length mm	Dia. of stirrer shaft mm	For ground joint NS	For reaction vessel ml
C 376-12	350	10	29/32	500
C 376-14	450	10	29/32	1.000
C 376-16	510	10	29/32	2.000
C 376-18	600	10	29/32	4.000-6.000
C 376-20	600	10	45/40	4.000/6.000







BOLA Distillation Heads

Material: PTFE

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

FDA conform

Two ground joint cones size 29 and one vertical connection with flexible PTFE/Silicone sealing and PPS screw cap to insert and fix thermometers of an O.D. of 7-8 mm. Integrated special nut (Safe-Lab) for easy locking and unlocking of the ground joint.

Cone	For dia.	Angle of vertical cone	Cat. No.:
NS	mm		
29/32	7-8	90°	B 289-03



















BOLA Receiver Adaptors

Material: Temperature resistance: Chemical resistance:
PTFE from -20°C to +230°C +++ 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 288). Integrated special nut (Safe-Lab) for easy locking and unlocking of the ground joint.

Cat. No.:	Lateral angle	Lateral socket NS	Socket mm	Cone NS
B 292-02	15°	29/32	19/26	29/32



BOLA Vacuum Stopcocks

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

FDA conform

Product description:

Ground joint cone size 19, bore diameter 2 mm, connections for tubing 0.D. 8 mm. Integrated special nut (Safe-Lab) for easy locking and unlocking of the ground joint.

Cone NS	Bore shape Stopcock	Bore dia. of stopcock	Cat. No.:
19/26	9	2	B 293-02





BOLA Links

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

FDA conform

Product description

Auxiliary to keep a BOLA Liebig Condenser "Vertical" with diagonal past the reactor lid connection in vertical position. Integrated special nut (Safe-Lab) for easy locking and unlocking of the ground joint.

Cone NS	Socket mm	Angle	Cat. No.:
29/32	29/32	15°	B 303-02





BOLA Ground Joint Tube Fittings

Material: Temperature resistance: Chemical resistance: PTFE from -200°C to +205°C +++ 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.

Cat. No.:	Bore dia. mm	For tubing I.D. x O.D.	Cone NS
B 304-10	5	4,0 x 6,0	19/26
B 304-16	2	1,6 x 3,2	29/32
B 304-20	8	4,0 x 6,0	29/32
B 304-22	8	6,0 x 8,0	29/32
B 304-24	8	8.0 x 10.0	29/32





BOLA Ground Joint Distributors

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

Cat. No.:	Length x Width x Total height	Cone	Socket
	mm	NS	NS
B 302-02	113 x 40 x 105	29/32	2 x 29/32



















BOLA "SAFE LAB" Nuts

Material:

Temperature resistance:

Chemical resistan

PTFE-GF

from -200°C to +250°C +++ universal

FDA conform

Product description:

Allows a tight and safe connection as well as an easy disconnection of cone and socket. The special nut which is held on an external thread above the cone holds and locks the socket. For disconnection, this special nut has to be turned clockwise. The power is enforced by the thread pitch and is transferred axially to the socket. The ground joint is released.

Cat. No.:	Suitable for ground joint NS
K 1349-06	19/26
K 1349-10	29/32
K 1349-16	45/40















Loosen combi-nut

Insert ground joint

Tighten ground joint body

int stuck Loosen ground joint

BOLA Dropping Funnels

Material: **PTFE, FEP**

Temperature resistance:

Chemical resistance:

Transparency:

115, 157

from 0°C to +110°C

+++ universal

transparent

FDA konform

Product description:

Dropping funnel made of transparent FEP, fine adjustment stopcock with cone size 29 made of PTFE. Integrated special nut (Safe-Lab) for easy locking and unlocking of the ground joint.

Capacity ml		Cat. No.:
125		B 285-01
250		B 285-02
500		B 285-03







BOLA Liebig Condensers "Transparent"

Material: Temperature resistance: Chemical resistance: Transparency: PTFE, PFA from -20°C to +110°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. Integrated special nut (Safe-Lab) for easy locking and unlocking of the ground joint.

Length mm		Cat. No.:
300		B 291-02
450		B 291-04
600		B 291-06



BOLA Cold Traps

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

FDA conform

Product description:

Transparent, connecting nut made of PTFE reinforced with glassfibres, head made of PTFE with two threaded necks GL 14 for connection of hard-walled tubing by means of separately available laboratory screw joints (page 90). For soft, flexible tubing we recommend to use GL hose connectors (see page 139).

Collecting capacity	O.D. of column	Total height	Cat. No.:
ml	mm	mm	
320	60	400	B 317-60



BOLA Threaded Adaptors

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

FDA conform

Product description:

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

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

Transition from GL 40 / S 40 to GL 45

Suitable for Merck $^{\circledR}$ bottles with GL 40 thread or for all PFA-, PTFE bottles and jars with thread GL 40 and S 40

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

Transition from GL 32 to GL 45

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

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





















Easy handling, sturdy design and pressure resistance up to 30 bar: also in HPLC applications BOLA Screw Joints are your first choice.







SCREW JOINTS FOR HPLC



















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BOLA HPLC-Distributors for Bottles – what you should know about.

They consist of a screw cap made of glass-fibre reinforced PP with GL 45 thread and a movable body with connection ports. All necessary screw joints and gaskets for connecting hard-walled tubing (e.g. PTFE, FEP or PFA, see page 189) up to a maximum diameter of 6 mm are included in delivery and make the HPLC distributors usable immediately. Tubing up to a diameter of 4 mm can be passed and fixed absolutely tightly at the requested immersion depth. The distributors with stopcocks allow closing unused ports; the FEP stopcock plug provides a universal chemical resistance.

Because of the stopcocks, it is not possible to pass the tubing. A connection to the bottom of the bottle can still be made by pushing tubing with O.D. of 5 mm or I.D. of 6 mm in or on the port on the lower side of the distributor. A possible unevenness of the bottle neck is adjusted by an o-ring behind an elastic sealing lip, and the bottle is closed tightly. The product is only exposed to the body of the distributor.

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



BOLA HPLC Distributors for Bottles

Material: PP, Silicone

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

autoclave: 121°



Product description:

Green screw cap made of glass-fibre reinforced PP for bottle thread GL 45 and body made of PP. Available either with four ports with screw joints suitable for tubing 0.0. 1,6 to 2,0 mm and 2,1 to 4,0 mm or with four ports with screw joints suitable for tubing 0.D. 6,0 mm. Plugs for closing unused ports are included in delivery.

Cat. No.:	Four ports for tubing O.D.	Suitable for thread GL
D 606-08	1,6 - 4,0	45
D 608-08	6,0	45





BOLA Extender with Adaptor for Syringe Filters

Material:

Chemical resistance:

PTFE

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



Product description:

Made of PTFE, with female Luer cone for fixing syringe filters.

Cat. No.:	0.D.	Connection
	mm	
D 610-50	3,5	Luer cone



For sterile aeration by means of syringe filters.













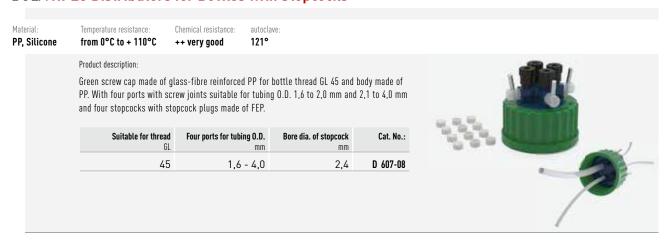








BOLA HPLC Distributors for Bottles with Stopcocks



Spare Parts for: HPLC Distributors for Bottles

Description	Material	Packing Unit	for tubing O.D.	suitable for	Cat. No.:	
Replacement Nuts	PP	1 piece	1,6 - 4,0 6,0	all HPLC-Distributors all HPLC-Distributors	D 610-02 D 610-04	
Replacement Sealing Rings	Silicone / FKM	Pack size: 10 pieces	1,6 - 2,0 2,1 - 4,0 6	all HPLC-Distributors all HPLC-Distributors all HPLC-Distributors	D 610-08 D 610-12 D 610-16	3333
Replacement Plugs	Silicone	Pack size: 10 pieces		all HPLC-Distributors	D 610-30	1100



BOLA Screw Joints for HPLC

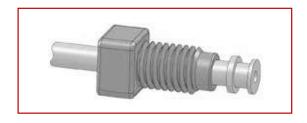
The BOLA HPLC Screw Joint System - what you should know about.

This system is based on flanged tubing and UNF 1/4" 28 G threads. These threads have their origin in the United States and are mainly used in chromatography/HPLC. 1/4" stands for the outer diameter of 6,35 mm. "28 G" stands for 28 thread pitches at the length of one inch (25,4 mm).

Following tubing sizes are mainly used in HPLC:

- » 1/8" (O.D. approx. 3,2 mm x I.D. approx. 1,6 mm)
- » 1/16" (O.D. approx. 1,6 mm x I.D. approx. 0,8 mm)

The screw joint itself consists of a screw (BOLA Tube End Fitting) with washer and flanged tubing. It resists pressures up to 30 bar.



The metal-free washer provides ideal contact pressure of the flanged tubing and prevents small folds during the last phase of tightening the tube end fitting.

The flowing product is only exposed to PTFE – the screw joint has a universal chemical resistance and is absolutely clean.

The PTFE tubing to be flanged must be made of a special type of PTFE. Our tubing fulfils this requirement (see page 189). Besides PTFE tubing, there can also be used FEP and PFA tubing (both gastight and transparent).

The different colours of the tube end fittings (see page 307) can be used for distinction.

How to flange PTFE tubing

- » cut tubing square
- » clamp tubing by means of tubing holder overhang approx. 3-5 mm
- » press tubing on flanging tip and preform it
- » press preformed tubing end on cooling plate
- » push fitting and washer on the tubing and tighten the fitting
- » ready.







Of course we also have flanged tubing with assembled tube end fittings in different lengths in our standard range (see page 299).

We can also manufacture tubing according to your requirements

Don't confuse UNF 1/4" 28 G and M6 threads!

Besides the common UNF threads, there are also M6 threads circulating. These threads are very similar to the UNF thread, but please only use UNF tube end fittings to avoid damage or leakage of your fittings. You can find universal couplings for a transition from UNF 1/4" 28G to M6 on page 305.













BOLA Distributors for Bottles

Material:

Temperature resistance:

Chemical resistance:

PTFE, PPS

from -15°C to +200°C +++ universal



FDA conform

Product description:

Black screw cap made of PPS for bottle thread GL 45, distributor made of PTFE with ports UNF 1/4" 286 female to connect tubing on upper and lower side and to join them down to the bottom of the flask. For a tight closure, a possible unevenness of the bottle neck is compensated by an elastic sealing lip with o-ring. The product is only exposed to the body of the distributor. Freely rotating PTFE-insert, the cap can be fixed on another bottle without the risk of disarranging the assembled tubing. Very good chemical resistance, for working temperatures up to +200°C.

See page 299 for suitable flanged tubing.

	For tubing I.D. x O.D.	Bore dia.	Connections	Cat. No.:
A	0,8 x 1,6	0,8	2 x UNF 1/4" 28G	F 745-02
В	0,8 x 1,6	0,8	4 x UNF 1/4" 28G	F 745-10

	For tubing I.D. x O.D.	Bore dia.	Connections	Cat. No.:
A	1,6 x 3,2	1,6	2 x UNF 1/4" 28G	F 745-04
В	1,6 x 3,2	1,6	4 x UNF 1/4" 28G	F 745-12



BOLA Distributors for Bottles with Stopcocks

Material:

Temperature resistance:

Chemical resistance:

PTFE, PPS

from -15°C to +200°C

+++ universal

FDA conform

Product description:

Black screw cap made of PPS for bottle thread GL 45, distributor made of PTFE with ports UNF 1/4" 286 female to connect tubing on upper and lower side and to join them down to the bottom of the flask. Ports on upper side with integrated stopcocks. For a tight closure, a possible unevenness of the bottle neck is compensated by an elastic sealing lip with o-ring. The product is only exposed to the body of the distributor. Freely rotating PTFE-insert, the cap can be fixed on another bottle without the risk of disarranging the assembled tubing. Very good chemical resistance, for working temperatures up to +200°C. See page 299 for suitable flanged tubing.

	For tubing I.D. x O.D.	Number of stopcocks	Bore dia. mm	Connections	Cat. No.:
A	0,8 x 1,6	2	0,8	2 x UNF 1/4" 28G	F 746-02
В	0,8 x 1,6	3	0,8	3 x UNF 1/4" 28G	F 746-10

	For tubing I.D. x O.D.	Number of stopcocks	Bore dia.	Connections	Cat. No.:
A	1,6 x 3,2	2	1,6	2 x UNF 1/4" 28G	F 746-04
В	1.6 x 3.2	3	1.6	3 x UNF 1/4" 28G	F 746-12







BOLA Chromatography Adaptors

Material:

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

PTFE, PPS

+++ universal

FDA conform

Product description:

Black screw cap made of PPS with GL thread. Body made of PTFE with one port with female $\ensuremath{\mathsf{P}}$ thread UNF 1/4" 28 G for connection of Mini Fittings (see tube end fittings page 299). A possible unevenness of the bottle neck is adjusted by an o-ring behind an elastic sealing lip, and the bottle is closed tightly. The product is only exposed to the body of the adaptor. Very good chemical resistance, for working temperatures up to max. +200°C.

Thread of screw cap	For tubing I.D. x O.D.	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	For tubing I.D. x O.D.	Cat. No.:
•	•	Cat. No.: F 757-03
mm	mm	
	mm (1/16" x 1/8") 1,6 x 3,2	F 757-03
	mm (1/16" x 1/8") 1,6 x 3,2 (1/16" x 1/8") 1,6 x 3,2	F 757-03 F 757-06





BOLA Flanged Tubing

Material: PTFE, PA Temperature resistance: from 0°C to +100°C Chemical resistance: +++ universal

30 bar

FDA conform

Product description:

Flanged PTFE tubing with black tube end fittings UNF 1/4" 28 G made of PP and washers made of PA. The tubing is ready for use.

