SERTO®

Compendium SERTO

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Technical information

Operating principle SERTO
Installation instructions

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The SERTO system

Radial assembly and disassembly – connect and save

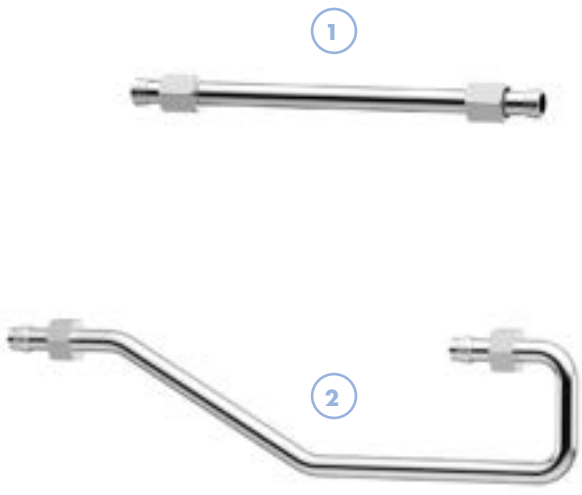
SERTO compression ferrule unions with radial assembly and disassembly save time during installation and maintenance. They prevent you from having to bend or cut through tubes and can also be reused, just like the unions. This saves you time and money.

1)
Removable tube system with SERTO fittings.

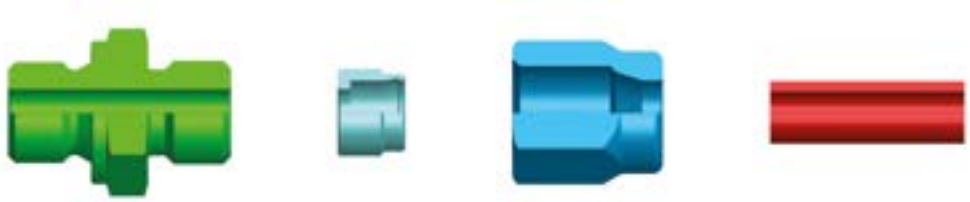
Your benefit:
- shortest possible connection
- minimum costs
- optimum KV value

2)
Removable tube system with conical fittings.

Disadvantage:
- costs for tube bending
- longer tubes
- reduced KV value



Individual components



Grundteil | Klemmring | Anschlussmutter | Rohr / Schlauch *

Union before installation

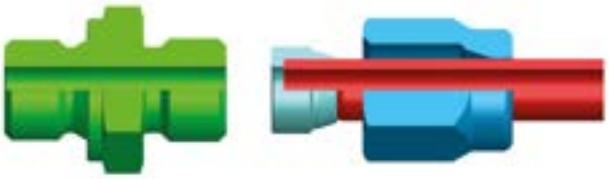
View of the tube union ready for installing

Union after installation

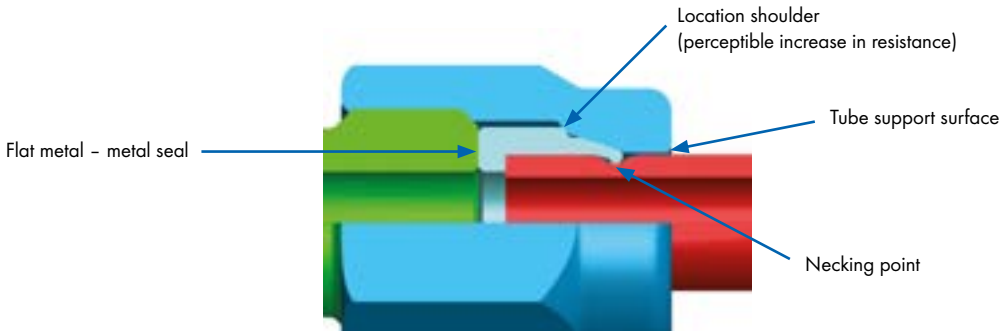
View of the installed tube union

Union after dismantling

View of a dismantled tube union



Functional features



* stiffener sleeves are required to reinforce thin-walled, soft and plastic tubes

SERTO modular system

SERTO components can be combined like the elements in a building block set. The basic elements of our standard programme are the different types of tube unions (straight, elbows, panel and banjo unions, L, T and cross unions, etc.). Together with connecting parts from SERTO, innumerable, individual, compact solutions with metal-to-metal seals, which can be mounted radially, are available for prompt delivery.

Connection option 1

Connecting part replaces the compression ferrule – instead of the standard compression ferrule use

- plug, to temporarily close off the line
- tube stub, as replacement for a short tube section
- reduction compression ferrule, in order to reduce by up to 2 dimensions

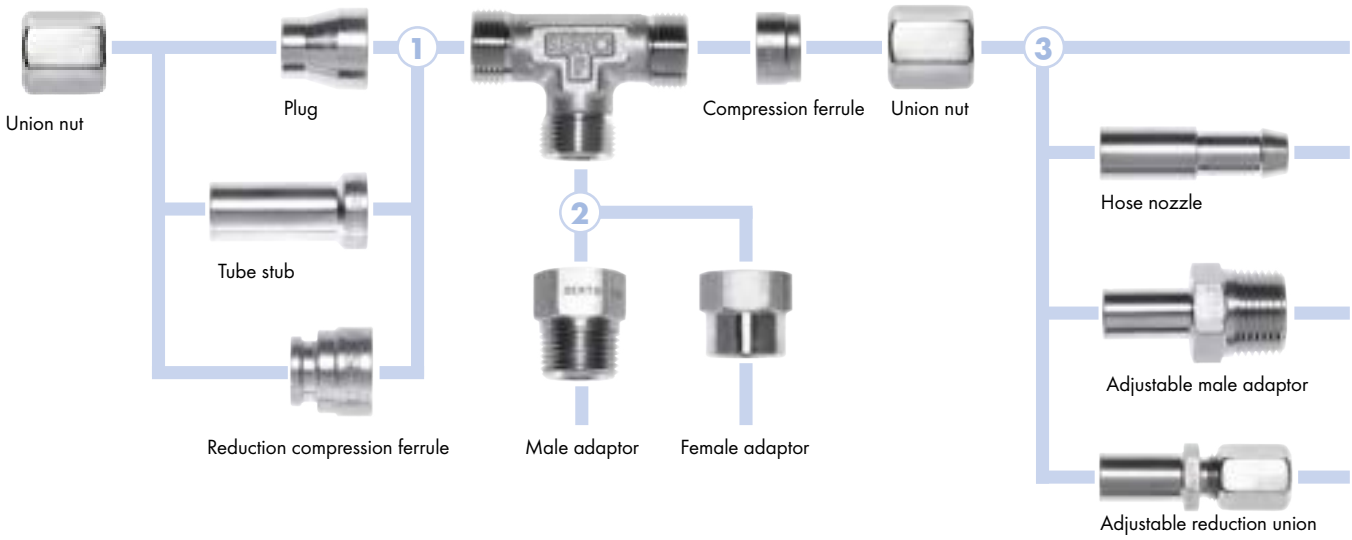
Connection option 2

Connecting part replaces compression ferrule and union nut – instead of nut and compression ferrule use

- male adaptor, to change to other thread types and sizes
- female adaptor, to change to other thread types and sizes

Connection option 3

- Connecting part is mounted on the SERTO standard connection - in addition to the standard connection use
- hose nozzle, to connect a hose
- adjustable male adaptors with an imitation tube socket for an adjustable connection
- adjustable reduction unions, to connect smaller tube diameters



Operating principle

Grip on smooth tubing

When the union is tightened, the compression ferrule is deformed by the inside taper of the nut, necking the tube slightly without notching it.

Metal / metal sealing

The deformation forces are resolved by the taper of the nut. The radial component creates a high surface pressure on the tube in the necking zone, and the axial component likewise on the end face of the compression ferrule, thus assuring the metallic seal against the plane end of the SERTO basic component.

Leakage rates up to 10^{-9} mbar l/s.

Butt connection – radial dismantling

Dismantling does not entail straining or bending the pipework. With SERTO, all components can be conveniently radially dismantled.

Repeated installation and dismantling

The elasticity of the compression ferrule permits a great number of dismantling without any detrimental effect on performance (tightness and pressure reliability).

Up to 25 repeated installations are possible.

Reliability of SERTO connections

SERTO unions are exceptionally resistant to vibration, pressure shock and to temperature-change. Safety and reliability have been proven for highly demanding applications.

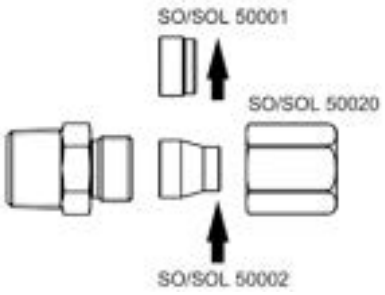
Application examples and combination options for metallic unions

Reduction compression ferrule

Sample combinations:

Single stage reductions for tube connections can be simply achieved by replacing the normal compression ferrule with reduced compression ferrules.

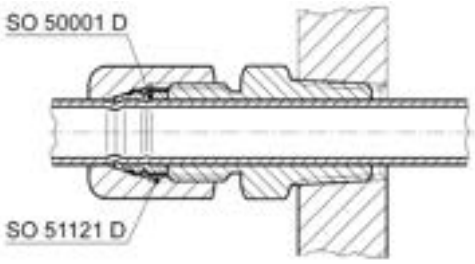
Example:
Reduction of a tube connection 15 mm to 12 mm:
Replace compression ferrule SO 50001-15 with SO 50001-15-12 RED. The union nut SO 50020-15 remains.



Compression ferrule for temperature probes

Sample combinations:

Measuring lines can be pushed through the compression ferrule without collar. Unions for gauge lines are also available.
For ordering, the type number of the standard union must be supplemented with "D", e.g. SO 51121-8-1/4 D.



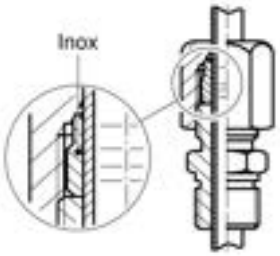
Temperature up to +300 °C

When mounted for the first time, the compression ferrule is pressed onto the tube by tightening the nut. A metal sealing is the result.

The union can be demounted by loosening the nut. However, the compression ferrule remains on the tube. A displacement of the tube is not possible after the first mounting.

For later displacement of the compression ferrule, the use of the temperature probe union with PTFE compression ferrule SO 51194-D-PTFE is recommended.

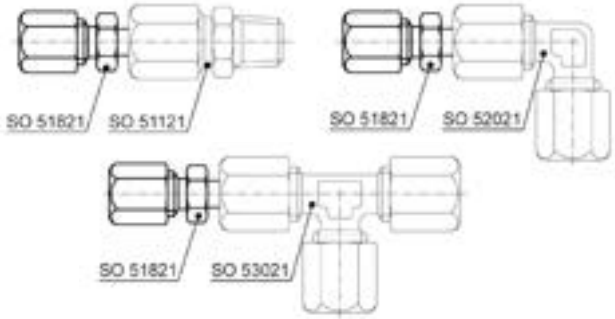
For size M6x0.75 we recommend the use of the washer SO 40507.
If necessary, the relevant washer must be ordered separately.



Adjustable reduction union

Sample combinations:

The reduction SO 51821 can be combined with all SERTO unions. The cyl. turned stub Ad is inserted in the bore d of the SERTO connection SO 50021 and tightened. This permits further tube reductions.

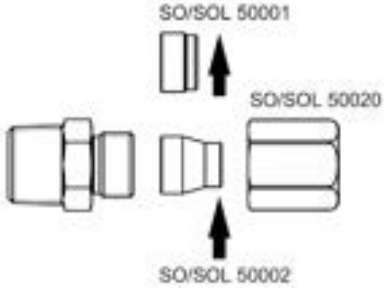


Plug

Sample combinations:

The plug can be inserted into all unions instead of a compression ferrule of the same size. If a reduction compression ferrule is replaced by a plug, the size of the union nut must be used as a basis.

Sample combinations: Tighten the union nut with approx. ⅛. turn.

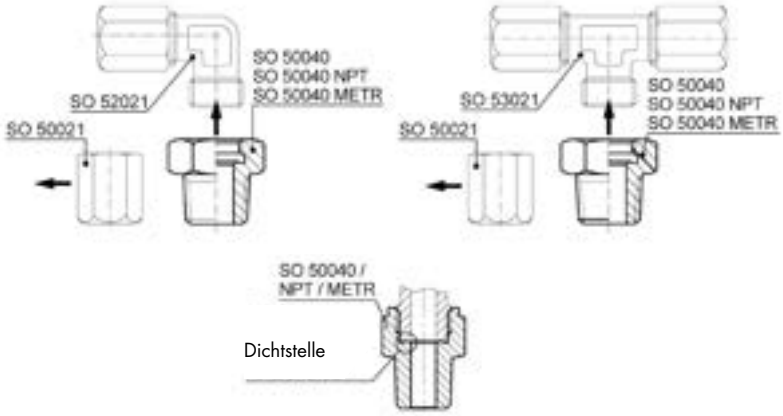


Male adaptor

Sample combinations:

The male adaptor can be screwed onto all SERTO moulded parts with a matching cylindrical thread and must be tightened with approx. ⅛ - ¼ turn.

Sealing principle: During assembly, the sealing edge of the male adaptor presses into the SERTO moulded part to produce a perfect seal.



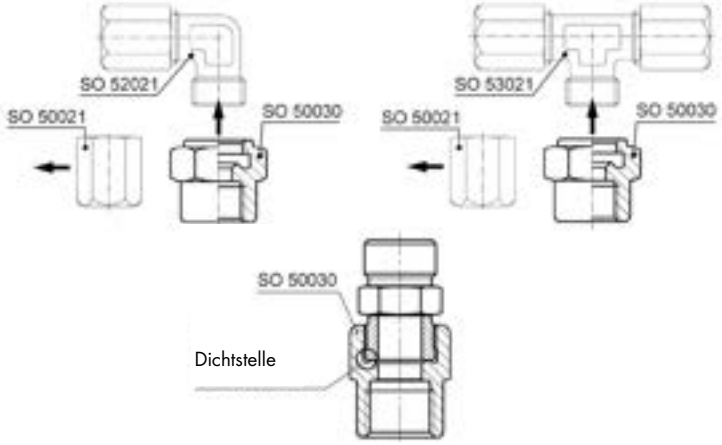
Female adaptor

Sample combinations:

The female adaptor can be screwed onto all SERTO moulded parts with a matching cylindrical thread and must be tightened with approx. ⅛ - ¼ turn

Sealing principle: During assembly, the sealing edge of the female adaptor presses into the SERTO moulded part to produce a perfect seal.

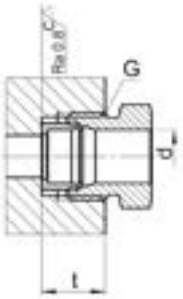
We recommend additional lubrication on the plane surface.



Nipple connection

Sample combinations:

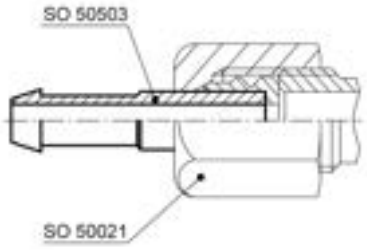
The shortest union for the tightest installation conditions.



Hose nozzle

Sample combinations:

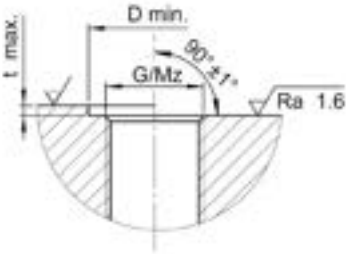
With this hose nozzle, hoses and tubes made of plastic, e.g. PTFE, PVDF, polyamide etc. can be connected directly to SERTO unions. To secure the hose, use the SO 40512 hose clamp (see Mounting accessories).



Male adaptor union

with edge seal or O-Ring

Recommendation for installation:



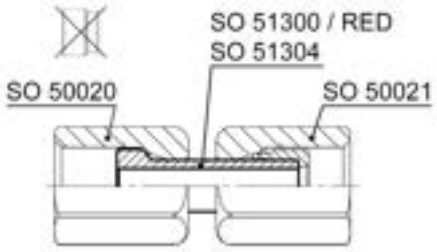
Tube stub
radial dismantling

Sample combinations:

If the tube stubs are coupled with a union nut and a nut connection (union nut and compression ferrule), an adjustable union is produced.

Also available pre-assembled
(SO 51325 / SO 51326).

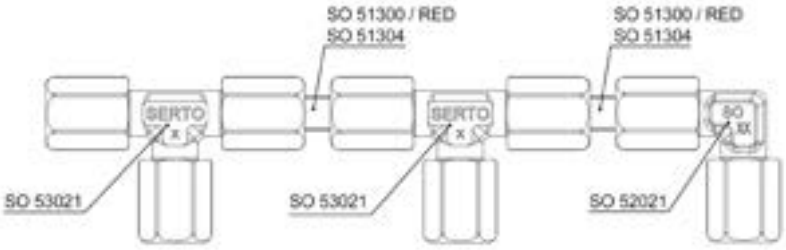
Assembly information: Tighten the union nut on the side of the turned compression ferrule (left in pict.) with approx. ¼ turn. Thighten the union nut on the other side (right in pict.) 1 ¼ turns.



Anwendungsbeispiele:

With the adjustable union, parts with the same connecting thread can be connected.

Note: Radial dismantling is only possible with tube stub SO 51304.



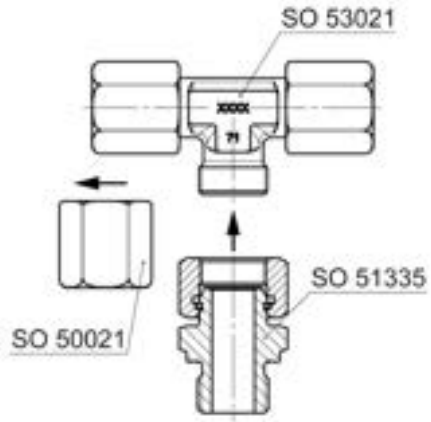
Adjustable male adaptor union
with edge seal

Sample combinations:

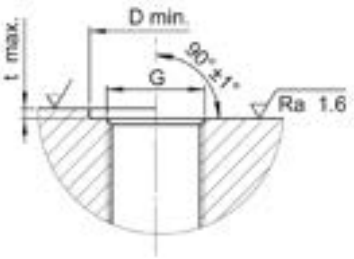
With the adjustable male adaptor union different basic components can easily be connected. Compact construction, quick assembly, and easy fixing of the components in the desired position.

d = nominal size: corresponds to tube outside diameter of the nut connection SO 50021 which can be replaced by the adjustable male adaptor union SO 51335..

Assembly information: Tighten the union nut with approx. ¼ turn. We recommend additional lubrication on the plane surface.



Recommendation for installation:



Adjustable union

with edge seal

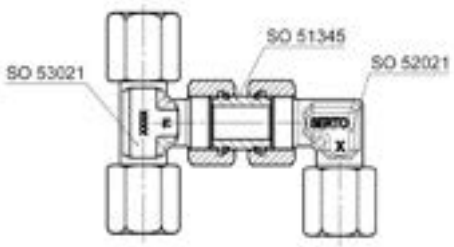
Sample combinations:

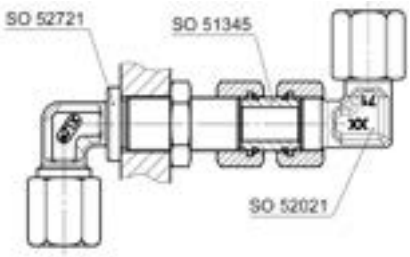
With the adjustable union different basic components can easily be connected. Compact construction, quick assembly, and easy fixing of the components in the desired position.

See SO 51335 for additional possibilities.

d = nominal size: corresponds to tube outside dia. of the nut connection SO 50021 which can be replaced by the adjustable union SO 51345.

Assembly information: Tighten the union nut with approx. ¼ turn. We recommend additional lubrication on the plane surface.



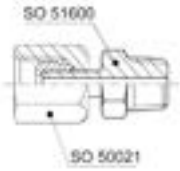


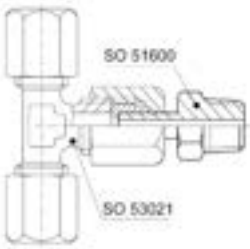
Adjustable male adaptor

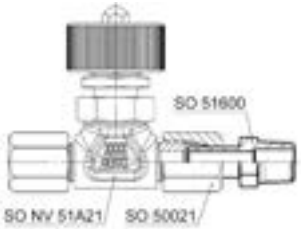
Sample combinations:

Possible combinations:
- with nut connection to adjustable male adaptor union
- with unions/valves to adjustable unions/ valves

Also available pre-assembled (SO 51625).



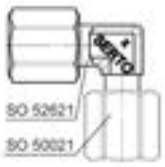


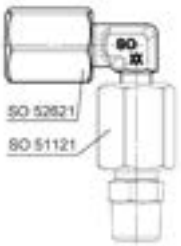


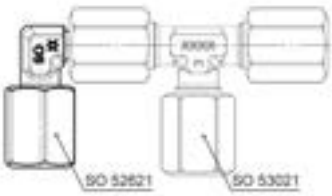
Adjustable elbow union

Possible combinations:

Possible combinations:
- with nut connections to adjustable elbow unions
- with unions to adjustable unions
- with male adaptor unions to adjustable male adaptor elbow unions. This combination
- is simpler to produce, as screwing in and alignment are carried out separately.





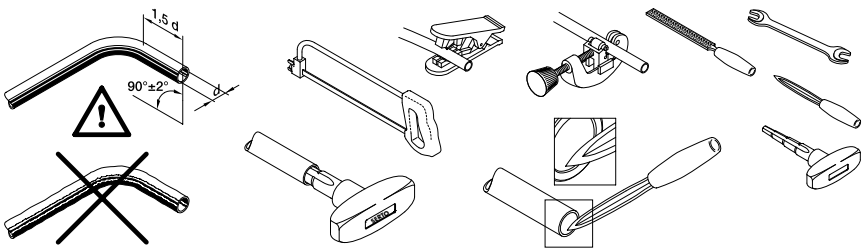


Installation instructions

Brass / Stainless Steel

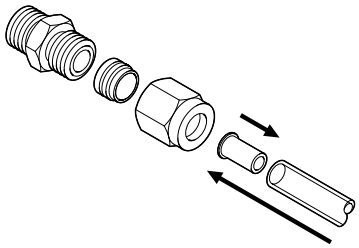
1. Preparation

Cut the tube [1] to length and deburr it. The tube must be straight and free from blemishes for approximately 1,5 d from the end. The union is pre-lubricated. For easier assembly and re-assembly of bigger sized union, it is recommended to use a suitable lubricant, for example AC 850 (lubricate thread and compression ferrule).



2. Reinforcing the tube and pushing it in

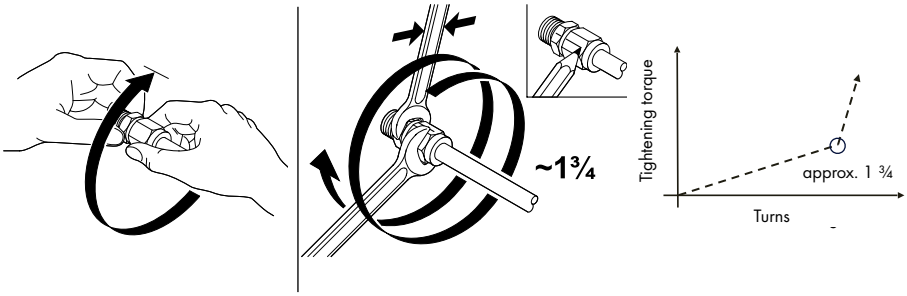
Stiffener sleeves are required to reinforce plastic tubes and thin walled tubes [2]. Align tube and union. Insert the tube as far as the stop. Details see paragraph **tube recommendations** in this chapter.



3. Compression, stress relieving

3.1 Screw the union nut on by hand until you feel an increase in resistance.

3.2 Tighten down the union nut approx. **1¾ rotation** using an open ended spanner (mechanical stop). At the same time, push the tube against the fitting. Making a mark will assist in correct rotation. Hold fitting from turning with a second wrench.

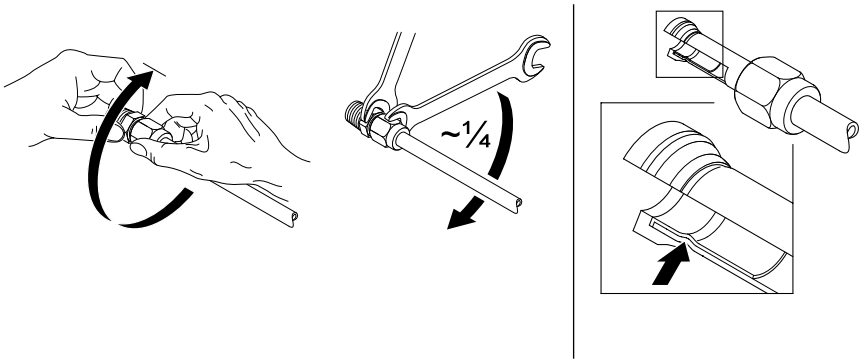


Repeated fitting of the union

When reassembling the same tube union, screw the union nut back on by hand until perceptible stop and tighten down the union nut with an open ended spanner approx. ¼ rotation for the final fit.
In case of repeated assembly, parts must be lubricated.

Checking of fit (optional)

A distinct bead or deformation must be visible on the inside of the tube.



[1] Tubes

Tubes with a clean smooth surface and with an outside diameter tolerance of ± 0.1 mm should be used. (See also paragraph «tube recommendations» in this chapter.)

We will be pleased to provide you with installation training on your premises – contact us.

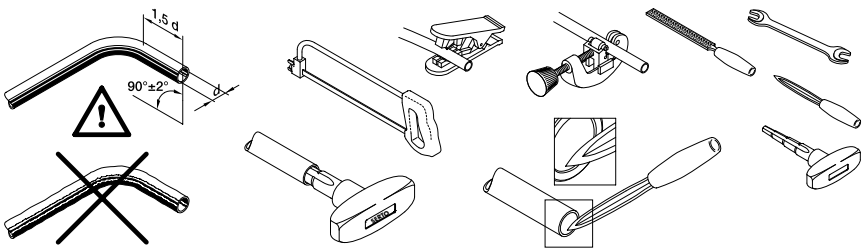
Turnable compression ferrule

It is of no detriment to the efficiency of the connection if, after assembly, the ferrule can be turned on the tube.

Installation instructions
Aluminium

1. Preparation

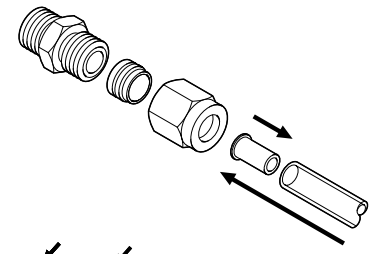
Cut the tube [1] to length and deburr it. The tube must be straight and free from blemishes for approximately 1,5 d from the end. The union is pre-lubricated. For easier assembly and re-assembly of bigger sized union, it is recommended to use a suitable lubricant, for example AC 850 (lubricate thread and compression ferrule).

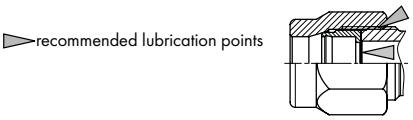


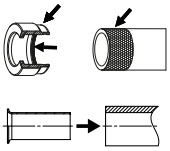
2. Lubrication / Reinforcement

Apply special lubricant AC 850 to the compression ferrule and tube end.

For **plastic tubes**, insert aluminium support sleeves.





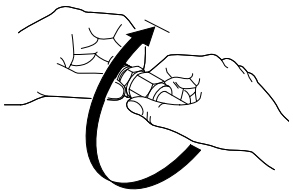


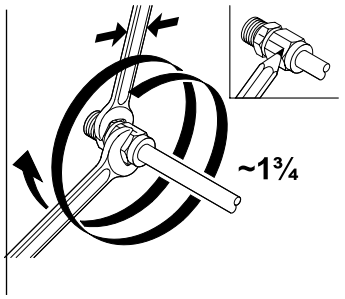
	Union mm					
	8	10	10	12	12	15
Platic tube / Hose	8/6x1.0	10/8x1.0	10/7x1.5	12/10x1.0	12/9x1.5	15/12x1.5
Stiffener sl. alu	SO 10003-8-6	SO 10003-10-8	SO 10003-10-7	SO 10003-12-10	SO 10003-12-9	SO 10003-15-12

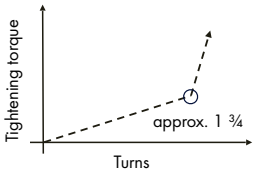
3. Compression, stress relieving

3.1 Screw the union nut on by hand until you feel an increase in resistance.

3.2 Tighten down the union nut approx. **1¾ rotation** using an open ended spanner (mechanical stop). At the same time, push the tube against the fitting. Making a mark will assist in correct rotation. Hold fitting from turning with a second wrench.





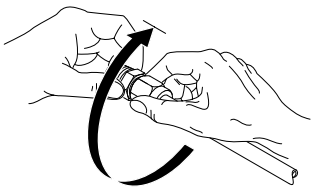


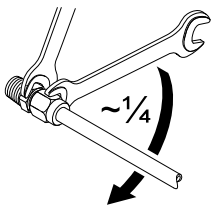
Repeated fitting of the union

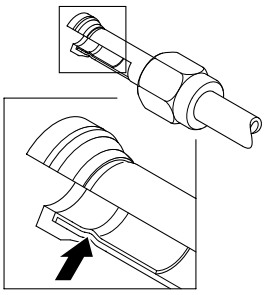
When reassembling the same tube union, screw the union nut back on by hand until perceptible stop and tighten down the union nut with an open ended spanner approx. ¼ rotation for the final fit. **In case of repeated assembly, parts must be lubricated.**

Checking of fit (optional)

A distinct bead or deformation must be visible on the inside of the tube.







[1] Tubes

Tubes with a clean smooth surface and with an outside diameter tolerance of ± 0.1 mm should be used. (See also paragraph «tube recommendations» in this chapter.)

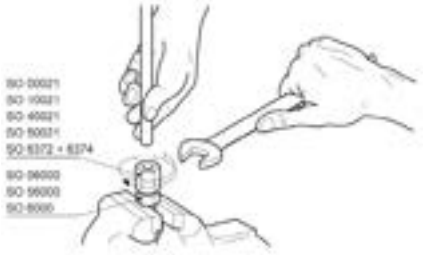
We will be pleased to provide you with installation training on your premises – contact us.

Turnable compression ferrule

It does not affect the quality of the connection if the compression ferrule can be rotated on the tube after installation.

Pre-assembly stud
for metallic unions

Sample combinations:



The pre-assembly stud is used for the pre-fitting of the nut connection.

Instructions:

Clamp the pre-assembly stud in a vise. Screw on the nut connection.
Push the tube into the nut connection.

Tighten the union nut approx. 1 ½ turns with an open ended spanner (mechanical stop). Final assembly in the equipment approx. ¼ turn.

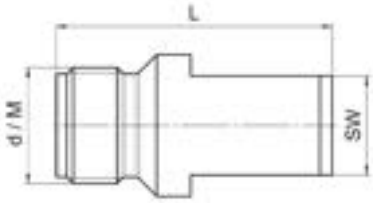
Keep the flat metal surface clean.

Occasional lubrification of the thread and the flat metal surface facilitate pre-assembly.

Please refer to the installation instructions.

For automated pre-assembly see the devices SERTOtool/SERTOspeed.

Material: Steel 1.2312



d=tube outside diameter

Hydraulic and pneumatic pre-assembly tools

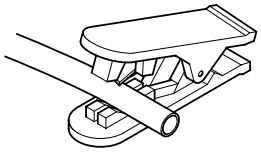
SERTOspeed / SERTOtool - see page 84, 85

Installation instructions
PVDF / PA

The unions are supplied ready for installation.

1. Preparation

Clean the tube and cut squarely to length, e.g. with the Cutty AC 835. Pack the screw-in thread with PTFE tape (except for unions with cylindrical thread).

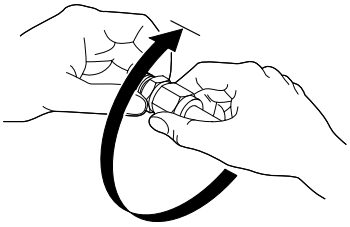


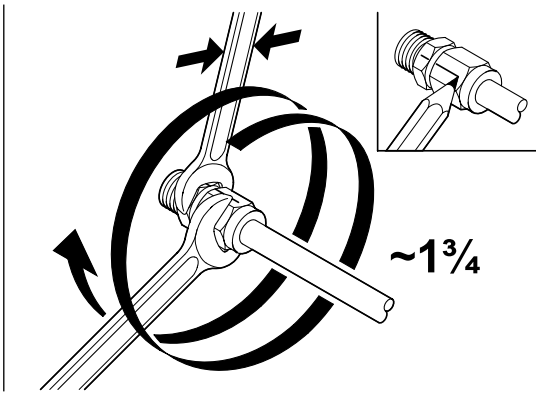
2. Insert tube/hose [1)]

Insert the tube/hose into the union as far as the stop.

3. Tighten the knurled screw

3.1 Screw the union nut on by hand until you feel an increase in resistance.
3.2 Tighten down the union nut approx. **1¾ rotation** using an open ended spanner. At the same time, push the tube against the fitting. Making a mark will assist in correct rotation. Hold the fitting with a second wrench.

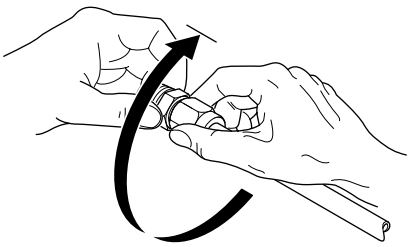


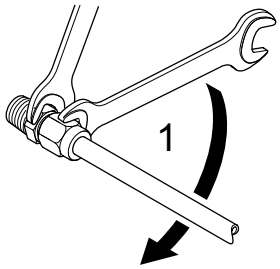


Dismantling, reassembly

When unscrewing the nut, the compression ferrule remains on the tube/hose.
When reassembling the same tube union, screw the union nut back on by hand until perceptible stop and tighten down the union nut with an open ended spanner 1 rotation for the final fit. By tightening the nut again, the joint becomes completely leak-proof again.

If a union that has already been used is taken for a new tube/hose, at least the compression ferrule must be replaced.





[1)] Tubes/Hoses

Concentric tubes with a clean smooth surface and with an outside diameter tolerance of ± 0.1 mm should be used. (See also paragraph «tube recommendations» in this chapter.)

We will be pleased to provide you with installation training on your premises – contact us.

Turnable compression ferrule

It is of no detriment to the efficiency of the connection if, after assembly, the ferrule can be turned on the tube/hose.

Assembly aid
for compression ferrules PVDF/PA

Assembly aid AC 870

Our accessories range includes the assembly aid AC 870. This tool makes it easier to install plastic compression ferrules on fittings with a shaft. It consists of an aluminium handle and stainless-steel inserts for each connection size, which can be attached on either the left or right side. The components can be ordered individually.

Application:

Supports the assembly of compression ferrules on shaft components.

Operation:

Different sizes of inserts can be fixed on both sides of the handle AC 870-0.

Material:

Handle (AC 870-0):	aluminium
Inserts (AC 870-6 to -16):	stainless steel 1.4571

Please order each part separately.

