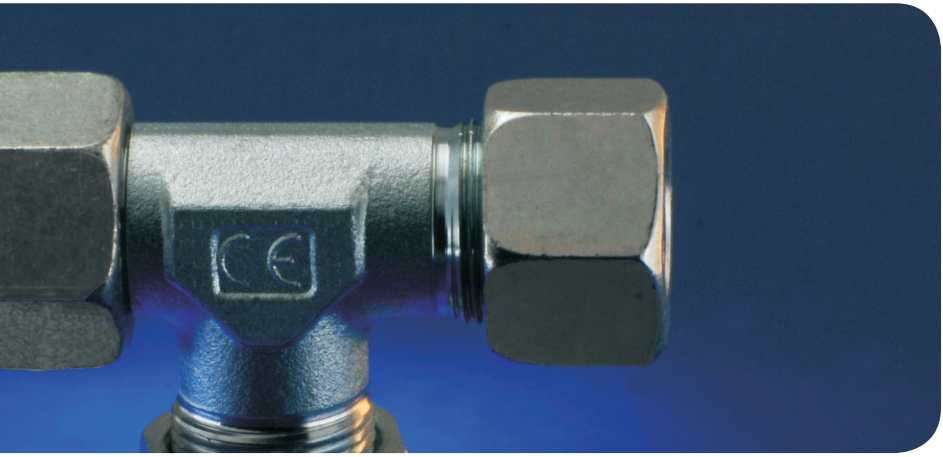

TUBE FITTINGS IN STEEL AND STAINLESS STEEL

INSTALLATION GUIDE
TECHNICAL INFORMATION
1.1

CONEXA
PRÄZISIONSARMATUREN

Table of contents

Safety Notice

Tube fittings from CONEXA are only suitable for fluid systems.

All safety notices and applicable regulations must be observed.

The operational safety of the CONEXA tube fittings includes that the respective installation guidelines and operation conditions are kept to. Not keeping to these restrictions can result in malfunctions and failures of the entire system. Incorrect usage such as improper installation revokes any warranty claims.

Vibrations in the system must be compensated with suitable tube clamps and parts of the system with different vibrations frequencies must be separated from each other.

Tubes must be installed without any residual tension. The tube fittings must be installed easily, while it must be possible to easily turn the nut along the entire length of the threads.

CAUTION!

Tightening the nuts and venting the system must be done when there is no pressure in the system. Danger of death! Danger of death!

Only use fittings for welding that are made of weldable material.

The design and installation of a tube system must be done by qualified personnel!

Any combination of elements (cutting rings, fittings Tubes etc.) made of different materials (steel, stainless steel etc.) is not permitted!

The nominal pressure of a combination of fittings is defined by the fitting with the lowest pressure rating.

Stud connectors must be installed with the correct torque. The ports for must be made in accordance with the respective standards.

Pay attention to the tube weight and according media and the thermal expansion.

Please contact us when you have any questions.