Tubing I.D. x O.D.	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

Cat. No.:	Total length mm	Tubing I.D. x O.D. mm
F 740-20	100	(1/16" x 1/8") 1,6 x 3,2
F 740-22	250	(1/16" x 1/8") 1,6 x 3,2
F 740-24	500	(1/16" x 1/8") 1,6 x 3,2
F 740-26	750	(1/16" x 1/8") 1,6 x 3,2
F 740-28	1.000	(1/16" x 1/8") 1,6 x 3,2



Connection to BOLA Distributors for Bottles or BOLA Chromatography Adaptors.























BOLA Miniature Couplings

Material: Temperature resistance: Chemical resistance: PTFE, POM from -30°C to +100°C +++ universal

Type Material

FDA conform

Product description:

Three types of couplings available: straight type made of PTFE or POM with higher mechanical strength, "T" type with three connections or "cross" type with four connections, all made of PTFE. The tubing is connected by means of tube end fittings (see page 299) to a female thread UNF 1/4" 28 G.

For tubing I.D x O.D. Connections Total length

3

25

25

Height

Cat. No.:

F 707-16

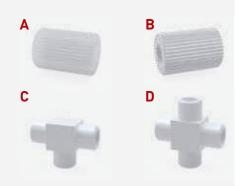
F 707-20

Cat. No.:

			mm		mm	
A		POM	(1/32" x 1/16") 0,8 x 1,6	2	17	F 707-02
В		PTFE	(1/32" x 1/16") 0,8 x 1,6	2	17	F 707-06
C	-	PTFE	(1/32" x 1/16") 0,8 x 1,6	3	25	F 707-14
D	49	PTFE	(1/32" x 1/16") 0,8 x 1,6	4	25	F 707-18
	-					
			, , , , , , , , , , , , , , , , , , , ,			
	Туре	Material	For tubing I.D x O.D.	Connections	Total length	Cat. No.:
A	Туре	Material POM	For tubing I.D x O.D.	Connections 2		Cat. No.: F 707-04

(1/16" x 1/8") 1,6 x 3,2

(1/16" x 1/8") 1,6 x 3,2





BOLA Miniature Distributors

C

D

Material: Temperature resistance: Chemical resistance: Pressure

PTFE from -200°C to +250°C +++ universal 30 bar

For tubing I.D. x O.D.

PTFE

FDA conform

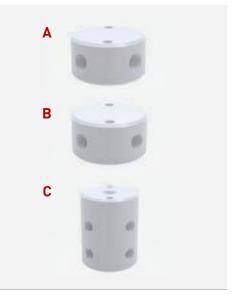
Product description:

Blocks with up to nine connections. The tubing is connected by means of tube end fittings (see page 299) to a female thread UNF $\frac{1}{4}$ " 28 G. With two mounting holes dia. 3,5 mm for fixing.

Connections

0.D.

	111111		111111	111111	
A	(1/32" x 1/16") 0,8 x 1,6	3	28	15	F 710-01
В	(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.	Connections	0.D.	Height	Cat. No.:
	For tubing I.D. x O.D. mm	Connections	O.D. mm	Height mm	Cat. No.:
A	•	Connections 3		•	F 710-03
A B	mm		mm	mm	



BOLA Miniature 2-Way Stopcocks

Material: Temperature resistance: Chemical resistance: PTFE, FEP from -200°C to +205°C +++ universal 8 bar FDA conform A В 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 heightincluding stopcock plug made of FEP: 20 mm. For tubing I.D. x O.D. Connections Connections Total length Cat. No.: female thread male thread **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 35 F 730-06 For tubing I.D. x O.D. Connections Connections Total length Cat. No.: female thread male thread (1/16" x 1/8") 1,6 x 3,2 2 32 F 730-04 (1/16" x 1/8") 1,6 x 3,2 35 F 730-08

BOLA Miniature 3-Way Stopcocks

PTFE. FEP	from -200°C to +205°C	+++ universal	8 bar	
Material:	Temperature resistance:	Chemical resistance:	Pressure:	

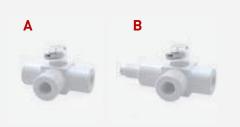
FDA conform

Product description:

3-way stopcock with "L"-shaped or "T"-shaped bore and three connections. Available either with three female threads UNF 1/4" 28 G or with two female threads UNF 1/4" 28 G and one male thread UNF 1/4" 28 G. Total height including stopcock plug made of FEP: 20 mm.

	For tubing I.D. x O.D. mm	Connections female thread	Connections male thread	Bore shape of stopcock	Total length mm	Cat. No.:
A	(1/32" x 1/16") 0,8 x 1,6	3			32	F 731-02
	(1/32" x 1/16") 0,8 x 1,6	3		-	32	F 731-06
В	(1/32" x 1/16") 0,8 x 1,6	2	1	9	42	F 731-10
	(1/32" x 1/16") 0,8 x 1,6	2	1	-	42	F 731-14

	For tubing I.D. x O.D.	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		9	32	F 731-04
	(1/16" x 1/8") 1,6 x 3,2	3		-	32	F 731-08
В	(1/16" x 1/8") 1,6 x 3,2	2	1		42	F 731-12
	(1/16" x 1/8") 1.6 x 3.2	2	1		42	F 731-16























BOLA Miniature Manifold Blocks

Material:

Temperature resistance:

Chemical resistance:

Pressure

PTFE, FEP

from -200°C to +205°C

+++ universal

8 bar

FDA conform

Product description:

Block made of PTFE with one inlet and four outlets with female thread UNF 1/4" 28 G. Also available with four stopcocks with stopcock plugs made of FEP for easy interruption and control of flow. Suitable flanged tubing can be found on page 299.

For tubing I.D. x O.D.	Number of stopcocks	Bore dia. mm	Inlet	Outlet	Cat. No.:
(1/32" x 1/16") 0,8 x 1,6	4	0,8	1	4	F 712-10
(1/16" x 1/8") 1,6x 3,2	4	1,6	1	4	F 712-12



BOLA Miniature Pressure Relief Valves

матегіаі:

Temperature resistance:

Chemical resistance:

Pressure

PTFE, PPS

from -20°C to +250°C

+++ universal

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 299.

Cat. No.:	Total height	0.D.	For tubing I.D. x O.D.
	mm	mm	mm
F 738-08	50	32	(1/32" x 1/16") 0,8 x 1,6
F 738-08	50	32	2" x 1/16") 0,8 x 1,6

Cat. No.:	Total height mm	0.D.	For tubing I.D. x O.D.
F 738-16	50	32	(1/16" x 1/8") 1,6 x 3,2



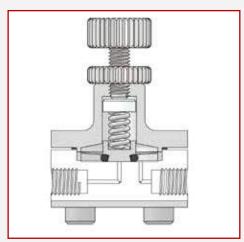
- » low dead volume
- » flow direction is marked by an arrow
- » two holes for panel mounting
- » universal chemical resistance, the flowing product is only exposed to PTFE

Applications

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









BOLA Universal Couplings

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



Product description:

Coupling made of PTFE for transition from M6 thread to UNF 1/4" 28 G thread. The M6 thread is marked by a groove.

	Female thread	Female thread	Bore dia.	Cat. No.:
A	M 6	UNF 1/4" 28G	0,8	F 770-08

	Male thread	Male thread	Bore dia. mm	Cat. No.:
В	M 6	UNF 1/4" 28G	0,8	F 772-08



BOLA Miniature Screw-in Adaptors

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



Product description:

Adaptor made of PTFE for transition from female thread UNF 1/4 " 28 G to male thread NPT 1/6 " or NPT 1/4 ".

For tubing I.D. x O.D.	Female thread	Male thread	Bore dia. mm	Cat. No.:
(1/32" x 1/16") 0,8 x 1,6	UNF 1/4" 28G	NPT 1/8"	0,8	F 716-02
(1/32" x 1/16") 0,8 x 1,6	UNF 1/4" 28G	NPT 1/4"	0,8	F 716-06

For tubing I.D. x O.D.	Female thread	Male thread	Bore dia.	Cat. No.:
(1/32" x 1/16") 1,6 x 3,2	UNF 1/4" 28G	NPT 1/8"	1,6	F 716-04
(1/32" x 1/16") 1,6 x 3,2	UNF 1/4" 28G	NPT 1/4"	1,6	F 716-08





















BOLA Miniature Luer Connectors

Material: Temperature resistance: Chemical resistance: PTFE from -200°C to +250°C +++ universal FDA conform A Product description: Connector made of PTFE for transition from Luer connection to female thread UNF 1/4" 28 G. Female thread For tubing I.D. x O.D. Luer cone Cat. No.: Bore dia. mm **A** (1/32" x 1/16") 0,8 x 1,6 UNF 1/4" 28G F 717-02 female 1,0 **B** (1/32" x 1/16") 0,8 x 1,6 UNF 1/4" 28G F 717-06 male 1,0 В For tubing I.D. x O.D. Female thread Luer cone Bore dia. Cat. No.: mm (1/16" x 1/8") 1,6 x 3,2 UNF 1/4" 28G F 717-04 female 1,6 (1/16" x 1/8") 1,6 x 3,2 UNF 1/4" 28G male 1,6 F 717-08

BOLA Miniature Luer Lock Connectors

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

FDA conform

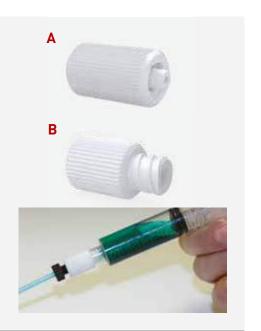
Product description:

Connector made of PTFE for transition from Luer Lock connection to female thread UNF 1/4" 28 G. The inner cone of the Luer-Lock connection provides good sealing, the additional thread (either male or female) prevents accidental loosening. The tubing is connected by means of tube end fittings (see page 299) to a female thread UNF 1/4" 28 G.

	For tubing I.D. x O.Dmm	Female thread	Luer Lock cone	Bore dia.	Cat. No.:
A	(1/32" x 1/16") 0,8 x 1,6	UNF 1/4" 28G	male	0,8	F 718-02
В	(1/32" x 1/16") 0,8 x 1,6	UNF 1/4" 28G	female	4	F 718-06
	For tubing I.D. x O.D mm	Female thread	Luer Lock cone	Bore dia. mm	Cat. No.:
A	•				Cat. No.: F 718-04



Connection of components with Luer Lock such as syringes or cannulas to a tubing system.



BOLA Double Tube End Fittings

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

Cat. No.:	Colour	For tubing I.D. x O.D. mm
F 703-02	white	(1/32" x 1/16") 0,8 x 1,6
Cat. No.:	Colour	For tubing I.D. x O.D.
F 703-04	white	(1/16" x 1/8") 1,6 x 3,2



111

BOLA Tube End Fittings

Material:

Temperature resistance: from -40°C to +100°C

Chemical resistance:

PTFE, PA

+++ universal



FDA conform

Product description:

White tube end fittings made of PTFE. With male thread UNF 1/4" 28 G; washers made of PA are included in delivery. Packing unit: 10 pieces, differing ordering quantities are rounded up to factor 10.

For tubing I.D. x O.D.	Colour	Cat. No.:
(1/32" x 1/16") 0,8 x 1,6	white	F 702-02
For tubing I.D. x O.D.	Colour	Cat. No.:
(1/16" x 1/8") 1,6 x 3,2	white	F 702-04



Material:

Temperature resistance:

Chemical resistance:

PP, PA from 0°C to +100°C

++ very good

FDA conform

Product description:

Coloured tube end fittings made of PP. With male thread UNF 1/4" 28 G; washers made of PA are included in delivery. Packing unit: 10 pieces, differing ordering quantities are rounded up to factor 10

For tubing I.D. x O.D.	Colour	Cat. No.:
(1/32" x 1/16") 0,8 x 1,6	natural (white)	F 702-06
(1/32" x 1/16") 0,8 x 1,6	black	F 702-10
(1/32" x 1/16") 0,8 x 1,6	red	F 702-18
(1/32" x 1/16") 0,8 x 1,6	orange	F 702-22
(1/32" x 1/16") 0,8 x 1,6	yellow	F 702-26
(1/32" x 1/16") 0,8 x 1,6	green	F 702-30
(1/32" x 1/16") 0,8 x 1,6	blau	F 702-34
(1/32" x 1/16") 0,8 x 1,6	violet	F 702-38
(1/32" x 1/16") 0,8 x 1,6	grey	F 702-42

Cat.	Colour	For tubing I.D. x O.D. mm
F 702	natural (white)	(1/16" x 1/8") 1,6 x 3,2
F 702	black	(1/16" x 1/8") 1,6 x 3,2
F 702	red	(1/16" x 1/8") 1,6 x 3,2
F 702	orange	(1/16" x 1/8") 1,6 x 3,2
F 702	yellow	(1/16" x 1/8") 1,6 x 3,2
F 702	green	(1/16" x 1/8") 1,6 x 3,2
F 702	blau	(1/16" x 1/8") 1,6 x 3,2
F 702	violet	(1/16" x 1/8") 1,6 x 3,2
F 702	grey	(1/16" x 1/8") 1,6 x 3,2

Applications:

Different colours for better distinction.



#SUITABLE page 189 Tubing for all screw joints

















BOLA Plugs

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

FDA conform

Product description:

Made of PTFE. For closing unused ports of miniature fittings. With male thread UNF 1/4" 28 G. Packing unit: 10 pieces, differing ordering quantities are rounded up to factor 10.