Inserts	Handle
AC 870-6	AC 870-0
AC 870-8	
AC 870-10	
AC 870-12	
AC 870-16	

Sample combinations:

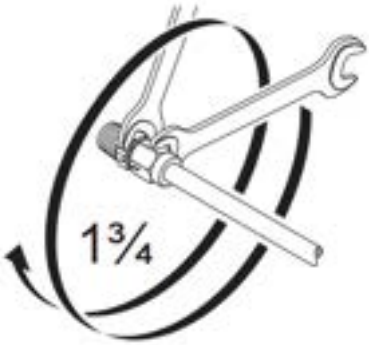
AC 870-12 AC 870-0 AC 870-8

Assembly instructions with AC 870

1. Place the union nut with the compression ferrule onto the fitting (shaft).

2. Use the AC 870 assembly aid to slide the compression ferrule all the way on. This ensures that the compression ferrule is correctly positioned on the shaft.

3. Tighten the union nut approx. 1 ¾ rotations with a spanner. Hold the nipples in place with a second spanner.

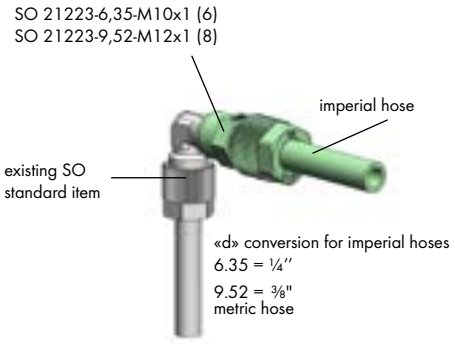


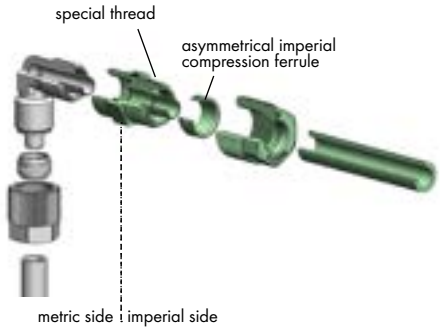
Straight adaptor union METRIC/IMPERIAL

The SERTO PVDF range is generally designed for metric hose dimensions. The adaptor union allows connection from metric to imperial sizes.

Installation

When installing the adaptor union, make sure the asymmetrical imperial compression ferrule is fitted in the correct direction. The special thread design makes the adaptor union easier to install.





Tubes and stiffener sleeves

Use of stiffener sleeves

Recommendations for tubes

Copper tubes

Seamless copper tubes (esp. EN 12449/1057) with clean smooth surface. Tolerance of outside diameter ± 0.1 mm, tubes Ø < 6 mm tolerance ± 0.05 mm.

Recommended wall thickness for use without stiffener sleeves:

for brass M unions (metric tubes)		
Dimension	PN [bar]	recommended wall thickness [mm]
3.2	125	0.6
6.35	250	0.8
7.94	150	1.0
9.52	125	0.8
12.7	40	1.0
15.88	40	1.5
19.05	25	1.5
22.22	25	1.5

for brass M unions (metric tubes)		
Dimension	PN (bar)	recommended wall thickness [mm]
2	125	0.5
3	125	0.5
4	125	0.5
5	125	0.5
6	250	1.0
8	150	1.0
10	125	1.5
12	100	1.5
13	40	1.5
14	40	1.5
15	40	1.5
16	40	1.5
17	40	1.5
18	40	1.5
19	25	1.5
22	25	1.5
28	16	2.0
35	16	2.5

Stainless steel tubes

Material

- stainless steel 1.4571 or 1.4301 according to EN 10305-1 / EN 10216-5 / ISO 1127

Type

- seamless, cold finished, bright, annealed, state of delivery CFA, according to DIN EN 10216-5

Tolerance

- EN 10305-1, option 10 (outer Ø according to table 5)
- ISO 1127 (tolerance classes D4/T3)
- tubes Ø < 6 mm tolerance ± 0.05 mm

Surface finish

- non-scaling
- no surface damage (careful handling is essential!)
- tubes must be free of grooves

Hardness

- Vickers hardness 155-178 HV
- suitable for bending

Recommended wall thickness for use **without** stiffener sleeves:

for stainless steel unions			for chemically nickel-plated brass	
Dimension	PN [bar]	recommended wall thickness [mm]	PN [bar]	recommended wall thickness [mm]
2	250	0.5	–	–
3	250	0.75	125	0.5
5	250	1.0	125	0.5
6	250	1.0	125	0.5
8	200	1.0	125	1.0
8	200	1.0	80	1.0
10	160	1.5	60	1.0
12	160	1.5	40	1.5
14	100	1.5	–	–
15	100	1.5	25	1.5
16	100	1.5	–	–
18	100	1.5	25	1.5
22	64	1.5	25	1.5
28	40	2.0	16	2.0
35	–	–	16	2.0

for stainless steel unions (imperial tubes)		
Dimension	PN [bar]	recommended wall thickness [mm]
1.6	250	0.5
3.2	250	0.6
6.35	200	0.8
7.94	200	0.8
9.52	160	0.8
12.7	160	1.65
13.5	100	1.65
15.88	100	1.65
17.2	100	1.65
19.05	64	1.65
21.3	64	1.65

Aluminium tubes

Drawn tubes with the alloys AW 6060 (T6 / T4) or AW 5049 (H111) and with diameter tolerances according to DIN EN 754-7 (seamless drawn) or 754-8 (not seamless drawn).

for aluminium unions		
Dimension	PN (bar)	recommended wall thickness [mm]
8	160	1.0
10	100	1.0
12	100	1.5
15	100	1.5
18	100	1.5
22	64	2.0
28	64	2.0
35	40	2.5

Tubes (general)

Handling

- Rdo not grind tubes on hard surfaces (e.g. cement, asphalt, gravel or metals)
- protect tube ends during transport and handling (with plastic caps, adhesive tape, etc.)
- lift tubes carefully out of case
- use only sharp tube cutters or hack saws and avoid cutting too deep in one turn
- always debur tube ends inside and out
- contamination and shavings can cause damage in the system and lead to leakage

Other version

Ask us about welded tubes, we will be happy to advise you.

Plastic tubes/hoses used with metallic unions.

Plastic tubing with an outside diameter tolerance of ± 0.1 mm can also be connected with SERTO unions. Plastic tubes must always be reinforced with stiffener sleeves.
(e.g. PA: see DIN 73378)

SERTOflex is used without stiffener sleeves.

Combination possibilities Unions / Tubes

		Material Union					
		Stainless Steel	Aluminium	Brass	BrassCV	PVDF	PA
Tube material	Stainless Steel	●	✖	(✔)	✔	(✔)	✖
	Aluminium	(✔)	●	(✔)	(✔)	✖	✖
	Copper	(✔)	(✔)	●	(✔)	✖	✖
	Brass	(✔)	(✔)	✔	(✔)	✖	✖
	PVDF	✔	✔	(✔)	✔	✔	(✔)
	PTFE	✔	✔	(✔)	✔	●	(✔)
	PFA	✔	✔	(✔)	✔	✔	(✔)
	FEP	✔	✔	(✔)	✔	✔	(✔)
	PA	(✔)	(✔)	✔	✔	(✔)	●
	PE	(✔)	(✔)	✔	✔	(✔)	✔
	PU	(✔)	(✔)	✔	✔	(✔)	✔
	SERTOflex	(✔)	(✔)	✔	✔	✖	✖

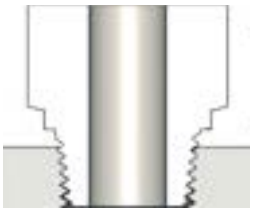
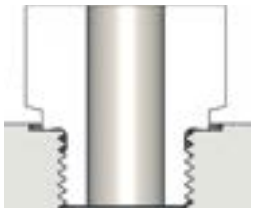
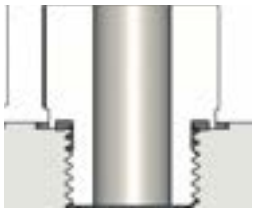
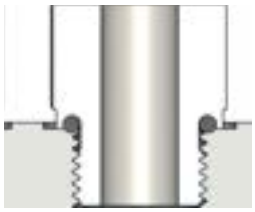
✔ appropriate combinations
(✔) combinations possible, but not appropriate
✖ combinations not possible or not recommended
● Best choice / our recommendation

Torques for screw-in threads
(standard values in Nm)

Recommendation:

For a perfect fit and reliable performance, we recommend using cylindrical male adaptor unions with O-ring or sealing edge.

1. Stainless steel

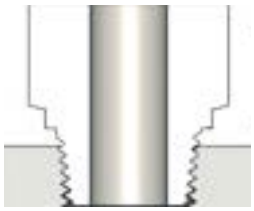
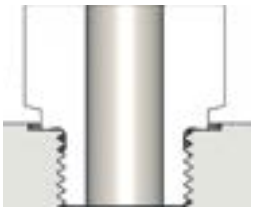
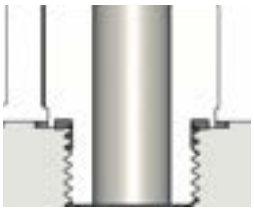
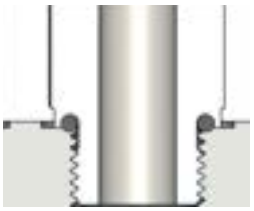





	for threads R / M tapered	for threads NPT	threads with edge seal	for threads with O-ring
1/16		15		
1/8	18	25	30	20
1/4	35	40	70	50
3/8	45	55	100	70
1/2	60	110	150	100
3/4	110	150	180	120
1	180		220	150
1 1/4	200			
M5	2		8	
M6X0.75	3		16	
M8x1	10		15	
M10x1	20		30	
M12x1.5	25		35	30
M14x1.5			45	
M16x1.5			65	
M18x1.5			100	
M22x1.5	150		190	130
M26x1.5			200	
M33x2			250	

Depending on the lubricant the necessary torques may be up to 10% lower.

Torques for screw-in threads
(standard values in Nm)

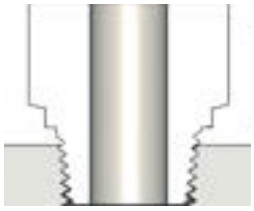
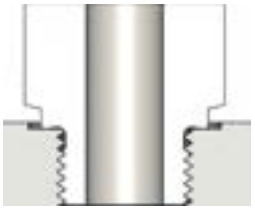
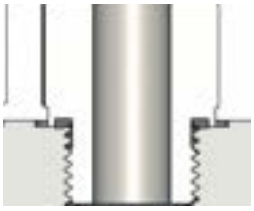
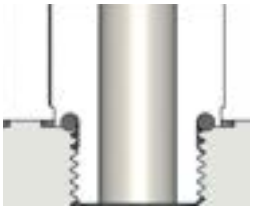
2. Brass and aluminium

	for threads R / M tapered	for threads NPT	threads with edge seal	for threads with O-ring
⅛	8	15	20	15
¼	12	25	50	35
⅜	20	40	80	50
½	30	80	100	80
¾	30	90		90
1		110		
1 ¼	50			
M5			4	3
M6x0.75			6	
M6			6	
M8x1	5		9	
M10x1	5		10	
M12x1.5	20		20	
M14x1.5	30		30	
M16x1.5	50		50	
M18x1.5			60	
M22x1.5			80	

Depending on the lubricant and when using gaskets the necessary torques may be up to 10 % lower.

3. PVDF and PA

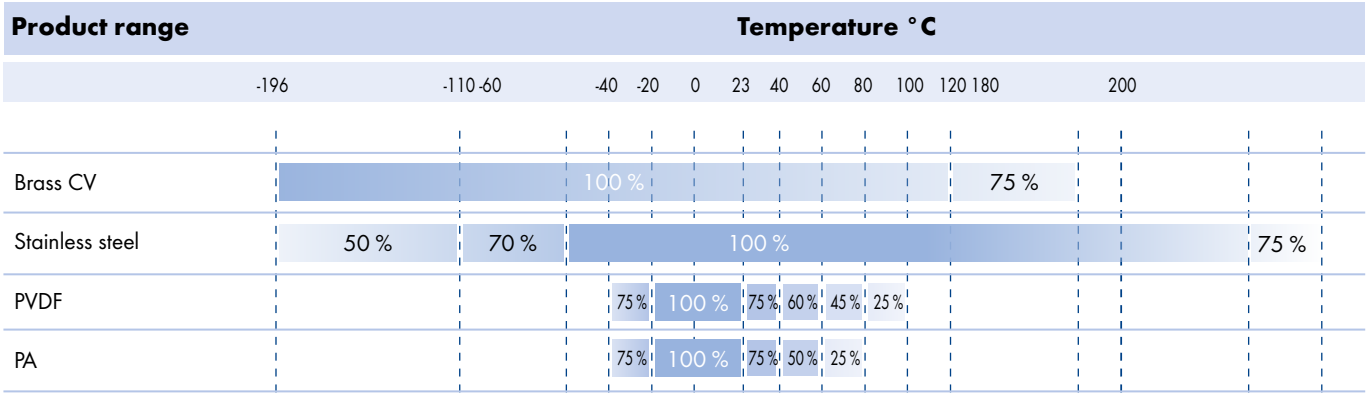





	for threads R / M tapered	for threads NPT	threads with edge seal	for threads with O-ring
⅛	0.8	1	1	0.8
¼	2.5	3.5	3.5	2.5
⅜	4	5	5	4
½	8		9	8
M10x1			1	0.8
M12x1.5			3.5	2.5
M14x1.5			5	4

Temperatures and pressure coefficient

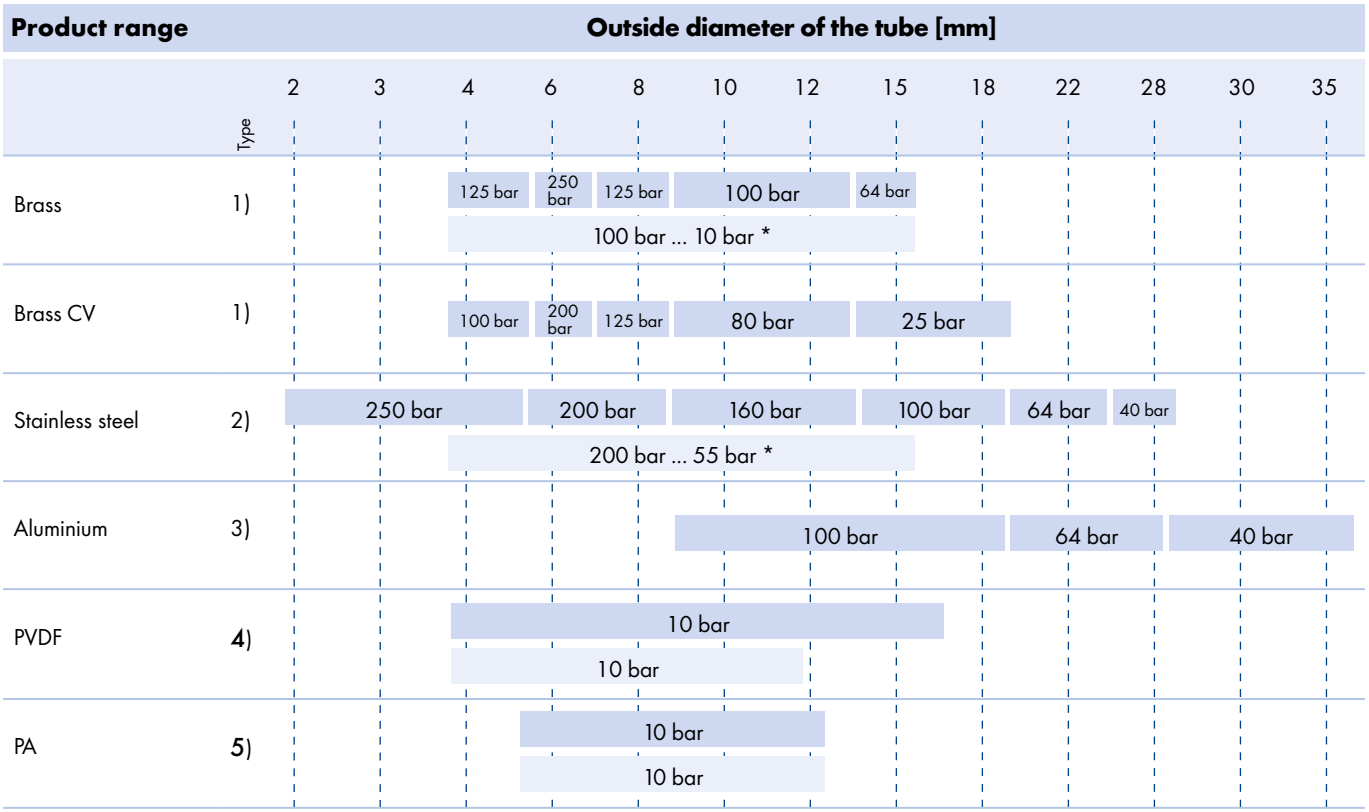
The percentage values in the bars indicate the operating pressure coefficient in function of temperature.

Applicable for SERTO unions.



Tube diameter and maximum operating pressure

The values indicated in the bars indicate the maximum admissible operating pressure of the respective diameter range.



Tube unions

Valves

* specific values see tables of the products in the online shop

To dermine the above values, the following tubes/hoses have been used:

1) copper
2) stainless steel
3) aluminium
4) PVDF, PTFE, FEP, PFA
5) PA, PE, PU

Overview of safety factors

Metal unions SF=4
Plastic unions SF=3
Hoses SF=3
Valves (all materials) SF=1.5
Single banjos (all materials) SF=1.5

Stainless steel

Unions

Overview

Compression ferrule

SO 50001

Plug

SO 50002

Stiffener sleeve

SO 50003

Hexagon nut METR

SO 50006

Union nut

SO 50020

Nut connection

SO 50021

Female adaptor

SO 50030

Male adaptor

SO 50040

Hose nozzle

SO 50503

Nipple connection

SO 51001

Straight union

SO 51021

Male adaptor union

SO 51121

Temperature probe union

SO 51124D

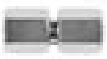
Female adaptor union

SO 51221

Tube stub

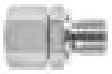
SO 51300

Adjustable union



SO 51325

Adjustable male adaptor union



SO 51335

Adjustable union

SO 51345

Weld-on union

SO 51429

Panel mount union

SO 51521

Adjustable male adaptor

SO 51600

Adjustable reduction union

SO 51821

Elbow union

SO 52021

Male adaptor elbow union

SO 52421

Overview

Adjustable elbow union

SO 51621

Adjustable male adaptor elbow union

SO 52695

Panel mount elbow union

SO 52721

Single banjo

SO 52824

Tee union

SO 53021

Adjustable tee and L union

SO 53621

Adjustable tee union

SO 53635

Optional services on request:

see chapter services

Special treatment – degreased

Special treatment for use with oxygen

Special treatment – silicone free

Confirmations on www.serto.com

RoHS CE FDA

Characteristics, specialities

- easy and fast to install
- resistant to corrosion
- compact size
- extensive product range
- many combination possibilities
- Ø2mm - Ø28mm / Ø1/16" - Ø27/32"

Material

Stainless steel 1.4571 (≈ AISI 316 Ti) with alloy X6CrNiMoTi17-12-2,
DIN EN 10088-3

Working pressure PN

Up to 250 bar (safety factor of 4)
See product tables in the online shop

Temperature range

-196°C to +500°C, up to +600°C on request

Leak rate with helium

10^{-9} mbar • l/s *

Vacuum

Up to 10^{-4} mbar, higher values are possible

Tubes to use

Tubes of plastic and stainless steel seamless precision tubes (to DIN EN 10216-5/EN ISO 1127) with clean smooth surface. Tolerance of outside diameter ± 0.1 mm, tubes Ø < 6 mm tolerance ± 0.05 mm; exception: plastic tubes.

Inspection certificate

Inspection certificate 3.1 according to EN 10204 (with costs)

Approvals

DNV, DVGW, SVGW, ABS, EC79
Additional information on request.

Confirmations

FDA for FKM O-rings

Adaptor stem, male thread

British Standard Pipe (BSP) and metric fine thread DIN 3852; tapered form C; thread with edge seal form B. NPT-thread according to ANSI B1.20.1.
For sealing of the tapered male adaptor thread we recommend PTFE Band AC840.

Pressure coefficient % of PN

* With proper installation, leakage rates of up to 10^{-9} mbar • l/s can be achieved;
see sections:
- Installation instructions
- Tube recommendations

Brass

Unions

Overview

Compression ferrule

SO 40001

Plug

SO 40002

Stiffener sleeve

SO 40003

Washer

SO 40005

Hexagon nut METR

SO 40006

Union nut

SO 50020

Nut connection

SO 40021

Female adaptor

SO 40030

Male adaptor

SO 400040

Hose nozzle

SO 40503

Nipple connection

SO 41001

Straight union

SO 41021

Male adaptor union

SO 41121

Female adaptor union

SO 41221

Reduction union

SO 41300

Adjustable union

SO 41325

Adaptor union with soldering nipple

SO 41421

Panel mount union

SO 41321

Adjustable male adaptor

SO 41600

Adjustable male adaptor union

SO 41625

Adjustable female adaptor

SO 41704

Adjustable female adaptor union

SO 41726

Reduktionsverschraubung

SO 41821

Elbow union

SO 42021

Overview

Female adaptor elbow union

SO 42321

Male adaptor elbow union

SO 42421

Female adaptor elbow union

SO 42521

Adjustable elbow union

SO 42621

Panel mount elbow union

SO 42721

Single banjo

SO 42824

Tee union

SO 43021

Adjustable tee and L union

SO 43621

Male adaptor tee and L union

SO 43721

Tee banjo

SO 43824

Cross union

SO 44021

Single banjo

SO 47624

Optional services on request:

see chapter services

Special treatment – degreased

Special treatment for use with oxygen

Special treatment – silicone free

Confirmations on www.serto.com

Characteristics, specialities

- easy and fast to install
- compact size
- extensive product range
- many combination possibilities
- Ø2mm - Ø35mm / Ø1/8" - Ø7/8"

Material

Brass CW 617N (CuZn40Pb2), the surface is pickled.

Working pressure PN

Up to 250 bar (safety factor of 4)
See product tables in the online shop

Temperature range

-196°C to +180°C

Leak rate with helium

10^{-9} mbar • l/s*

Vacuum

Up to 10^{-4} mbar, higher values are possible

Tubes to use

Tubes of plastic and seamless copper tubes (esp. EN 12449/1057) with clean smooth surface. Tolerance of outside diameter ± 0.1 mm, tubes Ø < 6 mm tolerance ± 0.05 mm; exception: plastice tubes. Further meterials on request.

Approvals

SVGW, DVGW

Adaptor stem, male thread

British Standard Pipe (BSP) and metric fine thread DIN 3852; tapered form C; thread with edge seal form B. NPT-thread according to ANSI B1.20.1.
For sealing of the tapered male adaptor thread we recommend the PTFE tape AC 840.

Pressure coefficient % of PN

* With proper installation; see sections:
- Installation instructions
- Tube recommendations

Brass chemically nickel-plated

Unions

Overview

Compression ferrule

SO 80001

Plug

SO 80002

Stiffener sleeve

SO 80003

Hexagon nut METR

SO 80006

Union nut

SO 80020

Nut connection

SO 80021

Female adaptor

SO 80030

Male adaptor

SO 80040

Hose nozzle

SO 80503

Straiht union

SO 81021

Male adaptor union

SO 81121

Female adaptor union

SO 81221

Tube stub

SO 81300

Panel mount union

SO 81521

Adjustable male adaptor

SO 81600

Reduction union

SO 81821

Elbow union

SO 82021

Male adaptor elbow union

SO 82421

Adjustable elbow union

SO 82621

Panel mount elbow union

SO 82721

Tee union

SO 83021

Adjustable tee union

SO 83621 T

Adjustable L union

SO 83621 L

Male adaptor Tee union

SO 83721 T

Overview

Optional services on request:

see chapter services

Special treatment – degreased

Special treatment for use with oxygen

Special treatment – silicone free

All products in chapter Brass are available chemically nickel plated (CV) for an additional charge.

Confirmations on www.serto.com

Characteristics, specialities

- easy and fast to install
- compact dimensions
- extensive product range
- many combination possibilities
- Ø2mm - Ø28mm / Ø1/16" - Ø27/32"

Basic material

Brass CW617N (CuZn40Pb2)

Chemical nickel-plating

Nickel:	88 – 89,5 %
Phosphorus:	10,5 –12 %
Melting point:	ca. +880°C
Degree of hardness:	450/500 Vickers

Thickness of the layer

Generally:	ca. 7 - 8 ·m
Exception:	valve spindles ca. 2 - 3 ·m

Working pressure PN

Up to 125 bar (safety factor of 4)
See product tables in the online shop

Temperature range

-196°C to +180°C

Leak rate with helium

10^{-8} mbar • l/s *

Vacuum

Up to 10^{-4} mbar, higher values are possible

Stainless steel tubes to use

Seamless stainless steel precision tubes (to DIN EN 10216-5/EN ISO 1127) with clean smooth surface. Tolerance of outside diameter ± 0.1 mm, tubes Ø < 6 mm tolerance ± 0.05 mm.

Other tubes to use

Tubes of plastic and seamless copper tubes (esp. EN 12449/1057) with clean smooth surface. Tolerance of outside diameter ± 0.1 mm.

Pressure coefficient % of PN

* With proper installation; see sections:
- Installation instructions
- Tube recommendations

Brass SAE

Unions and accessories

Overview

Kit unions SAE

SO 40231 SAE

Calibration tool SAE

AC 957

Calibration tool SAE

ACE 950

Optional services on request:

see chapter services

Chemical nickel-plated

Confirmations on www.serto.com

Overview

Characteristics, specialities

- easy and fast to install
- compact size
- conforms to standards and guidelines of the cooling industry
- no more soldering, brazing or flaring
- with calibration tools for tubes

Application

Specifically developed for the cooling/air-conditioning industry. Connects directly to the SAE cone.

Material

Brass CuZn40Pb2 (CW 617N),
the surface is pickledt

Working pressure PN

See product tables in the online shop (safety factor of 4)

Temperature range

-196°C to +180°C

Leak rate with helium

10^{-6} mbar • l/s *

Vacuum

Up to 10^{-4} mbar, higher values are possible

Tubes to use

Seamless copper tubes (esp. EN 12449/1057) with clean smooth surface. Tolerance of outside diameter ± 0.1 mm.

Pressure coefficient % of PN

* With proper installation; see sections:
- Installation instructions
- Tube recommendations

Aluminium

Unions

Overview

Compression ferrule

SO 10001

Plug

SO 10002

Stiffener sleeve

SO 10003

Hexagon nut

SO 10006 METR

Union nut

SO 10020

Nut connection

SO 10021

Nipple connection METR

SO 11001

Straight union

SO 11021

Male adaptor union

SO 11124 OR

Adjustable male adaptor union

SO 11335 OR

Adjustable union

SO 11345 OR

Panel mount union

SO 11524

Elbow union

SO 12021

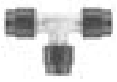
Panel mount elbow union

SO 12721

Single banjo

SO 12824

Tee union



SO 13021

Cross union

SO 14021

Confirmations on www.serto.com

Overview

Characteristics, specialities

- very light – almost one third of the weight of stainless steel or brass
- easy and fast to install
- compact size
- good resistance to corrosion and weathering
- initially lubricated, therefore ready for installation
- Anodised coating is non-conductive
- Ø8mm - Ø35mm

Basic material

Aluminium EN AW-6082, 3.2315
- union nut/nipple connection: blue anodised
- compression ferrule: coated
- union body: coluorless anodised

Working pressure PN

Up to 100 bar (safety factor of 4)
See product tables in the online shop

Temperature range

-196°C to +120°C

Leak rate with helium

10^{-6} mbar • l/s *

Vacuum

Up to 10^{-4} mbar, higher values are possible

Tubes to use

Drawn tubes with diameter tolerances according to DIN EN 754-7 (seamless drawn tubes), or 754-8 (not seamlessly drawn).
Pressed (not drawn) tubes may also be used. However the external diameter must be within the tolerance range of DIN EN 754.

Adaptor stem, male thread

British Standard Pipe (BSP) and metric fine thread DIN 3852; thread with edge seal form B.

Pressure coefficient % of PN

* With proper installation; see sections:
- Installation instructions
- Tube recommendations

Plastic PVDF

Unions

Overview

Compression ferrule

SO 20001

Plug

SO 20002

Hexagon nut METR

SO 20006

Union nut knurled

SO 20020

Female adaptor

SO 20030

Hose nozzle

SO 20503

Straight union

SO 21021

Male adaptor union

SO 21121

Female adaptor union

SO 21221

Female adaptor union

SO 21223

Tube stub

SO 21300

Panel mount union

SO 21521

Panel mount male adaptor union

SO 21524 OR

Adjustable male adaptor

SO 21600

Adjustable reduction union

SO 21821

Elbow union

SO 22021

Male adaptor elbow union

SO 22421

Adjustable elbow union

SO 22621

Panel mount elbow union

SO 22721

Tee union

SO 23021

Adjustable tee and L union

SO 23621

Male adaptor tee union

SO 23721

Confirmations on www.serto.com

Overview

Characteristics, specialities

- easy and fast to install
- extensive product range
- high resistance to chemicals
- Ø4mm - Ø16mm / Ø1/4"; Ø3/8"

Material

Polyvinylidene fluoride (PVDF) offers excellent chemical resistance combined with good mechanical and thermomechanical properties. This material stands out due to its chemical resistance to a large number of aggressive media (see resistance list in the appendix). The PVDF is also very resistant to sunlight, especially UV rays.

Flammability: according to UL94 V0

Working pressure PN

10 bar at +23°C (safety factor of 3), higher pressures in combination with SERTO plastic tubes on request (bar+).

Temperature range

40°C to +100°C
sterilizable up to +121°C, material may turn yellowish at higher temperatures.

Tubes to use

Tolerance complying tubes and hoses with clean surface and uniform wall thickness.

Tapered male threads

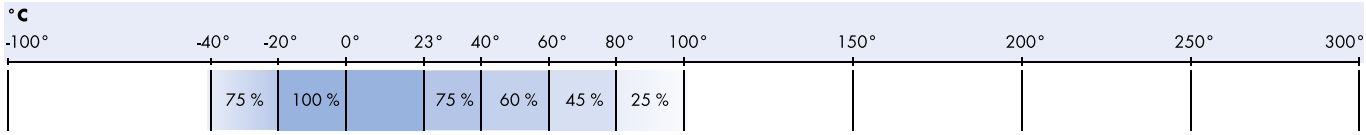
For sealing the male threads we recommend the PTFE tape AC 840 or the sealing stick «Plas-to-Joint» AC 833.

FDA-Cpmpliance

Polyvinylidene fluoride complies with the CFR* 21, § 177.2510 of FDA (Food and Drug Administration, USA) and can be used in contact of food
FKM-O-rings are also FDA-compliant.

*Code of Federal Regulations

Pressure coefficient % of PN



Plastic PA

Unions

Overview

Compression ferrule

SO 30001

Plug

SO 30002

Union nut knurled

SO 30020

Straight union

SO 31021

Male adaptor union

SO 31121

Female adaptor union

SO 31221

Tube stub

SO 31300

Panel mount union

SO 31521

Adjustable male adaptor

SO 31600

Adjustable reduction union

SO 31821

Elbow union

SO 32021

Male adaptor elbow union

SO 32421

Adjustable elbow union

SO 32621

Panel mount elbow union

SO 32721

Single banjo

SO 32821

Single banjo

SO 37621

Double banjo

SO 32921

Tee union

SO 33021

Adjustable tee union

SO 33621

Male adaptor tee union

SO 33721

Confirmations on www.serto.com

Overview

Characteristics, specialities

- easy and fast to install
- advantageous price
- extensive product range
- Ø4mm - Ø12mm

Material

Polyamide PA6.6 grey offers very good strength and toughness. The fittings can be used universally, whereby the general resistance must be taken into account in any case (see resistance list in the appendix). The PA fittings must be protected against direct UV radiation.

Working pressure PN

10 bar at +23°C (safety factor of 3), higher pressures in combination with SERTO plastic tubes on request (bar+).

Temperature range

-40°C to +80°C

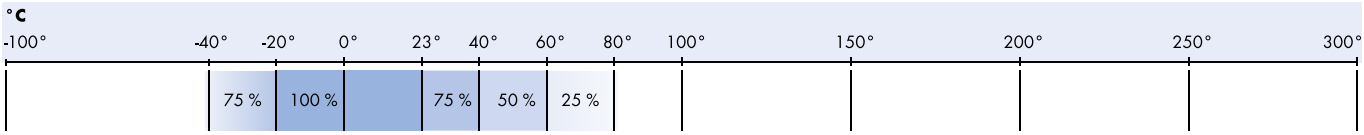
Hoses to use

True to tolerance hoses with clean surface and uniform wall thickness.

Tapered male threads

For sealing the male threads we recommend the PTFE tape AC 840.