For tubing I.D. x O.D.	Colour	Cat. No.:
(1/32" x 1/16") 0,8 x 1,6	white	F 705-02
For tubing I.D. x O.D.	Colour	Cat. No.:
(1/16" x 1/8") 1,6 x 3,2	white	F 705-04



BOLA Washers

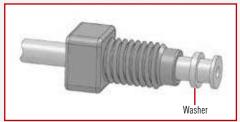
Material: Temperature resistance: PA from -40°C to +100°C

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.	Cat. No.	.:
(1/32" x 1/16") 0,8 x 1,6	F 728-0	8
For tubing I.D. x O.D.	Cat. No	.:
(1/16" x 1/8") 1,6 x 3,2	F 728-1	6





BOLA Assortments of Tube End Fittings

Material: Temperature resistance: Chemical resistance:
PP from 0°C to +100°C ++ very good

FDA conform

Product description:

Tube end fittings made of PP in 9 different colours, two fittings per colour. With male thread UNF $\frac{1}{4}$ 28 G; washers made of PA are included in delivery. Colours: natural, black, orange, yellow, green, blue, violet and grey

Cat. No.:	For tubing I.D. x O.D. mm
F 704-02	(1/32" x 1/16") 0,8 x 1,6
Cat. No.:	For tubing I.D. x O.D.
F 704-04	(1/16" x 1/8") 1,6 x 3,2



Different colours for better distinction.



111

BOLA Tubing

FDA conform

Product description:

Tubing especially suitable for making flanges with BOLA Thermoelectric Flanging Tool.

PTFE:

» competitive standard tubing in laboratories, transparent to milky white colour, working temperature range between -200°C and + 250°C, universal chemical resistance

PFA:

» transparent, non-porous and gastight tubing, wide temperature range between -200°C and + 260°C, universal chemical resistance

FFP.

» transparent, non-porous and gastight tubing, working temperature $\,$ range between $\,$ -200°C and + 205°C, universal chemical resistance

Dimensions I.D. x 0.D.	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 189)

Following sets are available:	For tubing I.D.	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 0.D. 1,6 mm (1/16") and 3,2 mm (1/8")	0,8	230V 50 HZ	F 701-12
1 x Basic flanging tool 230V/50 Hz 1 x Exchangeable flanging tip for flanging tubing I.D. 1,6 mm 1 x Tubing holder for tubing O.D. 1,6 mm [1/16"] and 3,2 mm (1/8")	1,6	230V 50 HZ	F 701-14























BOLA Tubing Holders

Product description

For tubing with O.D. 1,6 mm (1/16") and 3,2 mm (1/8").

For tubing O.D.	Cat. No.:
(1/16") 1,6 x (1/8") 3,2	F 706-06

Product advantages:

- » safe fixing of the tubing during the flanging procedure
- » easy assembly and handling
- » injuries due to the hot flanging tips are avoided





BOLA Flanging Tips

Product description:

For flanging different inner diameters of tubing, suitable for BOLA Thermoelectric Flanging Tools see page 309.

For tubing I.D.	Cat. No.:
0,5	F 709-50
(1/32") 0,8	F 709-52
(1/16") 1,6	F 709-54
2,4	F 709-56



BOLA Standard Construction Kits



Product description:

For making flanges at the ends of plastic tubing (e.g. PTFE, PFA or FEP see page 189)

Following sets are available	For tubing I.D.	Version	Cat. No.:
1 piece BOLA Thermoelectric Flanging Tool with exchangeable flanging tip for tubing I.D. 0,8 mm and suitable tubing holder 1 piece BOLA Tube End Fitting Set 5 piece BOLA Plugs 10 piece BOLA Miniature Couplings (straight) 2 piece Miniature Couplings (T) 1 piece BOLA Miniature Coupling (cross) 10 metres of PTFE tubing	8,0	230V 50 HZ	F 700-02
1 piece BOLA Thermoelectric Flanging Tool with exchangeable flanging tip for tubing I.D. 1,6 mm and suitable tubing holder 1 piece BOLA Tube End Fitting Set 5 piece BOLA Plugs 10 piece BOLA Miniature Couplings (Straight) 2 piece BOLA Miniature Couplings (T) 1 piece BOLA Miniature Coupling (cross) 10 metres of PTFE tubing	1,6	230V 50 HZ	F 700-04



000

SPECIAL REQUIREMENTS? CUSTOMIZED!



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

No problem:

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

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

Checklist for your customised product:

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



















BOLA Joining Fittings

PTFE, ETFE

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

Chemical resistance:

5 bar

suitable

FDA conform

Product description:

Fitting made of PTFE. One side with connecting nut with compression rings for connecting tubing or tubes with O.D. 4, 6, 8 or 10 mm. Other side with laboratory screw joint for connecting tubing with O.D. 1,6 or 3,2 mm (see page 90).

From tubing I.D. x O.D.	To tubing O.D. mm	0.D. mm	Total length mm	Cat. No.:
(1/16" x 1/8") 1,6 x 3,2	4 and 6	25	70	F 762-14
(1/16" x 1/8") 1,6 x 3,2	8 and 10	25	70	F 762-18







#SUITABLE page 189

Tubing for all screw joints

BOLA Transition Fittings

Material:

Temperature resistance:

Chemical resistance:

Pressure:

PTFE

from -200°C to +250°C +++ universal

5 bar

FDA conform

Product description:

Fitting made of PTFE. One side with metric thread and connecting nut with compression rings for connecting tubing or tubes with O.D. 4, 6, 8 or 10 mm. Other side with female thread UNF $^{1}\!/_{4}$ " 28 G for connecting flanged tubing with 0.D. 1,6 or 3,2 mm by means of tube end fittings (see page 299).

From tubing I.D. x O.D.	To tubing O.D.	0.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

Cat. No.:	Total length	0.D.	To tubing O.D.	From tubing I.D. x O.D.
	mm	mm	mm	mm
F 760-08	40	21	4 and 6	(1/16" x 1/8") 1,6 x 3,2
F 760-18	46	26	8 and 10	(1/16" x 1/8") 1,6 x 3,2





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BOLA Vario Couplings

Material: Temperature resistance Chemical resistance: Pressure: autoclaw
PVDF from -30°C to +150°C ++ very good 3 bar 121°C



FDA conform

Product description:

Two-part coupling made of PVDF for connecting elastic tubing (e.g. Viton®, Tygon®, silicone) to hard-walled tubing made of PTFE, glass or other plastics. Easy and ingenious functioning: the elastic tubing is pushed on a cone and fixed on the coupling by means of a connecting nut. On the other side, the hard-walled tubing is connected as follows:

Flanged PTFE tubing with miniature connectors (e.g. Cat. No. F 740 page 299) is connected to a female thread UNF $1/4^{\circ}$ 28 G.

Hard-walled tubing up to a maximum 0.D. of 10 mm is connected to a GL thread by means of laboratory screw joints (see page 90). Restricted chemical resistance, working temperatures up to max. +150°C.

	For tubing I.D.	For tubing wall thickness mm	Bore dia. mm	Connecting thread UNF	Cat. No.:
A	0,8	0,8 to 1,2	0,8	1/4" 28G	F 778-08
	1,6	0,8	1,6	1/4" 28G	F 778-16

Cat. No.:	Connecting thread GL	Bore dia.	For tubing wall thickness mm	For tubing I.D.	
D 681-08	14	0,8	0,8 to 1,2	0,8	В
D 681-16	14	1,6	0,8	1,6	
D 681-24	14	3,2	1,6	3,2	
D 681-32	14	4,0	1,6	4,0 to 4,8	
D 681-40	18	6,4	1,6	6,4	
D 681-48	18	8.0	1.6 to 2.4	8 to 11.5	



A





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" 286 for connecting flanged tubing with 0. D. 1,6 and 3,2 mm by means of tube end fittings.

For tubing I.D. x O.D. mm	Bore dia.	Fitting Thread GL	Female Thread UNF	Total length mm	Cat. No.:
(1/32" x 1/16") 0,8 x 1,6	0,8	14	1/4" 28G	39	F 761-08
(1/16" x 1/8") 1,6 x 3,2	1,6	14	1/4" 28G	39	F 761-16





#SUITABLE page 90

Laboratory screw joints



















BOLA UNF Screw-in Tube Fittings

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

FDA conform

Product description:

Straight tube fitting made of PTFE. One side with fitting thread GL 14 for connecting hard-walled tubes and tubing by means of BOLA Laboratory Screw Joints. Other side with male screw-in thread UNF 1/4" 28G for connection to units and fittings with female thread UNF 1/4" 28G.

For tubing I.D. x O.D. mm	Bore dia. mm	Fitting thread GL	Male thread UNF	Total length mm	CatNo.
(1/32" x 1/16") 0,8 x 1,6	0,8	14	1/4" 28G	39	F 763-08
(1/16" x 1/8") 1,6 x 3,2	1,6	14	1/4" 28G	39	F 763-16



BOLA Adaptors for Prominent®-Pumps UNF

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

FDA conform

Material:

PTFE-GF

Product description:

Adaptor made of glass-fibre reinforced PTFE, transition from pump thread M20 x 1,5 to female thread UNF 1/4" 286. Pressure resistant connection (max. 10 bar). The tubing is connected by means of tube end fittings to a female thread UNF 1/4 286. Universal chemical resistance, the product is only exposed to PTFE.

For tubing	Bore dia.	Cat. No.:
mm	mm	
(1/32" x 1/16") 0,8 x 1,6	0,8	D 731-12
(1/16" x 1/8") 1,6 x 3,2	1,6	D 731-24





BOLA Connection Bolts

Material: Temperature resistance: Chemical resistance: Pressure:
PEEK from -50°C to +250°C ++ very good 450 bar

FDA conform

Product description:

Connection bolt and sealing cone made of PEEK, suitable for female thread UNF 10-326. Suitable for pressures up to max. 450 bar.

Cat. No.:	For tubing/tube O.D.
	mm
F 830-10	(1/16") 1 6



1

BOLA Connection Bolts



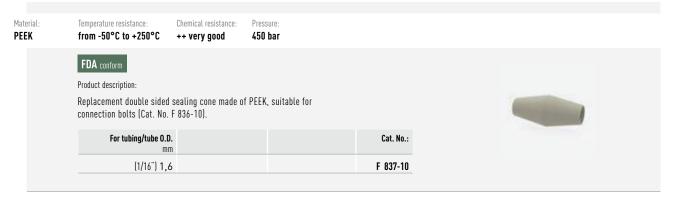
BOLA Sealing Cones for Connection Bolts



BOLA Connection Bolts

aterial: EEK	Temperature resistance: from -50°C to +250°C	Chemical resistance: ++ very good	Pressure: 400 bar		
	FDA conform				
	Product description:				
	Hayaganal assession half				
	ů .	ngeable sealing cone	oling cone made of PEEK, suitable for female available separately (Cat. No. F 837-10). s of up to max. 400 bar.		
	thread UNF 10-32G. Excha	ngeable sealing cone Suitable for pressure: D.	available separately (Cat. No. F 837-10).	4	

BOLA Double Sealing Cones for Connection Bolts



















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331 Filters and Semi-finished Filters

Filtering Tiles

Filtering Sheets

Filtering Discs

Filtering Rods

Filtering Rods

Filtering Membranes





FILTRATION





















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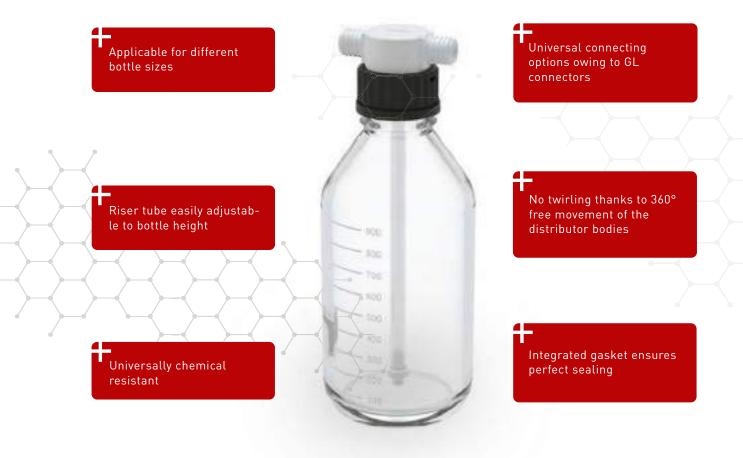
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BOLA Filters and fittering devices – what you should know about.

Filters and filtering devices made of fluoroplastics characterize with extraordinary resistance against chemical substances. They are resistant against acids, caustic solutions and many other chemicals which makes them ideal for use in various laboratory applications. Beside this, PTFE filters are heat resistant and can withstand temperatures up to 250°C.

BOLA filters and filtering devices have excellent non-stick properties whereby particles slip off easily and make cleaning easier. The high mechanical stability ensures that they keep their form also under pressure.





BOLA Filtration



What you should know about porous PTFE.

For the production of porous rods, tubes and tiles, PTFE particles are melted together.

The pore size can be determined both by the selection of the PTFE granules and the process parameters.

Due to the non-adhesive surface, filtering devices made of fluoroplastics (PTFE/PFA) are easy to clean and have a long durability.

Microporous PTFE has the same unique properties like "normal" PTFE:

- » non-adhesive / dirt-repellent
- » hydrophobic / water-repellent
- » non-wettable
- » no release of trace elements in the filtrate (no plasticisers)
- » almost universal chemical resistance to acids, bases and solvents
- » excellent temperature resistance between -200°C and + 250°C
 (temporarily even +300°C)
- » autoclavable

Information about pore sizes - what do these indications mean?

Class	Indication	Pore size in µm
00	P 500	250 - 500 *
0	P 250	160 - 250 *
1	P 160	100 - 160 *
2	P 100	40 - 100
3	P 40	16 - 40
4	P 16	10 - 16
5	P 1,6	1 - 1,6

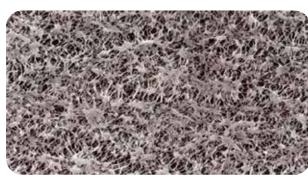
^{*} not feasible with PTFE at the moment

Application

Typical applications - often asked.

Pore size

50 µm	Filtration of coarse particles, distribution of gas in liquids
5 μm	Filtration of medium-sized particles, laboratory filtration, valve for packings (gas permeable, leak proof)
1 µm	Filtration of aqueous solvents, elimination of particles
0,45 µm	Prefiltration of aqueous solvents, HPLC solvents, protein solvents and alcohols, sterile filtration of air or other gases
0,2 µm	Ultracleaning of organic solvents and alcohols, sterile filtration of air or other gases
0,05 µm	Ultracleaning of solvents or gases (virus)





























BOLA Flow Filters

Material: PTFE, PPS Temperature resistance: from -20°C to +160°C

Chemical resistance: +++ universal

121° suitable



FDA conform

Product description:

Suitable for overpressure or vacuum, usable for example as added filter or as large-area in-line apparatus in a line system. Suitable for temperatures up to +160°C. The optionally available filtering membranes (page 332) can be exchanged easily. Tubing can be connected to GL threads by means of the included laboratory screw joints.

The filters are produced without plasticisers and have an almost universal chemical resistance. They do not release any trace elements into the filtrate. Due to the non-adhesive surface, they are easy to clean and can be reused.

For membrane dia. mm	Filtration surface m ²	Connecting thread GL	For tubing O.D.	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 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.	Pore size	Product	Flow ml/min.	For membrane dia.	Pore size	Product	Flow ml/min.
25	1,00	water	5	47	0,45	water	3
25	1,00	air	92	47	0,45	air	122
25	0,45	water	1	90	1,00	water	57
25	0,45	air	34	90	1,00	air	1.191
47	1,00	water	16	90	0,45	water	12
47	1,00	air	325	90	0,45	air	446



#SUITABLE PAGE 90

Ideally coordinated laboratory screw-joints

Spare parts for: Flow Filter

Description	Material	Packing Unit	For membrane dia.	suitable for: Cat. No.:	Cat. No.:	
Replacement Gasket with O-Ring	PTFE/ FKM	pack size: 3 pieces	25 47 90	N 1670-08 N 1670-16 N 1670-24	N 912-01 N 912-02 N 912-03	0

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BOLA Single-Stage Flow Filter

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



Product description:

Filter made of PFA with connecting nut made of glass-fibre reinforced ETFE. Suitable for vacuum and overpressure up to max. 150 kPa (1.500 mbar) and for temperatures up to max. +160°C. Easy exchange of the optionally available filtering membrane (page 332). Couplings for connecting tubing (page 189) with 0.D. 6,35 mm (1/4") are included.

For membrane dia.	Filtration surface cm ²	0.D. mm	For tubing O.D.	Cat. No.:
47	14,1	62	(1/4") 6,35	N 1678-08

Flow rate:

Flow capacity under vacuum of 100 kPa (1000 mbar) with Water / 1 kPa (10 mbar) with air using a PTFE filtering membrane with a diameter of 47 mm and a thickness of 0,2 mm:

Pore size µm	Product	Flow ml/min.
1,00	water	16
0,45	water	4
1,00	air	325
0,45	air	122





BOLA Three-Stage Flow Filter

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

FDA conform

Product description:

Filter made of PFA with connecting nut made of glass-fibre reinforced ETFE. Suitable for vacuum and overpressure up to max. 150 kPa (1.500 mbar) and for temperatures up to max. +160°C. Multi-stage filtrations with up to 3 different filtering membranes are possible. Easy exchange of the optionally available filtering membrane (page 332). Couplings for connecting tubing (page 189) with 0.D. 6,35 mm (1/4") are included.

Cat. No.:	For tubing O.D.	0.D. mm	Filtration surface cm ²	For membrane dia.
N 1682-08	(1/4") 6,35	62	3 x 14,1	47

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 m√min.
1,00	water	6
0,45	water	1
1,00	air	418
0,45	air	231

























BOLA Vacuum Filters

Material:

Temperature resistance:

Chemical resistance:

PTFE, PFA

from -200°C to +250°C +++ universal

FDA conform

Product description:

Filtration unit made of PTFE, multi-stage hose connector with integrated lock screw for connecting vacuum tubing with I.D. 6 mm or 8 mm, PTFE supporting disc to fit optionally available filtering discs (page 332). Collecting vessel made of PFA, filling vessel with lid for protection against contaminations also made of PFA. The filters are produced without plasticisers and have an almost universal chemical resistance. They do not release any trace elements into the filtrate. Due to the non-adhesive surface, they are easy to clean and can be reused.

For membrane dia. mm	Filtration surface cm ²	Capacity of filling/ collecting (vessel ml)	0.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 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.	Pore size µm	Flow m√min.
47	1,00	55
47	0,45	20
47	0,20	11

F	or membrane dia.	Pore size	Flow m√min.
	90	1,00	199
	90	0,45	72
	90	0,20	42



#SUITABLE PAGE 332

Dimensionally coordinated filtering membranes

BOLA Vacuum Filtering Funnels

Material -

Temperature resistance:

Chemical resistance

PTFE, PFA

from -200°C to +250°C

+++ universal

FDA conform

Product description:

Filtration unit made of PTFE with cone size 29 for connection to a vessel (must be suitable for vacuum) with socket size 29. Multi-stage hose connector with integrated lock screw for vacuum tubing with I.D. 6 and 8 mm, filtration surface 13,8 cm^2 , easily exchangeable filtering membrane dia. 47 mm (optionally available - page 332). Filling vessel made of PFA with PTFE lid for protection against contaminations.

Capacity of filling vessel	0.D. mm	Total height mm	Cat. No.:
125	62	188	N 1658-08

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 m√min.
1,00	61
0,45	15
0,20	8







BOLA Vacuum Adaptor GL

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



NEW

FDA conform

Product description:

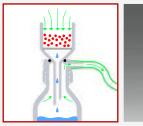
 ${\it Made of PTFE. Pass-through with o-ring made of FKM for safe assembly of standard filter}$ funnels made of glass or plastic on flasks with thread GL 45. Lateral 2-step hose connector made of PTFE for connection to a vacuum pump by means of suitable tubing.

Cat. No.:	2-Step hose connector		For funnel outlet	For thread
	B 0.D. mm	A 0.D. mr	max. Ø mm	GL
N 1656-45	12	9	22	45



Applications:

For vacuum filtration, the o-ring at the pass-through provides good sealing to the filter funnel. A slight vacuum is sufficient.





BOLA Vacuum Adaptor with Ground Joint

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



FDA conform

Product description:

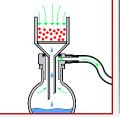
 $\label{thm:made-of-FKM} \mbox{Made of PTFE. Pass-through with o-ring made of FKM for safe assembly of standard filter}$ funnels made of glass or plastic on vessels and round- bottom flasks with ground joint. Lateral 2-step hose connector made of PTFE for connection to a vacuum pump by means of suitable tubing.

Cone size GL	For funnel outlet max. Ø mm	2-Step hose A 0.D. n		Cat. No.:
14/23	8	9	12	N 1655-01
19/26	11	9	12	N 1655-02
29/32	22	9	12	N 1655-04
45/40	22	9	12	N 1655-06



Applications:

For vacuum filtration, the o-ring at the pass-through provides good sealing to the $\,$ filter funnel. A slight vacuum is sufficient.

























BOLA Buchner Funnels

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

FDA conform

Product description:

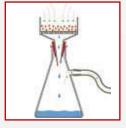
Made of PTFE. Two-part version demountable in upper and lower part for easy cleaning and removal of filter cake. Suitable for vacuum filtration. Nominal sizes and dimensions as per DIN 12 905. Suitable for commercial filter papers (not included in the scope of delivery). Universal chemical resistance, the medium is only exposed to PTFE.

Nominal size As per DIN 12 905	Volume ml	For filter paper dia.	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



For suspension of solids.







BOLA Vacuum Traps

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

FDA conform

Product description:

Consisting of a screw cap red made of PBTP for thread GL 45, distributor body made of PP with 2-step hose connectors for connection of elastic tubing (such as silicone, Viton® or Tygon®) as well as a gas inlet tube made of FEP. With arrow on the top side of the distributor body to display the flow direction. The gas inlet tube can be cut to length on request. Limited chemical resistance, for working temperatures up to max. +110 °C.

	2-Step hose 0.D. a	connector O.D. b mm	Length gas inlet tube mm	Width including necks mm	Cat. No.
A	9	12	150	80	D 810-05

Applications:

Protection of pumps or vacuum systems from damages through vapour or condensate.

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

Chemical resistance:

autoclave: Vacuum: 121 °C suitable

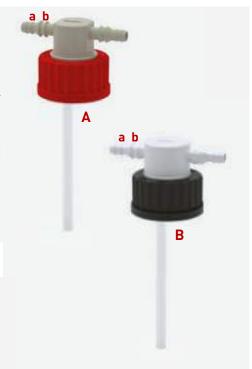
Product description:

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.

	2-Step hose O.D. <mark>a</mark>	connector O.D. b mm	Length gas inlet tube mm	Width including necks mm	Cat. No.
В	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 +++ universal

Chemical resistance:

2 bar

121°

FDA conform

Product description:

Adaptors can be screwed together into multi-stage filters (prefilter, main filter). The low weight of only 14 g or 44 g allows easy exchange of the optionally available filtering membranes (page 332).

Cat. No.:	Total height	0.D.	Filtration surface	For membrane dia.
	mm	mm	cm ²	mm
N 1666-08	35	21	0,78	13
N 1666-16	40	34	3,80	25

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.	Pore size	Flow ml/min.
13	1,00	1
13	0,45	0,3
25	1,00	5
25	0,45	2







BOLA Pressure Pre-Filters

Material: Temperature resistance: Chemical resistance: Pressure: autoclave: PTFE from -200°C to +250°C 121° +++ universal 10 bar

FDA conform

Product description:

For direct fine filtration in front of HPLC columns. For filtering membranes (available optionally – page 332) with a diameter of 13 mm and a thickness between 0,2 μm, f iltration surface of 132 \mbox{mm}^2 for filtration with nearly no dead volume. The membrane can be exchanged by hand. Connection threads on both sides UNF 1/4" 28 G, suitable flanged tubing can be found on page 299.

	For filtering membrane with dia. mm	For tubing I.D.
13 F 780-08	13	(1/32") 0,8
13 F 780-16	13	(1/16") 1,6



























BOLA Scrubber Bottles

PFA, PTFE

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

Chemical resistance: +++ universal

no pressure

transparent



Product description:

Bottle made of PFA. PTFE top with two threaded connections. The standard PTFE frit has a pore size of approx. 3 μm and is screwed on the riser tube with an M8x1 thread. It can be exchanged with the PTFE gas distributor with fine bores (Cat. No. N 1501-16 - page 327) which needs a lower primary pressure.

	Connection for tubing O.D. mm	Total height mm	Capacity ml
6 A 118-01	2 x 6	175	250
6 A 118-02	2 x 6	200	500
8 A 118-03	2 x 8	240	1.000

Product advantages:

- » transparent
- » unbreakable
- » frit easily exchangeable

Flow rate:

Using the standard gas distributor and at the stated system pressure.

Cat. No.:	System pressure			
	0,1 bar	0,3 bar	0,6 bar	
A 118-01	12,5 l/h	67,5 l/h	140,0 l/h	
A 118-02	7,5 l/h	30,0 l/h	80,0 l/h	
A 118-03	7,5 l/h	37,5 l/h	80,0 l/h	





BOLA Gas Frits

Material:

Chemical resistance:

PTFE

from -200°C to +250°C +++ universal



Product description:

Microporous PTFE with pore size 5 μm for steady sparkling of the flowing gas. Suitable for scrubber bottles and columns (page 326) with M 8x1 thread and for gas inlet tubes (page 329).

0.D. mm	Length mm	Receiver	Suitable for Cat. No.:	Cat. No.:
15	15	M 6 x 1		N 1503-28
25	26	M 8 x 1	A 117/ A 118	N 1503-32
15	15	Ø 5 mm		N 1503-36
25	26	Ø 7 mm		N 1503-40



BOLA Gas Distributors

Material:

Temperature resistance:

Chemical resistance:

PTFE

from -200°C to +250°C +++ universal

FDA conform

Product description:

With finest bores (4 x 0,4 mm) for steady sparkling of the flowing gas, only low pressure is necessary. Suitable for scrubber bottles and columns (page 326) with M 8x1 thread and for gas inlet tubes (page 329).

Cat. No.:	Suitable for	Receiver	Height	0.D.
	Cat. No.:	M	ca. mm	mm
N 1501-16	A 117- / A 118-	8 x 1	24	28



BOLA Scrubber Columns

Material: FEP, PTFE Temperature resistance:

from -200°C to +205°C +++ universal

Chemical resistance:

Transparency: no pressure transparent

FDA conform

Product description:

Tall, slim scrubber column made of FEP. Inlet and outlet tube as well as riser tube are made of FEP (5,6 x 8 mm), bottom and top are made of pure PTFE. The standard PTFE frit has a pore size of approx. 3 μm and is screwed on the riser tube with an M8x1 thread. It can be exchanged with the PTFE gas distributor with fine bores (Cat. No. N 1501-16 - page 327) which needs a lower primary pressure.

Capacity ml	Total height mm	Connection for tubing O.D. mm	O.D. of column mm	Cat. No.:
500	400	2 x 8	54	A 117-04
1.000	700	2 x 8	54	A 117-08

Product advantages:

- » transparent
- » unbreakable
- » intense mixing of gas due to tall riser tube
- » frit easily exchangeable

Using the standard gas distributor and at the stated system pressure.

Cat. No.:	System pressure			
	0,1 bar	0,3 bar	0,6 bar	
A 117-04	15,0 l/h	62,5 l/h	130,0 l/h	
A 117-08	5,0 l/h	50,0 l/h	117,5 l/h	





#SUITABLE PAGE 328

Scrubber Adaptors for Bottles for GL 45 and GLS 80



























BOLA Scrubber Bottles Vitrum

Material:

Chemical resistance:

PTFE, PP

+++ universal

121°

FDA conform

Product description:

Consisting of PTFE body with screw cap and two lateral GL 18 threaded necks, suitable bottle made of borosilicate glass as well as a FEP inlet tube and a gas distributor with finest bores. Easy in- and outlet of gas by means of hard-walled tubing (e.g. PTFE) which can be connected to the threaded necks with BOLA Laboratory Screw Joints. Elastic tubing can be connected by means of hose connectors.