Pressure coefficient % of PN



Valves

Brass
Stainless steel
PVDF
PA

Accessories

Overview

Valves brass

Regulating valve

SO NV 41A21

Elbow regulating valve

SO NV 41C21

Elbow fine regulating valve

SO NV 41A21E

Valves brassFine regulating valve

SO NV 41C21E

Taper seat non-return valve

SO CV 43A21

Single banjo

SO 47724

Mini-Kugelhahn

SO BV 48A00

Valves stainless steel

Regulating valve

SO NV 51A00

Fine regulating valve

SO NV 51C00

Metering valve

SO NV 51D21

Elbow regulating valve

SO NV 51A21E

Elbow fine regulating valve

SO NV 51C21E

Taper seat non-return valve

SO CV 53B21

Ball valve with full flow

SO BV 58A00

Valves plastic PVDF

Regulating valve

SO NV 22A21

Regulating valve

SO NV 22A24

Elbow regulating valve

SO NV 22A21E

Accessories

SO 29900

Taper seat non-return valve

SO CV 23B21

Stopcock

SO BV 28A00

Stopcock

SO BV 28A21

Overview

Stopcock

SO BV 28A24

Valves Accessories

Flange mount

SO 09900

Handwheel

SO 09950

Valve labels (set)

SO SO NV

Valves plastic PA

Regulating valve

SO NV 32A21

Elbow regulating valve

SO NV 31A21E

Taper seat non-return valve

SO CV 33B21

Stopcock

SO CV 38A00

Single banjo

SO 37621

Valves brass

Optional services on request:

see chapter services

US – Special treatment – degreased

CP – Pre-coated threads with PTFE-tape

CT – Pre-coated threads with Loctite 5061

CV – Chemical nickel-plated

Confirmations on www.serto.com

RoHS, CE, Ex

Valves inox

Optional services on request:

see chapter services

US – Special treatment – degreased

OX – Special treatment for use with oxygen

SI – Special treatment – silicone free

Confirmations on www.serto.com

RoHS, CE, Ex, FDA

All Valves plastic

Confirmations on www.serto.com

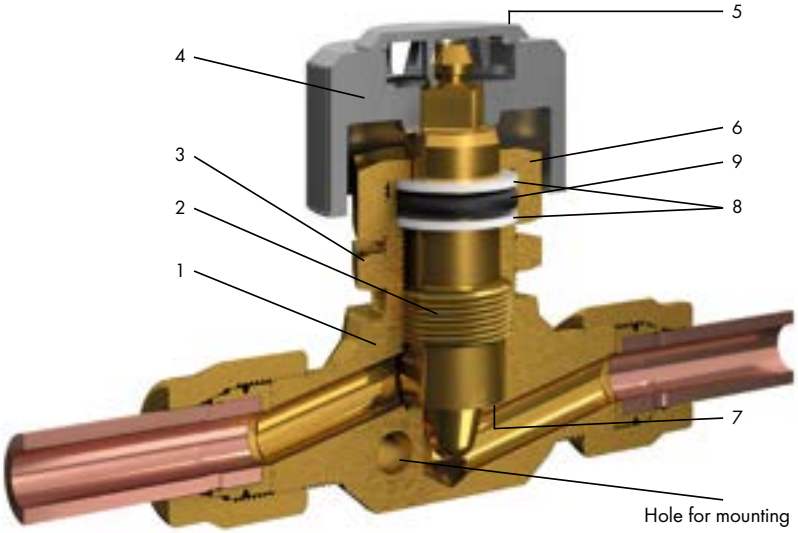
REACH, RoHS, CE, Ex, FDA

PVDF only

Regulating / fine regulating valve

SO NV 41A21 / SO NV 41C21

No	Description	Material
1	Valve body	Brass
2	Valve spindle	Brass
3	Counter nut	Brass
4	Handwheel (grey)	Polyamide
5*	Valve label (grey)	Polyamide
6*	Valve cap	Brass
7*	Spindle meal	NBR / PTFE[1)]
8	Sealing washer	PVDF
9*	Seal	NDR



Specifications

Working pressure (PN): 50 bar
Temperature: -20 °C to +80 °C
Safety factor: 1.5 times

Accessories

Flange mount for wall fastening for types SO NV 41A21 and SO NV 41C21 see SO 09900

Characteristics

- Function: regulating and stop valve
- Uses: air, water, oils and liquid gases (check resistance of seal)
- Material: brass CW617N (CuZn40Pb2)
- Special: compact dimensions, high reliability

[1)] Regulating valve = NBR
Fine regulating valve = PTFE

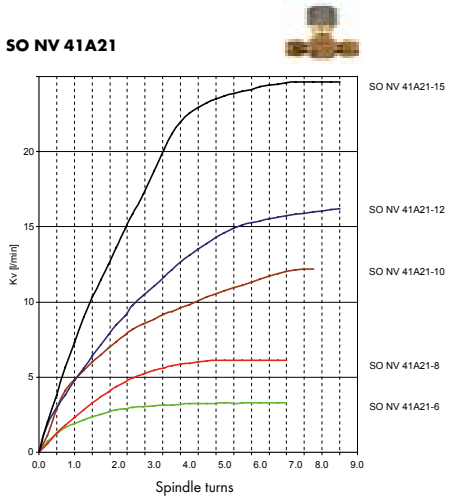
*** Options**

- No. 5 - Valve labels also available in colors blue, red and green, see VSD SO NV
- No. 6 - Torque for valve cap in panel mounting = 3.4 Nm
- No. 7 - Regulating valve only: EPDM, FKM
- No. 9 - Regulating/fine regulating valve: EPDM, FKM
- Other versions: with female SO 40030 or male adaptor SO 40040

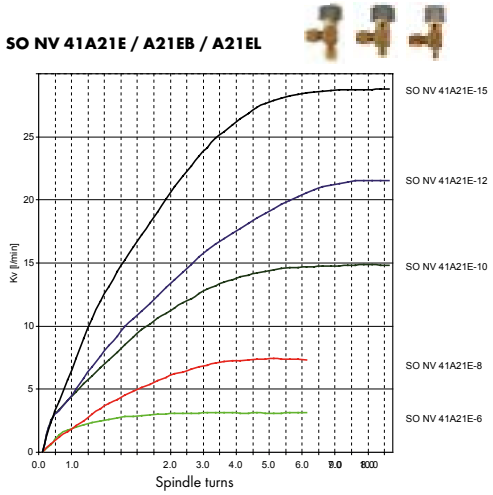
Flow rate water

Regulating valves

SO NV 41A21

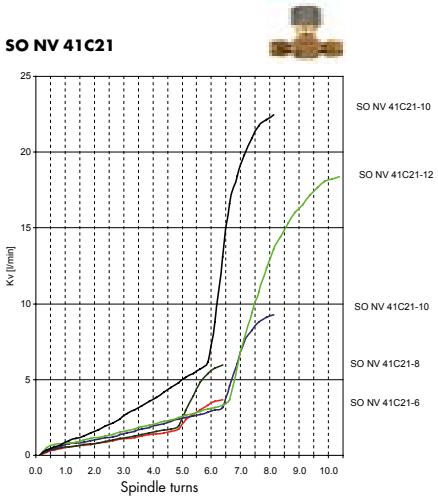


SO NV 41A21E / A21EB / A21EL

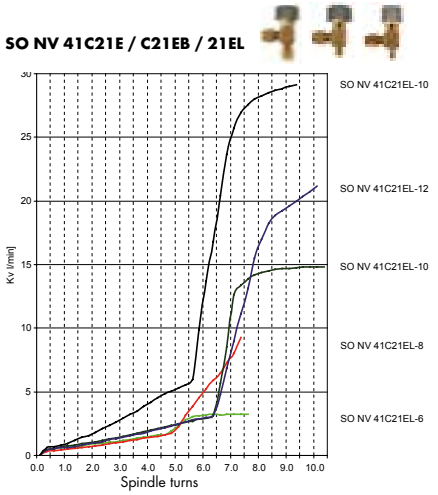


Fine regulating valves

SO NV 41C21



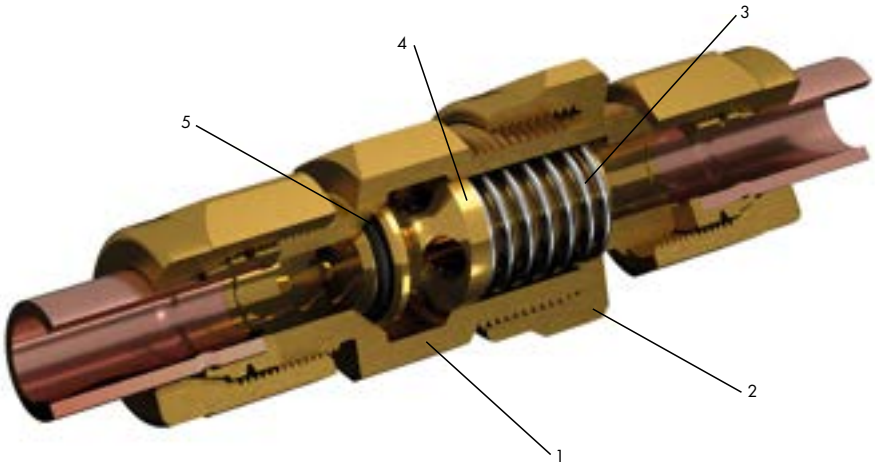
SO NV 41C21E / C21EB / 21EL



Taper seat non-return valve

SO CV 43A21

No.	Description	Material
1	Valve cone guide	Brass
2	Valve nut	Brass
3*	Compression spring	1.4401
4	Valve cone	Brass
5*	Seal	NDR



Specifications

Working pressure (PN): 50 bis 100 bar
Temperature: -20°C to +80°C
Opening pressure: 0.2 bar ± 0.1 bar
Safety factor: 1.5-times

Characteristics

- Function: check valve
- Uses: air, water, oils and liquid gases (check resistance of seal)
- Material: brass CW617N (CuZn40Pb2)
- Special: flow-optimised design, damps water hammer

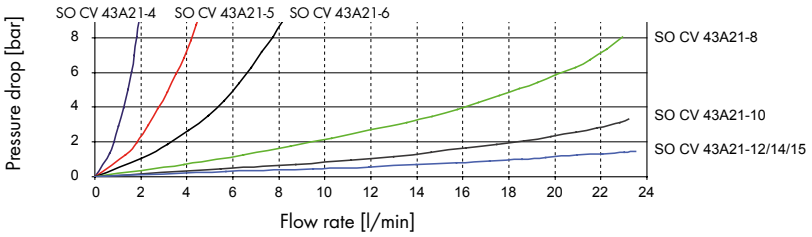
* Options

- No. 3 - Compression spring: opening pressure 0.5, 1, 2, 3, 5 bar ± 20 % (min. +/- 0.1bar)
- No. 5 - Seal: EPDM, FKM
- Other versions: with female SO 40030 or male adaptor SO 40040

Flow rate water

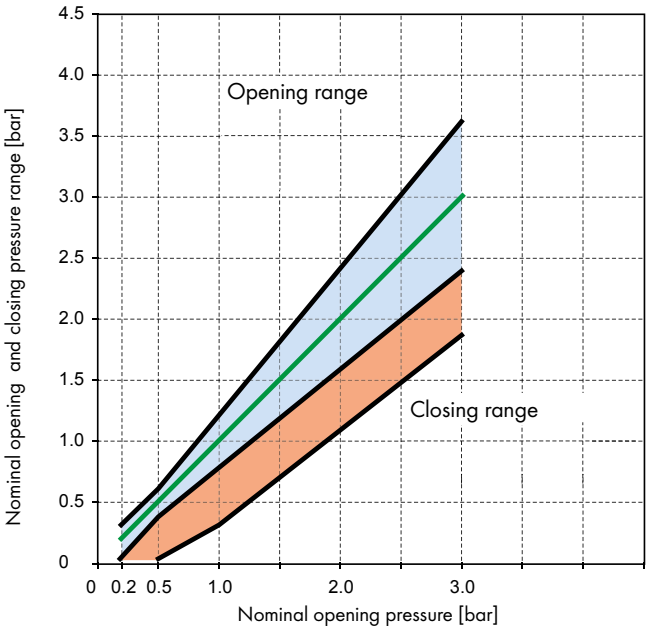
The pressure drop increases disproportionally with increasing flow rate.

SO CV 43A21



Opening pressure diagram

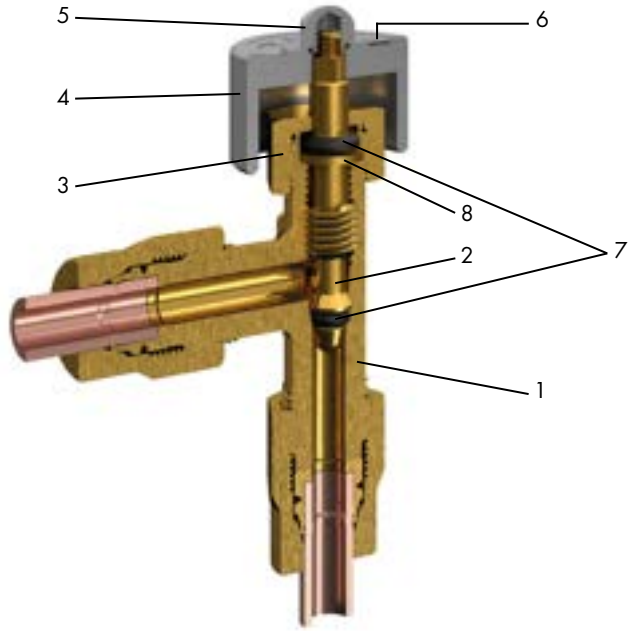
The opening pressure ranges within the blue section. The valve closes within the red section



Elbow regulating / fine regulating / metering valve

SO NV 01A21 / SO NV 01C21 / SO NV 01D21

No.	Description	Material
1	Valve body	Brass
2	Valve spindle	Brass
3	Valve cap	Brass
4	Handwheel (grau)	Aluminium
5	Cap nut	Brass CV
6*	Valve label (black)	Aluminium
7*	Seal	NBR
8	Washer	Brass



Specifications

Working pressure (PN): 50 bar
Working pressure: -20°C to +80°C
Safety factor: 1.5-times

Characteristics

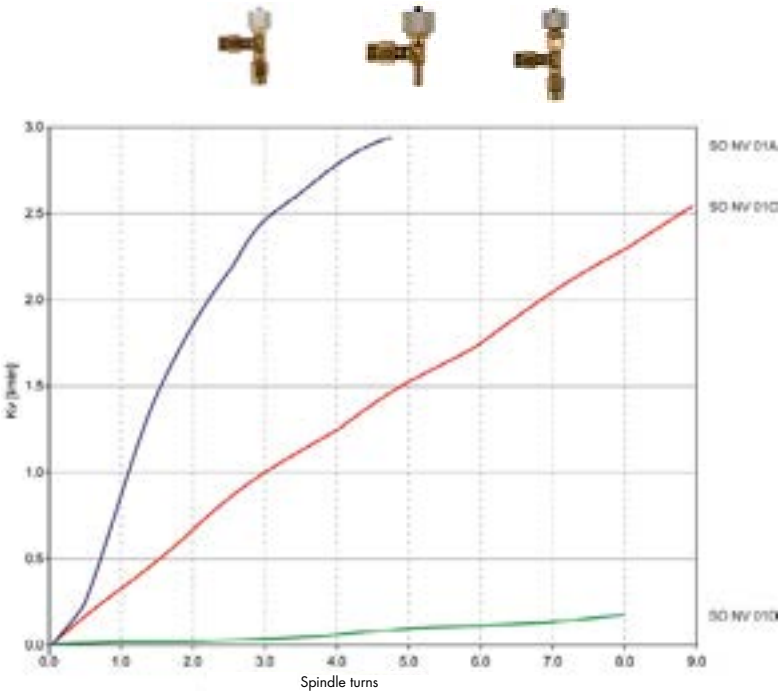
- Regulating and stop valve (SO NV 01Axx) Fine regulating valve (SO NV 01Cxx) Dosing valve (SO NV 01Dxx)
- Uses: air, water, oils and liquid gases (check resistance of seal)
- Material: brass CW617N (CuZn40Pb2)

*** Options**

- No. 6 - Valve labels also available in colors blue, red, green, yellow, see VSD SO NV
- No. 7 - Seal: EPDM, FKM

Flow rate water

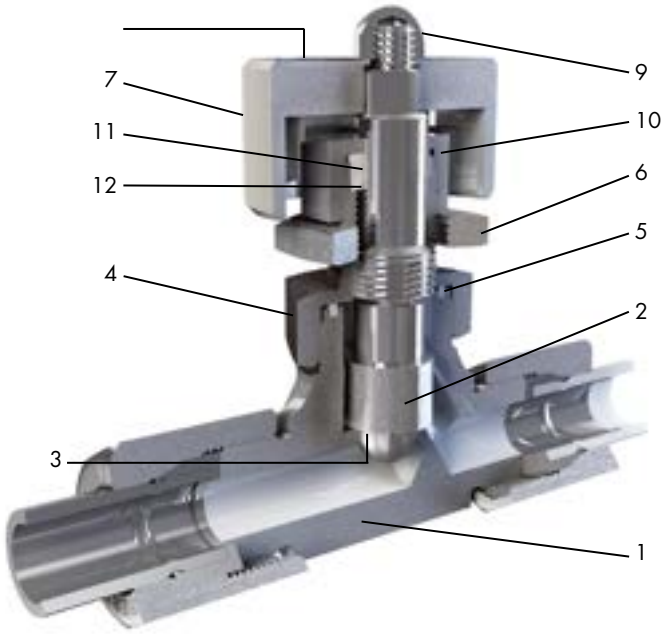
SO NV 01A21E / SO NV 01A21EL / SO NV 01A21ET / SO NV 01C21E / SO NV 01D21E / SO NV 01D21ET



Regulating / fine regulating / metering valve

SO NV 51A21 / SO NV 51C21 / SO NV 51D21

No.	Description	Material
1	Valve body	1.4571
2	Valve spindle	1.4571
3	Seal	PTFE (FDA) 25 % GF
4	Panel top	1.4571
5	Seal	PTFE (FDA)
6	Counter nut	1.4571
7	Handwheel	Aluminium
8*	Valve label (black)	Aluminium
9	Cap nut	Brass CV
10*	Valvecap	1.4571
11	Spindle seal	PTFE (FDA) 25 % GF
12	Washer	1.4571



Specifications

Working pressure (PN): 64 to 100 bar
Temperature: -40°C to +180°C
Safety factor: 1.5 times

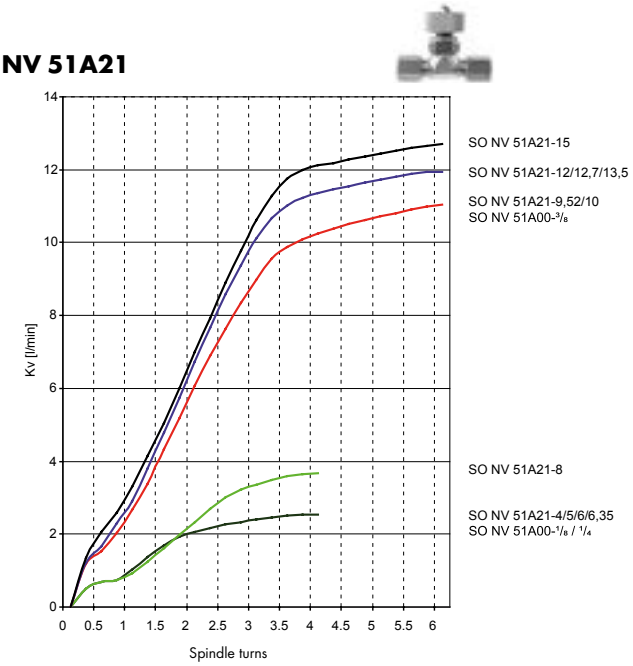
Characteristic

- Function: regulating and stop valve
- Uses: applications with high demands for resistance (check resistance of seal)
- Compact dimensions, high reliability
- Constructed for maximum flow
- No. 8 - Valve labels: also available in colors blue, red, green, yellow, see VSD SO NV
- No. 10 - Torque for valve cap in panel mounting:
- Sizes 3/5/6/8/s"/¼" = 2 Nm Sizes 10/12/15/3/s" = 2.5 Nm
- Other versions: with female SO 50030 or male adaptor SO 50040

Flow rate water

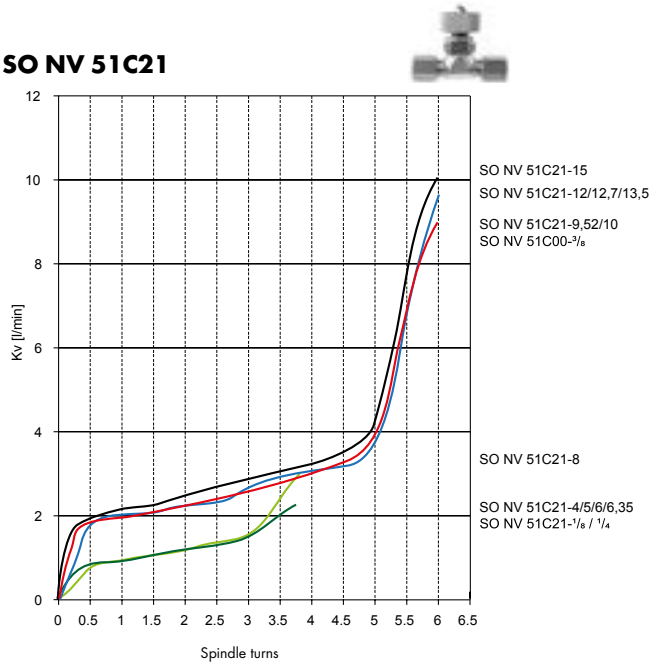
Regulating valves

SO NV 51A21



Fine regulating valves

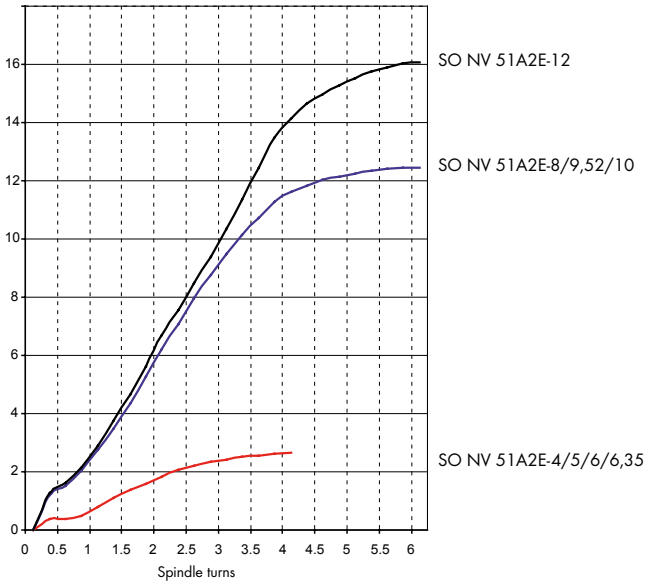
SO NV 51C21



Flow rate water

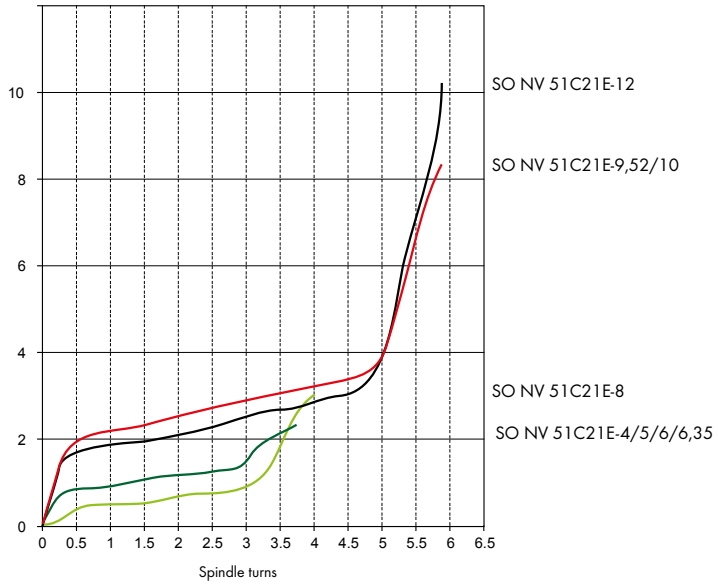
Regulating valves

SO NV 51A21E / A21EB / A60EL



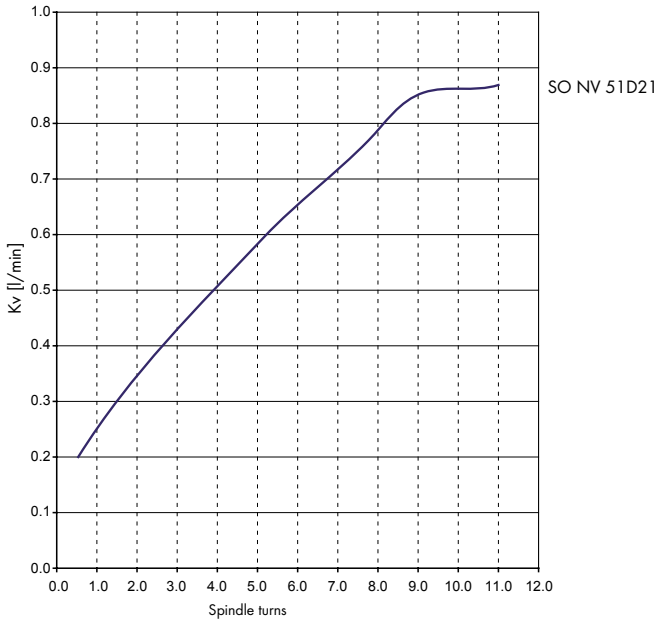
Fine regulating valves

SO NV 51C21E / C21EB / C60EL



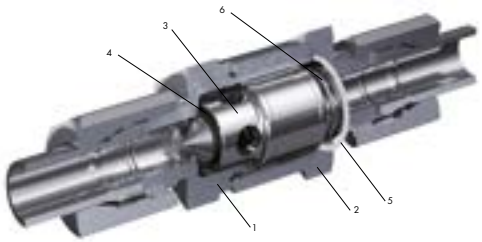
Metering valves

SO NV 51D21



Taper seat non-return valve

SO NV 51A21 / SO CV 53BXX / SO NV 51C21 / SO NV 51D21



No.	Description	Material
1	Valve cone guid	1.4571
2	Valve nut	1.4571
3	Valve cone	1.4571
4*	Seal	FKM (FDA)
5	Sealing washer	PTFE (FDA)
6*	Compression spring	1.4401

Specifications

Working pressure (PN): 100 to 200 bar
Temperature: -20°C to +200°C
Opening pressure: 1 bar ± 20 %
Safety factor: 1.5 times

Characteristics

- Function: check valve
- Uses: air, oils and liquid gases (check resistance of seal)
- Material: stainless steel 1.4571

* Options

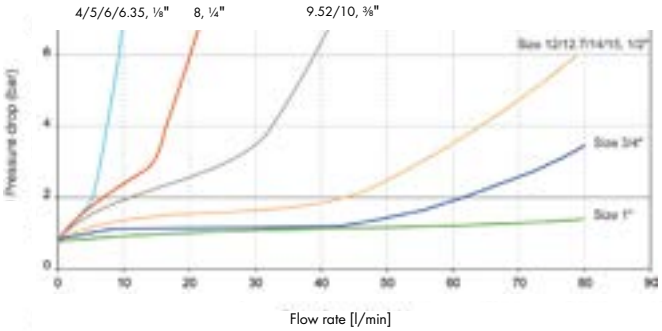
- No. 4 - Seal: EPDM, FFKM
- No. 6 - Compression spring: opening pressure 0.2, 0.5, 2, 3, 5 bar, ± 20 % (min. ± 0.1 bar)
- Other versions: with female SO 50030 or male adaptor SO 50040

Flow rate water

The pressure drop increases disproportionally with increasing flow rate.

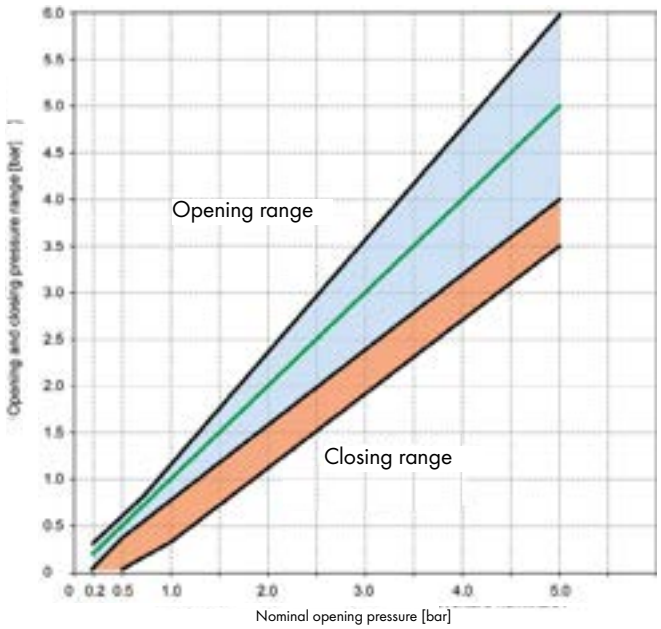
SO CV 53B21

Opening pressure: SO CV 53B00/21/30/40 1 bar



Opening pressure diagram

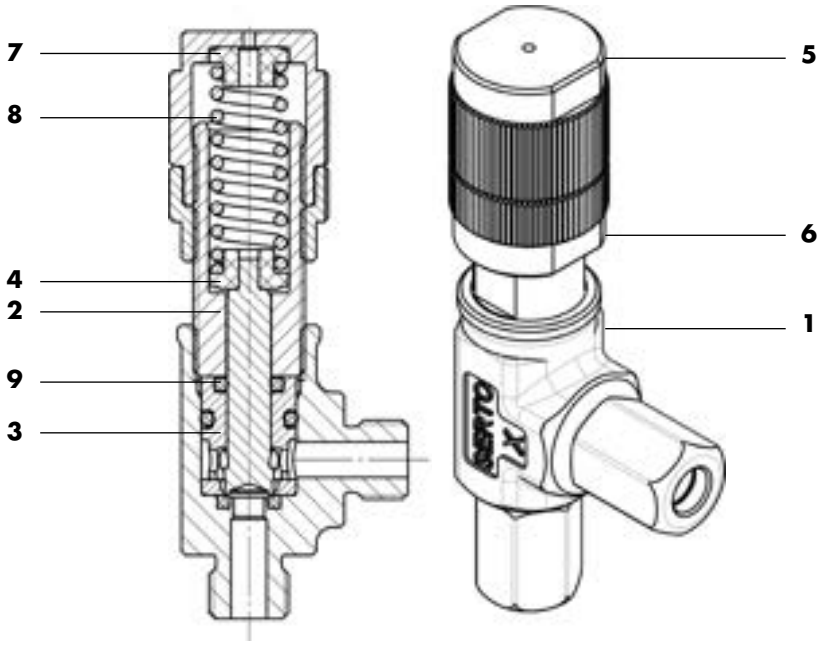
The opening pressure ranges within the blue section. The valve closes within the red section.



Relief valve in stainless steel for low-pressure applications

No.	Description	Material
1	Valve body	Inox 1.4571
2	Valve plunger	Inox 1.4571
3	Seal insert	Inox 1.4571
4	Pressure insert	Messing CV*
5	Adjusting nut	Messing CV*
6	Counter nut	Messing CV*
7	Pressure disc	POM-C
8	Spring	Inox 1.4571 / 1.4404
9	Seals	FKM (FDA)

*chemically nickel-plated



Options

- Seal: other materials (FFKM, EPDM, VMQ, others on request)
- Spring set: others on request Optionen

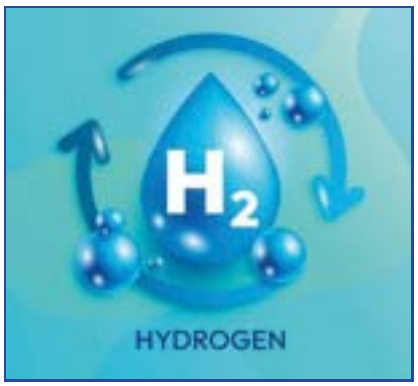
Features

Properties	Customer benefits
Compact design	Suitable for tight spaces
Externally adjustable	Opening pressure can be adjusted even after installation
Interchangeable spring sets	Optimally adjustable for various opening pressure ranges
Stainless steel only in media-contact areas	Excellent value thanks to material mix

Fields of application

Dosing systems

Gas compressors

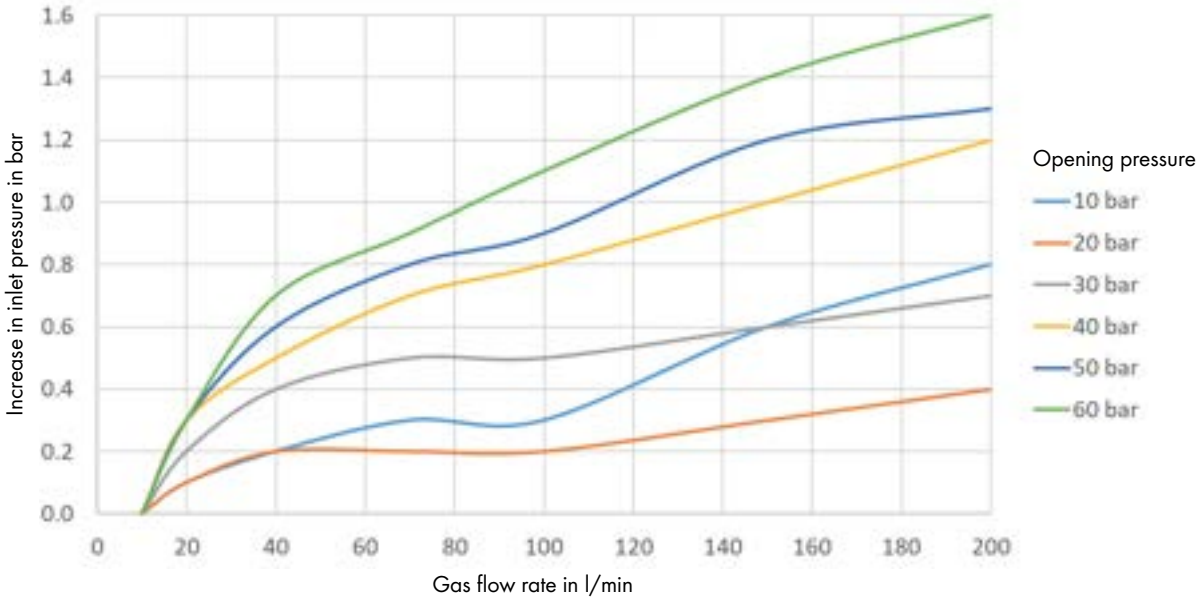


Electrolysers / fuel cells

Technical information

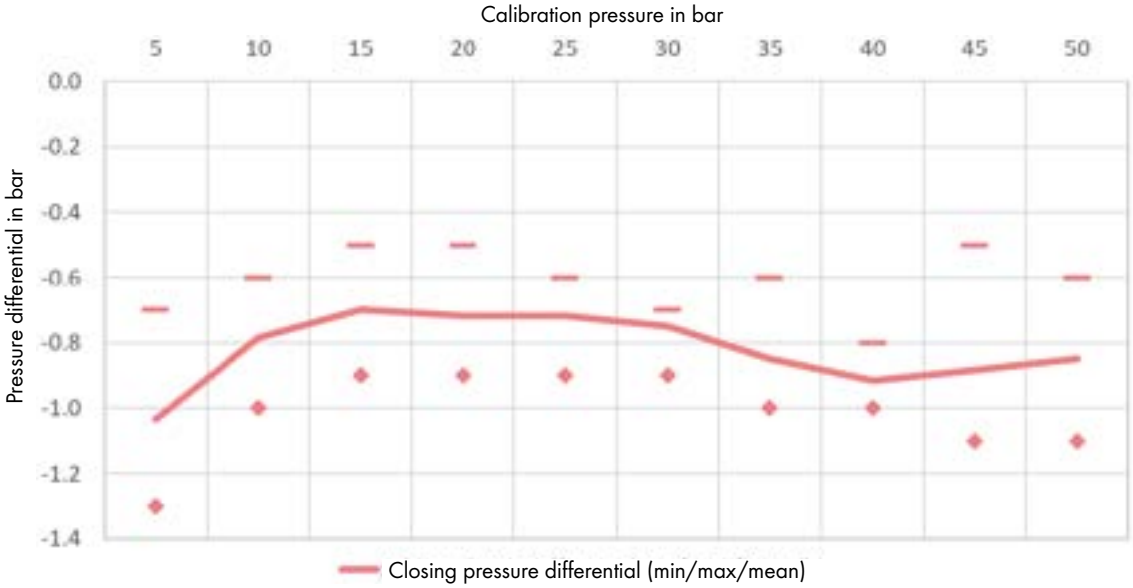
Increase in inlet pressure as a function of flow rate

- Test medium: nitrogen gas
- Flow rate at set pressure: Opening pressure: 8-12 l/min



Closing pressure as a function of calibration pressure

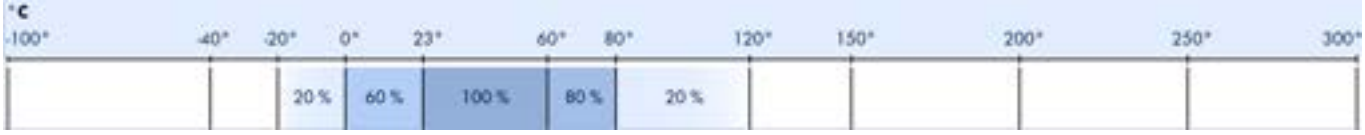
- Test medium: nitrogen gas
- Reference flow rate: 8-12 l/min



Specifications

Operating pressure PN:	100 bar
Safety factor:	1.5
Calibration range:	5 to 50 bar (with corresponding spring set)
Temperature:	-15 leak-tightness up to +120°C (FKM sealing material)
external:	<2×10^{-7} mbar·l/s (helium leakage rate)

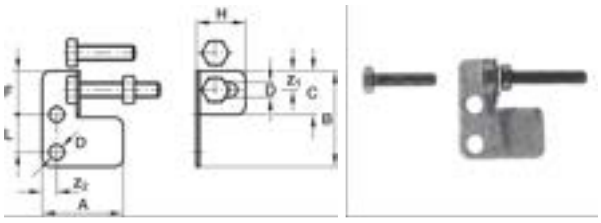
Pressure coefficient in % of PN



Valves Accessories

Flange mount

SO 09900



Type	Mat.-Nr.	L	A	B	C	D	F	H	z2	z1	kg / 100
SO 09900	028.2750.000	13.0	28.0	33.0	15.0	5.2	15.0	17.0	5.0	6.5	1.660

Material:

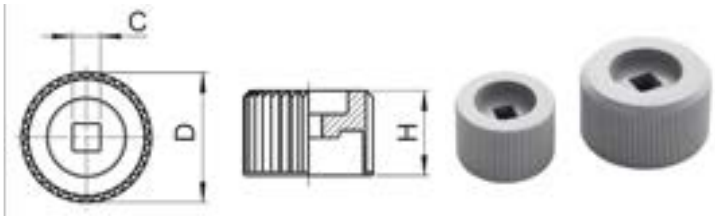
- Mount: inox 1.4571
- Screw/nut: steel 8.8 black

For wallmounting of all valves, types SO NV 41A21 / SO NV 41C21 and SO NV 01A21 / SO NV 01C21

Handwheel

for regulating valves brass M, polyamide

SO 09950



Type	Mat.-Nr.	D	H	C	kg / 100
SO 09900	025.1220.080	26.0	17.0	5.5	0.600
SO 09950 D36	025.1220.150	36.0	19.5	7.0	1.300

Valve labels (set)

VSD SO NV

Type	Inhalt
VSD NV 01A/31A/51A-6/8 (RV) colored	2 pc.
VSD NV 51A-10/12/15 (RV) colored	2 pc.
VSD NV 01C/51C-6/8 (FRV) colored	2 pc.
VSD NV 51C-10/12/15 (FRV) colored	2 pc.
VSD NV 01A+C/31A/51A+C-6/8 (RV/FRV) black	10 pc.
VSD NV 51A+C-10/12/15 (RV/FRV) black	10 pc.
VSD SO NV41A Set RV	3 pc.
VSD SO NV41C Set FRV	3 pc.
VSD SO NV41A Set grey / RV	10 pc.
VSD SO NV41C Set grey / FRV	10 pc.