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

	Capacity ml	For bottle thread	Necks GL	Total height mm	Cat.No.:
A	500	GL 45	2 x 18	207	N 1662-14
	1.000	GL 45	2 x 18	256	N 1662-24
В	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.:	0,1 bar	System pressure 0,3 bar	0,6 bar
N 1662-14	150 l/h	325 l/h	425 l/h
N 1662-24	150 l/h	325 l/h	425 l/h
N 1662-34	500 l/h	1000 l/h	1500 l/h
N 1662-44	500 l/h	1000 l/h	1500 l/h





BOLA Scrubber Adaptors for Bottles

Material:

Chemical resistance:

autoclave:

PTFE, PP

+++ universal

121°

FDA conform

Product description:

Consisting of PTFE body with connecting nut and two lateral GL 18 threaded necks, a FEP inlet tube with a length of 300 mm and a gas distributor with finest bores. Easy in- and outlet of gas by means of hard-walled tubing (e.g. PTFE) which can be connected to the threaded necks by means of BOLA Laboratory Screw Joints (page 90). Elastic tubing can be connected by means of hose connectors (page 139). Inlet tube can be shortened individually. The special feature: the body of the adaptor can be turned independently from the connecting nut. This means that the completely assembled adaptor can be removed and fixed on another bottle without the risk of disarranging the tubing. Suitable for bottles of Duran Group (formerly Schott AG) with GL 45 and GLS 80 thread and a volume between 100 and 5000 ml.

	For bottle thread	Gas inlet tube	Width incl. threaded necks	Cat. No.:
		mm	mm	
A	GL 45	300	76	N 1660-14
В	GLS 80	300	76	N 1660-24

Using the standard gas distributor and at the stated system pressure.

Cat. No.:	System pressure 0,1 bar 0,3 bar 0,6 bar			
N 1660-14	150 l/h	325 l/h	425 l/h	
N 1660-24	500 l/h	1000 l/h	1500 l/h	





BOLA INNOVATION



#1 Scrubber Adaptors for Bottles

Usable for different bottle sizes since the 300 mm FEP tube can be shortened individually. BOLA is offering two versions: suitable for bottle thread GL 45 or GLS 80 (e.g. from Duran Group).

BOLA Gas Inlet Tubes

Material: Temperature resistance: Chemical resistance: PTFE from -200°C to +250°C +++ universal FDA conform Product description: For constructing a gas washing equipment. Tube with inner diameter 5 mm, one side with hose connector dia. 9 mm for connecting tubing, other side with thread M 8x1 for connecting a gas frit or a gas distributor. Length Cat. No.: 200 N 1502-02 400 N 1502-04 600 N 1502-06 thread hose connector

Spare parts for: Scrubber Adaptors for Bottles and Scrubber Bottles Vitrum

Description	Material	Packing Unit	suitable for Cat. No. :	Cat. No.:	
Replacement Gas Inlet Tubes	FEP	Pack size: 5 pieces	N 1660-14 / N 1660-24 / N 1662-14 N 1662-24 / N 1662-32 / N 1662-44	N 911-01	
Replacement Gas Distri- butor GL 45	PTFE	Pack size: 5 pieces	N 1660-14 / N 1662-14 / N 1662-24	N 910-01	Į.
Replacement Gas Distri- butor GLS 80	PTFE	Pack size: 5 pieces	N 1660-24 / N 1662-34 / N 1662-44	N 910-02	





















BOLA Micro Scrubber Bottles

 Material:
 Temperature resistance:
 Chemical resistance:
 Pressure:
 Transparency:

 PFA
 from -200°C to +250°C
 +++ universal
 no pressure
 transparent



Product description:

For use with volumes up to 50 ml. The gas inlet tube (not included, please choose a hard-walled tubing) is inserted through the fitting on the top and can be fixed safely. The side fitting is used as gas outlet.

Capacity ml	Total height mm	Connection for tubing O.D. mm	O.D. of bottle	Cat. No.:
50	180	6	31	A 119-24

Product advantages:

- » transparent
- » unbreakable
- » non-porous

Applications:

Can also be used as cold trap.



BOLA Suction Filters

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

FDA conform

Product description:

Consisting of a receiver made of PTFE with female thread UNF 1/4" 28 G and an easily exchangeable frit made of porous PTFE (Cat. No. F 766-..). Ideal prefilters in front of pump systems for protecting gaskets, pistons or column packings against premature wearing due to contamination. Suitable flanged tubing can be found on page 299.

Cat. No.:	Length of filter	Dia. of filter	For tubing I.D.	Pore size
	mm	mm	mm	μm
F 765-08	25	14	(1/32") 0,8	2
F 765-16	25	14	(1/16") 1,6	2
F 765-48	25	14	(1/32") 0,8	10
F 765-56	25	14	(1/16") 1,6	10





Spare Parts for: Suction Filters

Description	Material	Packing Unit	Pore size µm	suitable for Cat. No.	Cat. No.:	
Replacement-Frits for Suction Filters	PTFE	1 piece	2 10	F 765-08 / F 765-16 F 765-48 / F 765-56	F 766-08 F 766-48	

111

BOLA Filtering Tiles

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



Product description:

Made of microporous PTFE, standard tiles with dimensions of $320 \times 320 \text{ mm}$ for cutting or stamping.

Pore size	Thickness	Cat. No.:
μm	mm	
5	1	N 1610-10
10	1	N 1616-10
10	2	N 1616-20
10	3	N 1616-30



BOLA Filtering Sheets

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



Product description:

Made of porous PTFE, width approx. 150 mm x length 300 mm.

Pore size	Thickness mm	Cat. No.:
0,05	0,2	N 1617-02
0,20	0,2	N 1617-04
0,45	0,2	N 1617-06
1,00	0,2	N 1617-10
1,00	1,0	N 1617-15
2,50	0,2	N 1617-20
2,50	1,0	N 1617-25
5,00	0,2	N 1617-30
5,00	1,0	N 1617-35
10,00	0,2	N 1617-40
10,00	1,0	N 1617-45
25,00	1,0	N 1617-55



Applications:

Suitable for cutting and blanking. A reduction of stability and mechanical load capacity has to be observed when processing materials with larger pore sizes.





















BOLA Filtering Membranes

Material:

Temperature resistance:

Chemical resistance:

PTFE

from -200°C to +250°C +++ universal



Product description:

Made of microporous PTFE, thickness 0,2 mm, packing unit: 10 pieces

Dia. of membrane mm	Pore size µm	Filtration surface mm ²	Cat. No.:
13	0,05	132	N 1690-08
13	0,20	132	N 1690-12
13	0,45	132	N 1690-16
13	5,00	132	N 1690-24
25	0,05	490	N 1690-28
25	0,20	490	N 1690-32
25	0,45	490	N 1690-36
25	5,00	490	N 1690-44
47	0,05	1.735	N 1690-48
47	0,20	1.735	N 1690-52
47	0,45	1.735	N 1690-56
47	1,00	1.735	N 1690-60
47	5,00	1.735	N 1690-64
47	10,00	1.735	N 1690-65
90	1,00	6.362	N 1690-80
90	5,00	6.362	N 1690-84





Flow 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

from -200°C to +250°C

Chemical resistance: +++ universal

FDA conform

Product description:

Made of porous PTFE, thickness 1,0 mm, packing unit: 10 pieces.

Dia. of membrane mm	Pore size	Filtration surface mm ²	Cat. No.:
47	1,0	1.735	N 1565-06
47	5,0	1.735	N 1565-12
47	10,0	1.735	N 1565-18
47	25,0	1.735	N 1565-24



Flow 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 m√min.
1,00	air	101
1,00	water	14
5,0	air	311
5,0	water	60
10,0	air	981
10,0	water	568
25,0	air	2997
25,0	water	1996

BOLA Filtering Rods

Material: Temperature resistance: PTFE

Chemical resistance: +++ universal

FDA conform

Product description:

from -200°C to +250°C

Made of microporous PTFE for further treatment and processing. Diameter and length are nominal dimensions and can contain a machining tolerance.

Pore size	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:

Temperature resistance:

Chemical resistance:

PTFE

from -200 °C to +250 °C +++ 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.

Pore size	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.





111

BOLA Dirt Traps

Material: **PTFE**

Temperature resistance:

from -200°C to 250°C +++ universal

Chemical resistance:

Pressure: 10 bar Vacuum: suitable

FDA conform

Product description:

With two threads GL 18 for the connection of hard-walled hoses (e. g. of PTFE, PFA, FEP) or tubes with BOLA laboratory screw joints. Lateral connection with plug for easy exchange of filtering membrane (membrane thickness: 0.2-3.0 mm) and for cleaning. The flow direction is marked with an embossed arrow. Completely made of PTFE, the liquid come only in contact with PTFE.

Cat. No.:	Total height	Through hole	Diameter Filtering Discs	Connection Thread
	mm	mm	mm	GL
N 1674-18	88	8	25	18

Applications:

For further processing through turning, milling or cutting e.g. as filtering frits. With increasing pore size, a decrease in strength and mechanical load capacity can be noted.







#SUITABLE PAGE 90

Ideally coordinated laboratory screw joints.

BOLA PRACTICAL TIP Protect Pump

In order to prevent that dirt or loosened particles destruct your pump, just insert a dirt trap in your piping system.

























Pumps







338 Pumps

Cordless Pumps for Acids and

Caustic Solutions 338
Sampling Pump 338



Adaptors for Prominent®

Pumps 339



















BOLA Cordless Pumps for Acids and Caustic Solutions

Material:

Temperature resistance:

Chemical resistance:

from +5°C to +60°C

++ 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 Dia. of suction pipe Cat. No.: 400 25 G 870-01 600 25 G 870-01

Product advantages:

- » powerful pumping capacity of up to 6 litres per minute free flowing
- » compact construction
- » battery operated and therefore usable anywhere
- » easy handling
- » very light weight (only 500 g including batteries)
- » low-risk pumping
- » also suitable for narrow mouth vessels with ground joint 29/32 or thread GL 45, carboys or barrels

For pumping low viscous liquids (e.g. acids, bases etc.)



#SUITABLE PAGE 189

Tubing for all screw joints







BOLA Sampling Pump

Material:

Temperature resistance:

Chemical resistance:

PTFE, PP

from -10°C to +90°C ++ very good



FDA conform

Product description:

Made of polypropylene and PTFE. A pull on the ball handle produces a slight vacuum in the sampling bottle. Due to this vacuum, the sample is sucked into the sampling bottle. Both glass bottles and plastic bottles with a GL 45 thread can be used as sampling bottles. The pump provides universal chemical resistance since the sample is only exposed to PTFE.

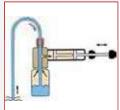
Thread for connection GL	For bottles with a capacity of ml	Suction lift of water max. m	Cat. No.:
18	100 - 2.000	4,5	A 124-16

Product advantages:

- » compact construction
- » usable anywhere (no power or air supply needed)
- » easy handling
- » quick and low-risk pumping of ultrapure liquids
- » no cleaning necessary, only the PTFE tubing gets in contact with the product.
- » volume per stroke 50 ml
- » for tubing O.D. 6 mm, PTFE tubing (length 2 m) included in delivery

For pumping liquids from sources that are not easily accessible; also suitable for liquids with a high viscosity, e.g. oils.









Spare Parts for: Sampling Pump

Description	Material	Packing Unit	suitable for Cat. No.	Cat. No.:	
Replacement Suction Membrane	Silicone	Pack size: 5 pieces	A 124-16	A 910-01	

BOLA Adaptors for Prominent®-Pumps

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



FDA conform

A Product description:

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

Cat. No.:	Bore dia. mm	Connecting thread GL	
D 730-12	3,0	14	
D 730-24	10.5	18	





В





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.

Cat. No.:	Bore dia.	For tubing
	mm	mm
D 731-12	0,8	(1/32" x 1/16") 0,8 x 1,6
D 731-24	1,6	(1/16" x 1/8") 1,6 x 3,2













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)	-	0	0	0	+	+	+++	++	+++	+++
Sterilisable with Y-radiation	-	-	-	-	0	++	0	+	+	+
Chemical resistance	+++	+++	+++	+++	+	0	++	++	0	0

Definition: - not suitable, not recommended

o possible, moderate to good

+ good

+++ very good, best choice

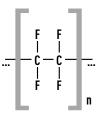
PTFE - Polytetrafluorethylene

PTFE - TFM

products.

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.

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



Trade names

3M™ DyneonTM PTFE by Dyneon Teflon® by Chemours Fluon® by AGC Chemicals Europe





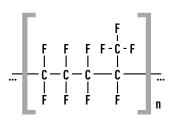






FEP - Tetrafluorethylene-Perfluoropropylene

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.



Teflon® FEP by Chemours Dyneon™ Fluorothermoplastics FEP by Dyneon Neoflon® by Daikin



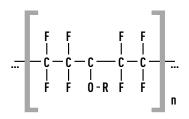
Trade names



PFA - Perfluoralkoxy 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 highpurity 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



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BOLA Materials

ETFE - Ethylen-Tetrafluorethylene Copolymer

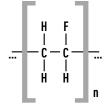
Partly fluorinated ethylene-tetrafluorethylene copolymer. Unlike the high-molecular PTFE which can be processed only by means of pressing or sintering, ETFE can be thermoplastic processed as already described before for PFA and FEP. I. e. this plastic material can be injection moulded or extruded with 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™ Fluorothermoplastics ETFE by Dyneon

Trade names

Solef® PVDF by Solvay Kynar® PVDF by Arkema



Trade names

Tedlar® Foils by DuPont

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.

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.

THV - Tetrafluorethylene-Hexafluorpropylene-Vinylidenfluoride Terpolymer

THV consists of the monomers tetrafluorethylene, hexafluorpropylene and vinylidenfluoride. This fluorother-moplastic 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™ Fluorothermoplastics 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 temperate of more than 150 °C.



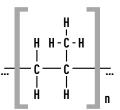
The permanent operating temperature is defined as the maximum temperature with which the material can be operated for 20.000 hours but without loosing more than 50 % of its original rigidity and ductility. This means, a plastic material having a rigidity of 40 MPa in new condition has to show a rigidity of minimum 20 MPa after having been stored at its maximum permanent operating temperature for 20.000 hours.



Standard-Plastics

PP - Polypropylene

A polymer of ethylene with isostatic 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.



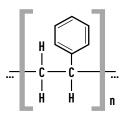
Trade names

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

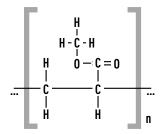
Condensation polymers obtained either from amino acids respectively from their lactams (e. g. caproic lactam) or diamine and dicarboxylic acid (e. g. adipic acid and hexamethylene-diamine). In general, polyamides are defined according to the number of carbon atoms of their monomers, e. g. PA 6 = polycarbonic lactam or PA 12 = polylauric lactam. PA 6 is the most commonly used polyamide. All polyamides are characterised by high strength and scuff resistance. The application range varies from simple turned parts such as screws or nuts to plain bearings or toothed wheels.

Trade names

Ultramid® by BASF Durethan® by Bayer Grilon® by Ems Chemie

PMMA - Polymethylmethacrylate

An acrylic resin based on methyl methacrylate. It has become generally known under the trade name Plexiglas®. On the one hand, PMMA is approx. 60 times more elastic than window glass but on the other hand it is approx. 10 times more permeable than silicate glass. Of course, the hardness of its surface does not correspond to that of glass but compared with other materials it can be easily polished to high brilliance. As to weight, Polymethylmethacrylate is much more lightweight than normal window glass.



Trade names

Plexiglas® by Evonik Röhm Perspex® by ICI Oroglas® by Rohm and Haas

High-performance Plastics

PPS - Polyphenylsiloxan

Technical high-performance plastic. This macromolecule consists of phenylene rings and one S-atom which provide a good chemical resistance even at high working temperatures. PPS is particularly suitable for the production of moulded pieces which are exposed to high mechanical and thermal stresses. Injection moulding is the most common processing technology for this material, in addition, single components can be made of semi-finished products by cutting. Special glass-fibre reinforced compounds offer an improved rigidity, sturdiness and dimensional stability under heat compared to non-reinforced compounds.

Trade names

Fortron® by Celanese Ryton® by Phillips Petroleum Chemicals Alton® by Intern. Polymer Corp.

PEEK - Polyetheretherketone

Partly crystalline thermoplastic that withstands high temperatures. Due to its unique properties, PEEK is mainly used for high-value and highly stressable components. The high upper working temperature (+250 °C), the good chemical stability and resistance to hydrolysis as well as the high mechanical values of this material will allow PEEK to become the material of the future. PEEK components are commonly used as HPLC fittings, screw joints or as tubing. Its natural colour is brown, its price is considerably higher than that of PTFE or PFA. PEEK is available in many different types, e. g. modified for self-lubricating bearings.

Trade names Victrex® by Victrex VESTAKEEP® PEEK by Evonik





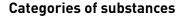
Materials - Chemical Resistance

Please note:

All information in our catalogue is based on current technical knowledge, experience and manufacturers' data. Users should check the suitability of parts and materials described in the catalogue before purchase.

BOLA does not accept any warranty claims as to suitability and fitness of purpose of the materials and products described in this catalogue. Users should avoid making any assumptions on, or interpretation of, the data herein. Therefore we cannot provide warranty and cannot accept responsibility for any damage.

Additionally, an overview stating the chemical resistance of all BOLA materials against many different substances from A like Accumulator Acid up to Z link Zinc



Classes of substances at +20 °C	PTFE	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA
Aldehydes	+	+	+	+	+	+	0	•	-	-
Alcohols	+	+	+	+	+	+	+	-	0	0
Amines	+	+	+	+	+	•	0	0	+	-
Bases/Caustic solutions	+	+	+	+	+	+	+	•	0	-
Esters	+	+	+	+	+	•	+	+	-	-
Ether	+	+	+	•	0	•	0	0	-	-
Glycols	+	+	+	+	+	+	+	+	+	0
Ketones	+	+	+	•	0	•	0	+	-	-
Hydrocarbons, aliphatic	+	+	+	+	+	+	0	+	-	-
Hydrocarbons, aromatic	+	+	+	+	+	+	•	+	-	-
Hydrocarbons, halogenated	0	+	+	+	+	+	0	0	-	-
Mineral oils	+	+	+	+	+	+	-	+	+	•
Oxidizing agents, strong	+	+	+	•	0	+	0	-	-	-
Vegetable oils	+	+	+	+	+	+	0	+	+	0
Acids inorganic	+	+	+	•	•	+	+	-	+	0
Acids organic	+	+	+	•	•	+	+	-	•	+
Lubricating oils	+	+	+	+	+	+	+	+	+	+

Nitrates is available for download on our website in pdf-format:











Definitions and abbreviations:

- + Excellent chemical resistance continuous exposure for more than 30 days does not cause any damage or only minor damages.
- Limited chemical resistance depending on the plastic material, a continuous exposure for a longer period of time may cause damages such as cracks, decrease of mechanical strength, discoloration, etc.
- Poor resistance the plastic material can be deformed or destroyed.

Elastomers

Their main characteristic is their elasticity: Elastomers can easily be stretched and bent and return to their original shape and size after being released. These synthetic materials are most commonly used for o-rings, flat gaskets or resilient elements.

NBR - Acrylonitrile-Butadiene-Caoutchouc

Elastomer on the base of acrylonitrile-butadiene-caoutchouc which is mainly used as budget-priced sealing material (e. g. O-rings for stop-cocks). This material has a good resistance to mineral oils and fats as well as to HFA, HFB and HFC-hydraulic fluids. It has a very good elasticity. PERBUNAN® (its well-known trade name of BAYER AG) is not resistant to brake fluids on the basis of glycol, HFD liquids, aromatic compounds(e. g. benzol), ester, ketone and amines as well as in concentrated acids and caustic solutions. Due to its restricted chemical resistance, PERBUNAN® is not the ideal material for chemistry.

FKM - Fluorocaoutchouc

Elastomer on the base of fluorocaoutchouc, more familiar as VITON®(DuPont). Many O-rings, lip seals and sleeves are made of FPM. It has a very good resistance to heat, chemicals, weather and ozone. Furthermore, it is resistant to sulphurated mineral oils and fats and to hardly inflammable HFD liquids (basis phosphor ester or chlorinated hydrocarbon). It is not resistant to anhydrous ammonia, caustic soda, potassium, ketones, ether, dioxane, as well as some amines and organic acids. For BOLA products, FPM is mainly used as sealing material, mostly protected from the medium by a PTFE sealing lip.

$$... - \begin{bmatrix} F & H & F & F & F & F \\ | & | & | & | & | & | & | & | \\ C - C & X & | & | & | & Y & | & | & Z \\ | & | & X & | & | & | & Y & | & | & Z \\ F & H & F - C - F & F & F & F & F \\ | & | & | & | & | & | & | \\ F & & | & | & | & | & | & | \\ \end{bmatrix} _{n}$$

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 0-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.

$$\begin{array}{c} ... \\ -CF_2 - CF_2 \frac{1}{X} CF - CF \frac{1}{Y} CF_2 - CF \frac{1}{X} \\ 0 & Br \\ CF_3 \end{array}$$

Elastomers - Chemical Resistance

Classes of substances at 20°C	NBR	FKM	FFKM	EPDM
Water	++	++	++	++
Acids	+	+	++	++
Lyes	+	+	0	++
Oils and fats	+	++	++	-
Fuels	+	++	++	-
Ozone	0	++	++	++
Hydrocarbon, aliphatic	++	++	++	-
Hydrocarbon, aromatic	-	++	++	-
Hydrocarbon, chlorinated	-	++	++	-
Temperature range, °C	-40 up to +130	-20 up to +200	-20 up to +250	-30 up to +140

Definition: - not suitable, not recommended

o possible, moderate to good

- good

+++ very good, best choice

Materials - Physical Properties

Property	Standard	Unit	PTFE1	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA ³	PPS	PEEK
Density	DIN 53 479	g/cm³	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 extin- guishing	self extin- guishing	self extin- guishing	flammable	flammable	flammable	yes	self extin- guishing	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	PTFE1	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA ³	PPS	PEEK
Tensile strength 23 °C	DIN 53 456	N/mm²	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/mm²	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/mm²	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/mm²	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/mm²	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	PTFE1	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/cm³	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	PTFE1	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 103	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		300-3300	1–14	0.02	20	
Volume resistivity	DIN 53 482	Ω x cm	1018	1018	1018	1016	1015	1014	>1016	1012	>1011	1015	>10'13	5x10 ¹⁶
Surface resistivity	DIN 53 482	Ω	1017	1017	1016	1014	1014	1013	>1013	1010	>1013	5 x 10 ¹³	>10'15	1012
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		cm³/m² d/bar	0.7		3.8	4.7	1.5	0.06	4.3	0.5	0.27	1	-	
Oxygen permeability		cm³/m² d/bar	2.05	_	30	15.6	0.39	0.05	19	1.2	2.35	1	-	
Carbon dioxide permeability		cm³/m² d/bar	5.7	_	60	38	17	0.2	61	4	8	_	4	
Water vapor permeability		g/m²/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.

























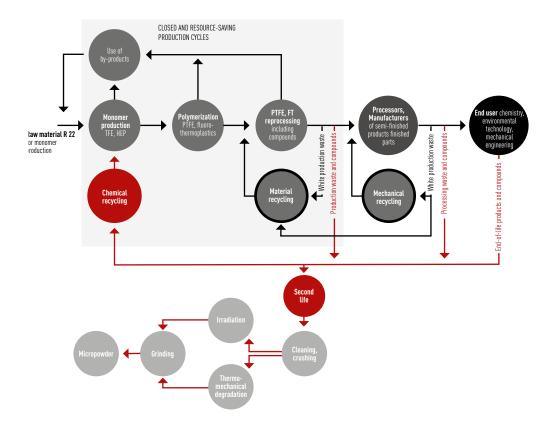
Recycling of fluoropolymers and other plastics

Dr. Michael Schlipf

With more than 50 percent, polytetrafluoroethylene (PTFE) is the most important representative of the fluoropolymers. For PTFE and other fully fluorinated fluoropolymers, the same applies from the beginning of their use: The material costs are comparatively high and the most important raw material, fluorspar

(CaF2), is one of the finitely available resources. Reasons enough why various recycling cycles for fluoropolymers were developed early on and integrated into their life cycle. Today, they are general practice (Fig. 1).

Established cycles during production, processing and use of fluoropolymers



Waste incineration with recovery

If waste from monomer production and polymerisation is incinerated, integrated lime flue gas purification (Ca(OH)2) enables the recovery of fluorspar. This can then be used again as a raw material for monomer production.

Beginning of a "second life"

It is also possible to extend the life cycle. For this purpose off-spec batches from polymer production are converted into PTFE micropowder by thermomechanical degradation of the molecules. This is then used as an additive in paints, printing inks or lubricants.

The thermomechanical degradation of fluoropolymers is particularly environmentally friendly: New, stricter purity regulations, which stipulate low-molecular "fragment" content of less than 25 ppb, are easily complied with.

Mechanical recycling

Machining waste from the production of semi-finished and finished parts is collected, cleaned and ground. This can then be used to produce semi-finished products such as rods, tubes or sheets by means of ram extrusion. It is also possible to break down polymers by highenergy irradiation and reuse the resulting PTFE micro powder.

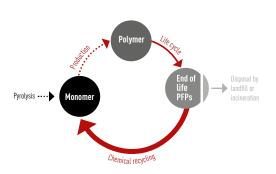
If products are easy to clean at the end of their life cycle, they too can be ground and used either as a raw material for Ram-extrusion or, after radiation degradation, as PTFE micro powder in additive applications. The reprocessing is done by companies specialised in this. They deliver the recycled products back to their point of origin, where they are processed again.

Fluorothermoplastics such as PFA, FEP, ETFE or PVDF can be used in injection moulding or extrusion after state-of-the-art processes such as grinding, cleaning and reuse. The fact that these thermoplastics are usually marketed without the use of fillers makes recycling particularly easy.

Chemical recycling

Chemical recycling, also referred to as upcycling in the case of fully fluorinated fluoroplastics, is a new technology (Figure 2). It has been developed on an industrial scale since 2015 in an experimental industrial plant with a capacity of one thousand tons per year. In the meantime, it is ready for market launch. The fully fluorinated polymers, PTFE, modified PTFE, PFA and FEP, as well as some PTFE compounds can be recycled. The monomer recovery rate is around 85 percent.

Figure 2: In the upcycling process, the products are not incinerated after reaching the end of their life, but are returned to the cycle. The polymers produced again in this way polymers produced in this way show no loss of quality.



For the upcycling process, too, the products are collected after reaching the end of their lives, cleaned and then mechanically shredded. This is followed by thermal splitting back into the monomers at over 600 °C. Reaction products are primarily tetrafluoroethylene (TFE) mixed with a little hexafluoropropene (HFP). After purification of the raw gas mixture by distillation and special washing processes, high-purity monomers are recovered. These can be reused for the polymerisation of new fluoropolymers.

Polymers produced with this process show no reduction in quality compared to the original polymers. Upcycling thus transforms "old" into "new" materials. The quality is thereby raised to the initial level. Fears that the properties of upcycled products are inferior to those of new products do not apply.