VSD NV 01A/31A/51A-6/8 (RV) colored:
for regulating valve (RV) brass G/PA/Inox, sizes 6-8 geen/yellow, blue/red anodized (PU = 1 pc. each)

VSD NV 51A-10/12/15 (RV) colored:
for regulating valve (RV) Inox, sizes 10-15 geen/yellow, blue/red anodized (PU = 1 pc. each)

VSD NV 01C/51C-6/8 (FRV) colored:
for fine regulating valve (FRV) brass G/PA/Inox, sizes 6-8 geen/yellow, blue/red anodized (PU = 1 pc. each)

VSD NV 51C-10/12/15 (FRV) colored:
for fine regulating valve (FRV) Inox, sizes 10-15 geen/yellow, blue/red anodized (PU = 1 pc. each)

VSD NV 01A+C/31A/51A+C-6/8 (RV/-FRV) black:
for regulating-/fine regulating valve (RV/FRV) brass G/PA/Inox sizes 6-8 black anodized (PU = 10 pcs.)

VSD NV 51A+C-10/12/15 (RV/FRV) black:
for regulating-/fine regulating valve (RV/FRV) Inox sizes 10-15 black anodized (VPE = 10 pc.)

VSD SO NV41A Set RV:
for regulating valve (RV) brass M/G, red/ blue/ green (PU = 1 pc. each)

VSD SO NV41C Set FRV:
for fine regulating valve (FRV) brass M/G, red/ blue/green (PU = 1 pc. each)

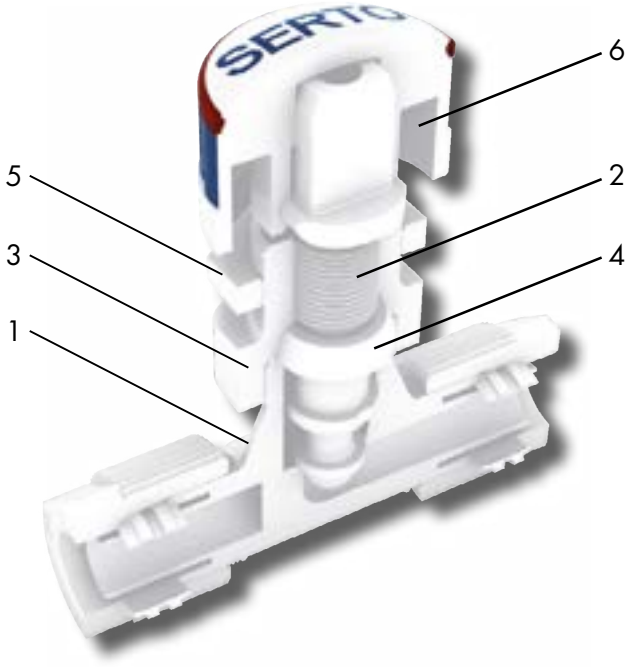
VSD SO NV41A Set grey / RV:
for regulating valve (RV) brass M/G, grey (PU = 10 pc.)

VSD SO NV41C Set grey / FRV:
for fine regulating valve (FRV) brass M/G, grey (PU = 10 pc.)

Regulating valve

SO NV 22AXX

No.	Description	Material
1	Valve body	PVDF (FDA)
2	Valve spindel	PVDF (FDA)
3	Panel top	PVDF (FDA)
4	Sealing washer	PVDF (FDA)
5	Counter nut	PVDF (FDA)
6*	Handwheel	PVDF / TPE



Specifications

Working pressure (PN): 10 bar
Temperature: -20°C to +100°C
Sterilizable: up to +121°C
Safety factor: 1.5 times

Characteristics

- Function: regulating and stop valve
- Uses: medical, clean room and laboratories, for aggressive media (see chemical resistance list PVDF; TPE has identical properties as PVDF)
- Two-piece hand wheel for non-slip operation
- Special: zero static construction, compact sizes

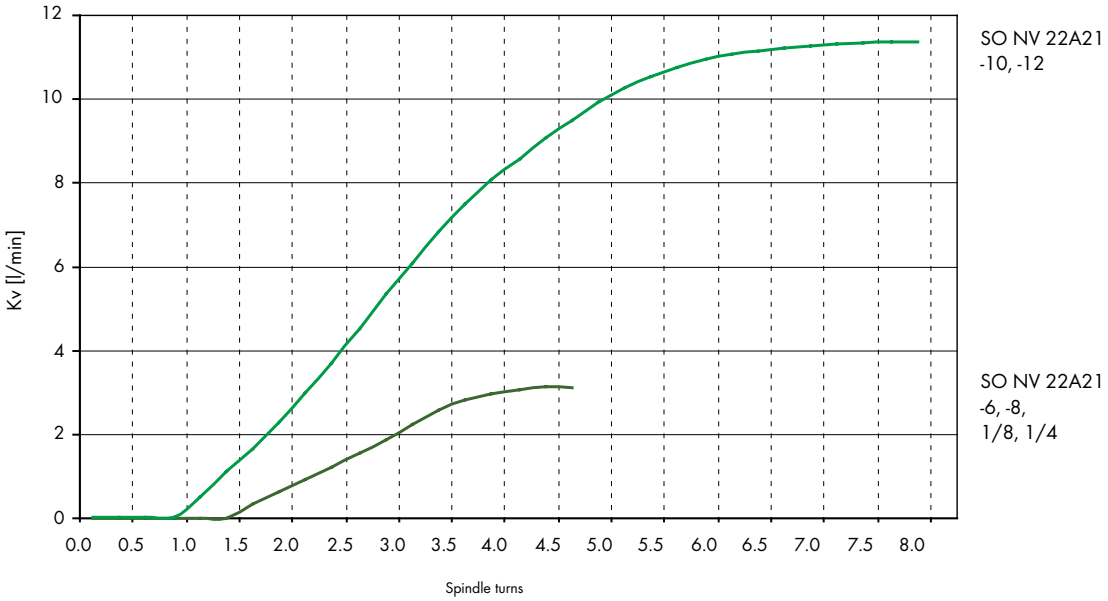
*** Options**

- No. 6: exchangeable marking rings in neutral (white), blue, red, yellow, green (included in the scope of delivery
- Other versions: with female adaptor SO 20030 or adjustable male adaptor SO 21600/21624

Flow rate water

Valid for the specified types.

SO NV 22A00 / SO NV 22A21 / SO NV 22A21E / SO NV 22A21EB / SO NV 22A21EL



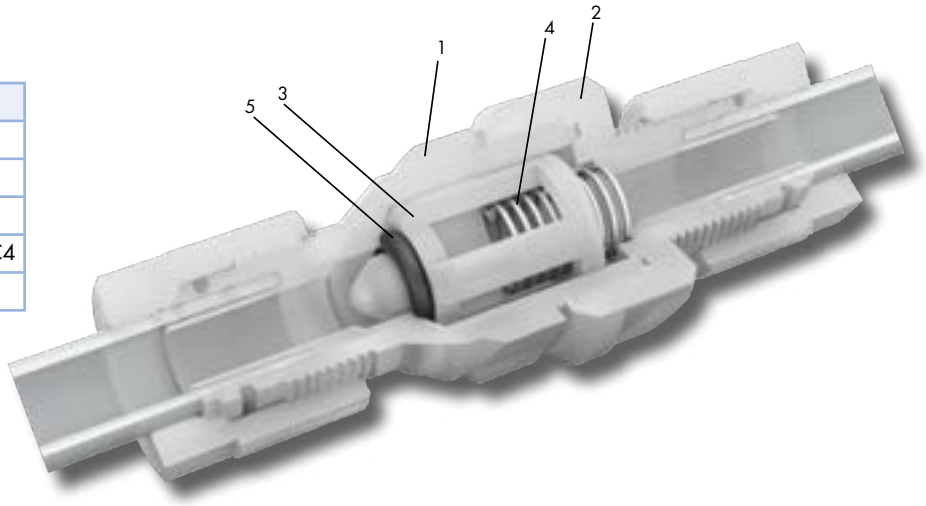
Accessories

- Flange mount for wall fastening SO 29900

Taper seat non-return valve

SO CV 23B21

No.	Description	Material
1	Valve seat	PVDF (FDA)
2	Valve nut	PVDF (FDA)
3	Valve cone	PVDF (FDA)
4	Compression spring	Hastelloy® 2.4610 C4
5*	Seal	FKM (FDA)



Specifications

Working pressure (PN): 10 bar
Temperature: -20°C to +100°C
Sterilizable: up to +121°C
Opening pressure: 0.2 ± 0.1 bar
Safety factor: 1.5 times

Characteristics

- Function: check valve
- Uses: medical, clean room and laboratories, for aggressive media (see chemical resistance list PVDF and FKM)
- Special: low pressure loss due to flow-optimised design

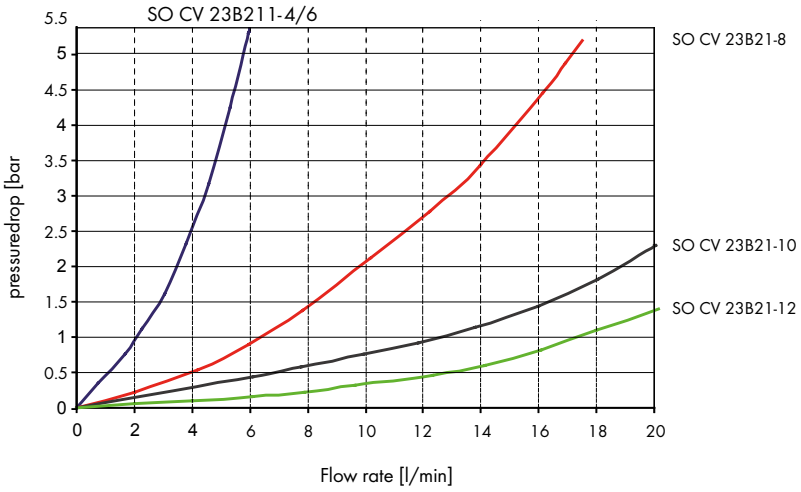
* Options

- No. 5 - Seal: EPDM, FFKM
- Other versions: with female adaptor SO 20030

Flow rate water

The pressure drop increases disproportionally with increasing flow rate.

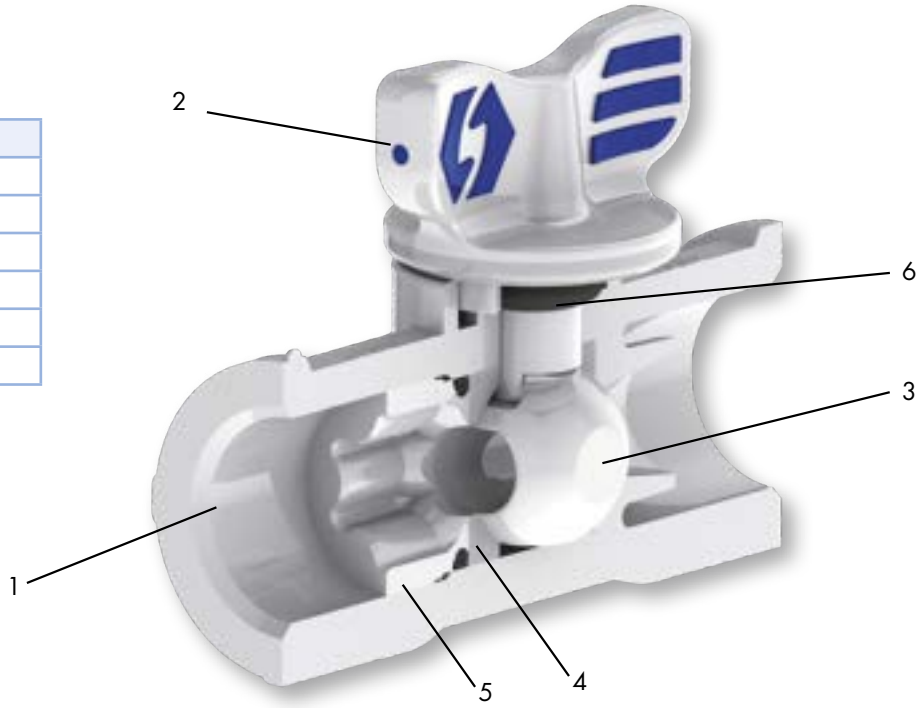
SO CV 23B21



Stopcock

SO BV 2800

No.	Description	Material
1	Body	PVDF (FDA)
2	Turning handle	PVDF/TPE
3	Valve ball	PVDF (FDA)
4	Sealing washer	PTFE (FDA)
5	Adjusting screw	PKM (FDA)
6*	Seal	PTFE (FDA)



Specifications

Working pressure (PN): 10 bar
Temperature: -20°C to +80°C
Safety factor: 1.5 times

Characteristics

- Function: open and shut-off flow
- Uses: medical, chemical and pharma industry, water treatment; for aggressive media (see chemical resistance list)
- Special: two-piece turning handle for non-slip operation, low dead space design, compact sizes, integrated holes for mounting, used PVDF raw material and sealing are FDA compliant, adjustable sealing when sign of wear is showing
-

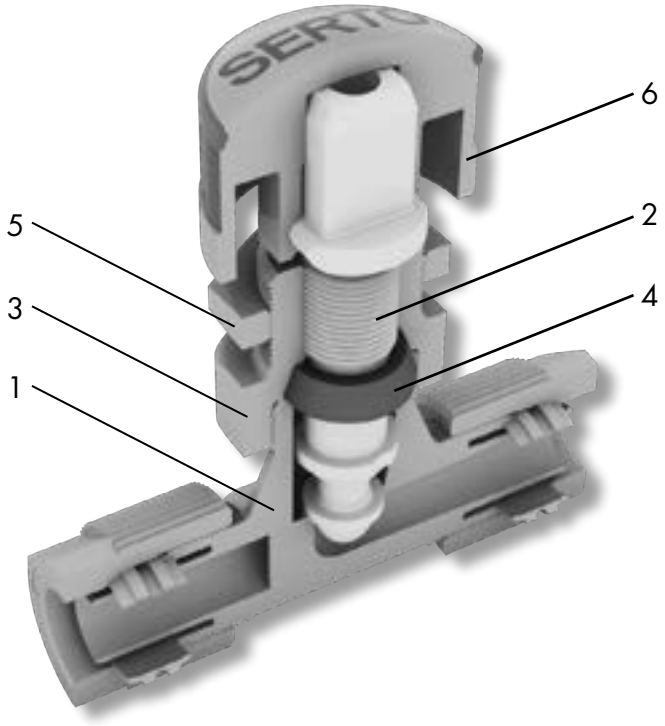
Options

- * No. 6 – seal EPDM, FFKM
- Version with tube connection SO BV 28A21 or bulkhead fitting SO BV 28A24

Regulating valve

SO NV 32A21

No.	Description	Material
1	Valve body	PA
2	Valve spindle	PVDF
3	Panel top	PA
4	Sealing washer	EPDM
5	Counter nut	PA
6	Handwheel	PA/TPE



Specifications

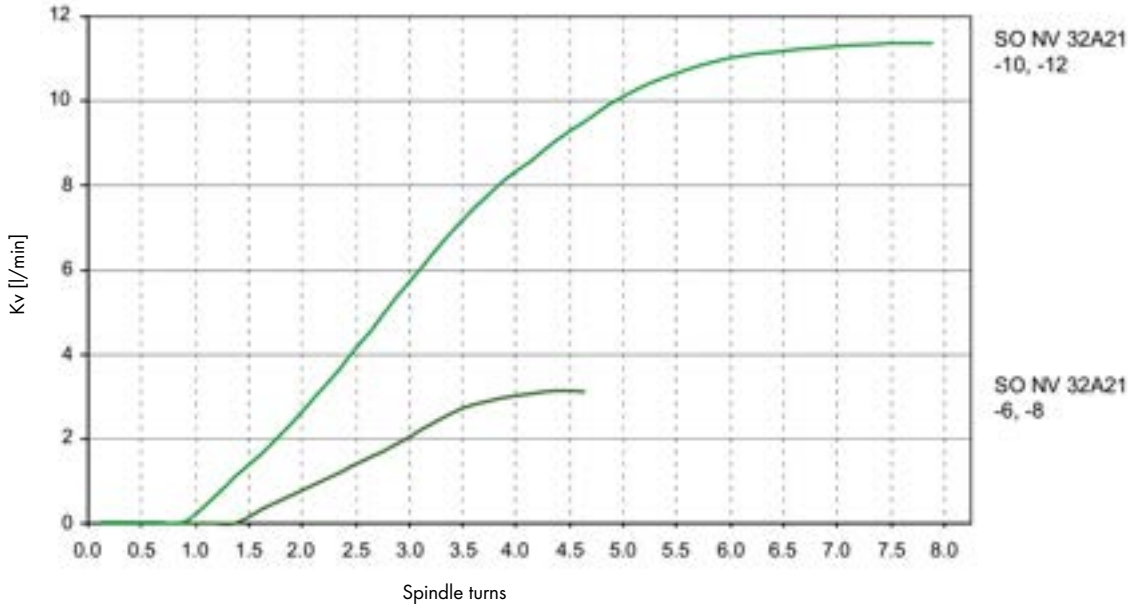
Working pressure (PN): 10 bar
Temperature: -20°C to +40°C
Safety factor: 1.5 times

Characteristics

- Function: regulating and stop valve
- Uses: pneumatics, measurement and control technology, machine and apparatus engineering, for non-aggressive media (see chemical resistance list PA; TPE has identical properties as PA)
- Two-piece hand wheel for non-slip operation
- Special: zero static construction, compact sizes

Flow rate water

SO NV 32A21



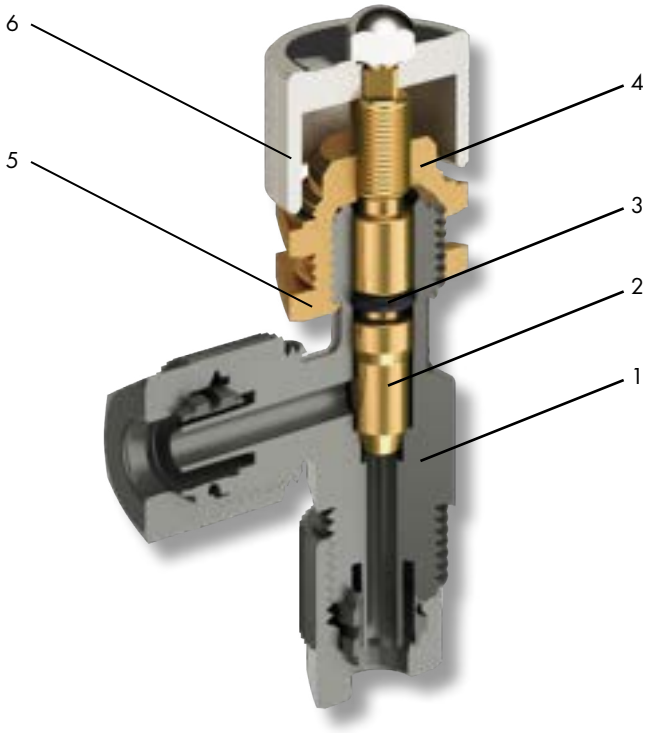
Accessories

Flange mount for wall fastening SO 29900

Elbow regulating valve

SO NV 31A21

No.	Description	Material
1	Valve body	PA
2	Valve spindle	Brass
3	Seal	NBR
4	Valve cap	Brass
5	Counter nut	Brass
6	Handwheel	Aluminium



Specifications

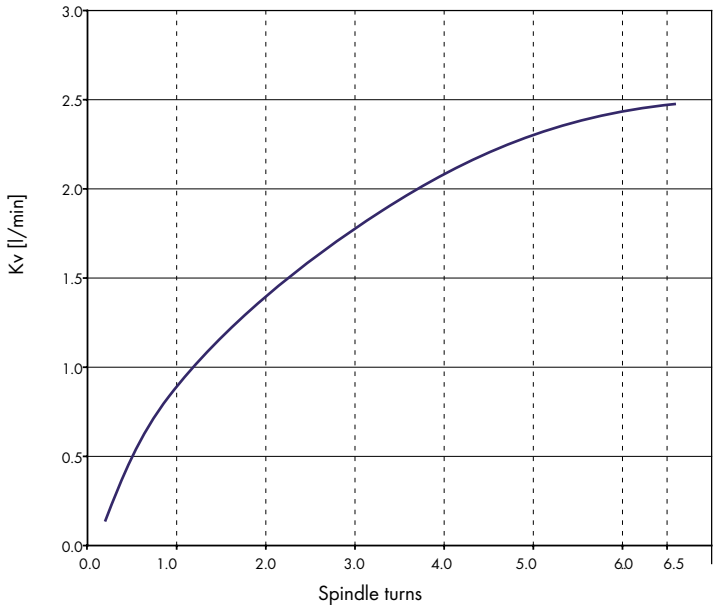
Working pressure (PN): 10 bar
Temperature: -20°C to +40°C
Safety factor: 1.5 times

Characteristics

- Function: regulating and stop valve
- Uses: pneumatics, measurement and control technology, machine and apparatus engineering, for non-aggressive media (see chemical resistance list PA)
- Special: zero static construction, compact sizes

Flow rate water

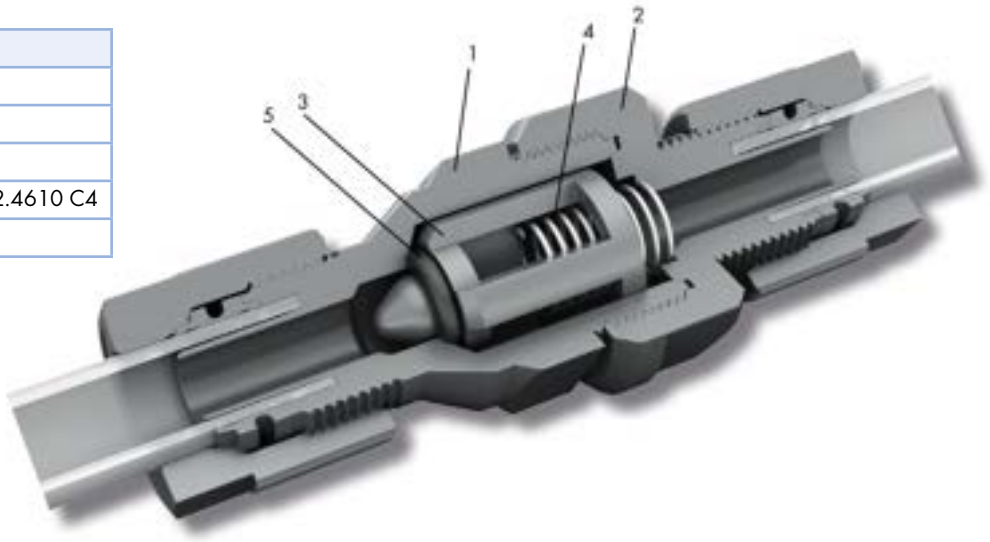
SO NV 31A21E / SO NV 31A21EB



Taper seat non-return valve

SO CV 33B21

No.	Description	Material
1	Valve seat	PA
2	Valve nut	PA
3	Valve cone	PA
4	Compression spring	Hastelloy® 2.4610 C4
5*	Seal	FKM



Specifications

Working pressure (PN): 10 bar
Temperature: -20°C to +80°C
Opening pressure: 0.2 ± 0.1 bar
Safety factor: 1.5 times

Characteristics

- Function: check valve
- Uses: medical, clean room and laboratories (see see chemical resistance list PA and FKM)
- Special: low pressure loss due to flow-optimised design

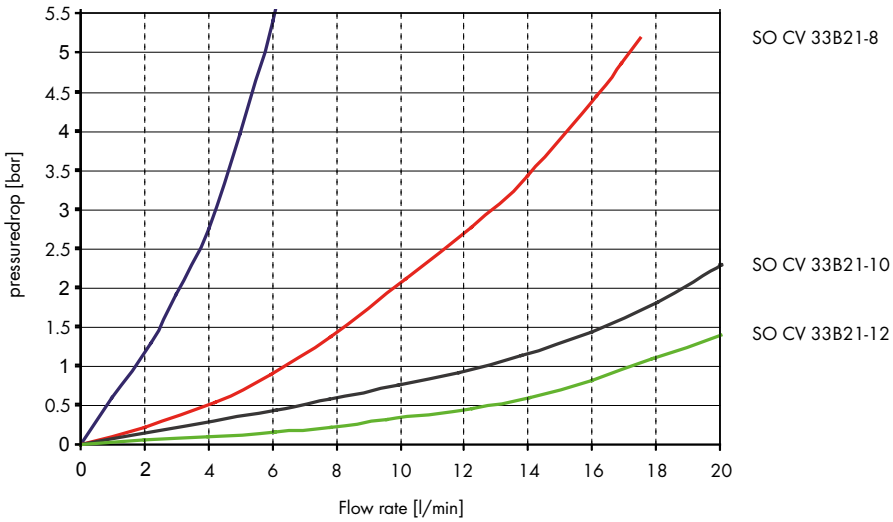
* Optionen

- No. 5 - Seal: EPDM

Flow rate water

The pressure drop increases disproportionally with increasing flow rate.

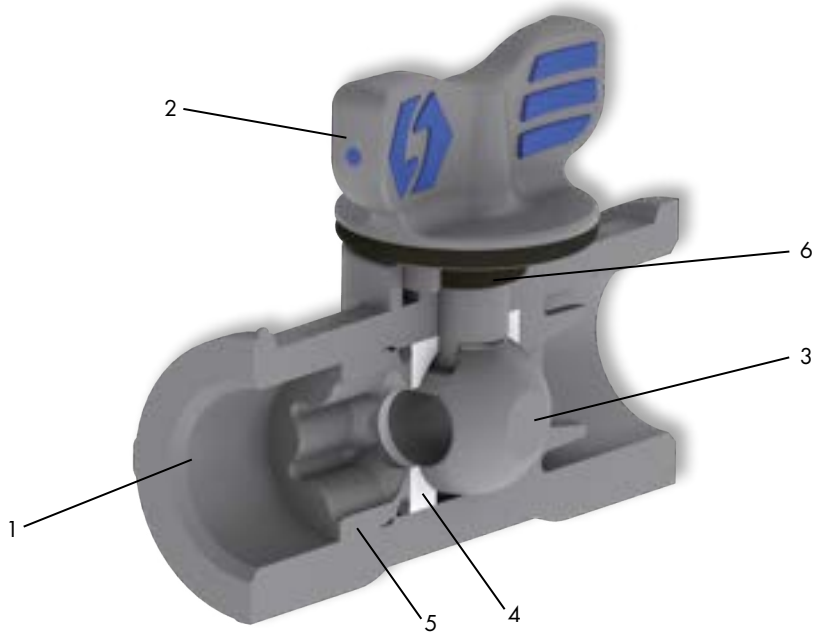
SO CV 33B21



Stopcock

SO BV38A00

No.	Description	Material
1	Body	PA 6.6
2	Turning handle	PA 12 / TPE
3	Valve ball	PA 12
4	Sealing washer	PTFE
5	Adjusting screw	PA 6.6
6	Seal	FKM



Specifications

Working pressure (PN): 10 bar
Temperature: -20°C bis +40°C
Safety factor: 1.5 times

Characteristics

- Function: open and shut-off flow
- Uses: pneumatics, measurement and control technology, machine and apparatus engineering; for non-aggressive media (see chemical resistance list); protect against direct UV radiation
- Special: two-piece turning handle for non-slip operation, low dead space design, compact sizes, integrated holes for mounting, adjustable sealing when sign of wear is showing

Optionen

- Other version: with tube connection (type SO BV 38A21)

Quick-disconnect couplings

Stainless steel
Brass
PVDF
PA

Accessories

Overview

Quick couplings inox

Series 50 "coupler"

Series 50 "nipple"

Series 51 "coupler"

Series 51 "nipple"

Series 52 "coupler"

Series 52 "nipple"

Series H "coupler"

Series H "nipple"

Series 25 "coupler"

Series 25 "nipple"

Quick couplings PVDF

Coupling Plus “coupler”

Coupling Plus “nipple”

Safety coupling “coupler”

Safety coupling “nipple”

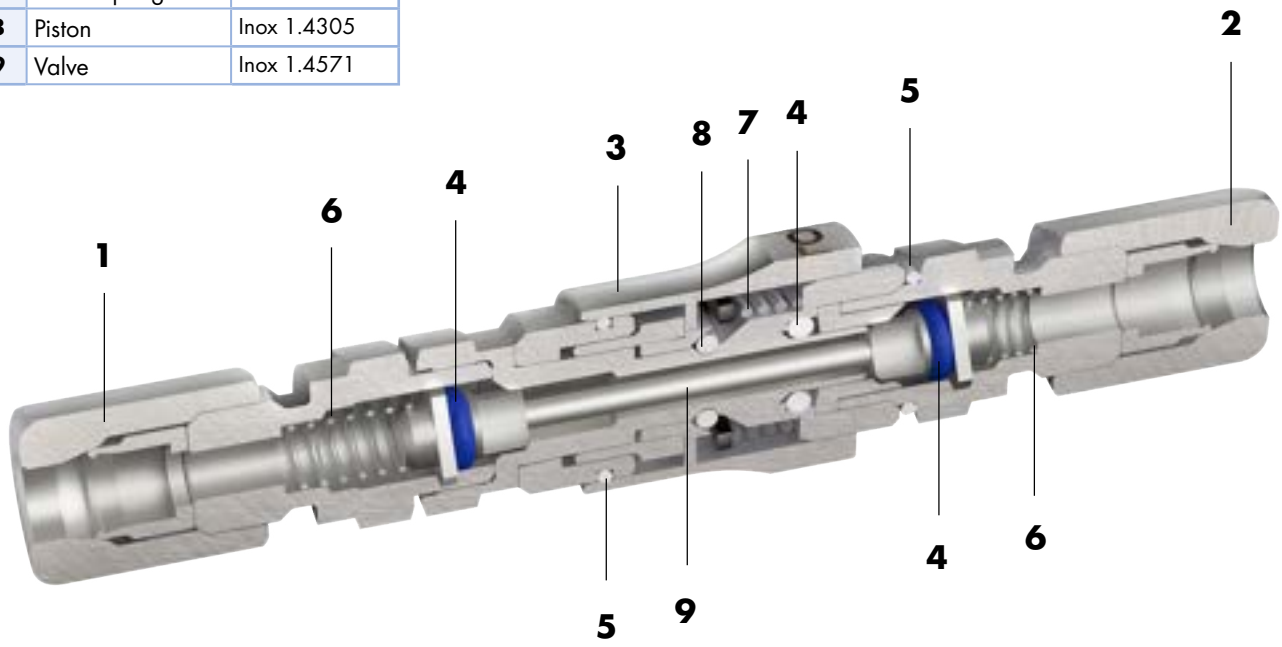
Accessories

Protection cap / plug

Gasket set

Quick coupling with mechanical and color coding

No.	Description	Material
1	Nipple	Inox 1.4571
2	Coupler	Inox 1.4571
3	Sliding sleeve	Inox 1.4571
4*	Seal	FKM (FDA)
5	Colour coding	FKM
6	Compression spring	Inox 1.4310
7	Return spring	Inox 1.4310
8	Piston	Inox 1.4305
9	Valve	Inox 1.4571



Specifications

Working pressure (PN): 200 bar
Temperature: -20°C to +120°C
Sterilizable: yes
Safety factor: 1.5 times

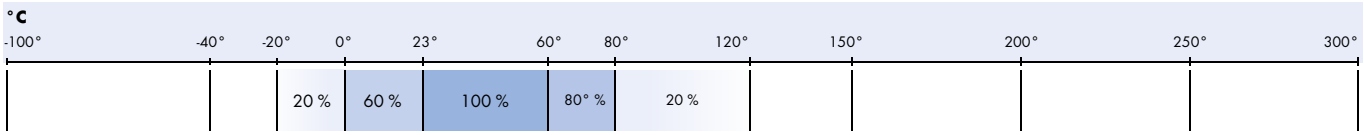
Characteristics

The color coded version provides significant advantages in respect of safety in use and is available in blue, green, yellow and red. Correct coupling ist guaranteed visually with the different colored options and mechanically with the geometry of the parts – differing colors will not interconnect.

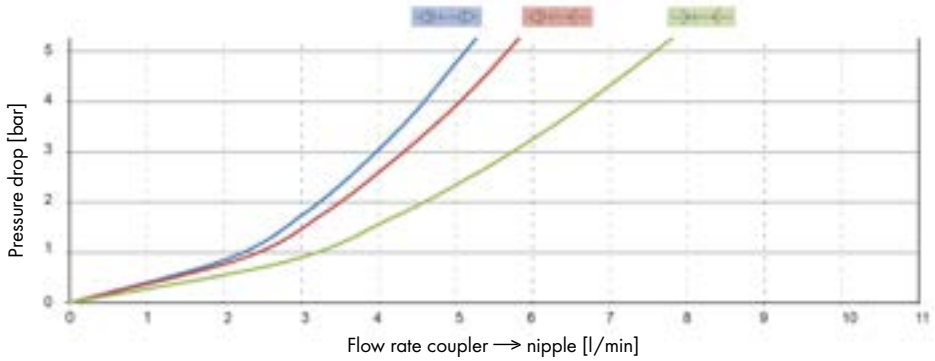
*** Options available**

- 4 - Seal: other materials on request
- 5 - Coding: colors blue, red, green, yellow
- Cleaning / lubricating: OX (for use with oxygen) and SI (silicone-free)

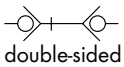
Pressure coefficient % of PN



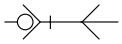
Pressure loss curve for water



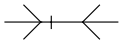
Coupling functions



double-sided shut-off
coupler shut-off Q50 C..V
nipple shut-off Q50 N..V



one-sided shut-off
coupler shut-off Q50 C..V
nipple no shut-off Q50 N..P



no shut-off
coupler no shut-off Q50 C..P
nipple no shut-off Q50 N..P

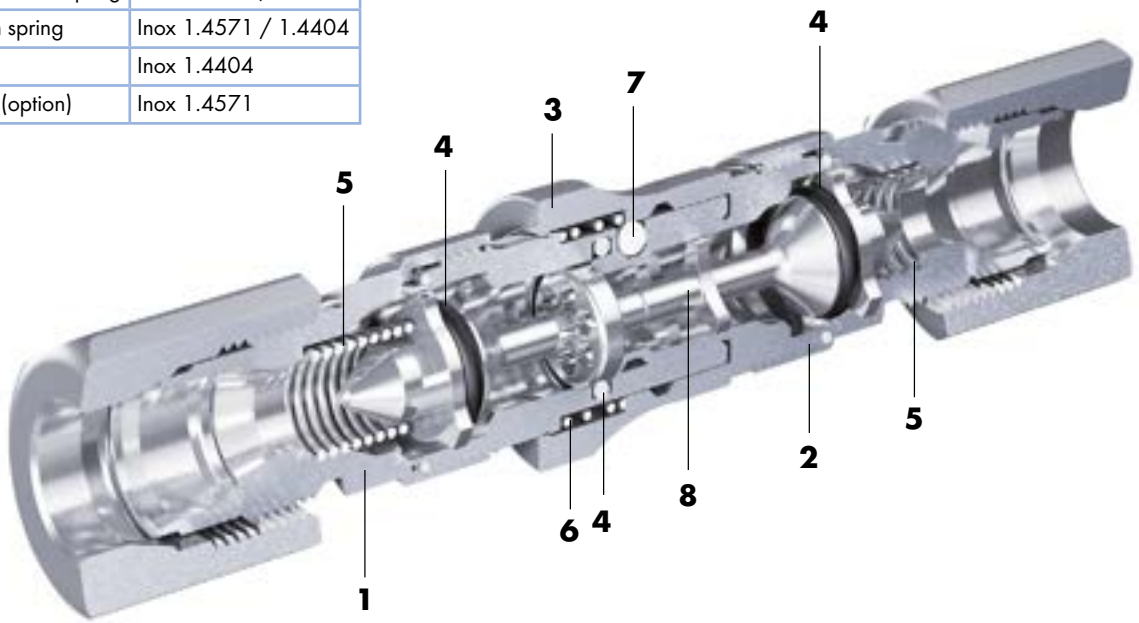
Order information material description

Example: Q50 C04VS-6 B

Q	Coupling SERTO
5	Material (stainless steel)
0	Series
C	C **C**oupler N **N**ipple
04	DN 04
V	V shut-off (**V**alve) P no shut-off (**P**lain)
S	S SERTO connection P panel mount with SERTO connection M male thread (parallel)
-6	Size – tube outside diameter – or thread
B	Color B blue R red G green Y yellow

Quick coupling – compact and high flow rate

No.	Description	Material
1	Nipple	Inox 1.4571
2	Coupler	Inox 1.4571
3	Sliding sleeve	Inox 1.4571
4	Seal	FKM (FDA)
5	Compression spring	Inox 1.4571 / 1.4404
6	Return spring	Inox 1.4571 / 1.4404
7	Balls	Inox 1.4404
8	Valve (option)	Inox 1.4571



Specifications

Working pressure (PN): 65 to 200 bar
Temperature: -15°C to +200°C
Sterilizable: yes
Safety factor: 1.5 times

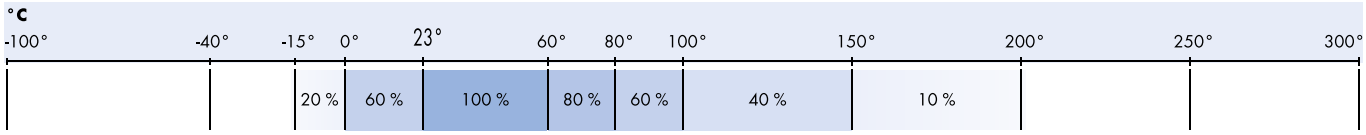
Characteristics

- higher-than-average flow rate with low pressure drop
- ergonomic design
- one-hand operation for efficient and convenient coupling and decoupling
- smooth surface, easy cleaning, low dirt accumulation

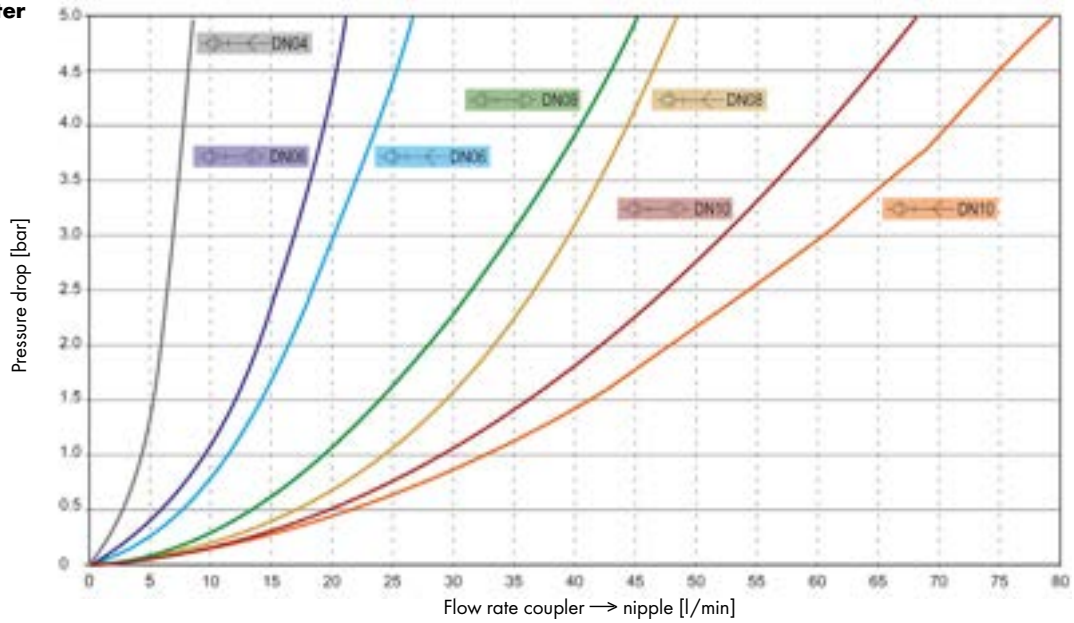
*** Options available**

- 4 - Seal: other materials on request (EPDM, FFKM, VMQ, NBR)
- Cleaning / lubricating: OX (for use with oxygen) and SI (silicone-free)

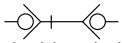
Pressure coefficient % of PN



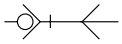
Pressure loss curve for water



Coupling functions



double-sided shut-off
coupler shut-off Q51 C..V
nipple shut-off Q51 N..V



one-sided shut-off
coupler shut-off Q51 C..V
nipple no shut-off Q51 N..P

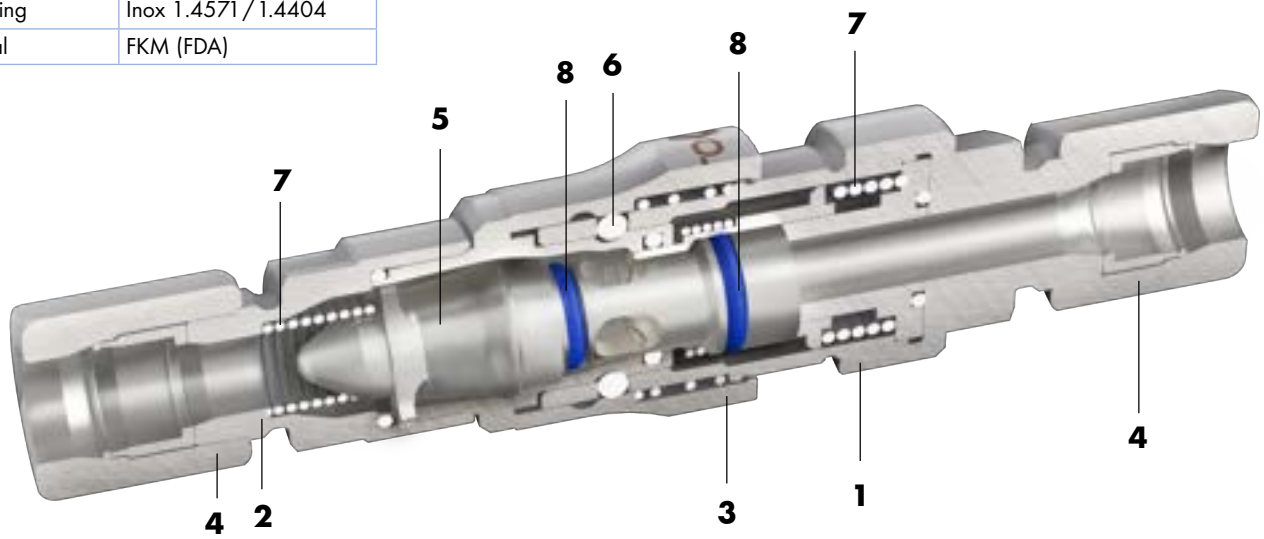
Order information material description

Example: Q51 C04VS-6

Q	Coupling SERTO
5	Material (stainless steel)
1	Series
C	C **C**oupler N **N**ipple
04	DN 04 06 08 10
V	V shut-off (**V**alve) P no shut-off (**P**lain)
S	S SERTO connection P panel mount with SERTO connection M male thread (parallel) F female thread (parallel) N hose nozzle
-6	Size – tube outside diameter – or thread

Stainless steel quick coupling for drip-free coupling

No.	Description	Material
1	Coupler	Inox 1.4571
2	Nipple	Inox 1.4571
3	Sliding sleeve	Inox 1.4571
4	Connection	Inox 1.4571
5	Interior part	Inox 1.4571
6	Balls	Inox 1.4404
7	Spring	Inox 1.4571 / 1.4404
8	Seal	FKM (FDA)



Options

- Seal: other materials (FFKM, EPDM, VMQ, others on request)
- Cleaning/lubrication: OX (oxygen), SI (silicone-free), HT (high-temperature), FC (food contact)

Features

Ergonomic design	Costumer benefits
One-handed operation	couplings fit perfectly in the hand
Flat-face technology	efficient and comfortable coupling and uncoupling
Smooth surfaces	leakage-free coupling and uncoupling, easy to clean
Innovative valve construction	easy to clean, accumulates little dirt
FDA-compliant materials	high flow rate with low pressure loss
SERTO modular system	broad field of applications, e.g. in the food industry
SERTO options	numerous connection options available
SERTO Optionen	custom models thanks to alternative materials/lubricants

Fields of application

ng

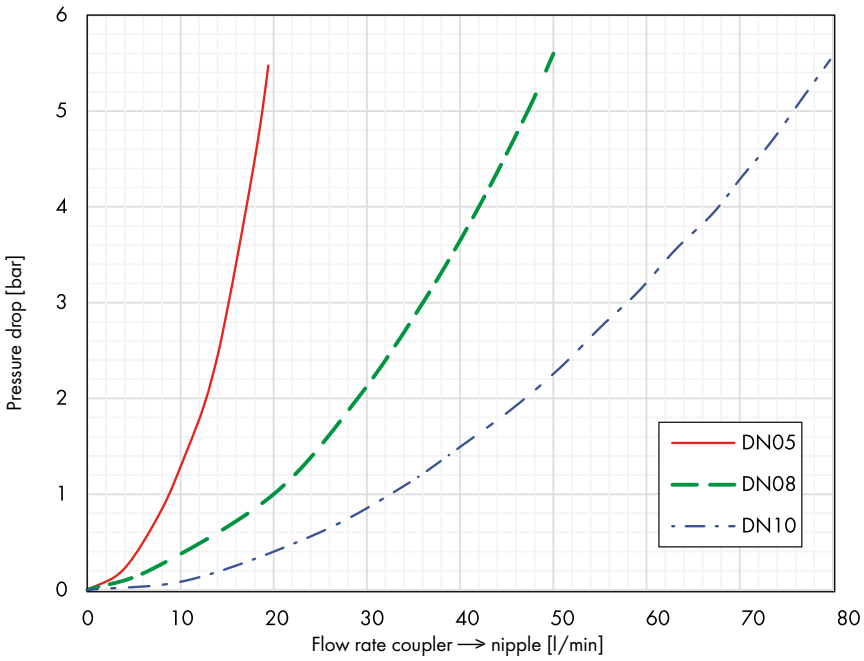
Process temperature control

Container filling

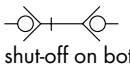
Food/cosmetics

Technical information

Water pressure loss curve



Coupling functions



shut-off on both sides
coupler with valve Q52+ C..V
nipple with valve Q52+ N..V

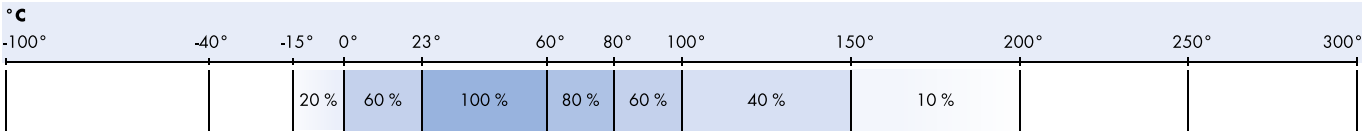
Coupling / uncoupling under pressure

Depending on the installation or the aggressiveness and temperature of the medium, complete depressurisation is recommended before coupling or uncoupling.
The following maximum pressures should be considered as guide values.
Nominal width DN05: 5 bar
Nominal width DN08: 4 bar
Nominal width DN10: 3 bar

Specifications

Operating pressure PN:	from 65 up to 100 bar, depending onnominal width DN
Safety factor:	1.5
Temperature:	from -15 up to +200°C (FKM sealing material)
Leak-tightness:	10^{-7} mbar l/s (helium leakage rate)
Vacuum:	up to 300 mbar relative to atmosphere
Sterilisable:	at 121°C

Pressure coefficient % of PN



Bestellhinweis Typ

Q	Couplings SERTO
5	Material (Stainless steel)
2	Series
C	C **C**oupler N **N**ipple
05	DN 05 08 10
V	V shut-off (**V**alve)
S	S SERTO connection P Bulkhead version SERTO connection M External thread cylindricala F Internal thread cylindrical
10	Size: Tube outside diameter or thread

Couplings inox series H

Materials series H

- Coupler and nipple: stainless steel 1.4401
- Seals: FKM (standard) others on request

Nominal bore

¼" – 1½"; DN6 – DN40

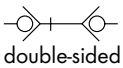
Temperature range

FKM: -20°C to +200°C

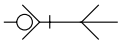
Working pressure

105 to 690 bar at +23°C

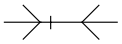
Coupling functions



double-sided shut-off
coupler shut-off S-VHC
nipple shut-off S-VHN



one-sided shut-off
coupler shut-off S-VHC
nipple no shut-off S-PHN



no shut-off
coupler no shut-off S-PHC
nipple no shut-off S-PHN

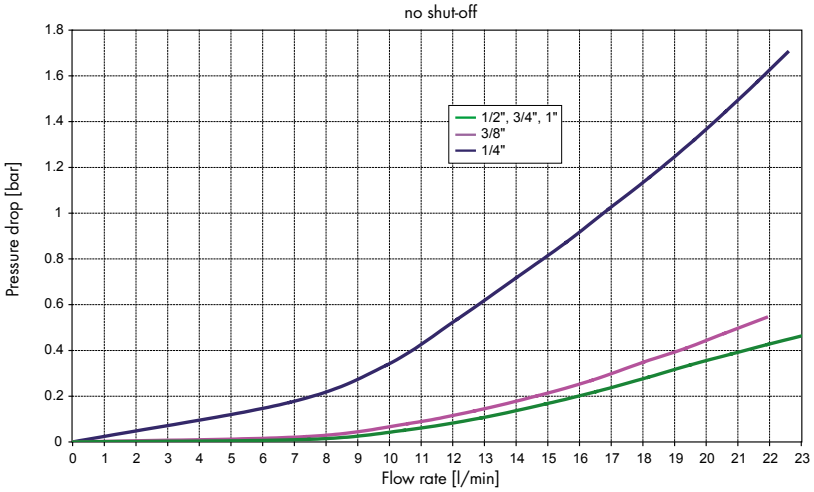
Properties

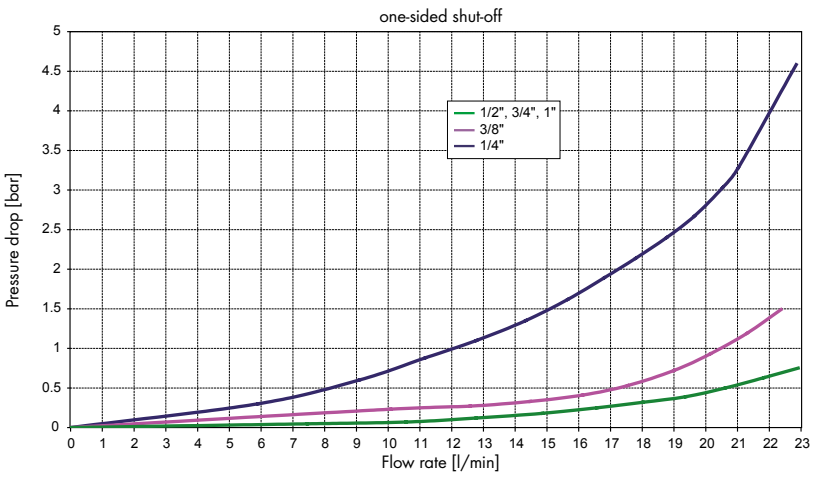
- fast and easy to use
- special "jet stream" valve for low flow resistance
- steady flow
- very little pressure loss
-

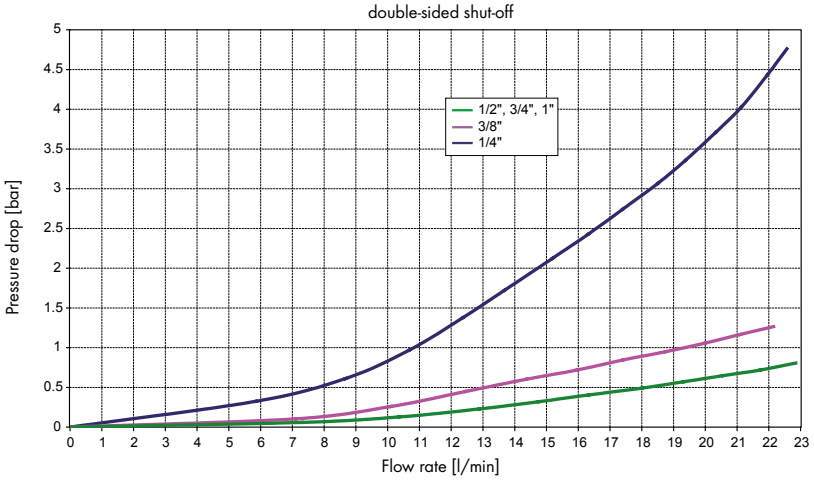
Characteristics

- Uses: hydraulic and pneumatic systems
- Media: fluids, gases

Flow capacity







Couplings inox series 25

Materials series 25

- Coupler and nipple: stainless steel 1.4401
- Seal: Coupler: KEL-F
  Nipple: PTFE

Nominal bore

¼" – ½"; DN6 – DN12

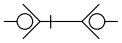
Temperature range

un coupled: -73 °C to +150 °C
coupled: -240 °C to +150 °C

Working pressure

70 bar bei +23 °C

Coupling functions



double-sided shut-off
coupler shut-off S-V25C
nipple shut-off S-V25N

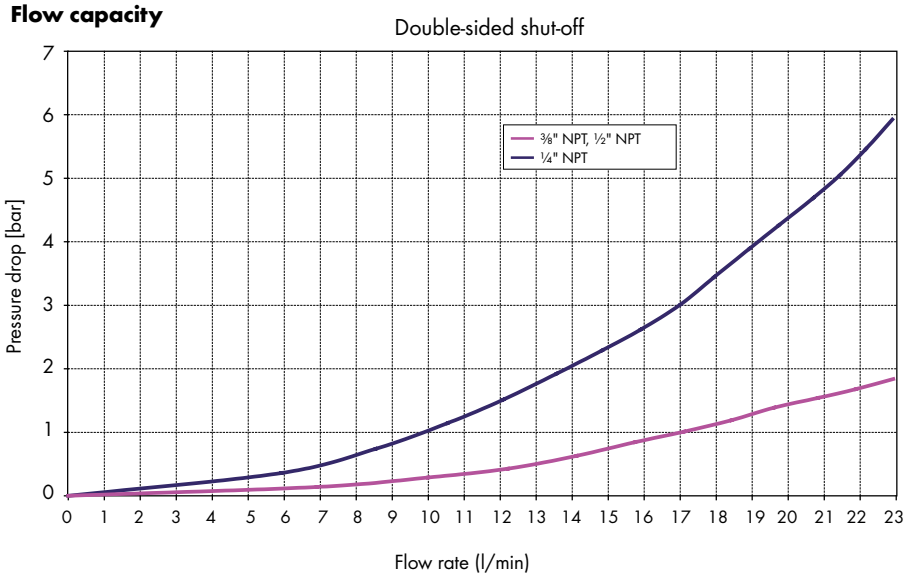
Properties

- minimum pressure drop
- reliable shut-off ball fitting
- tubular valve construction

Characteristics

- Uses: chemical industry
- Media: highly corrosive substances, hydro-carbons, esters, ethers, ketones

Flow capacity



Quick coupling Accessories

Protection cap / plug

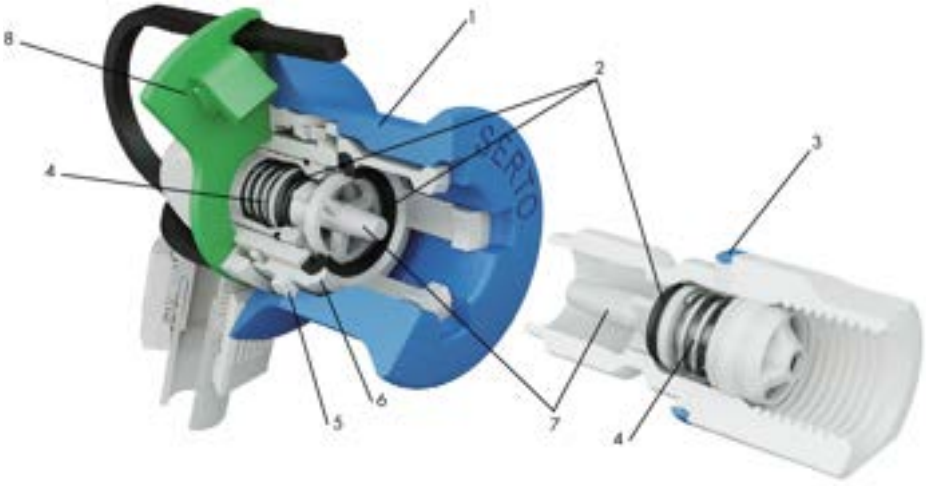
for quick couplings series EA/E, H, 25

Gasket set

for quick couplings series H

PVDF safety coupling

No.	Description	Material
1*	Sliding sleeve blue	PVDF (FDA)
2*	Seal	EPDM (FDA)
3*	Color coding blue	PVDF (FDA)
4	Compression spring	Inox 1.4310
5	Return spring	PVDF (FDA)
6	Collet	PVDF (FDA)
7	Valve insert (option)	PVDF (FDA)
8	Safety lock	PVDF (FDA)



Specifications

Working pressure (PN): 10 bar
Temperature: -20°C to +100°C
Sterilizable: up to +121°C
Safety factor: 1.5 times

Characteristics

Especially for demanding applications, for example in the chemical and pharmaceutical industries.
In medical technology ideal for connecting dialyser cartridges.

* Options available

- 1 - Sleeve: red, white
- 2 - Seal: FKM, silicone
- 3 - Coding: red, white

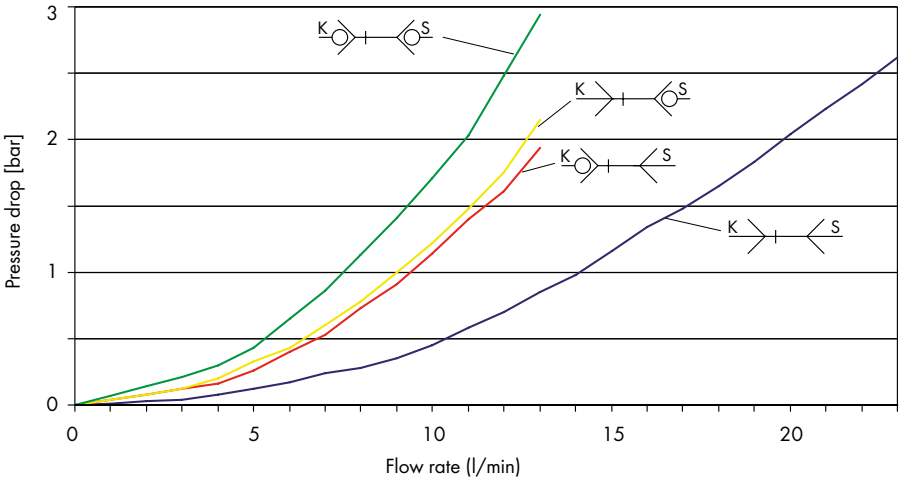
Order information material description

Example: Order no CO KA/BS-SOT-LW6-PE

CO	CO	Coupling
KA/	K	Coupler straight no shut-off
	KU	Coupler angled no shut-off
	KA	Coupler straight shut-off
	KAU	Coupler angled shut-off
	T	Nipple straight no shut-off
	TA	Nipple straight shut-off
BS–	BS	blue with safety lock
	NS	nature (white) with safety lock *
	RS	red with safety lock *
	F	without return spring, with safety lock *
SO	SO	SERTO
T–	T	hose nozzle
	I	female thread
	S	SERTO tube connector
LW6–	LW6	port size for hose id 6 mm
	1/4	BSP thread straight
	6	for tube outside diameter 6 mm
P	PFDV	
E	Seal	E EPDM
		V FKM *
		S Silicone *

* Option auf Anfrage

Pressure loss curve for water



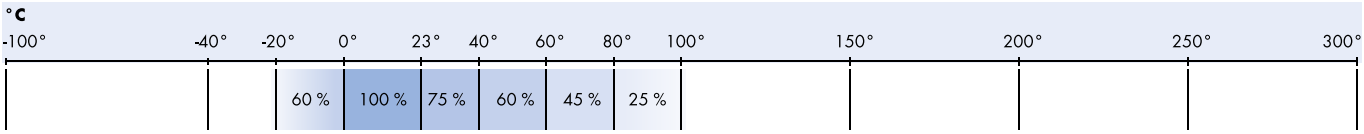
Coupler

K shut-off
K no shut-off

Nipple

S shut-off
S no shut-off

Pressure coefficient % of PN



Coupling PVDF Plus

PVDF coupling "Plus"

No.	Description	Material
1	Nipple	PVDF (FDA)
2	Valve cone	PVDF (FDA)
3	Compression spring	PVDF (FDA)
4	Seal	Hastelloy® 2.4610
5*	Lock nut	EPDM(FDA)
6	Safety clamp	PA / TPE
7	Loss protection	PA
8	Verliersichtung	EPDM

Specifications

Working pressure (PN): 10 bar
Temperature: -20°C to +100°C
Sterilizable: up to +121°C
Safety factor: 1.5 times

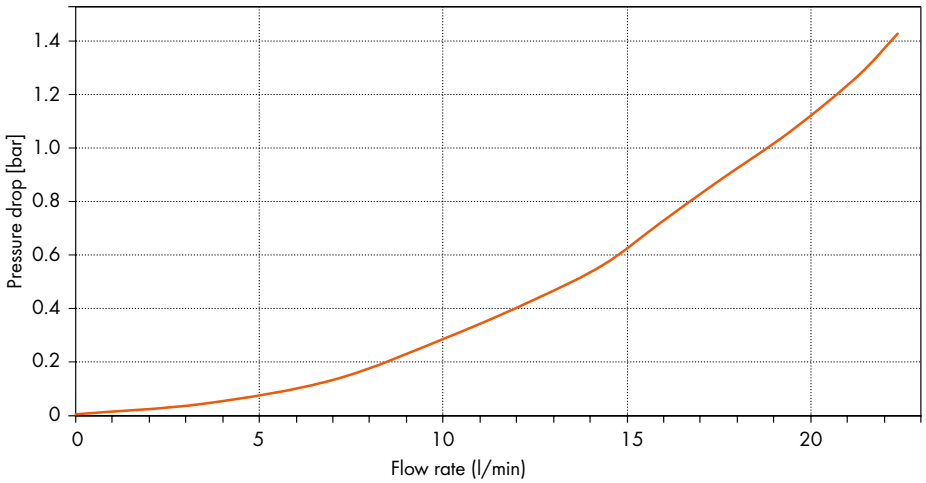
Characteristics

Screw coupling for maximum safety in use. The safety clamp prevents accidental release of the lock nut. Optimised design with minimal dead space for high flow rates.

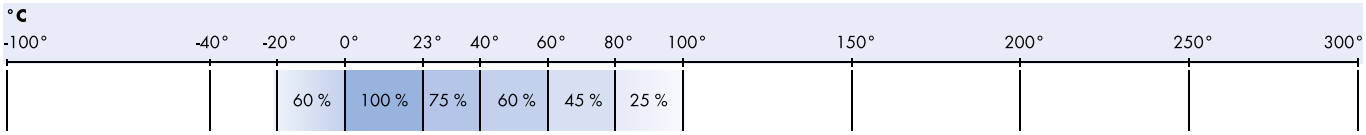
Options

- Other versions: with female adaptor SO 20030

Pressure loss curve for water



Pressure coefficient % of PN



Hose nipples

Brass CV
PVDF

Overview

Hose nipples brass CV

Straight hose nozzle

LO CV 1000

Straight hose nozzle reduced

LO CV 1000 RED

Panel mount hose nozzle

LO CV 1500

Panel mount hose nozzle reduced

CV 1500 RED

Male adaptor hose nozzle

LO CV 1100

Distributor 60°

LO CV 3000 60

Tee hose nozzle

LO CV 3000 T

Cross hose nozzle

LO CV 4000

Optional services on request:

see chapter services

Special treatment – degreased

Hose nipples PVDF

Straight hose nozzle

LO PVDF 1000

Straight hose nozzle reduced

LO PVDF 1000 RED

Elbow hose nozzle

LO PVDF 2000

Tee hose nozzle

LO PVDF 3000

Y hose nozzle

LO PVDF 3000 Y

Characteristics, specialities

- simple and fast connections
- space-saving
- large product line:
  - lightweight plastics
  - brass, flow-optimized
- inexpensive

Application

For tube connection in gauging and regulating systems, laboratories, apparatus manufacturing, etc.

Tubing

Suitable are tubes where the material is sufficiently elastic to stretch for an adequate length of time without suffering damage, i.e. polyurethan, polyamide, PVC, rubber.

Material

- nickel-plated brass
- plastic PVDF

Working pressure PN

Admissible working pressure up to PN 6 acc. to DIN EN 1333. The applicable operating pressure will depend on the tube used. Under high load conditions or where the natural elasticity of the tube is insufficient, additional fixtures, e.g. hose clips, may be necessary (see mounting accessories).

Adaptors

Brass
Stainless steel
Aluminium
Plastic

Various

Overview

Adaptors brass M

Male threaded adaptor

AD HN 40

Female adaptor

AD FA 40

Adaptor female - male

AD A 40

Hexagonal threaded socket

AD HC 40

Hexagonal cap

AD HCP 40

Screw plug

AD HP 40

Female threaded elbow

AD FE 40

Adaptors brass CV

Female adaptor

AD FA 80

Adaptor female - male

AD A 80

Screw plug

AD SP 80

Male adaptor hose nozzle

SO 80511

Optional services on request:

see chapter services

Special treatment - degreased

Chemical nickel-plated

Overview

Adaptors stainless steel

Male threaded adaptor

AD HN 50

Male adaptor

ADH A 50

Tube double threaded nipple

AD CN 50

Adaptor female - male

AD A 50

Threaded socket long

AD C 50

Threaded socket short

AD CS 50

Hexagonal threaded socket

AD HC 50

Hexagonal cap

AD HCP 50

Screw plug

AD HP 50

Hexagonal counter nut

AD HCN 50

Female threaded elbow

AD FE 51

Male/female threaded elbow

AD SE 51

Female threaded tee

AD FT 51

Male adaptor hose nozzle

SO 50511

Straight adaptors

EA

Straight reducing adaptors

EAR

Optional services on request:

see chapter services

Special treatment – degreased

Confirmations on www.serto.com

Adaptors Aluminium

Male adaptor hose nozzle

SO 10511 OR

Overview

Adaptor PVDF

Female adaptor

SO 20031

Adaptor female - male

SO 20041

Adaptor female G - male G

SO 20041 OR

Screw plug

SO 20371

Male adaptor hose nozzle

SO 20511

Male threaded adaptor

SO 21109

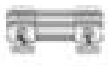
Adaptor PA

Male adaptor hose nozzle

SO 30511

Various

Tube compensator stainles steel, aluminium



RK 51900

Confirmations on www.serto.com

Adaptor brass

Characteristics, specialities

- simple connecting pieces with internal and external threads, hose nozzles and end elements
- large number of design types
- many possible combinations

Working pressure

low to medium pressure

Material

Brass CW 617N (CuZn40Pb2), the surface is pickled.
Details for nickel-plated brass see chapter Brass chemically nickel-plated.

Manufacture

Brass M and CV:
- straight connectors: made of solid material
- types AD FE/FT: die casting

Threads

G = BSP pipe thread (parallel) ISO 228
R = BSP pipe thread (tapered) EN 10226-1
NPT = NPT pipe thread (tapered) ANSI B 1.20.1

Adaptor stainless steel

Characteristics, specialities

- simple connecting pieces with internal and external threads, hose nozzles and end elements
- large number of design types
- many possible combinations

Working pressure

low to medium pressure

Materials

- type 50 = 1.4571 (~ AISI 316 Ti)
- type 51 = 1.4401 (AISI 316)

Manufacture

straight connectors: made of solid material
elbows and Tees: die casting

Threads

G = BSP pipe thread (straight) ISO 228
R = BSP pipe thread (tapered) EN 10226-1
NPT = NPT pipe thread (tapered) ANSI B 1.20.1

Confirmations

FDA for FKM O-rings

Adaptor Kunststoff

Characteristics, specialities

- simple connecting pieces with internal and external threads, hose nozzles and end elements
- large number of design types
- many possible combinations

Working pressure PN

10 bar at +23°C (safety factor of 3), higher pressures in combination with SERTO plastic tubes on request (bar+).