Raw-material saving by upcycling

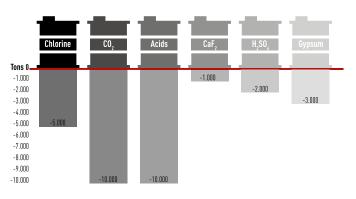
The raw materials for fluoropolymers are fluorspar, crude oil/natural gas, methane and common salt (NaCl). From these, first the fluorocarbon intermediate R22 and finally tetrafluoroethylene (TFE) are produced in a multi-stage process. All fluoropolymers are made from this raw material. Besides a high energy demand, waste products are also produced, especially hydrochloric acid (HCl). These have to be reprocessed or recycled in complex processes. In addition, all the raw materials mentioned are only available in limited quantities. Once these resources are used up, substitute products will be in short supply.

However, if fluoropolymers that have reached the end of their useful life or machining waste are used instead of these finite resources, the raw material and waste savings that can be achieved are enormous. Figure 3 shows the environmental relief per 1,000 tonnes of fully fluorinated polymer returned to the cycle through upcycling. The amounts of "waste acid" or saved carbon dioxide (CO2) are about ten times the

weight of the recycled fluoropolymers. The CO2 footprint ("carbon footprint") of fluoropolymers is thus significantly reduced via the upcycling process to better values.

Figure 3: The environmental impact per 1,000 tonnes of upcycled monomer TFE is enormous. Unwanted by-products of the regular monomer production process, such as CO2 and hydrochloric acid, are even completely avoided.

Environmental relief per 1.000 t of recovered TFE



Re-use of PE and PP

Two important representatives of the "standard plastics" are polyethylene (PE) and polypropylene (PP). Due to the comparatively low raw material prices of virgin materials, only low-cost recycling processes are used here; chemical recycling is not possible because of the comparatively high costs.

PE and PP in the production of laboratory supplies are essentially chips or remnants. These are collected, shredded, cleaned and then converted back into new products via thermoplastic processing methods. The preferred recycling method for PE is film production. Recycled PP is reused by means of injection moulding mainly for technical products, for example bumpers or lamp housings for motor vehicles. In these applications, the material cycles can also be passed through several times. About 14 per cent of the plastics currently used in Germany come from such recycling processes.

Plastic mixtures collected via the "yellow bag", for example, provide a "PE-rich fraction" and a "PP-rich fraction" in automated processes. These are then also suitable for further processing by extrusion or injection moulding. Non-separable municipal plastic waste ends up in so-called "energy recycling" as substitute fuel in coal-fired power plants and thus replaces lignite or hard coal.

























Fluoroplastics - Cleaning and Worth Knowing



All fluoroplastics, PTFE, PFA and FEP have a smooth, non-wetting surface and can usually be cleaned without any problems. Abrasive scouring agents might damage the surface and result in a milkiness of the vessels – especially those made of PFA and FEP. You may use all neutral detergents (pH 7). For a stronger contamination we recommend to use an alkaline detergent up to pH 12. Clean or dry vessels in a laboratory washing machine only when they are completely opened.

Cleaning and re-utilisation of tubing

In principle, fluoroplastic tubing shall only be reused provided the material which shall be conveyed is known and rated with + in the chemical resistance chart. If the first conveyed products or components of chemical compounds are unknown, the reuse of tubing cannot be recommended. Appropriate detergents are all water-soluble substances (such as salts, acids, lyes, etc.). Volatile solvents such as alcohols, ester, ketones, low-boiling hydrocarbons, chlorinated hydrocarbon, etc. will be reversibly dispended 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 HN03 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, $T_{\rm 50}$ (the time taken to reach 50% of the final reading) or $T_{\rm 90}$ (the time taken to reach 90% of the final reading) are stated.



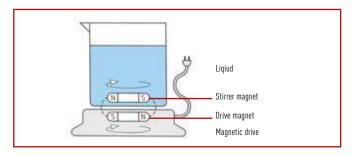
Field-proven method of determination: Put the temperature probe in an ice cold water bath and let it reach a steady-state. Then transfer it quickly to a column of steam and monitor its resistance until a steady state is reached again.

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:

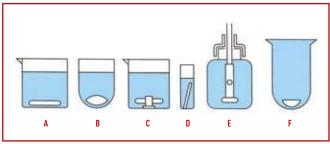
A stirrer magnet placed in the liquid and a magnetic drive located outside the vessel. Both, stirrer magnet and magnetic drive form a magnetic circuit. For trouble-free stirring in liquids with different viscosities the magnetic drive shall have a wide range of different speeds. That is why the strength 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, Polytetraflouroethylene 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.

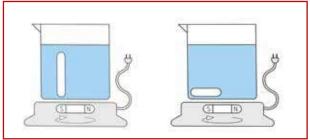


A Cylindrical magnetic stirring bar » B Oval or Egg-shaped magnetic stirring bar » C Magnetic stirring bar with bearing neck » D Magnetic stirring bar for cuvettes » E Magnetic stirring bar for culture bottles » F Custom manufacture for flanced reactors

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 agitor 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:

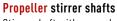
Assumption: Inner diameter of the vessel (D) = 300 mm

1. Determination of the outer diameter of the stirring element $R = (0.2 \text{ to } 0.4) \times D$, thereafter follows $90 \text{ mm} = 0.3 \times 300 \text{ mm}$. 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 x 100 mm. The recommended distance of the stirrer to the bottom is 120 mm.

Signs and symbols:

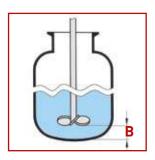
- Inner diameter of the vessel
- R Outer diameter of the stirring element (stirring diameter)
- **B** Distance of the stirrer to the bottom
- **H** Height of the stirring element

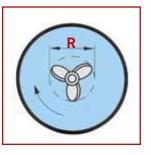


Stirrer shaft with several, inclined, arched and partly twisted blades. Also with draught tube. Stirring effect is based on a mainly axial flow which moves away from the agitator; changes in the blade inclination or rotating direction result in a change of the flow direction.

 $\mathbf{R} = (0.2 \text{ to } 0.4) \times \mathbf{D}$

 $B = (1.0 \text{ to } 1.5) \times R$





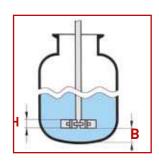
Discoidal stirrer shafts

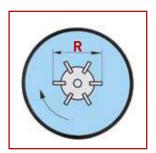
Stirrer shaft with a blade with several, plane or curved paddles. Stirring effect is based on a radial, outwards directed flow with axial suction from the bottom and the top. The dispersing liquid is exposed to a high shearing.

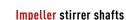
 $\mathbf{R} = (0.3 \text{ to } 0.4) \times \mathbf{D}$

 $H = 0.2 \times R$

 $\mathbf{B} = \mathbf{R}$





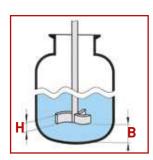


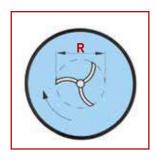
Stirrer shaft with three angular, arched paddles. The stirring effect is based on a radial flow which is diverted axially due to the ground level position of the stirrer.

 $\mathbf{R} = (0.50 \text{ to } 0.70) \times \mathbf{D}$

 $\mathbf{H} = (0.12 \text{ to } 0.17) \times \mathbf{R}$

 $B = (0.08 \text{ to } 0.18) \times R$





























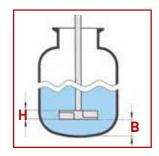
Stirrer Shafts with rigid paddle

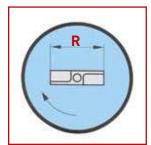
Stirrer with a narrow blade. The stirring effect is based on a radial and axial flow. The product is opposed to shear forces ranging from moderate to strong.

 $\mathbf{R} = (0.70 \text{ to } 0.9) \times \mathbf{D}$

 $\mathbf{H} = (0.05 \text{ to } 0.1) \times R$

 $B = (0.10 \text{ to } 0.2) \times R$





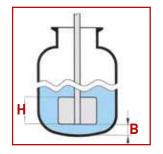
Stirrer Shafts with rigid blade

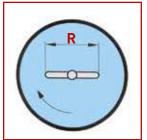
Solid, plane blade in user-defined form. Stirring effect due to different rotation speeds of the product displaced by stirring and the residual vessel content.

 $\mathbf{R} = (0.4 \text{ to } 0.5) \times \mathbf{D}$

 $\mathbf{H} = (0.9 \text{ to } 1) \times R$

B = 0.3 x R





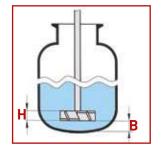
Stirrer Shafts with angular blades

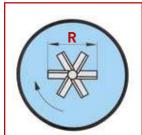
Stirrer shaft with several inclined, rectangular, straight blades (special form a2 = 90 degrees, also curved blades). The stirring effect is based on an axially directed flow combined with an increased shear rate. Reversion of the flow can be obtained by changing the inclination of the blades or the rotation direction.

 $\mathbf{R} = (0.30 \text{ to } 0.40) \times \mathbf{D}$

 $H = (0.15 \text{ to } 0.25) \times R$

 $\mathbf{B} = (0.50 \text{ to } 1.00) \text{ x R}$





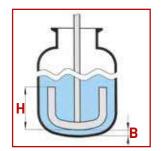
U-shaped stirrer shafts

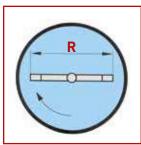
Anchor stirrer blade adapted to the vessel's wall, reaches from edge to edge. The stirring effect is based on a mainly tangential flow with poor axial forces.

 $\mathbf{R} = (0.90 \text{ to } 0.95) \times \mathbf{D}$

 $\mathbf{H} = (0.50 \text{ to } 1.00) \times R$

 $\mathbf{B} = (0.003 \text{ to } 0.005) \times R$



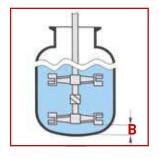


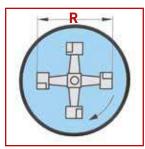
Double impulse stirrer shafts

Stirrer shaft with two contrarily aligned blades on a radial arm. The stirring effect is based on an axial flow with poor radial forces. Analogue to the conveying direction of the blades an axial flow arises near to the shaft. The conveying direction of the outer paddles is adapted to the mixing demands.

 $R = 0.70 \times D$ $H = 0.20 \times R$

 $B = 0.28 \times R$





Stirrer shafts - Maximum Revolutions per Minute

We would like to give advice on the appropriate RPMs, but unfortunately this question is not easy to answer. The following data are based on fieldexperience 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

Diameter of the stirrer shaft incl PTFE coating in mm

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.

















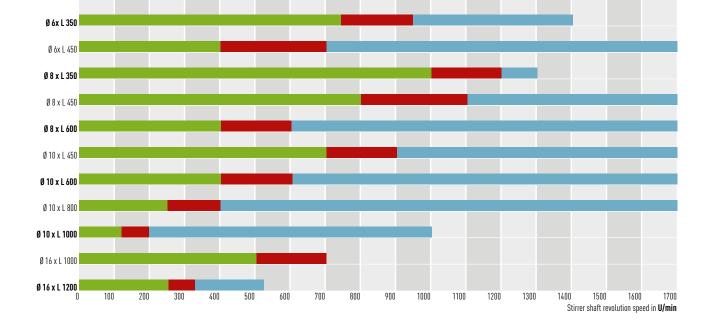












The chart

shall help you to choose the right stirrer shaft respectively to determine the maximum RPM. As many different parameters affect the quiet running of a stirrer shaft, it is recommended that the user will test it under his own conditions.

Please note that for double impulse stirrer shafts the critical RPM range lies 200 rpm below the stated values.

- » Green Area indicates up to which rpm the shaft will not be affected by vibration
- » Red Area -
- marks the critical RPM range. These rpms should be avoided whenever possible.
- » Blue Area
 - is reached after quick skipping of the critical RPM range, vibration seldom occurs, however, agitators and stirrer shafts are extremely stressed by high RPMs. Therefore we recommend to use stirrer shafts only in the green range - if possible.

Tubing - Notes

Thin hoses for vacuum or high temperatures

We recommend to support the tubes in the area of the laboratory screwing for high temperatures, vacuum operation or thin wall thickness. This can be done using a glass or metal tube section. This prevents that the tube can swerve inwards and become leaky. With this trick it is also possible to fix elastic, rubbery tubes at glass threads with the BOLA laboratory screwing.



Tolerances for BOLA Tubes

The tubes mentioned match exactly to the BOLA Screwing Systems. Therefore, you can be sure that all fittings and screwing fit together. The practise showed that tubes show a certain tolerance as to external diameter and the wall thickness. The tubes mentioned are checked several times. The basis for this are strong BOLA internal standards which go far beyond the usual market requirements as to quality and measurements.

Beside the outer diameter of a tube, the wall thickness is also important for the quality evaluation. We at BOLA, have also set a stronger tole-rance for the wall thickness than typically applied. Above all, we do not allow that due to chaining of tolerances the tube gets a totally different measurement than actually required. Therefore, the wall thickness of the BOLA tubes may vary only within the tolerance of the outer diameter as mentioned in the table beside.

Furthermore, the tubes are controlled that there are no material faults (e.g., inclusions of foreign particles), lengthwise grooves and/or gross grooves, and no unevenness at the outer and inner diameter.