Materials

- PVDF (polyvinylidene fluoride)
- PA (polyamide 6.6)

FDA-Compliance

Polyvinylidene fluoride complies with the CFR* 21,§ 177.2510 of FDA (Food and Drug Administration, USA) and can be used in contact with food.
FKM-O-rings are also FDA-compliant.

*Code of Federal Regulations

Manufacture

injection moulding

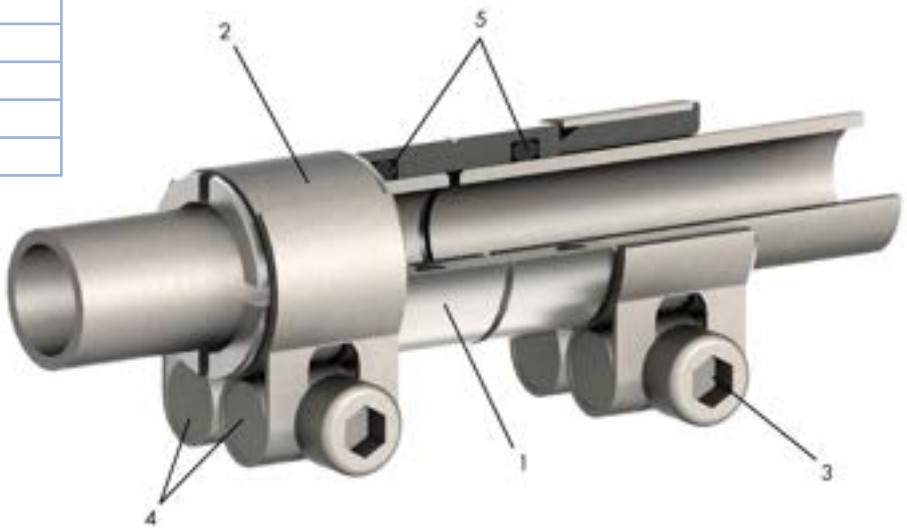
Threads

G = BSP pipe thread (straight) ISO 228
R = BSP pipe thread (tapered) EN 10226-1

Compensator

Tube compensator

No.	Description	Material
1	Body	INOX 1.4305
2	Hinge bolt clamp	INOX 1.4305
3	Hexagon socket screw	INOX 1.4305
4	Cross bolt	Brass CV
5*	Seal	VMQ



Specifications:

Working pressure (PN): 5 to 40 bar
Temperature: -60°C to +250°
Safety factor: 3 times

Characteristics

With the tube compensator, two tubes can be interconnected in a simple way.

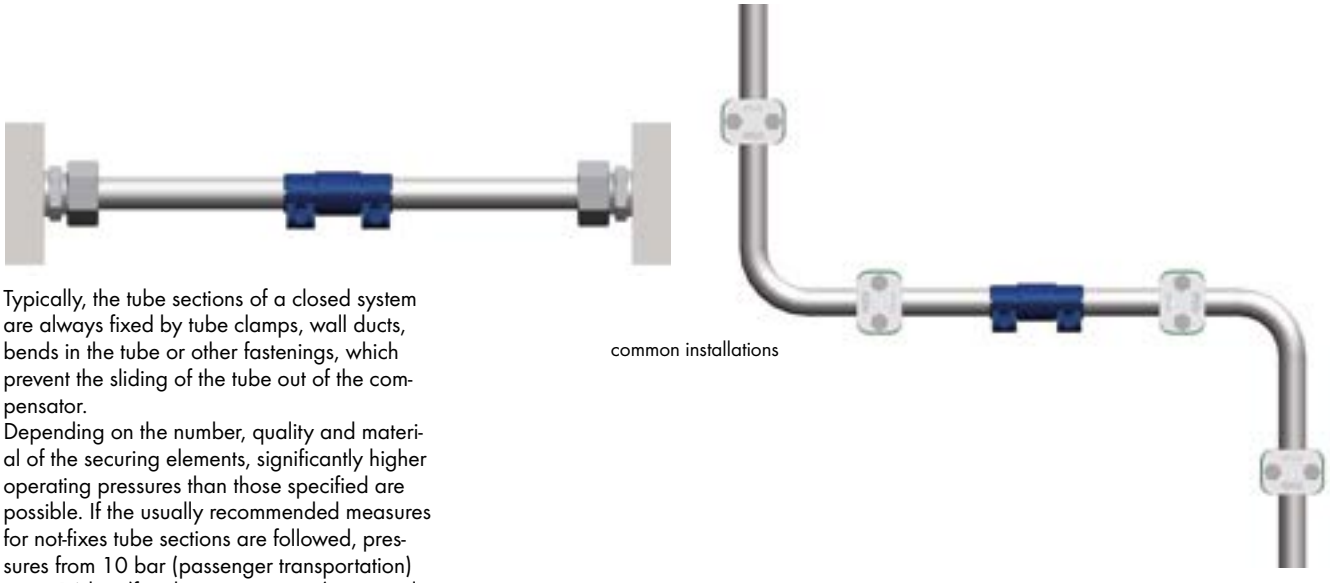
*** Options available**

- No. 5 - Seal: other materials on request

Working pressure

The test setup for the determination of the min. working pressure values consisted of two tube sections, not fastened at the sides, connected to a tube compensator RK 51900. The values stated are the result of this test and in consideration of a safety factor of 3.

test setup



common installations

Typically, the tube sections of a closed system are always fixed by tube clamps, wall ducts, bends in the tube or other fastenings, which prevent the sliding of the tube out of the compensator.
Depending on the number, quality and material of the securing elements, significantly higher operating pressures than those specified are possible. If the usually recommended measures for not-fixes tube sections are followed, pressures from 10 bar (passenger transportation) up to 16 bar (freight transportation) can easily be reached.

Tubes, Hoses

Plastics
Stainless steel
Jacoflon

Overview

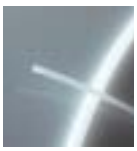
Polyamide tube (PA)

Polyethylene tube (LD-PE)

Polyurethane tube (PU)

Polytetrafluorethylene tube (PTFE)

Polyvinylide fluoride tube (PVDF)



Fluorinated ethylene propylene tube (FEP)

Perfluoroalkoxy tube (PFA)

SERTOflex tube

Stainless steel tubes 1.4301

Stainless steel tubes 1.4571

Jacoflon PTFE hoses

Characteristics, specialities:

- fits the special requirements of the SERTO unions
- tubes and hoses for special applications
- different materials available

Plastic tubes

Especially suitable for low pressure and low temperature ranges.

Cutting to length
Combination shears, scissors etc. can crush the tube ends and are often the cause for later splitting. The «Hose-Cutty» AC 835 is the ideal tool for the clean cutting

Thermal expansion
Plastic tubing has a high thermal expansion –or contraction. Proper installation entails the consideration of the temperature-dependent dimensional changes.

Light and temperature stabilized
Plastics should generally not be exposed to direct sunlight, should not come into contact with hot components nor installed in hot areas. Black plastic tubing should be used preferably (light and temperature stabilized).

Stainless steel tubes

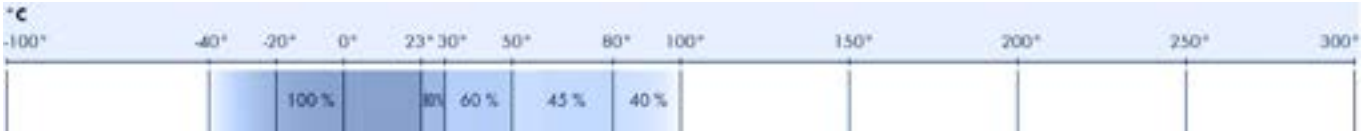
Material
1.4571 (≈ AISI 316Ti) and 1.4301 (= AISI 304)

Type
seamless, cold finished, bright, annealed, state of delivery CFA, according to EN 10305-1 / EN 10216-5 / ISO 1127

Tolerances
EN 10305-1, option 10 (outer Ø according to table 5) and ISO 1127 (tolerance classes D4/ T3)

Polyamide tube (PA)

Pressure coefficient % of PN



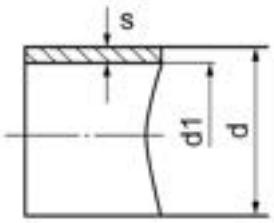
Specifications::

Material:	Polyamide PA 12/ PA10.12 soft
Temperature range:	-40°C to +100°C (shortterm: +125°C)
Flammability:	acc. to UL 94 HB
Hardness:	Shore D65
Burst pressure:	3 x working pressure
Colors:	W = white, S = black, B = blue, R = red, Y = yellow, G = green

All technical data are based on manufacturer's specifications.

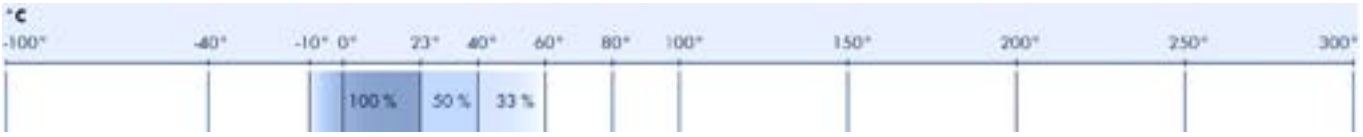
Characteristics:

- wide temperature and application range
- colour black, UV resistant
- silicone free, halogen free
- pressure and impact resistant
- smooth surface and impermeable
- chemical resistance list see appendix.
- applications: compressed air, hydraulics, negative pressure, cooling lines, fuel and lubricating lines



Polyethylene tube (LD-PE)

Pressure coefficient % of PN



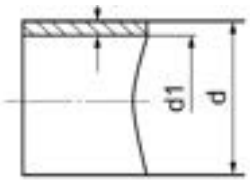
Specifications::

Material:	Polyethylene LD (low density)
Temperature range:	-10°C to +60°C (shortterm: +80°C)
Flammability:	acc. to UL 94 HB
Hardness:	Shore D45
Burst pressure:	3 x working pressure
(1) Colours:	W = white, S = black, B = blue, R = red, Y = yellow, G = green

All technical data are based on manufacturer's specifications.

Characteristics:

- good flexibility, impact resistant
- colour black UV-resistant
- silicone free, halogen free
- non-toxic
- chemical resistance list see appendix
- applications: compressed air for control technology, sampling lines, flexible pneumatic lines in low pressure range, environments with high humidity



Polyurethane tube (PU)

Pressure coefficient % of PN

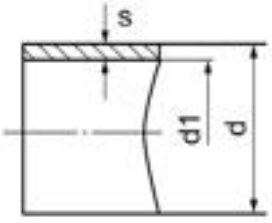
Specifications::

Material:	Polyurethane
Temperature range:	-40°C to +60°C (shortterm: +80°C)
Flammability:	acc. to UL 94 HB
Hardness:	Shore D52
Burst pressure:	3 x working pressure
(1) Colors:	S = black, B = blue

All technical data are based on manufacturer's specifications.

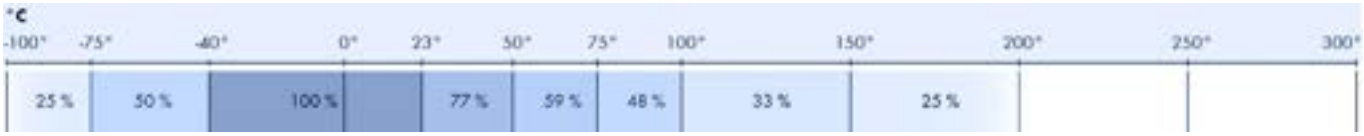
Characteristics:

- excellent bending, high cold flexibility
- little deformation even with long-term stress
- silicone free, halogen free
- abrasion resistant
- colour black UV-resistant
- chemical resistance list see appendix
- applications: measurement and control technology, pneumatics, hydraulics, machine and motor engineering, fuel and lubricating lines



Polytetrafluorethylene tube (PTFE)

Pressure coefficient % of PN



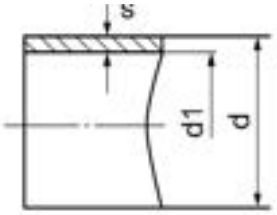
Specifications::

Material:	Polytetrafluoroethylene, FDA approved
Temperature range:	-200°C to +200°C (shortterm: +260°C)
Flammability:	acc. to UL 94 V0
Hardness:	Shore D55
Burst pressure:	3 x working pressure
Colour:	natural

All technical data are based on manufacturer's specifications.

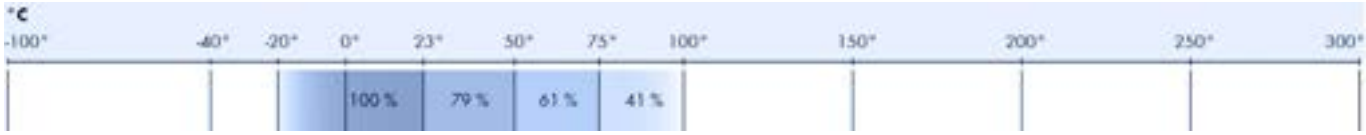
Characteristics:

- good temperature resistance
- non-toxic
- non-conductive
- high strength, rigidity, toughness and very good flexibility
- UV and weather resistant, silicone free
- outstanding non-stick properties
- not suitable for pressure pulsation recommendation: use FEP, PFA or Jacoflon
- universal chemical resistance; chemical resistance list see appendix
- applications: laboratory, medicine, chemical engineering, analysis technology, vacuum



Polyvinylide fluoride tube (PVDF)

Pressure coefficient % of PN



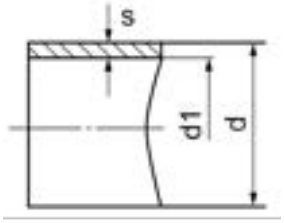
Specifications::

Material:	Polyvinylide fluoride, FDA approved
Temperature range:	-20°C to +100°C (shortterm: +130°C)
Flammability:	acc. to UL 94 V0
Hardness:	Shore D78
Burst pressure:	3 x working pressure
Colour:	natural

All technical data are based on manufacturer's specifications.

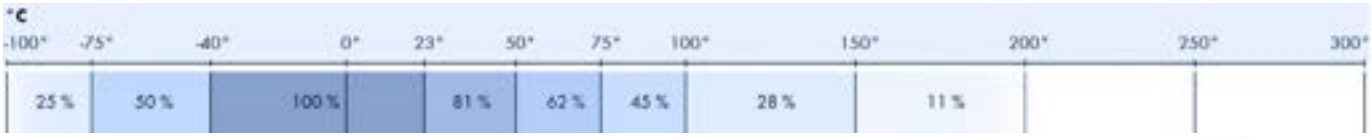
Characteristics:

- molecular, partially crystalline thermoplastic
- excellent combination of stability, strength, abrasion resistance
- excellent stress crack and chemical resistance
- non-toxic, sterilisable
- silicone free
- UV and weather resistant
- weldable
- chemical resistance list see appendix
- applications: medicine, chemical engineering, analysis technology, food industry



Fluorinated ethylene propylene tube (FEP)

Pressure coefficient % of PN



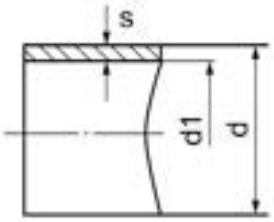
Specifications::

Material:	Fluorinated ethylene propylene, FDA approved
Temperature range:	-200°C to +200°C
Flammability:	acc. to UL 94 V0
Hardness:	Shore D55
Burst pressure:	3 x working pressure
Colour:	natural

All technical data are based on manufacturer's specifications.

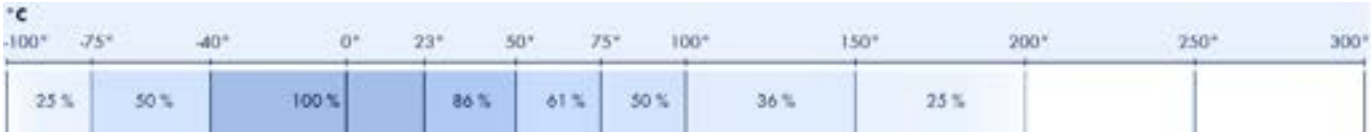
Characteristics:

- good temperature resistance
- good non-stick properties, silicone-free, sterilisable
- higher elasticity than PTFE
- low permeability
- dielectric properties, non-conductive
- UV and weather resistant
- resitant to oxygen and ozone; chemical resistance list see appendix
- applications: pharmaceuticals, laboratory, medicine, food industry, semiconductor technology



Perfluoroalkoxy tube (PFA)

Pressure coefficient % of PN



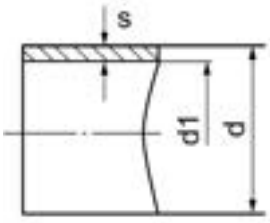
Specifications::

Material:	Perfluoroalkoxy, FDA approved
Temperature range:	-200°C to +200°C (short term: +260°C)
Flammability:	acc. to UL 94 V0
Hardness:	Shore D60
Burst pressure:	3 x working pressure
Colour:	natural

All technical data are based on manufacturer's specifications.

Characteristics:

- good temperature resistance
- good non-stick properties, silicone-free, sterilizable
- higher elasticity than PTFE
- low permeability
- dielectric properties, non-conductive
- UV and weather resistant
- resitant to oxygen and ozone; chemical resistance list see appendix
- applications: pharmaceuticals, laboratory, medicine, food industry, semiconductor technology



SERTOflex tube

Pressure coefficient % of PN

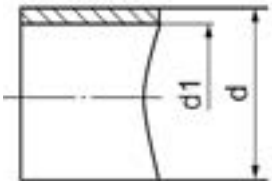
Specifications:

Temperature range: -40°C to +80°C
Colour: black
Burst pressure: 3 x working pressure
Tolerance outside Ø: +0.20/-0.35 mm

All technical data are based on manufacturer's specifications.

Characteristics:

- multilayer tube of PE and aluminium core
- can be bent manually
- stable in form, halogen and silicone free
- lightweight with high stability
- applications: exclusively for pneumatic control and process lines, especially in humid and wet environment



Stainless steel tubes 1.4301

Pressure coefficient % of PN

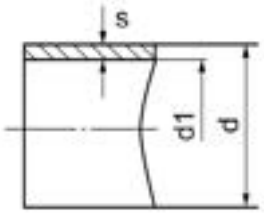
Specifications:

Material: 1.4301 (= AISI 304)
Temperature range: -196°C to +500°C (up to +600°C on request)
Burst pressure: 4 times working pressure under static load

Dimensions and tolerances: see chapter Tube recommendations

Characteristics:

- seamless, cold finished, bright, annealed, state of delivery CFA, accord. to EN 10305-1 / EN 10216-5 / EN ISO 1127
- especially adapted to our unions
- material test certificates according to DIN EN 10204 can be provided upon request



Stainless steel tubes 1.4571

Pressure coefficient % of PN

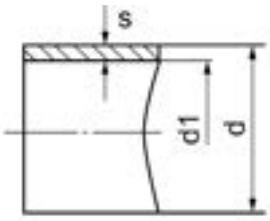
Specifications:

Material:	1.4571 (≈ AISI 316Ti)
Temperature range:	-196° to +500°C (up to +600°C on request)
Burst pressure:	4 times working pressure under static load

Dimensions and tolerances:
see chapter Tube recommendations

Characteristics:

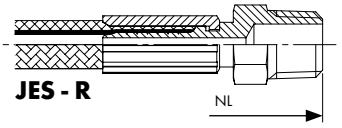
- seamless, cold finished, bright, annealed, state of delivery CFA, accord. to EN 10305-1 / EN 10216-5 / EN ISO 1127
- especially adapted to our unions
- material test certificates according to DIN EN 10204 can be provided upon request

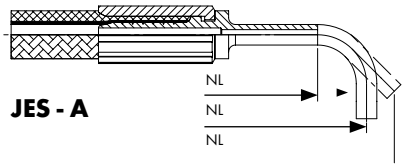


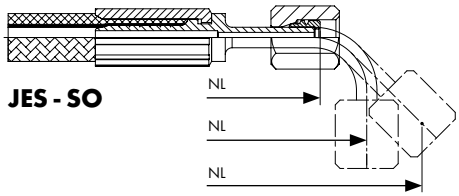
Jacoflon PTFE hoses with stainless steel braid

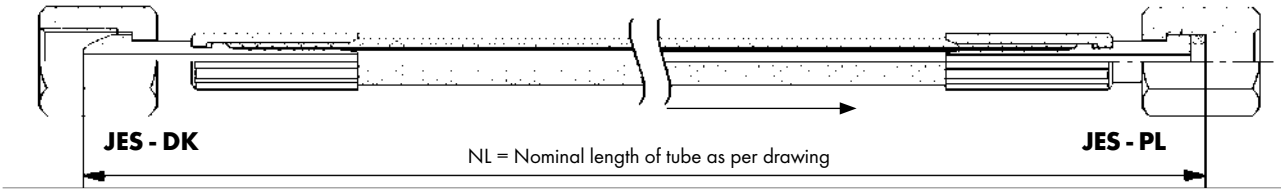
Technical data

Due to its flexibility and the excellent corrosion and pressure resistance the Jacoflon PTFE hose is ideally suited for special applications. The hoses with stainless steel fittings 1.4571 are available in different lengths and designs according to customer specifications .









Ordering example

1 AQ 1/8 - R 1/8 - A3 x 450

Tube type | 1. Fitting | 2. Fitting | Nominal length of tube mm

Characteristics

Werkstoff: Innenschlauch PTFE, Drahtgeflecht 1.4301
Temperaturbereich: -60°C bis +250°C
Nenndruck: grössenabhängig, siehe Produkttabellen
Sicherheitsfaktor: 3fach

http://www.serto.com/en/online-shop/tubes-hoses/hose-configurator/

Tolerances for tube length in mm

mm	0	500	1'000	2'000	3'000	5'000	10'000
	+5 / -3 mm	+10 / -5 mm	+20 / -10 mm	+70 / -15 mm	+80 / -20 mm	+100 / -30 mm	

Tubes, Hoses

Features

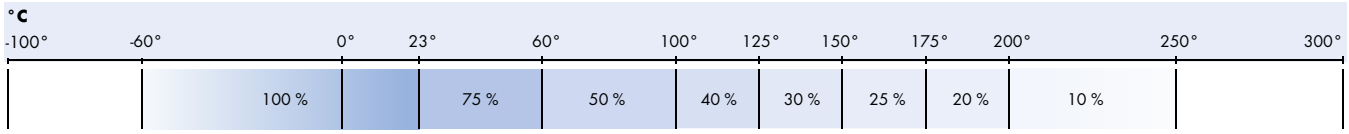
- high chemical resistance
- thermal stability
- non-toxic
- high operating safety
- longevity
- Applications: Superheated steam installations, wash- and cleaning stations, vulcanising presses, high-power burners, in laboratories or pharmaceutical labs, foodstuff industry

Installation guidelines for hose lines

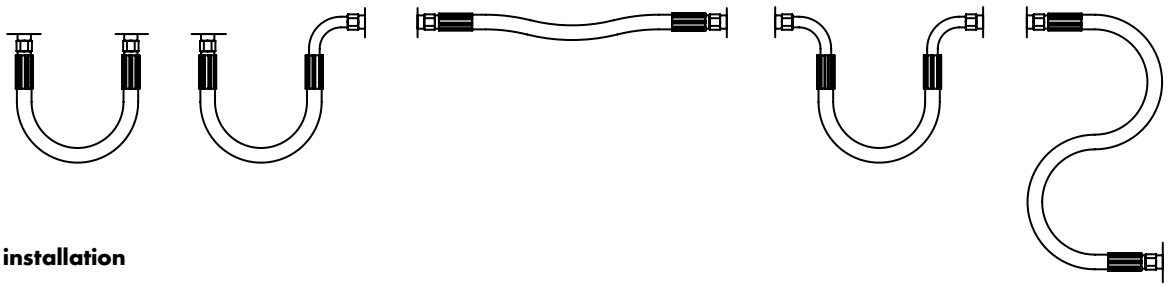
Hose lines must be arranged so that they are easy to install and check; chafing on other components must be avoided. It is essential that the stated minimum bending radii are complied with. In case of frequent movement the size of the hose should be increased by up to 50 % in order to improve the lifespan of the hose.

Each hose line must be installed so that it sags, taking into consideration any changes in length of the hose line under pressure. Torsional strain on the hose must be avoided during installation and in operation. Otherwise, axial swivel joints should be used. Ensure that the hoses are long enough, so that the hose line does not kink due to the movement of machine components.

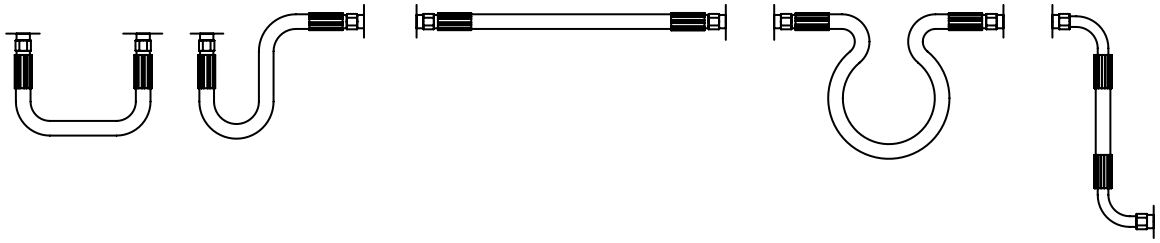
Pressure coefficient % of PN



Correct installation



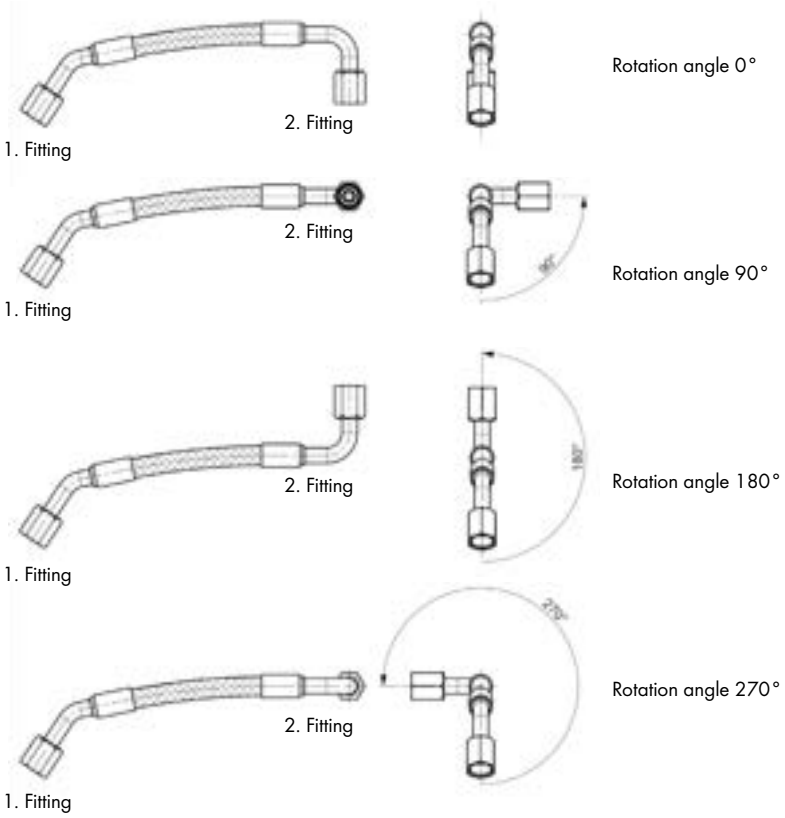
Incorrect installation



Rotation angle for angled fittings

If angled fittings are used on both sides, the rotation angle can be selected. This is defined, starting from the 1. fitting, in steps of 45° counterclockwise.

Examples:



General Information

Permeability of Jacoflon hoses

Permeability is the molecular transport of a gaseous medium through a physical, solid body by:

1. adsorption and absorption on the high concentration side,
2. diffusion through the solid material, e.g. hose material (PTFE core),
3. resorption from the low concentration side.

This very complex problem in combination with plastics is further negatively influenced by:

- the condition as delivered,
- the physical properties of the plastic,
- the chemical compositions of the medium and of the plastic used.

High flexible quality HQ

Maximum flexibility is achieved by the extremely thin PTFE core. However, the thin core leads to a higher permeability and is therefore not ideal for gas applications.

Permeation concentration

The concentration difference between the medium and the surroundings is the driving force of permeation and not necessarily the nominal pressure of the medium in the hose. The permeability of the hose increases exponentially with increasing temperature.

Jacoflon in vacuum applications

The smaller the inner diameter of the hose, the more suitable it is for use in vacuum applications. It is clear that we speak of rough vacuum to high vacuum. The vacuum is limited by the permeability of the hose and the collapse of the PTFE core.

Static applications

Given by the permeability, applications with gaseous media are recommended only if continuous supply and pressurisation are assured. Example: A fire extinguisher line filled with CO2 at 60 bar will, over time, lose pressure and eventually become completely depressurised.

Interpretation of the safety factor

The safety factor for Jacoflon hoses is determined for a sudden rise in pressure with water or hydraulic oil. No account is taken of the fall off in pressure but only of the failure of the hose/ braid.

Tube clamps

Overview

Clamp body PP, series A

RS RGA-PP

Clamp body PA, series A

RS RGA-PA

Clamp body PA flame ret., series A

RS RGA-PA FS

Clamp body aluminium, series A

RS RGA-AL

Clamp body PP, series B

RS RGB-PP

Clamp body PA, series B

RS RGB-PA

Clamp body PA flame ret., series B

RS RGB-FS

Weld-on plate short, series A

RS AKZ1A

Cover plate, series A

RS DPA

Cover plate, series B

RS DPB

Hexagon screw, series A

RS SSA

Hexagon screw, series B

RS SSB

Hexagon socket screw, series A

RS ISA

Hexagon socket screw, series B

RS ISB

Stacking screw, serie A

RS ASA

Mounting raill, series A

RS TS

Rail nut, series A

RS TMA/TMVA

Rail nut, series B

RS TMB

Tube clamps

Function

- fixation and guidance of tubes
- absorption of axial and radial forces
- to absorb or prevent movement

Norm

light series A/B, according to DIN 3015

Material

- tube clamps: PP, PA6, PA66 F, aluminium
- weld-on plates: steel phosphatized or stainless
- steel 1.4571/1.4401
- mounting rail: bright steel or stainless steel 1.4571/1.4401
- rail nuts, screws, cover plates: zinc-plated steel or stainless steel 1.4571/1.4401
- Chemische Beständigkeit

Characteristics

Tube clamps made of PP:
- -30°C to +90°C
- lighter than tube clamps made of PA
- tube holding power 0.6 kN to 2.3 kN
- color: dark green

Tube clamps made of PA6:
- -40°C to +120°C
- heavier than tube clamps made of PP
- tube holding power 0.6 kN to 3.5 kN
- slightly flame retardant
- color: black

Tube clamps made of PA66 F:
- -40°C to +120°C
- heavier than tube clamps made of PP
- tube holding power 0.6 kN to 3.5 kN
- fulfilment of the requirement sets R22 / R23 / R24 / R26 for the hazard levels HL1-HL2-HL3 according to EN 45545-2
- color: white-grey

Tube clamps made of aluminium:
- -40°C to +300°C
- tube holding power 3.5 kN to 8.9 kN
- color: grey

	Tube clamps made of PP	Tube clamps made of PA	Tube clamps made of aluminium
acids	limited resistance	limited resistance	limited resistance
alkalis	limited resistance	limited resistance	limited resistance
alcohols	resistant	resistant	resistant
gasoline	limited resistance	resistant	resistant
mineral oil	limited resistance	resistant	resistant
other oils	resistant	resistant	resistant

Installation options

1) Installation on weld-on plates

Weld the weld-on plates to a base suitable for the load. Here it is important to make sure the clamp is properly aligned.

Fasten the lower half of the clamp to the weldon plate, insert the tube, set the second half of the clamp in place, and use screws to tighten the clamp. Pay attention to the pretension; clamp halves should not be touching after installation.

Do not weld with plastic clamps in place!

2) Installation on mounting rails

The mounting rails are delivered in pieces of 1 m in length.

Weld the mounting rail, place the rail nuts in the rail and turn until they stop. Fasten the lower half of the clamp to the rail nuts, insert the tube, set the second half of the clamp in place, and use screws to tighten the clamp. The clamp can be positioned before the screws are tightened. Pay attention to the pretension; clamp halves should not be touching after installation.

Note:
When using hexagon socket screws no cover plates are used. The hexagon socket screws are countersunk in the clamp body.

1)

2)

Tube clamps

Schraubenanzugsmomente und axiale Rohrhaltekräfte

The specified screw tightening torques and axial tube holding power are based on the respective type of installation. The axial tube holding power (pursuant to DIN 3015, Part 10) is a mean value, determined from three tests at +23 °C with a steel tube according to DIN 2448 made of St 37, where static friction is provided. The tube will not slide in the clamp when force is applied to the clamp in the axial tube direction at the specified test load (F).

1. Installation with hexagon screws and cover plates according to ISO 4014/4017 (DIN 931/933).

Retaining screw for all types M6

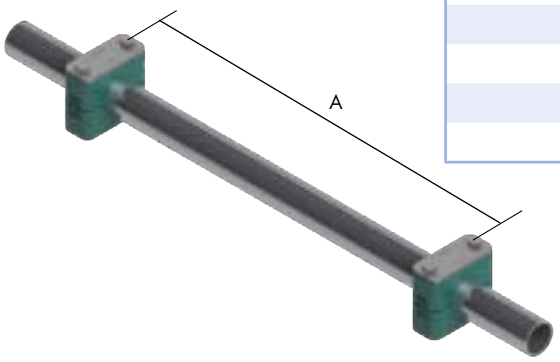
2. Installation with hexagon socket screws, without cover plates, according to ISO 4762

Retaining screw for all types M6

	PP		PA		Aluminium	
Size	Tightening torque (Nm)	Tube holding power F (kN)	Tightening torque (Nm)	Tube holding power F (kN)	Tightening torque (Nm)	Tube holding power F (kN)
	8	0.6	10	0.6	12	3.5
	8	1.1	10	0.7	12	4.2
2	8	1.2	10	0.8	12	4.3
3	8	1.4	10	1.6	12	4.8
4	8	1.5	10	1.7	12	5.0
5	8	1.9	10	2.0	12	7.3
6	8	2.0	10	2.5	12	8.9
7	8	2.3	10	3.2		

	PP		PA		Aluminium	
0	on request					
1	2.0	0.45	2.5	0.55	12	4.2
2	2.0	0.85	2.5	0.95	12	4.3
3	2.0	0.60	2.5	0.65	12	4.8
4	2.5	0.85	3.5	1.05	12	5.0
5	2.5	1.30	3.5	1.40	12	7.3
6	2.5	1.05	3.5	1.15	12	8.9
7	on request					

Recommended clamp spacing



Tube outer diameter (mm)	Clamping space A (m)
6.0 - 12.7	1.0
12.7 - 22.0	1.2
22.0 - 32.0	1.5
32.0 - 38.0	2.0
38.0 - 57.0	2.7
57.0 - 75.0	3.0
75.0 - 76.1	3.5

Tube elbow installation

Tube elbows should be fastened with tube clamps directly before and after the bend.