Tolerances for Pure, Unfilled PTFE, PFA, FEP Tubes

Nominal outer diameter mm	0,4-2,9	3,0	0,01	10,1-	16,0	16,1-22	2,0	über 22,1
Tolerance outer diameter mm	± 0,05		± 0,10	±	0,15	± 0,	20	± 0,20
Wall thickness mm	0,1-0),3	0,	4-1,0		1,1-2,0		über 2,1
Tolerance mm	± 0,0	25	±	0,05		± 0,10		± 0,20

Tolerances for antistatic ex-proof tubes, PTFE-EX

Nominal outer diameter mm	1,6-3,2	3,3-6,35	8,0-14,0	16,0
Tolerance outer diameter mm	± 0,10	± 0,25	± 0,30	± 0,40
Wall thickness mm	0,4-0,8	1,0		
Tolerance mm	± 0,10	± 0,20		

000

Tubing - Pressure Resistance

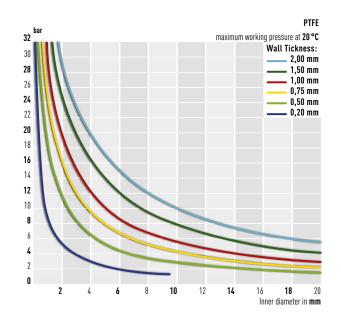
PTFE Tubing

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 $+20~^{\circ}\text{C}$ the working pressures stated in this graph have to be multiplied by the corresponding reduction factor. For temperatures below $+20~^{\circ}\text{C}$ 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 °€	50	75	100	150	200	250
Reduction Factor	0.87	0.77	0.68	0.53	0.39	0.28



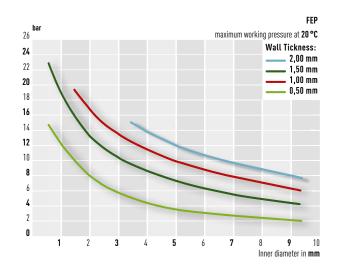
FEP Tubing

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



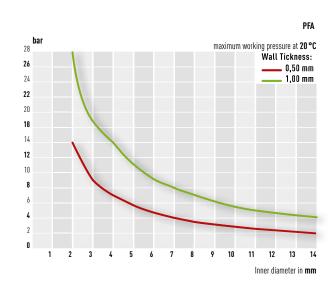
PFA Tubing

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 $^{\circ}\mathbb{C}$	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:

outer- \emptyset x 0.1 = wall thickness

For a "normat" 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. Ø 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-Ø of screw joint in mm	0.5-3,2	4.0-14	> 16
Recommended max. tolerance of tube/tubing in	± 0.05	± 0.1	± 0,25

Transition from imperial to metric tubing

With BOLA Tube Fittings and Reducing Unions, transition from imperial to metric tubing or connections between both can easily be made. For example: A pipe socket of an analytical device with an outer diameter of 1/4" shall be connected to a PTFE tubing with an outer diameter of 8 mm. **Needed components:** Reducing union 6 mm to 8 mm (Cat.No. D 526-10) and a set of tapered V-rings Ø 1/4" (6.35 mm; Cat.No. D 502-03). By exchanging the 6 mm V-rings with the 1/4" V-rings, the pipe socket can be connected to the 1/4" reducing union and the 8 mm PTFE tubing on the other side.





Tubing - Choice and Assembly

Easy assembly

First check whether your laboratory screw joint (inner diameter) fits your tubing (outer diameter). If it is still difficult to put the tubing inside the inner parts of the laboratory screw joint, a trick can be helpful. Just either sharpen the tubing with a simple sharpener or cut it diagonally. You should now be able to easily put the tubing through the inner parts.





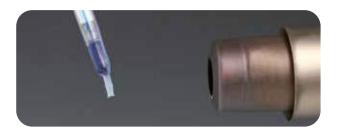






Processing of heat shrinkable PTFE tubing

Shrinking should be done at a temperature of +340 °C +/-10 °C. (At approx. +327 °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 °C lead to overheating of the heat shrinkable tubing and destroy its plastic memory (shrinking capacity). Thus, the tubing becomes unusable. Steady heating and cooling from all sides provides the best result, otherwise creases and tearing can arise. Appropriate heat sources are ovens or air heaters. We strongly advise against using gas flames as this can lead very easily to irregular overheating. Longitudinal shrinkage can occur during shrinking. The longitudinal shrinkage is approx. 15 %.





















Tubing - Useful Hints

Bending radius

of PTFE, PFA and FEP tubing

During the assembly of devices with fluoroplastic tubing we are often confronted with the problem of how to create the smallest bending radius when the space is limited. To avoid buckling of the tubing with all its negative aspects, the following graph will be helpful to determine the smallest possible bending radius.

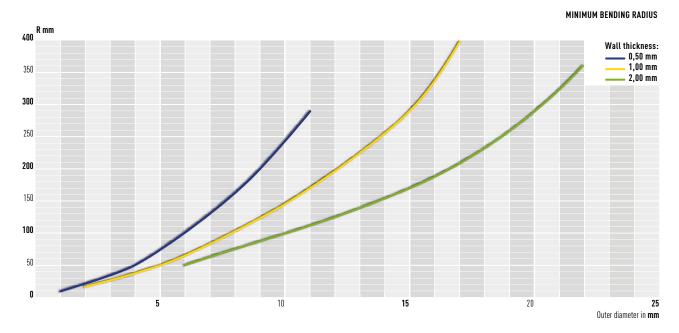
Take the outer diameter indicated on the horizontal axis, then follow the line upwards until it crosses with the appropriate wall thickness. From this intersection, follow the line to the left until it reaches the vertical axis which shows the minimum bending radius.

Rule of thumb for the bending radius:

$\frac{\text{outer-}\emptyset^2}{\text{wall thickness}} = \min. \text{ bending radius}$

As reference value, the smallest possible bending radius can be determined by the square of the outer diameter divided by the wall thickness.

Calculation example: PTFE tubing with an OD of 8 mm and a wall thickness of 1 mm results in a minimum radius of 64 mm.



Example: A PTFE tubing with outer diameter 10 mm and a wall thickness of 2 mm has a minimum bending radius of 100 mm.

Permeation values in a diagramm

Tubes made of fluorocarbon polymers PTFE, PFA or FEP are manufactured in special production processes. They are examined to be free of pores and can therfore be classified as gastight. The fluorpolymers 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 improber connection.





















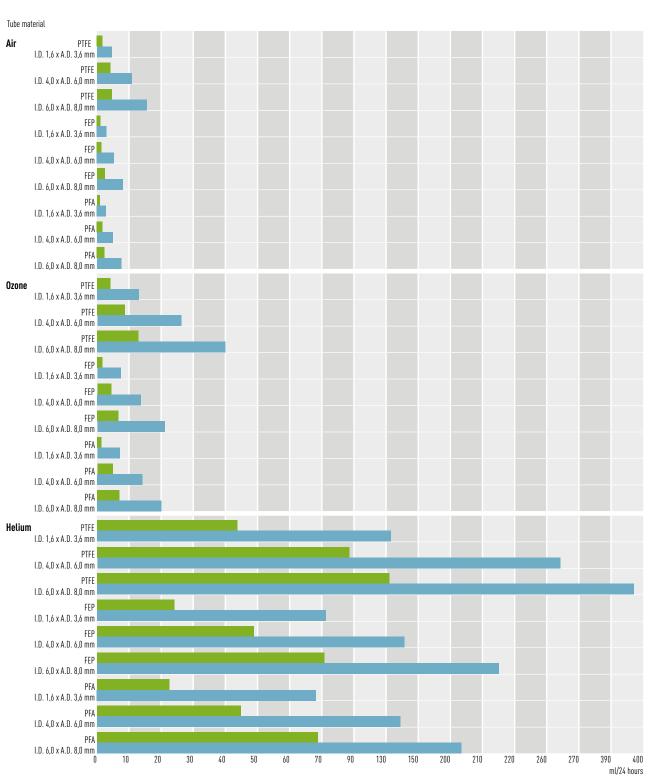












Tubing - Permeation at short-term use

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 isnot 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	Fluid
hydrogen (H2) One hour	Easily volatiles gases such as helium (He) or hydrogen (H2)
as dry HCI-gas One day	Gases with reduced volatility such as dry HCI-gas
c acid (H2SO4) More than one day	Non-volatile media such was hydrous sulphuric acid (H2SO4)



Tips for the use of plastic tubing for easily volatile media

The installation should be built up in a well-vented room respectively under an extractor hood. In times off from work (such as over night or on the weekend), close the gas supply valve and release pressure.

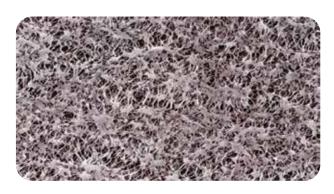
Filter - Notes

Specification of pore sizes

- what they mean.

Classification	Identification	Pore sizes in µm
00	P 500	250 - 500 *
0	P 250	160 - 250 *
1	P 160	100 - 160 *
2	P 100	40 - 100
3	P 40	16 - 40
4	P 16	10 - 16
5	P 1,6	1 - 1,6

^{*} Actually, not available in PTFE



Typical applications - frequently asked.

Pore size	Application
50 µm	Filtration of rough particles, gas distribution in liquids
5 μm	Filtration of medium particles, laboratory filtration, valves for packing (gas permeable, liquid tight)
1 µm	Filtration of aqueous solutions, removal of particles
0,45 μm	Pre-filtration of aqueous solutions, HPLC solutions, protein solutions and alcohols. Sterile filtration of air and other gases
0,2 µm	Ultra cleaning of organic solutions and alcohols, sterile filtration of air and other gases
0,05 µm	Ultra cleaning of solutions and gases (viruses)

111

Determination - Thread Types

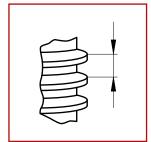
Choosing a suitable fitting, screw cap or multiple distributor with the correct thread type and size is not as easy as it might seem with regards to the multitude of thread types.

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.

















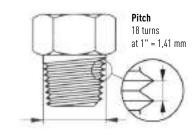
American Pipe Thread or BSP (British Standard Pipe) Thread

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	Туре	0. 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



NPT 3/8" - 0. D. = 16,6 mm

















Determination - Thread Types

G or R (Whitworth) or BSP (British Standard Pipe) Thread

Cylindrical threads which are mainly used in countries with imperial system. The size of e. g. R 3/4" does not stand for a diameter. Thus the corresponding size has to be determined according to charts.

Please note for the final determination whether you have a fitting with Gor 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	Туре	0. 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.

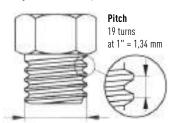
Thread	Туре	0. D. mm	Pitch mm
M	5	5	0,80
M	6	6	1,00
М	8	8	1,25
М	10	10	1,50
M	12	12	1,75
М	16	16	2,00

GL Threads

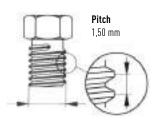
GL threads are round threads, i. e. there are only round and no sharp ends at the flanks of the screw thread. Due to its simple shape and the round ends of the flanks, this thread can be easily formed on glass pipes. The extremely high pitch and the large flanks give this thread an important carrying power.

Thread	Туре	0. 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:

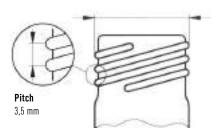


Example:



Example:

GL 25 - 0. D. = 25 mm



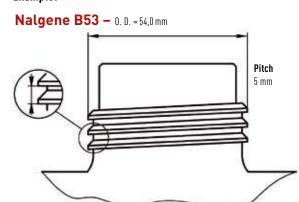
Determination - Thread Types

Nalgene Threads

The US-based company Nalgene produces amongst others plastic containers and flasks for storing chemicals. Especially Nalgene carboys are widely-used in laboratories. Nalgene threads can be recognized by their high collar on the buttress thread.

	Thread	Туре	0. D. mm	Pitch mm
	Nalgene B53	Typ 2	54,0	6,0
ĺ	Nalgene B83	Typ 2	88,0	12,7

Example:









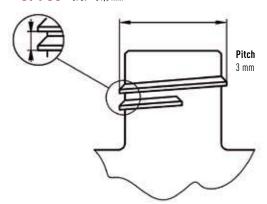
GPI Threads

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	Туре	0. D. mm	Pitch mm
GPI 33	Typ 2	31,8	3,0
GPI 38	Typ 1	37,05	4,0

Example:

GPI 33- 0. D. = 31,8 mm















UNF 1/4" 28G thread

It has its origin in the USA. Mainly used in chromatography / HPLC applications. Most common sizes are UNF 1/4" 28G and UNF 10 32G. The digits 28 G and 32 G stand for the number of thread pitches at a length of one inch (25.4 mm).

UNF 1/4" 28G versus M 6

Without exception all BOLA HPLC Fittings come with the most common HPLC thread UNF 1/4" 28G. In addition, fittings and distributors with the very similar thread M 6 are used.

Thread	Туре	0. D. mm	Pitch mm
UNF	1/4" 28G	6,2	28 turns at 1" = 0,91
UNF	3/8" 24G	9,4	24 turns at 1" = 1,06
UNF	1/2" 20G	12,6	20 turns at 1" = 1,27
UNF	5/8" 18G	15,7	18 turns at 1" = 1,41
UNF	3/4" 16G	18,9	16 turns at 1" =1,59
UNF	1" 12G	25,2	12 turns at 1" = 2,12

These threads can only be distinguished by exact determination of their outer diameter or by using a test mandrel (it is possible to screw in a tube end fitting in the counterpart of the other thread for at least 2-3 rotations). The UNF 1/4" thread has an outer diameter of 6.35 mm, the M 6 thread has precisely 6 mm (work tolerances are possible). We recommend to use only the UNF 1/4"-28 G thread to avoid confusion and double inventory.

Example:

UNF 1/4"-28G - 0. D. = 6,2 mm

28 turns at 1" = 0,91 mm











Determination - Thread Types

Canister Thread S

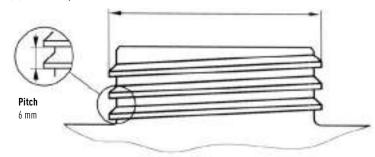
Coarse buttress thread commonly used for many plastic containers and flasks.

On the market you can find canisters with known standardized threads as well as models which are made as per special manufacturers' specifications. Just contact us if you have problems to determine your canister thread.

Thread	Туре	0. 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 - 0. D. = 65,0 mm



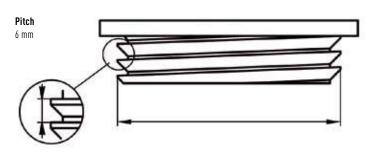
Barrel Threads Mauser 2", G 2"/R 2" and Tri Sure 2"

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	Туре	0. 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:

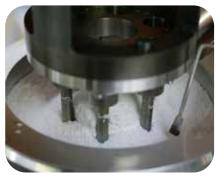
BCS 70 x 6 MAUSER 2"8 - 0. D. = 69,5 mm



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 toxical 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:

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