Mounting accessories

Pre-assembly tools
Complementary articles

Overview

Electro-hydraulic pre-assembly device

SERTOspeed

Pneumatic pre-assembly tool

SERTOtool

Bend clip
Suitable for:
PA, PU, LDPE, PTFE, FEP, PFA hoses
Not suitable for: PVDF tubes

AC 832

Fixations for tubes

AC SEE

Strap mount PP

AC 831

Hose clamp PE

AC SPE

T-Clip POM

AC 838

Thread seal tape of PTFE

AC 840

Special lubrication oil

AC 850

Lubricant OX

AC 851 OX

Hose-Cutty

AC 835

Hose scissors

AC 1163

Calibration tool SERTOflex

AC 86600

Deburring tool

AC 940

Assembly aid PA/PVDF

AC 870

Open ended spanner

AC 880

Crimping pliers

AC 1098

Pre-assembly stud

SO 56000

Electro-hydraulic pre-assembly device

For the pre-assembly of SERTO unions from 10 to 35 mm

Convenient table-top unit for SERTO unions from 10 mm to 35 mm. It is suitable for small (project orders) as well as large series and guarantees perfect pre-assembly with constant quality and high economic efficiency.

Lieferumfang

- pre-assembly device incl. power cable
- (without plug)

Order separately as required:
- pre-assembly unit SERTOspeed AD
- desired tool kit SERTOspeed WZS

Services

- demonstration at your premises
- possibility of borrowing for projects
- rental period 1 to 3 months

Technical data

Dimension:	L45 x W63 x H27 cm
Weight:	58 kg
Motor power:	0.75 kW

Type	Voltage
SERTOspeed US-FL/01, 230 Volt	230 V / 50 Hz / 1 Ph
SERTOspeed US-FL/01, 400 Volt	400 V / 50 Hz / 3 Ph

Pre-assembly unit for SERTOspeed

Pre-assembly unit suitable for the SERTOspeed device for pre-assembly of SERTO tube unions.

Article 980.3000.000

Version for pre-assembly device Tracto Turboform C available on request.

Tool kit

Tool insert and deformation bolt are size dependent.

For brass CV unions, use version brass M.

Tool kit consisting of:
- tool insert
- deformation bolt
- tool holder

D	Tool kit		
	Brass M	Stainless steel	Aluminium
	Article	Article	Article
6	WZS MSM 6	WZS INOX 6	
8	WZS MSM 8	WZS INOX 8	WZS ALU 8
10	WZS MSM 10	WZS INOX 10	WZS ALU 10
12	WZS MSM 12	WZS INOX 12	WZS ALU 12
15	WZS MSM 15	WZS INOX 15	WZS ALU 15
18	WZS MSM 18	WZS INOX 18	WZS ALU 18
22	WZS MSM 22	WZS INOX 22	WZS ALU 22
28	WZS MSM 28	WZS INOX 28	WZS ALU 28
35			WZS ALU 35

Deformation bolt

Tool holder

Pneumatic pre-assembly tool

Product range

SERTOtool for use with	for tube diameters (d)
Brass M	4, 5, 6, 8, 10
Stainless steel	4, 5, 6, 8, 10
Aluminium	8, 10, 12

SERTOtool is a pneumatic tabletop unit for safe and fast assembly of SERTO unions.

Weighing only approx. 10 kg, the unit is extremely handy and can be connected to any compressed air supply. Five tools for tube sizes from 4 to 10 mm are contained in the rotatable tool drum. They are labelled with the corresponding tube diameters to prevent mix-ups. The mechanically limited stroke and the integrated time delay ensure perfect pressing every time. Not suitable for the pre-assembly of adjustable parts.

SERTOtool is especially suitable for pre-assembling small to medium series and guarantees constant quality and high efficiency.

Technical data

Dimensions:	L33 x W20 x H14 cm
Weight:	approx. 10 kg
Power:	compressed air: 5.5 to 8 bar
Clamping force:	approx. 12 kN (at 6 bar)
Connection:	Coupling 1/4"

Services

Cleaning
Thread seals
Surface finishing
Project Engineering
Ready-to-fit assemblies
Bending

Special cleaning – degreased – unlubricated

Application area

Wherever special surface cleanliness is required for parts that come into contact with the media, but where the customer wishes to use his own lubricant.

Quality

Surface cleanliness
< 33 mg/m2 TOC as per ASTM* G93, Level B.
Every order is traceable; assembly and testing are done in the clean room.

*American Society for Testing and materials

Scope of supply

- individually packaged in heatsealed PE bags
- special label
- not assembled, i.e. loose nut and compression ferrule

Important information

The parts are generally not lubricated, however certain points must be lubricated for optimal functioning. Prior to assembly, the nut and the compression ferrule must be lubricated with a suitable lubricant.

Product range

Unions and valves in:
- brass / brass CV
- stainless steel

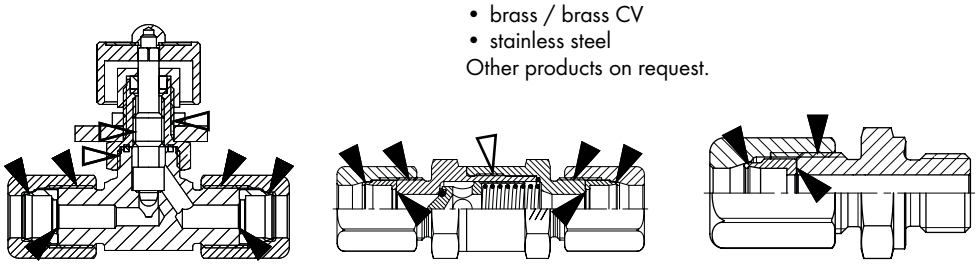
Other products on request.

Ordering information

SERTO products which need to be supplied degreased and unlubricated must be clearly marked with US after the material number or the material description when ordering.

e.g.: SO 51121-8-1/4 US

► lubricate before installation
▻ already lubricated with AC 851-OX



Special treatment for use with oxygen (oil- and grease-free)

Application area

Tube connectors and valves which are used in oxygen systems have very high cleanliness requirements, especially in regard to carbon compounds on the surface (oils and greases). Such contamination could self-ignite very easily and very quickly.

Qualität

Surface cleanliness
< 33 mg/m2 TOC as per ASTM*
G93, Level B.
Every order is traceable; assembly and testing are done in the clean room.

*American Society for Testing and materials

Scope of supply
- individually packaged in heatsealed PE bags
- special label
- pre-assembled, ready for installation
- initial lubrication

Lubricant

Special lubricant AC 851 OX, tested by BAM*. Operating temperature: max. 60°C / pressure: max. 330 bar (please note the pressure specifications for the components as stated in the online shop). Due to its titanium content, the BAM does not recommend using 1.4571 in oxygen systems.

* Bundesanstalt für Materialforschung und -prüfung

Product range

Unions and valves in:
- brass / brass CV
- stainless steel

Other products on request.

Ordering information

SERTO products which need to be supplied oil- and grease-free must be clearly marked with **OX** after the material number or the material description when ordering.

e.g.: SO 51121-8-1/4 OX

Special treatment – silicone-free

Application area

Tube connectors and valves which primarily come into contact with paints and varnishes may not have any silicone compounds on the media-contacting surfaces because these would prevent wetting of the surfaces.

Quality

Surface cleanliness < 33 mg/m2 TOC as per ASTM* G93, Level B. Every order is traceable; assembly and testing are done in the clean room.

*American Society for Testing and materials

The whole production process is silicone-free.

Scope of supply

- individually packaged in heatsealed PE bags
- special label
- pre-assembled, ready for installation
- initial lubrication

Lubricant

Where necessary, a guaranteed silicone-free lubricant is used.

Product range

Unions and valves in:
- brass / brass CV
- stainless steel

Other products on request.

Ordering information

SERTO components which need to be supplied silicone-free must be clearly marked with SI after the material number or the material description when ordering.

e.g.: SO 51121-8-1/4 SI

Chemical nickel plating for brass

By contrast to the electrolytic nickel plating process, chemical nickel plating can be done completely planeparallel.

Irrespective of the surface shape of the workpiece, a uniform plating thickness is always achieved over the entire surface. By that, the constructional dimensions will be changed only by the thickness of the plating layer.

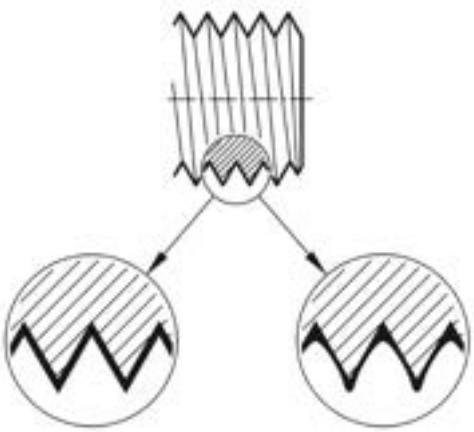
The chemical nickel plating strongly bonds with the brass material structure and achieves a highly durable improvement.

For SERTO screwed joints these characteristics mean:
- higher surface hardness
- improved resistance against corrosion, abrasion and wear compared to brass

Applications

Practically all brass products of SERTO can be chemically nickel plated.

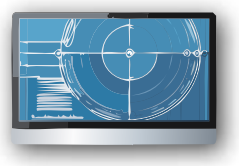
Typical areas of application are tubing in a slightly aggressive or corrosive environment, e.g. seawater, light acids, oil-air mixtures, laboratory apparatus manufacture for deionised water or for food etc.



Important!

Chemically nickel-plated tube unions can be used as a more favourable alternative to stainless steel in individual cases, but under no circumstances as a general alternative. Each application has to be individually clarified under the conditions of operation (pressure, medium, temperature, environment, etc.). If necessary, we recommend to carry out own tests beforehand or to consult us with exact details of the operating conditions.

Tailored solutions for every need



Manufacture to drawing

You visualise it, we bring it to life, in accordance with your exact specifications, whether as a STEP file, a drawing or a prototype.

System optimisation

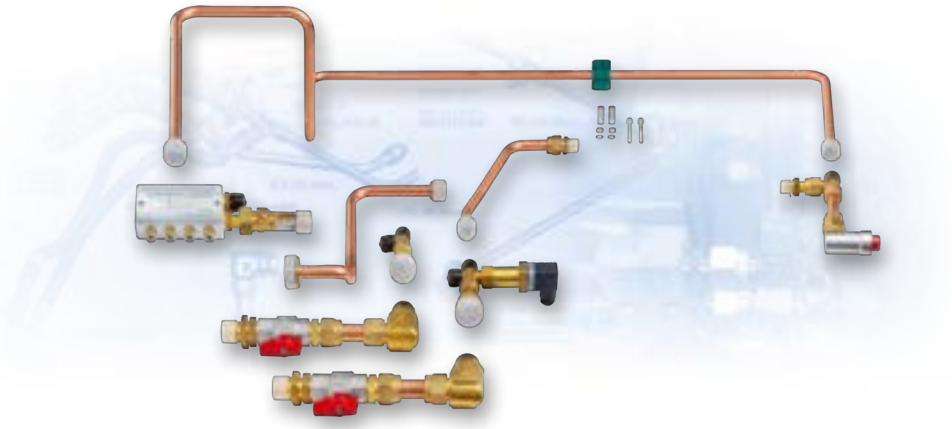
We put your system through its paces. Is it suitable for series production? Can manufacturing and assembly be simplified? Or any other areas? We provide you with optimisation proposals based on thorough analyses.

Manufacture to specification

Not yet found a solution for your specific needs? Then let us develop one for you – complete with simulation testing, prototyping and everything else that goes with it.

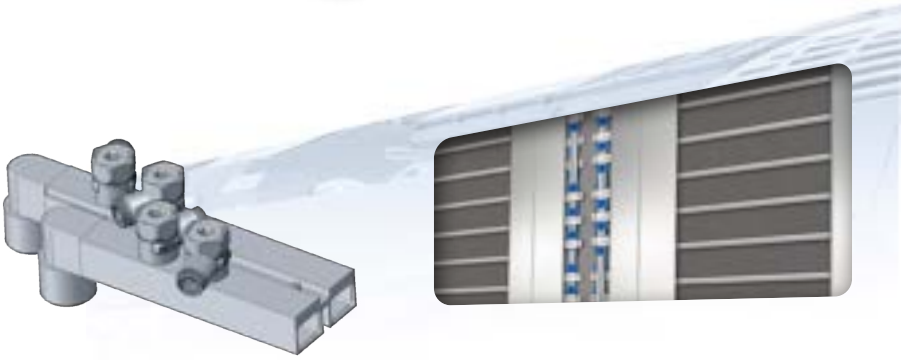
Example project I: System optimisation

Cooling of power electronics in a frequency converter.



Example project II: Manufacture to specification

Battery temperature control in a train, as a roof-mounted or underfloor container.



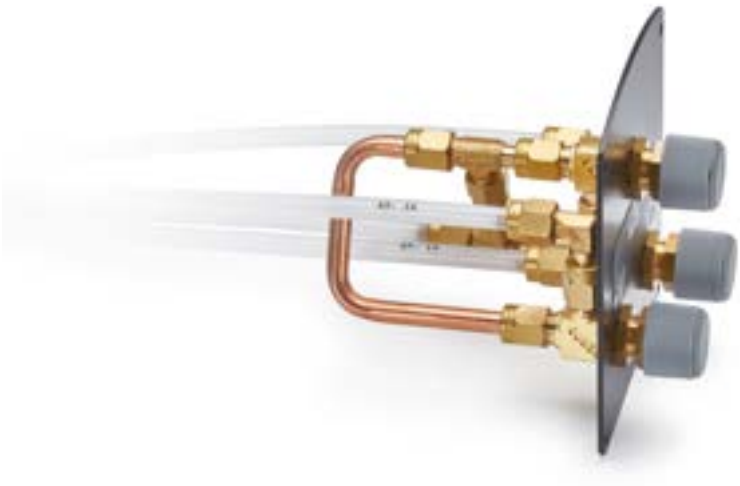
Example project III: Manufacture to drawing

Hose line for a processing plant in the chemical industry. FEP was chosen as the material due to the necessary corrosion resistance.

Impressive one-stop service

You can rely on our expertise in component assembly, no matter what you need. We provide a one-stop service for your assemblies, including professional installation of your system to ensure maximum safety and reliability. Whether it's 10, 100 or 1000 subassemblies – we assemble your components into complete systems, incorporating third-party components where necessary.

But that's not all: We also carry out comprehensive testing to ensure every assembly meets the highest standards. In addition, we take care of planning, manufacturing and distribution, allowing you to save valuable assembly time and make your planning, logistics and inventory management more efficient.



Precision and efficiency

With fully automated, CNC-controlled bending machines for tube diameters of up to 60 mm and a working radius of up to six metres, SERTO is able to offer cutting-edge solutions. Thanks to ten machining axes, even demanding bending geometries can be achieved without any problems.

But we aren't just experts in bending – we also assemble over 150,000 metres of metal tubes each year. The majority of these are not only bent but also crimped with unions, ball valves, other valves or couplings from our product range – all tailored to the customer's specific requirements.

Whether it's bending, assembly or the right connection solution – with us, you get everything from a single source, perfectly tailored to your project.

Benefits at a glance:

- Extensive inventory of rods:
  over 60 tonnes of raw materials (steel, stainless steel, aluminium, copper and brass) in 6-metre lengths are constantly available.
- Efficient carbide circular saws:
  up to 3000 cuts per hour ensure high productivity.
- High-precision tube measurement device:
  the non-contact, optical measurement system guarantees absolute process reliability for three-dimensional tubelines of up to 6 metres long. And that in seconds.
- In-house tool and fixture manufacturing:
  custom tools, fixtures and gauges are produced in-house to meet specific requirements.

Appendix

Technical explanations
Resistance table

A

Properties of sealing materials in SERTO products

Introduction

Every elastomer material has its limits of use. Be it the behaviour at heat and cold, the resistance to contact media or weathering or the mechanical properties. There are also special properties, such as food and medical compatibility, radioactive resistance, suitability for use in a vacuum, electrical properties, etc. The following phenomena may occur if the limits are exceeded:

- swelling or shrinkage
- hardening or softening
- severe deformation, flattening or expansion
- surface cracking
- mechanical destruction
- wear and destruction

Since these changes are a result of various criteria such as resistance to the medium, temperature, pressure and type of installation, the most suitable material must be selected. However, certain compromises are often necessary, as not all requirements for the material can be met.

For safe, trouble-free operation, the entire system design must be taken into account when selecting a product. The system designer and the user are responsible for the functioning of the products, their material compatibility, corresponding performance data and application limits, as well as for handling, operation and maintenance in accordance with the regulations.

NBR – Acrylonitrile-Butadiene-Elastomer

NBR is resistant to hydraulic oils, water glycols and oils in aqueous emulsions, mineral oils and mineral-oil products, animal and vegetable oils, benzine, fuel oil, water up to ca. +70°C, butane, propane, methane, ethane. NBR swells greatly with aromatic hydrocarbons, e.g. benzene, chlorinated hydrocarbons (e.g. trichloroethylene), esters, polar solvents, such as acetone, as well as in glycol ether-based brake fluids. NBR is not ozone resistant, please ensure protection from possible ozone sources during storage.

FKM/FPM – Fluorocarbon rubber

Fluororubber figures among the most significant developments in materials technology of the 1950s. The difference between FPM and FKM is only the name: FPM (according to DIN/ISO) and FKM (according to ASTM). The initial material is FDA-compatible (CFR 21, §177.2600). It is also known under the trading name Viton®.

FKM features high temperature, weathering, ozone and chemical resistance. The temperature application range is from –20°C to +200°C, short term +250°C.

FKM is highly resistant to nearly all mineral-oil and synthetic-based hydraulic fluids, as well as to ozone, oxygen, fuels, aromatic compounds, many organic solvents and chemicals. There are however restrictions for use in hot water, steam and at low temperatures. Due to the diminished low-temperature flexibility and moderate hot water and steam resistance, special materials should be selected for these applications. FKM is also not resistant to polar solvents, such as acetone, glycol-based brake fluids, ammonia gas, alkalis and low molecular-weight organic acids (formic acid and acetic acid).

EPDM – Ethylene-Propylene-Diene-Rubber

EPDM elastomers are very resistant to ageing and weathering, even with UV exposure and ozone influence. They exhibit low water vapour permeability and extremely low brittleness temperature. Due to its high elasticity and good chemical resistance, EPDM is used for diverse seals, such as e.g. o-rings and flat gaskets. The working temperature ranges from –40°C to +160°C, short term up to +180°C.

EPDM possesses excellent resistance to hot water and steam and good resistance to polar liquids, such as acetone, methanol, etc. The material is not resistant
to aliphatic and aromatic hydrocarbons (mineral oils, benzine, fuels) and greases.

FFKM/FFPM – Perfluoroelastomer

Chemically, FFKM is very similar to polytetrafluoroethylene (PTFE) and it combines the elasticity and sealing strength of a true elastomer with the chemical resistance of PTFE. Compared to pure PTFE seals, FFKM parts do not demonstrate creep behaviour or yield and little permanent deformation. FFKM perfluoroelastomer parts maintain their elastic properties in long-term operation at up from approx. -20° C to +315°C and in periodic operation up to +350°C, even when in contact with corrosive chemicals.

PUR – Polyurethane-Elastomer

PUR seals are used less frequently than other elastomer seals. They are used at temperatures between –30°C and +80°C. The advantages of PUR compared to rubber elastomer materials are, among other, the
very good mechanical properties, the excellent wear resistance with good flexibility and the high resistance to tear propagation in a hardness range of ca. 55° to 95° Shore A. Within this range of Shore hardness, PUR seals demonstrate an especially good combination of physical and chemical characteristics.
All PUR elastomers have a good swelling resistance to mineral oils, greases, benzine and diverse solvents. PUR elastomers are not suitable for direct contact with foodstuffs.

PTFE – Polytetrafluoroethylene

Due to its outstanding chemical, physical, thermal and electrical properties, PTFE is an important material
in a variety of industrial sectors. The material is non-toxic in its pure form and FDA-compatible (CFR 21,
§177.1550). The working temperature is between –200°C and +260°C (short term up to +300°C). PTFE has an exceptionally low coefficient of friction, tends, however, to cold flow and only has low resistance to pressure and wear.

PTFE is resistant to nearly all organic and inorganic chemicals (except elementary fluorine under pressure or at high temperatures, fluorine-halogen compounds and alkali metal fusions). At room temperature, PTFE is physiologically stable; contact with aggressive media does not alter its material properties.

VMQ – Silicone-Elastomer

VMQ is particularly characterised by its broad range of thermal application. The very good cold flexibility, the good ozone resistance and the good dielectric properties are additional advantages. The gas permeability is not as favourable as with other elastomers. The working temperature range is between –60°C and +250°C.

Introduction to the resistance table

For the optimal reliability and durability of SERTO products in applications with liquid or gaseous media, it is essential to exercise extreme care when selecting the materials that come into contact with the media. This is especially true for aggressive liquids. The following table on the chemical resistance of elastomers, plastics and metals to numerous gaseous and liquid media is intended to assist SERTO customers in the selection of suitable materials for their applications.

The chemical resistance of materials used by SERTO depends on many factors, such as the temperature of the medium, the degree of contamination of the medium, the admixture of unwanted impurities (e.g. traces of water in gaseous SO2), the concentration of the medium, the simultaneous effect of mechanical forces, e.g. static or dynamic stress, as well as the design characteristics of the product.
In practice, all these factors can influence, for example, the corrosion behaviour, the metallic and chemical resistance of polymer materials. The data contained in the chemical resistance tables cannot, therefore, cover all the working conditions and applications which you will meet in your daily use of SERTO products. For this reason, the information given in the chemical resistance tables should only be considered recommendations for which we assume no liability. No warranty claims or guarantees can be inferred from this information. The application-specific selection of materials, use, implementation and processing of purchased products lies solely within the scope of responsibility of the customer/user. If there is any doubt, we recommend installing our products – if indicated, in a variety of material combinations– in test installations to be able to determine their behaviour under real operating conditions.

Layout and content of the resistance table

The resistance table comprises three types of chemical liquids and gases: basic chemicals, trade products as well as foodstuffs. Specifically, the resistance of these fluids has been classified for the elastomer materials, plastics, metals and alloys frequently used in SERTO products. Information on the chemical resistance of materials not listed in the tables is available on request. A chemical formula for the most common substances has been included in the tables. The word „pure“ added to the chemical denomination of the medium refers to technical purity, which in most cases exceeds an active substance content of 95 %. Organic liquid or gaseous substances generally bear this term. So, for example, „acetic acid - pure“ means that this is at least a 98 % acetic acid. The word „aqueous“ is usually used in combination with substances that are miscible with water (e.g. ethanol) or for aqueous solutions of inorganic salts as well. Due to the diversity of the different concentrations possible, average concentrations are generally assumed. Only when it is explicitly mentioned does it concern a saturated aqueous solution. The reference temperature for the respective chemical resistance indicated is always room temperature. At elevated temperatures, a poorer heat-related resistance must be expected for plastics and elastomers.

Signs and symbols

+ little or no damage to the material, resistant
o slight to moderate attack, conditionally resistant
– strong attack to complete destruction, not resistant

If a material is classified as conditionally resistant, the amount of exposure time must be taken into account. For longer periods of exposure, the intensity of the attack is often greater, often resulting in complete destruction of the material. This can under certain circumstances have an effect on the service life of the respective part. This is why these parts are categorised as wearing parts, for which no guarantee can be given regarding the possibility of wear and tear.
Explicit statements are frequently not possible due to the varying operating conditions. In such cases, the o symbol for conditionally resistant is also used.

References

All the information contained in the resistance tables is based on empirical values of industry and on the data from material manufacturers (source: www.buerkert.ch).

Resistance to chemicals	NBR	EPDM	FKM	FFKM	PU	LD-PE	PTFE	MS	1.4401/1.4571	1.4305/1.4104	Al	PVDF	PA
Waste gases - containing hydrogen fluoride	+	+	+	+		+	+	o	o	o	–	+	o
Waste gases - containing carbon dioxide	+	+	+	+		+	+	+	+	o	+	+	+
Waste gases - containing carbon monoxide	+	+	+	+		+	+	+	+	+		+	+
Waste gases - containing nitrous gases	o	+	+	+		+	+	–	+	+	+	+	–
Waste gases - containing hydrochloric acid	+	+	+	+		+	+	o	o	–	–	+	–
Waste gases - containing sulphur dioxide (dry)	o	+	+	+		+	+	+	+	+	–	+	o
Waste gases - containing sulphuric acid - (sulphur trioxide moist)	o	+	+	+		+	+	–	+	o	–	+	–
Waste gases - containing sulphuric trioxide (dry)	o	+	+	+		+	+	o	+	+	–	+	+
Acetaldehyde - pure	–	+	o	+	+	o	+	+	+	+	+	–	o
Ethyl acetoacetate (acid-free, pure)	–	–	–	+			+	o	+	+	–	–	+
Acetone - pure	–	+	–	+	–	o	+	+	+	+	+	–	+
Acetophenone - pure	–		–	+		+	+	+	+	+	+	o	+
Acetyl acetone - pure	–	–	–	+			+	–	+	+	–	–	+
Acetyl chloride - pure	–	–	–	+		+	+	o	o	o	–	–	–
Acetylene - pure	–	+	–	+	+	+	+	[1]+	+	+	+	+	+
Acronal dispersion (polyacrylate for adhesives)	–	+	+				+	o	+	+			o
Acronal solutions	–	o	–				+	o	+	+			o
Acrylonitrile - pure	–	–	–	+	–	o	+	+	+	+	+	–	o
Ethyl acrylate - pure	–	o	–	+		–	+		+	+		o	
Adipic acid - aqueous	+	+	+	+		+	+		+	+	+	+	+
Battery acid (20 % sulphuric acid, aqueous)	o	+	+	+		+	+	–	+	o	o	+	–
Alum (potassium aluminium sulphate) - aqueous	+	+	+	+	+	+	+	–	+	o	+	+	+
Albumin - pure	+	+	+				+	o	+	+	+		+
Allyl alcohol - pure	+	+	–	+		–	+	+	+	+	+	+	+
Aluminium acetate - aqueous	o	+	+	+		+	+	o	+	+	+	+	+
Aluminium chloride - aqueous	+	+	+	+	o	+	+	o	o	o	–	+	o
Aluminium fluoride - aqueous	+	+	+	+		+	+	+	–	–	+	+	+
Aluminium sulphate - aqueous	+	+	+	+		+	+	–	o	o	+	+	o
Formic acid - pure	–	o	–	o	–	+	+	–	+	–	+	+	–
Formic acid - aqueous	–	o	–	–	–	+	+	–	+	o	o	+	–
Amino acetic acid (glycocol)	o	+	+			+	+	o	+	+	+	+	o
Ammonia (liquid) - pure	–	[2]o	–	o	–	+	+	o	+	+	+	–	+
Ammonia (gaseous) - pure	–	+	–	o	–	+	+	–	+	+	+	–	+
Ammonium hydroxide (spirits of ammonia)	–	+	–	o	–	+	+	–	+	+	+	+	+
Ammonium acetate - aqueous	+	+	+	+		+	+	o	+	+	+	+	
Ammonium carbonate - aqueous	+	+	+	+	–	+	+	–	+	+	+	+	+
Ammonium chloride - aqueous	+	+	+	+	–	+	+	o	o	o	o	+	+
Ammonium citrate - aqueous	+	+	+	+			+	o	+	+	+		o
Ammonium fluosilicate - aqueous	+	+	+	+			+	o	+	+	+		o
Ammonium fluoride - aqueous	+	+	+	o		+	+	o	o	o	–	+	
Ammonium formate - aqueous	+	+	+	+			+	o	+	+	+		+
Ammonium nitrate - aqueous	+	+	+	+	+	+	+	–	+	+	+	+	+
Ammonium oxalate - aqueous	+	+	+	+		+	+	o	+	+	+		o
Ammonium persulphate - aqueous	–	+	+	+	+	+	+	o	o	o	–		–
Ammonium phosphate - aqueous	+	+	+	+	+	+	+	o	+	+	–	+	+
Ammonium thiocyanate - aqueous	+	+	+			+	+	o			+		+
Ammonium sulphate - aqueous	+	+	+	+	+	+	+	–	o	o	+	+	o
Ammonium sulphide - aqueous	+	+	o	+		+	+	–	+	+	+	+	+
Ammonium sulphite - aqueous	+	+	+	+			+	–	+	o	+		+
Amyl acetate - pure	–	o	–	+	–	o	+	+	+	+	+	+	+
Amyl alcohol - pure	+	o	+	+	+	+	+	+	+	+	+	+	+
Pineapple juice						+	+	–	+	+	+		
Aniline - pure	–	+	o	o	–	o	+	–	+	+	+	+	–
Aniline hydrochloride - aqueous	o	+	[3]o	+			+	–	–	–	–	+	–
Anis seed oil	o						+	+	+	+	+		+
Anis seed oil - pure	o	o	–	+		–	+	+	+	+	+		+

Resistance to chemicals	NBR	EPDM	FKM	FFKM	PU	LD-PE	PTFE	MS	1.4401/1.4571	1.4305/1.4104	Al	PVDF	PA
Anon (cyclohexanone) - pure	–	–	–	+	–	–	+	o	+	+	+	+	+
Anthracene oil - pure	–	–	–	+			+	+	+	+	+		+
Anthraquinone sulphonic acid - aqueous	o	+	+	+			+	o	o	o			o
Antifrogen-N	+	+	+				+	o	+	+			+
Antimony chloride - aqueous	o	+	[3]+	+	+	+	+	o	–	–	–	+	–
Apple juice, Applesauce						+	+	–	+	+	+		+
Malic acid - aqueous	+	+	+	+	o		+	–	+	+		+	+
Orange juice						+	+			+	+		
Cider	+	+	+				+		+	+		+	+
Apricot juice							+	+	+	+			
Arabic acid - aqueous	+	+	+	+			+	–	+	+	+		
Argon - pure	+	+	+	+	+		+	+	+	+		+	+
Arsenious acid - aqueous	+	+	+	+	o	+	+	o	+	+	–		
Arsenic acid - aqueous	+	+	+	+	o	+	+	–	+	+	–	+	o
Arsenic trichloride - aqueous	+	+	+	+			+	–	o	o	+		–
Aryl silicates - aqueous	o	o	o	+			+	+	+	+			
Ascorbic acid - aqueous	+	+	+	+		+	+	–			+		
Aspartic acid - aqueous	+	+	+	+			+	–	+	+			+
ASTM fuel A	o	–	o	+			+	+	+	+			+
ASTM fuel B	o	–	o	+			+	+	+	+			+
ASTM fuel C	o	–	o	+			+	+	+	+			+
ASTM oil no. 1	+	–	+	+			+	+	+	+			+
ASTM oil no. 2	o	–	+	+			+	+	+	+			+
ASTM oil no. 3	o	–	o	+			+	+	+	+			+
ATE brake fluid	–	+	–	+			+	o	+	+	+		+
Essential oils	–	–	–	+		–	+	o	+	+			–
Cottonseed oil	+	+	+	+			+	+	+	+	+		–
Barium chloride - aqueous	+	+	+	+	+	+	+	+	+	o	+	+	+
Barium hydroxide - aqueous	+	+	+	+	+	+	+	+	+	+	o	+	o
Barium sulphide and polysulphide, aqueous	+	+	+	+	+	+	+	o	+	+	o	+	–
Cottonseed oil	o	–	o	+			+	+	+	+	+	+	
Benzaldehyde - aqueous	o	+	+	+	o	o	+	o	+		+	o	o
Benzidine sulphonic acids - aqueous	+	+	+	+			+	+	+	+			+
Gasoline (hexane) - pure	o	–	+	+		–	+	+	+	+	+	+	+
Gasoline-benzene alcohol (premium gasoline/methanol mixture)	–	–	o	+			+	o	+	+			o
Benzoic acid - aqueous	+	+	+	+	–	+	+	o	+	+	+	+	–
Benzene - pure	–	–	+	+	–	o	+	+	+	+	+	o	+
Benzene sulphonic acid - aqueous	+	+	+	+		+	+	o	+	+	o	+	
Benzyl alcohol - pure	–	+	o	+	–	–	+	+	+	+	+	+	o
Benzyl butyl phtalate - aqueous	–	–	–	+			+	+	+	+			+
Bergamot oil	–	–	–				+	o	+	+			–
Succinic acid - aqueous	+	+	+	+		+	+	+	+	+	+	+	
Beeswax	+	+	+			+	+	+	+	+	+		–
Beer	+	+	+			+	+	+	+	+	+	+	+
bisulphite (sodium hydrogen sulphite)	o	+	o	+		+	+	o	+	o	+	+	o
- aqueous	o	o	+	+	+	+	+	+	+	o	+	+	–
Hydrocyanic acid - aqueous	o	+	+	+	+	+	+	o	+	+	–	+	+
Lead acetate - aqueous	–	+	o	+		o	+	o	o	o	–	–	–
Bleaching lye (sodium hypochlorite)	+	+	+	+		+	+	–	+	+	+		
Lead nitrate - aqueous	o	o	+	+		+	+	o	+	+	+	+	+
Lead tetraethyl (tetraethyl lead) - pure	o	–	o	+			+	+	+	+	+		o
Drilling oils (cutting oils)	+	+	+	+	+		+	+	+	+	+	+	+
Borax - aqueous	+	+	+	o	–		+	–	–	–	–		
Borofluoric acid (fluoboric acid)	+	+	+	+	+	+	+	–	+	+	+	+	
Boric acid - aqueous	–	+	–	+		+	+	o	+	+	+		
Braking fluid (ATE braking fluids)	–	–	–	+	–	o	+	–	o	o	–		
Bromine (liquid) - pure													

Resistance to chemicals	NBR	EPDM	FKM	FFKM	PU	LD-PE	PTFE	MS	1.4401/1.4571	1.4305/1.4104	Al	PVDF	PA
Hydrobromic acid - aqueous	–	+	+	+		o	+	–	–	–	–	+	–
Butadiene (gaseous) - pure	o	o	o	+	o	–	+	+	+	+	+	+	+
Butane (gaseous and liquid)	+	–	+	+	+	+	+	+	+	+	–	+	
Butylene ether glycol - aqueous (10 %)	+	+	o	o			+	+	+	+	+	+	+
Butanol (butyl alcohol) - pure	o	+	+	+	o	o	+	+	+	+	+	+	+
Butyne diol - pure	o	o	o				+	+	o	+	+		+
Butoxyl (methoxybutyl acetate) - pure	+	o	o				+	o	+	+			
Butter	+	+	+			+	+	–	+	+	+	+	+
Buttermilk	+	+	+				+	o	+	+	+		–
Butyric acid - aqueous	o	o	o	o	–	–	+	o	+	o	+	+	o
Butyl acetate - pure	–	+	–	+	–		+	o	+	+	+	+	+
Butyl alcohol (butanol) - pure	o	+	+	+	o	o	+	+	+	+	+	+	+
Butylene (liquid) - pure	+	o	+	+			+	+	+	+	+	+	+
Butyl phtalate - pure	–	–	–	+			+	+	+	+	+		+
Calcium bisulphite - aqueous	+	+	+	+	o	+	+	–	+	o	o		–
Calcium chloride - aqueous	+	+	+	+	+	+	+	–	o	o	o	+	o
Calcium hydroxide (lime-milk) - aqueous	+	+	+	+	o	+	+	–	+	+	o	+	+
Calcium hypochlorite (chlorinated lime) - aqueous	–	+	o	+	–	+	+	–	o	o	–	+	–
Calcium nitrate - aqueous	+	+	+	+	+	+	+	o	o	o	+	+	+
Carbolineum (creosote; pesticide)	o	o	o	+		+	+	+	+	+	+		+
Carbolic acid (phenol) - aqueous	o	o	o	+	–	+	+	o	+	+	+	+	–
Caro's acid - aqueous	–	–	–				+	–	–	–			–
Cellosolve (glycol ethyl ether) - pure	–	–	–	+		–	+	+	+	+	+	+	+
Cellulose lacquers	–	o	–	+			+	o	+	+	+		+
Camphor oil - pure	+	–	+	o			+	o	+	+	+		
Chlophene (chlorobiphenyl)	+	o	+				+	+	+	+			
Chlorine (liquid) - pure	–	–	o	+	–	–	+	–	+	+	o	+	–
Chlorine (gaseous) - wet (chlorine water)	–	–	o	o	–	–	+	–	–	–	–	o	–
Chlorine (gaseous) - dry	–	–	o	+	–	–	+	–	+	–	o	+	–
Chloral hydrate (chloral) - aqueous	–	o	o	+		–	+	o	o	o	–	–	–
Chlorobenzene - pure	–	–	–	+	o	–	+	+	+	+	+	+	+
Sodium hypochlorite bleach - aqueous	–	+	o	+		o	+	o	o	o	–	o	–
Chlorine dioxide - aqueous	–	–	–	o	–		+	–	o	o	o	o	–
Chloroacetic acid - aqueous	–	o	–	+		o	+	o	o	–	–	+	–
Chloroethanol (ethylene chlorohydrine) - pure	–	–	o	+			+	+	+	+	o	+	o
Chlorinated lime (calcium hypochlorite) - aqueous	–	+	o	+	–	+	+	–	o	o	–	+	–
Chloromethane (methyl chloride) - pure	–	–	o	+	–	o	+	+	+	+	–	–	o
Chloronaphthaline - pure	–	–	o	+			+	+	+	+	+		+
Chloroform (trichloromethane) - pure	–	–	o	+	–	–	+	+	+	+	o	+	–
Chlorophenol - pure	–	–	–	+			+	+	+	+	+		
Chlorophenoxyacetic acid - pure	+	+	+				+		+	+			
Chloric acid - aqueous (10 %)	–	o	–	+		+	+	–	–	–	–	+	–
Chlorosulphonic acid - pure	–	–	–	+		–	+	o	o	o	o	o	–
Chlorine water (chlorine - wet)	–	–	o	o	–	–	+	–	–	–	–	o	–
Hydrogen chloride gas - pure	o	o	+	+			+	–	+	o	–	+	–
Chlorxylenol - pure	–	–	–	+			+	+	+	+			
Choline chloride - aqueous	+	+	+	+			o	–					
Chrome alum - aqueous	+	+	+	+			+	o	o	o	o	+	o
Chromic acid - aqueous (10 %)	–	o	+	+	–	+	+	–	o	o	+	+	–
Chromous sulfate - aqueous	+	+	+	+			+	o	o	o	+		o
Citral (citronella oil) - pure	–	–	–				+	+	+	+			+
Potassium cyanide - aqueous	+	+	+	+	o	+	+	–	+	+	o	+	+
Cyclanone (fatty alcohol sulphonate)	+	+	+				+		+	+	o		+
Cyclohexane - pure	–	–	o	+	+	–	+	+	+	+	+	+	+
Cyclohexanol - pure	–	–	+	+	–	+	+	+	+	+	+	+	+
Cyclohexanon (Anon) - pure	–	–	–	+	–	–	+	o	+	+	+	o	+

Resistance to chemicals	NBR	EPDM	FKM	FFKM	PU	LD-PE	PTFE	MS	1.4401/1.4571	1.4305/1.4104	Al	PVDF	PA
Cymene - pure	–	–	–				+	+	+	+	+		+
Decahydronaphthalene (decalin) - pure	–	–	+	+	+	–	+	+	+	+	+		+
Desmodur T	–	–	+				+	+	+	+	+		
Desmophen	+	+	+				+		+	+			
Dextrin - aqueous	+	+	+	+		+	+	+	+	+	+	+	+
Dextrose (glucose) - aqueous	+	+	+	+	+	+	+	+	+	+	+		+
Diacetone alcohol (anhydrous) - pure	–	+	–	+	+		+	o	+	+	+		o
Dibutyl phthalate - pure	–	o	–	+	o		+	+	+	+	+	–	+
Dibutylsebacat - pure	–	o	–	+	–	o	+	+	+	+	+	–	+
Dichloroethane (ethyl dichloride) - pure	–	–	–	+		–	+	–	+	–	+	+	+
Dichloroethylene - pure	–	–	o	+	–	–	+	+	+	+	o	+	+
Dichloromethane (methylene chloride) - pure	–	–	o	+	–	–	+	+	+	+	–	–	–
Dicyclohexyl ammonium nitrite - pure	+	+	+	+			+	o	+	+	+		
Diesel oil - pure	o	–	+	+		o	+	+	+	+	+	+	+
Diethyl ether (ether) - pure	–	–	–	+		–	+	+	+	+	+	+	+
Dimethylamine - pure	–	o	–	+		o	+	o	+	+	+	–	–
Dimethylformamide (DMF) - pure	–	–	–	+	o	+	+	o	+	+	+	–	–
Dimethylsulfoxide (DMSO) - pure				+	+	–	+				+	–	o
Dioctylphthalate (DOP) - pure	–	o	o	+	+	–	+	+	+	+	+	o	+
Dioxan - pure	–	o	–	+	–	o	+	+	+	+	+	–	+
Diphenyl + diphenyl oxide	–	–	–	+	–	+	+	+	+	+	+		+
Dissolved acetylene (acetylene + acetone)	–	+	–				+	+	+	+	+		+
Nitrogen monoxide (laughing gas, nitrous oxide)	+	+	+	+	+		+	+	+	+	+	+	+
Inert gases	+	+	+	+			+	o	o	+	+	+	+
Ferrous chloride - aqueous	+	+	+	+	o	+	+	–	–	–	–	+	+
Iron sulphate - aqueous	+	+	+	+	+	+	+	o	+	+	–	+	+
Protein solutions	+	+	+				+	o	+	+	+		+
Natural gas	o	–	+	+			+	o	+	+	+	+	+
Vinegar (wine vinegar)	+	+	+	+		o	+	–	+	+	+	+	–
Acetic ether (ethyl acetate) - pure	–	o	–	o		–	+	–	+	+	+	o	o
Acetic acid - pure	–	o	–	o	–	o	+	–	+	–	+	+	o
Acetic anhydride - pure	–	o	–	o		–	+	–	o	o	+	–	–
Ethane - pure	+	–	+	+			+	+	+	+	+	–	+
Ethanol (ethyl alcohol) - pure	o	+	o	+		+	+	+	+	+	+	+	o
Ethanolamine - pure	o	o	–	+			+	–	+	+	+	o	+
Ether (diethyl ether) - pure	–	–	–	+		–	+	+	+	+	+	+	+
Ethyl acetate (acetic ether) - pure	–	o	–	o		–	+	–	+	+	+	o	o
Ethyl alcohol - fermentation slurry	+	+	+	+			+	+	+	+	+	+	o
Ethyl alcohol - denatured (spirit)	o	o	o	+			+	o	+	+	+		o
Ethyl alcohol (ethanol) - pure	o	+	o	+		+	+	+	+	+	+	+	o
Ethyl alchohol + acetic acid	o	+	o	+			+	o	+	+	+	+	–
Ethyl benzene - pure	–	–	o	+		–	+	+	+	+	+	+	+
Ethyl choride - pure	+	+	+	+		–	+	–	+	+	o	+	+
Ethylene - pure	+	–	+	+			+	+	+	+	+	+	+
Ethylene bromide - anhydrous	–	–	–	+		–	+	+	+	+	o	+	+
Ethylene chlorohydrine (chloroethanol) - pure	–	–	o	+			+	+	+	+	o	+	o
Ethylene dichloride (dichloroethane) - pure	–	–	–	+		–	+	–	+	–	+	+	+
Ethylene diamine - pure	o	+	o	o		o	+	–	+	o	+	+	o
Ethylene glycol (glycol) - pure	+	+	+	+		+	+	o	+	+	+	+	o
Ethylene oxide (liquid) - pure	–	–	–	o		o	+	–	+	+	+	+	–
Ethyl formate	–	o	–	+			+	+	+	+	+	+	+
Dyeing surfactant (Nekal BX)	+	+	+				+	o	+	+			
Potassium ferricyanide	+	+	+	+		+	+	–	+	+	+	+	+
Fatty alcohols	+	o	+	+			+	+	+	o	+		+
Fatty alcohol sulphates (sulphated fats) - aqueous	+	o	+	+			+	o	+	+	o	+	o
Fats, fatty oils	o	–	o	+		+	+	o	+	+	+	+	+

Resistance to chemicals	NBR	EPDM	FKM	FFKM	PU	LD-PE	PTFE	MS	1.4401/1.4571	1.4305/1.4104	Al	PVDF	PA
Pine needle oil	o	–	+	+		–	+	o	+	+	+		
Oil varnishes	o	–	+	+			+	+	+	+	+		+
Fluorine (wet) - pure	–	–	–	–		–	o	–	o	o	–	–	–
Fluorine (dry) - pure	–	–	o	o		–	o	o	+	+	–	o	–
Fluoboric acid (borofluoric acid)	+	+	+	o	–		+	–	–		–	+	–
Fluorocarbons (Frigen)						–	+				o	o	+
Hydrofluoric acid - aqueous	–	–	–	–	+		o	–	o	–	–	+	–
Formaldehyde - pure	+	+	+	+			+	+	+	+	+	+	+
Formaldehyde - aqueous	o	o	o	+	+	+	+	–	+	+	+	+	+
Formamide - pure	+	+	o	o		+	+	o	+	o	+		o
Photo emulsions, developers, fixing baths	o	o	o	+		+	+				+	+	
Freon TF (Freon 113)	+	–	–	–			+	+	+	+	o	+	+
Frigen 12 B1 (Freon 12 B1)	+	–	o	+		–	+	+	+	+	o	+	+
Frigen 13	+	–	o	o			+	+	+	+	o	–	
Frigen 13 B 1 (Halon 1301)	+	–	o	+			+	+	+	+	o	o	+
Frigen 22	–	–	–	o		–	+	+	+	+	o	–	+
Frigen 23	+	–	o	–		–	+	+	+	+	o	o	
Frigen 502	–	–	–	o			+	+	+	+	o	o	+
Frigen substitute HCFC 123	–	–	–	–			+	+	+	+			
Frigen substitute HCFC 134a			–	–			+	+	+	+			
Anti-freeze for automobiles	o	+	+	+		+	+	+			+	+	
Fruit juices	o	o	o			+	+	–	+	+	+		o
Gas water	+	–	o				+	–	+	+	+		
Gelatine - aqueous	+	+	+	+		+	+	o	+	+	+	+	+
Tannic acid (tannin)	+	+	+	+	o	+	+	o	+	+	+	+	+
Glucose (dextrose) - aqueous	+	+	+	+	+	+	+	+	+	+	+	+	+
Glycine (aminoacetic acid) - aqueous	o	+	+			+	+	o	+	+	+	+	o
Glycol - aqueous	+	+	+	+		+	+	o	+	+	+	+	o
Glycol ethyl ether (Cellosolve)	–	–	–	+		–	+	+	+	+	+	+	+
Gycolic acid - aqueous	+	+	+	+			+	o	o	o	+	+	–
Glycerine - pure	o	+	+	+		+	+	o	+	o	+	+	+
Glycerine - aqueous	+	+	+	+	+	+	+	o	+	o	+	+	+
Mine gas (methane)	+	–	+	+	o		+	+	+	+	+	o	+
Hair shampoo	o	o	o				+	o	+	+	+		+
Urea - aqueous	+	+	+	+	+	+	+	o	o	o	+	+	+
Yeast - aqueous	+	+	+	+		+	+	o	+	+	+	+	+
Fuel oils	o	–	+	+		–	+	+	+	+	+	+	+
Helium	+	+	+	+	+	+	+	o	+	+	+	+	+
Heptane, hexane (gasoline) - pure	o	–	+	+	+	–	+	+	+	+	+	+	+
Hexamethylene tetramine - aqueous	+	+	+	+			+	o	+	+	+		+
Tar, wood oil (waterproofing oils)	–	–	–	+	+		+	+	+	+	+		
Humic acids	+	+	+				+	+	+	+	+		–
Hydraulic fluid, water-in-oil (HSB)	o	–	+	+			+	+	+	+	+		+
Hydraulic fluid, mineral oils (H, H-L, H-LP)	o	–	o	+			+	+	+	+	+		+
Hydraulic fluid, phosphoric ester (HSD)	–	o	o	+			+	+	+				–
Hydraulic fluid, polyglycol-water (HSC)	+	+	+	+			+	+	+	+	+		+
Hydraulic fluid, oil-in-water emulsions (HSA)	o	–	+	+			+	+	+	+	+		+
Diamide hydrate - aqueous	–	+	+	+	–	+	+	–	–	o	+	o	
Hydroquinone - aqueous	+	+	+	+		+	+		o	+	+	+	–
Hydroxylamine sulphate - aqueous	+	+	+	+		+	+	–	+	+	–		+
Waterproofing oils (tar)	–	–	–	+	+	+	+	+	+	+	+		
Isobutanol - pure	o	+	+	+	–	+	+	+	+	+	+	+	+
Isooctane - pure	+	–	+	+	+	o	+	+	+	+	+	+	+
Isopropyl alcohol (propanol) - pure		+	+	+	o	+	+	+	+	+	+	+	o
Iodine + potassium iodide - aqueous	o	o	o	+		+	+	-	o	o	+	+	-
Iodine tincture	o	o	o	o		o	+	o	o	o	+	+	-

Resistance to chemicals	NBR	EPDM	FKM	FFKM	PU	LD-PE	PTFE	MS	1.4401/1.4571	1.4305/1.4104	Al	PVDF	PA
Caustic potash solution (potassium hydroxide) - aqueous	-	+	-	+	+	+	+	-	+	+	-	-	o
Aluminium potassium sulphate (alum) - aqueous	+	+	+	+			+	–	+	o	+	+	
Potassium bromate - aqueous	+	+	+	+	+	+	+	+	o	o	+	+	–
Potassium bromide - aqueous	+	+	+	+	o	+	+	o	+	+	–	–	o
Potassium carbonate (potash) - aqueous	o	o	o	+	+		+	o	o	o	+	o	o
Potassium chlorate - aqueous	+	+	+	+	+	+	+	o	o	o	+	+	+
Potassium chloride - aqueous	o	+	o	+		+	+	+	o	o	+	+	–
Potassium chromate - aqueous	+	+	+	+	o	+	+	–	+	+	o	+	+
Potassium cyanide - aqueous	o	o	o	+	+	+	+	o	+	+	+	+	–
Potassium dichromate - aqueous	+	+	+	+		+	+	–	+	+	+	+	+
Potassium ferrocyanide, (tripotassium hexa-cyanoferrate III) - red prussiate of potash	+	+	+	+		+	+	+	o	–	+	+	+
- aqueous	+	+	+				+	o	+	+	+		–
Potassium ferrocyanide (potassium cya-noferrate II) - yellow prussiate of potash	–	+	–	+	+	+	+	–	+	+	–	–	o
- aqueous	–	+	o	+	–	o	+	o	o	o	–	+	–
Potassium hydrogen fluoride - aqueous	+	+	+	+		+	+	o	o	o	+	+	
Potassium hydroxide (caustic potash) - aqueous	+	+	+	+	+	+	+	o	o	o	+	+	+
Potassium hypochlorite - aqueous	+	+	+	+			+	+	+	+	+	+	+
Potassium iodide - aqueous	–	–	–	+		+	+	o	+	o	+	+	–
Potassium nitrate - aqueous	–	–	–	+			+	–	+	+	–		–
Potassium nitrite - aqueous	–	+	o	+		+	+	–	+	+	–	o	–
Potassium permanganate - aqueous	+	+	+	+			+	o	+	+	o	+	o
Potassium peroxide - aqueous	+	+	+	+		+	+	+	+	+	+	+	+
Potassium persulphate - aqueous	+	+	+	+		+	+	o	+	+	o	o	o
Potassium phosphate - aqueous	+	+	+	+	+	+	+	o	+	o	+		+
Potassium sulphate - aqueous	+	–	+	+	+	–	+	+	+	+	+	+	+
Potassium sulphide - aqueous	o	–	+	+		–	+	o	+	+	+		
Potassium sulphite - aqueous	o	o	o	+	–	+	+	–	o	o	–	+	–
Kerosene (petroleum benzine, gasoline)	o	–	+	+			+	+	+	+	+		+
Pine needle oil	+	+	+	+		+	+	–	o	o	o	+	+
Hydrofluosilicic acid (silicofluoric acid) - aqueous	+	+	+	+	+	+	+	–	o	o	o	+	+
Bone oil	+	+	+	+	+	+	+	o	+	+	o	+	o
Salt (sodium chloride)	+	+	+	+	+	+	+	+	+	+	o	+	+
Salt (sodium chloride) - aqueous	+	+	+	+	+		+	+	+	+	+	+	+
Carbon dioxide - wet	+	+	+	+	+	+	+	o	+	+	o	+	o
Carbon dioxide - dry	o	–	o	+		o	+	o	+	+	+	+	+
Carbon monoxide (carbon oxide)	–	–	–	+	–	–	+	–	–	–	–	–	–
Carbonic acid - wet	–	–	o	+		–	+	+	+	o	o	o	–
Coconut oil	o	+	+	+		+	+	o	+	+	–	+	o
Aqua regia	+	+	+	+	+		+	o	–	–	–	+	o
Cresol - aqueous (see Lysol)	+	+	+	+	+		+	o	o	o	–	+	o
Acetate of copper - aqueous	+	+	+	+	+		+	+	+	+	+	+	+
Copper chloride - aqueous	o	–	o	+			+	o	+	+	+	+	+
Copper sulphate - aqueous	o	o	+	+		o	+	o	+	+	+		
Laughing gas (nitrogen monoxide, nitrous oxide)	o	–	o	+		o	+	o	+	+	+	+	+
Food greases and oils	+	+	+	+	o	+	+	+	+	+	+	+	+
Cod liver oil	o	–	o	+			+	o	+	o		+	
Linseed oil	+	+	+	+			+	o	o	o	+	+	o
Coal gas (town gas, grid gas)	–	–	o	+		–	+	+	+	o	o	o	–
Linoleic acid	+	+	+	+	+	+	+	o	o	o	+	+	o
Lithium chloride - aqueous	+	+	+	+	+	+	+	+	+	+	+	+	o
Lysol (see also cresol)	o	–	o	+			+	o	+	+	+	+	+
Magnesium chloride - aqueous	+	+	+	+	–	+	+	o	+	o	+	+	o
Magnesium sulphate - aqueous	+	+	+	+			+	o	o	o			+
Corn oil	+	+	+	+			+	o	o	o			+
Maleic acid - aqueous													
Manganese chloride - aqueous													

Resistance to chemicals	NBR	EPDM	FKM	FFKM	PU	LD-PE	PTFE	MS	1.4401/1.4571	1.4305/1.4104	Al	PVDF	PA
Manganese sulphate - aqueous	+	+	+	+			+	o	+	o	+	+	+
Machine oil, see a) paraffin oils b) mineral oils; motor oils	+	–	+	+		o	+	+	+	+	+	+	+
Molasses, molasses extract	+	+	+	+		+	+	o	+	+	+	+	+
Mercaptans	–	–	o	+			+	o	+	+		o	+
Mersol (alkane sulfochloride)	+	o	+				+	o	o	o	–		
Methane (marsh gas) - pure	+	–	+	+	o		+	+	+	+	+	o	+
Methanol (methyl alcohol)	–	+	–	+	o	+	+	+	+	+	+	+	o
Methoxybutanol - pure	+	+	+	+		o	+	+	+	+	+		
Methyl acetate - pure	–	o	–	+		+	+	o	o	o	+	o	+
Methyl alcohol (methanol) - pure	–	+	–	+	o	+	+	+	+	+	+	+	o
Methylamine - aqueous	–	o	o	–		o	+	–	o	o	+	–	o
Methyl chloride (chloromethane) - pure	–	–	+	+	–	o	+	+	+	+	–	–	o
Methylene choride (dichloromethane) - pure	–	–	o	+	–	–	+	+	+	+	–	–	–
Methyl ethyl ketone - pure	–	o	–	+		–	+	+	+	+	+	–	o
Milk	+	+	+			+	+	o	+	+	+	+	+
Lactic acid - aqueous	o	o	+	+	+	+	+	o	o	o	+	+	o
Mineral oils - free of aromatic compounds (paraffin oils, motor oils)	+	–	+	+		o	+	+	+	+	+	+	+
Mineral water	+	+	+			+	+	o	o	o	+	+	+
Morpholine - pure	–	o	o	o		+	+	+	+	+	+	+	
Motor oils (mineral oils, machine oils)	+	–	+	+		o	+	+	+	+	+	+	+
Sodium arsenate and sodium arsenite - pure	+	+	+	+			+	+	+	+	+		
Sodium benzoate - aqueous	+	+	+	+		+	+	+	+	+	+	+	+
Sodium bicarbonate - aqueous	+	+	+	+	+	+	+	o	+	+	+	+	+
Sodium bisulphate - aqueous	+	+	+	+	–	+	+	o	o	o	+	+	+
Sodium bisulphite - aqueous (bisulphite)	o	+	+	+		+	+	o	+	o	+	+	+
Sodium bromate - aqueous	+	+	+	+		o	+	–	+	o	+	+	o
Sodium bromide - aqueous	+	+	+	+		+	+	o	o	o	–	+	–
Sodium carbonate (soda) - aqueous	+	+	+	+		+	+	o	+	+	o	o	+
Sodium chloroacetate	+	+	+	+			+	o	+	+	+		
Sodium chlorate - aqueous	o	o	o	+	+	+	+	o	o	o	+	+	o
Sodium chloride (salt) - aqueous	+	+	+	+	+	+	+	–	o	o	o	+	+
Sodium chlorite - aqueous	–	o	o	+		o	+	o	o	–	o	+	–
Sodium chromate - aqueous	o	+	o	+		+	+	+	o	o	+	+	–
Sodium cyanide - aqueous	+	+	+	+	o	+	+	–	+	+	–	+	+
Sodium dodecylbenzenesulfonate - aqueous	+	+	+			+	+	o	+	+	+		+
Sodium fluoride - aqueous	+	+	+	+	+	+	+	+	+	o	+	+	+
Monosodium glutamate - aqueous	+	+	+	+			+		+	+	+		
Sodium bicarbonate - aqueous	+	+	+	+		+	+	o	+	+	+	+	+
Sodium hydroxide - aqueous	–	+	–	+	+	+	+	–	+	+	–	–	+
Sodium hypochlorite bleach - aqueous	–	+	o	+		o	+	o	o	o	–	o	–
Sodium iodide - aqueous	+	+	+	+		+	+	o	o	o	+	+	
Sodium mercaptobenzothiazole - pure	o	o	+	+		+	+	+	+	+			
Sodium nitrate - aqueous	+	+	+	+	+	+	+	–	+	–	+	+	+
Sodium nitrite - aqueous	+	+	+	+	+	+	+	+	+	+	+	+	+
Sodium pentachlorphenolate - pure	+	+	+				+	+	+	+			+
Sodium perborate - aqueous	o	+	+	+		+	+	o	+	+	+	+	
Sodium persulphate - aqueous	o	+	+	+			+	–	+	o	–	+	–
Sodium phosphate - aqueous	+	+	+	+	+	+	+	o	o	o	+	+	+
Sodium propionate - aqueous	+	+	+				+	+	+	+	+	+	+
Sodium metabisulphite - aqueous	o	+	+		+	+	+	o	+	o	+		+
Sodium silicate - aqueous	+	+	+	+		+	+	o	+	+	+	+	+
Sodium stannate - aqueous	+	+	+	+			+	o	+	+	+		o
Sodium sulphate - aqueous	+	+	+	+		+	+	–	+	+	+	+	+
Sodium sulphide - aqueous	+	+	+	+		+	+	o	+	+	o	o	+
Sodium sulphite - aqueous	+	+	+	+		+	+	o	+	o	+	+	+
Sodium tartrate - aqueous	+	+	+	+			+	+	+	+			+
Sodium thiosulphate - aqueous	+	+	+	+		+	+	o	o	o	+	+	+

Resistance to chemicals	NBR	EPDM	FKM	FFKM	PU	LD-PE	PTFE	MS	1.4401/1.4571	1.4305/1.4104	Al	PVDF	PA
Sodium zincate - aqueous	o	+	+				+		+	+	–		
Soda lye (sodium hydroxide) - aqueous	o	+	o	+	+	+	+	o	+	+	–	–	o
Nekal BX - aqueous (dyeing surfactant)	+	+	+	o			+	o	+	+			
Nickel baths	+	+	+				+	–	+	o			+
Nickel sulphate - aqueous	+	+	+	+	+	+	+	–	o	o	–	+	+
Nitrobenzoic acids - aqueous	+	+	+	+		o	+	+	+	+	o		+
Nitrobenzene - pure	–	–	o	+	–	–	+	+	+	+	+	o	–
Nitrous fumes - wet and dry	–	o	–	o			+	–	+	+	+	o	–
Nitrotoluene (o-, m-, p) - pure	o	–	o	o		o	+	+	+	+	+	+	–
Fruit tree carbolineum (carbolineum)	o	o	o	+			+	+	+	+	+		+
Pyrosulfuric acid (fuming sulfuric acid) I	–	–	o	+	–	–	+	–	+	o	+	–	–
Olive oil)	o	–	o	+			+	o	+	+	+	+	+
Oxalic acid - aqueous	o	+	+	+	–	+	+	–	+	o	+	+	–
4Ozone - wet and dry	–	o	o	o	+	–	+	o	+	+	+	+	–
Paraffin oil (mineral oils)	+	–	+	+		+	+	+	+	+	+	+	+
Perchloroethylene (tetrachloroethylene) - pure	–	–	o	o	–	–	+	o	+	+	o	+	o
Peracetic acid - aqueous (6 %)	–	+	+	+			+	–	+	+			–
Petroleum - pure	+	–	+	+		o	+	+	+	+	+	+	+
Petroleum benzine, petroleum ether	+	–	+	+		–	+	+	+	+	+	+	+
Pesticide (carbolineum)	o	o	o	+			+	+	+	+	+		+
Phenol - aqueous	o	o	o	+	–	+	+	o	+	+	+	o	–
Phosgene (liquid) - pure		–	o	+			+	+	+	+	o		o
Phosgene (gaseous) - pure		–	+	+		–	+	+	+	+	o	+	o
Phosphorous chloride - pure	–	–	o	+		–	+		o	o	+	+	–
Phosphoric acid - aqueous	o	o	+	+	+	+	+	–	+	–	–	+	–
Picric acid (trinitrophenol) - pure	o	–	o	+	–	o	+	+	+	+	+	+	
Pinene (terpentine oil) - pure	o	–	o	+		–	+	o	+	+	+	+	+
Potash (potassium carbonate) - aqueous	+	+	+	+	o	+	+	o	+	+	–	–	o
Propane (liquid and gaseous) - pure	+	–	+	+	+	–	+	+	+	+	+	+	+
Propyl alcohol (isopropyl alcohol) - pure	–	+	+	+	o	+	+	+	+	+	+	+	o
Propylene glycol - pure	+	+	+	+		+	+	+	+	+	+	+	o
Pydraul-A 150	–	o	+				+	–	+				+
Pydraul-A 200	–	o	+				+	–	+				+
Pydraul-AG	–	+	+				+	–	+				+
Pydraul-F-9	–	+	+				+	–	+				–
Pyridine - pure	–	–	–	+	–	o	+	+	+	o	+	o	+
Mercury	+	+	+	+	+	+	+	–	o	+	o	+	+
Mercurous chloride - aqueous	+	+	+	+	+	+	+	–	o	o	–	+	–
Mercury salts - aqueous	+	+	+	+	+		+	–	+	+	–	+	–
Rapeseed oil	o	–	o	+			+	o	+	+	+	+	+
Castor oil	o	–	o	+		+	+	o	+	+	+	+	+
Saccharin (sweetener)	+	+	+				+	+	+	+			
Ammonia solution (liquid ammonia)	–	+	–	+	–	+	+	–	+	+	+	+	+
Nitric acid - aqueous (40 %)	–	–	[3]+	+	–	–	+	–	+	–	–	+	–
Hydrochloric acid - aqueous (36 %)	–	o	[3]+	+	+	+	+	–	+	o	–	+	–
Oxygen	o	o	[5]+	+		o	+	+	+	+	+	+	+
Lubricating oils (mainly mineral oils)	+	–	+	+		–	+	+	+	+	+	+	+
Sulphur chloride (oxychloride) - pure	–	–	+	+			+	o	+	–	o	+	–
Sulphur dioxide (liquid) - pure	–	+	+	+	–	–	+	+	+	+	o	+	–
Sulphur dioxide (gas, wet)	–	+	+	+		–	+	–	+	o	o	+	o
Sulphur dioxide (gas, dry) - pure	–	+	+	+		–	+	o	+	o	o	+	o
Sulphur hexafluoride - pure	+	+	o	o			+	+	+	+	+	+	
Sulphurous acid - aqueous	–	+	+	+	o	+	+	–	+	–	o	+	–
Carbon bisulphide - pure	–	–	+	+	+	–	+	–	+	o	+	+	o
Sulphuric acid - concentrated (96 %)	–	–	o	+	–	–	+	–	–	–	–	+	–
Sulphuric acid - aqueous (30 %)	o	+	+	+	o	+	+	–	–	–	o	+	–
Hydrogen sulphide - aqueous	o	+	–	–		+	+	o	+	+	+	+	–

Resistance to chemicals	NBR	EPDM	FKM	FFKM	PU	LD-PE	PTFE	MS	1.4401/1.4571	1.4305/1.4104	Al	PVDF	PA
Soap solution - aqueous	o	o	o	+			+	o	+	+	o	+	o
Silver nitrate - aqueous	o	+	+	+			+	–	+	+	–	+	+
Silicone oil	+	+	+	+	+	+	+	+	+	+	+	+	+
Skydrol 500	–	+	o	+			+	–	+	+			o
Skydrol 7000	–	+	–	+			+	–	+	+			o
Soda (sodium carbonate)	+	+	+	+		+	+	o	+	+	o	o	+
Sojabean oil	o	–	o	+			+	o	+	+	+	+	+
Brine (cooling brine)	+	+	+	+			+	o	o	o		+	+
Edible oil	o	–	o	+		+	+	o	+	+	+	+	+
Spindle oil (mineral oil)	+	–	+	+			+	+	+	+	+	+	+
Spirits - (depends on ingredients and flavours)	o	o	o			+	+	–	+	+	+	+	
Starch solution - aqueous	+	+	+	+	+	+	+	o	+	+	+	+	+
Stearic acid	+	+	+	+	+	o	+	o	+	+	+	+	+
Nitrogen oxide (nitrous fumes)	–	–	–	o			+	–	o	–	+	o	–
Nitrous oxide (dinitrogen oxide)	+	+	+	+	+		+	+	+	+	+	+	+
Nitrogen	+	+	+	+	+		+	+	+	+	+	+	+
Styrene - pure	–	–	o	+	o	–	+	o	+	+	+	+	+
Marsh gas (methane)	+	–	+	+	o		+	+	+	+	+	o	+
Tall oil	o	o	o				+	–	+	o	+	+	+
Creosote (carbolineum)	+	+	+	+	o	+	+	o	+	+	+	+	
Terpentine (terpentine oil) - pure	o	o	o	+		+	+	+	+	+	+		+
Terpentine substitute (solvent naphtha)	o	–	o	+		–	+	o	+	+	+	+	+
Solvent naphtha - pure (Shellsol D)	o	–	o	+		o	+	+	+	+	+	+	+
Tetrachloroethylene (perchloroethylene)	o	–	o	+		o	+	+	+	+	+	+	+
Carbon tetrachloride - pure	–	–	o	o	–	–	+	o	+	+	o	+	o
Tetraethyl lead (lead tetraethyl)	–	–	+	+		–	+	o	+	+	+	+	+
Tetrahydrofurane - pure	o	o	+	+		+	+	o	+	+	+	+	+
Tetrahydronaphthalene (Tetralin) - pure	+	–	–	+		–	+		+	+	+	–	+
Thiophene - pure	–	–	+	+		–	+	+	+	+	+		+
Toluol - pure	–	–	–	+		–	+	o	+	+	+		
Toluol – rein	–	–	o	+	–	–	+	+	+	+	+	o	+
Dextrose (glucose) - aqueous	+	+	+	+	+	+	+	+	+	+	+	+	+
Tributylphosphate - pure	–	–	–	o	–	+	+	+	+	+	+	–	
Trichloroacetic acid - aqueous	o	o	–	+		–	+	–	–	–	+	o	–
Trichloroethylene - pure	–	–	o	+	–	–	+	–	+	+	+	+	–
Trichloromethane (chloroform)	–	–	+	+	–	–	+	+	+	+	o	+	–
Triethanolamine - pure	–	–	–	+		+	+	o	+	+	+	+	o
Triorthocresylphosphate - pure	–	–	–	+	o	+	+	o	+	+	+	–	+
Uranium hexafluoride - pure	+	+	+	o			+		+	o	+		–
UV varnish	–	+	–				+						
Vaseline oil (mineral oil)	+	–	+	+		–	+	+	+	+	+	+	+
Vinyl acetate - pure	+	+	+	+		+	+	o	+	+	+	o	
Vinyl chloride - pure	–	o	+	+	–		+	–	o	o	+	+	+
Detergent (synth. household detergent)	o	+	o	+		+	+	o	+	+	+	+	o
Water - distilled	+	+	+	+	+	+	+	o	+	o	+	+	+
Water - seawater	+	+	+	+	+	+	+	o	o	o	o	+	+
Steam - (elastomer seals up to +130°C)	o	+	[3]+	+	–		+	o	+	+	+	+	–
Soluble glass (sodium silicate)	+	+	+	+		+	+	o	+	+	+	+	+
6Hydrogen - pure	+	+	+	+	+	+	+	+	+	+	+	+	–
Hydrogen peroxide 0.5 %	o	+	+	+	+	+	+	–	+	o	o	+	+
Hydrogen peroxide 30 %	–	o	[3]+	+	+	+	+	–	o	–	o	+	–
Wines	+	+	+			+	+	–	+	+	–	+	–
Wine vinegar	–	o	–	o		o	+	–	o	o	+	+	o
Tartaric acid - aqueous	+	+	+	+	+	+	+	–	+	+	–	+	o
Xenon											+		
Xylene - pure	–	–	+	+	–	–	+	+	+	+	+	+	+
Zinc chloride - aqueous	+	+	+	+	o	+	+	–	o	–	o	+	–

Resistance to chemicals	NBR	EPDM	FKM	FFKM	PU	LD-PE	PTFE	MS	1.4401/1.4571	1.4305/1.4104	Al	PVDF	PA
Zinc sulphate (white vitriol) - aqueous	+	+	+	+	o	+	+	–	+	–	o	+	
Tin chloride - aqueous	+	+	+	+	+	+	+	–	o	–	–	+	o
Lemon juice	o	+	+			+	+	o	+	o	+		+
Citric acid - aqueous	+	+	+	+	+	+	+	o	+	o	+	+	+
Sugar solutions	+	+	+			+	+	+	+	+	+	+	+

1) for brass with up to 58 % Cu
2) diffuses through EPDM membrane; attacks epoxy resin
3) FKM in acid-resistant version with litharge
4) ozone damages most polymeric materials. Resistance should therefore be relativised.
5) tested under pressure according to BAM
6) hydrogen can cause metals to become brittle

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