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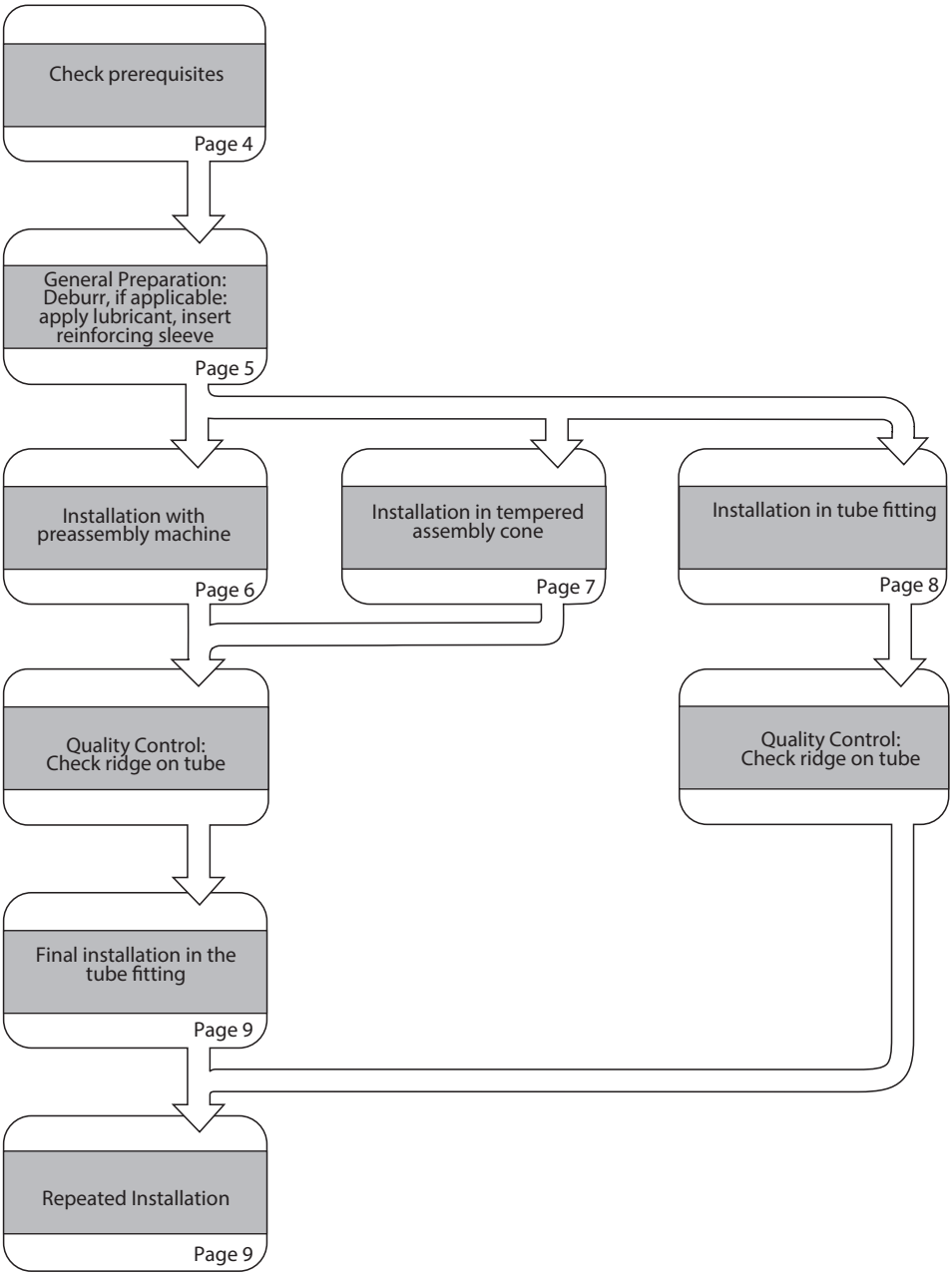
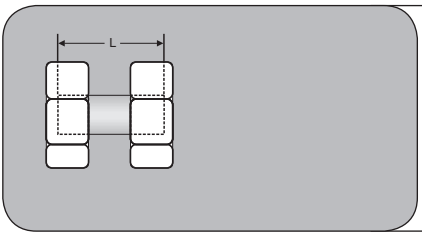
Procedure - Overview

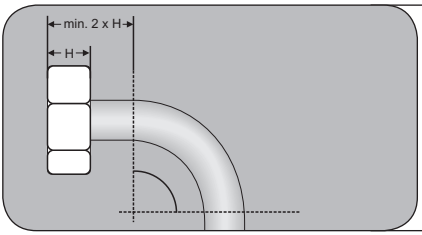


Requirements



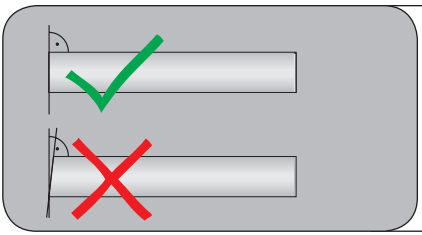
Minimum tube length for short tube segments:

- Note minimum lengths specified in table below.



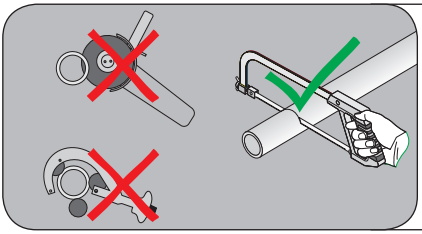
Minimum distance to bends:

- Note minimum lengths specified in table below.



Sawing off tube:

- Cut in 90 ° angle.
- Angle tolerance of 0.5 ° is tolerable!



Cutting the tube:

- Use saw.
- Do not use grinder or pipe cutter!

Required minimum lengths for short tubes or tubes with bends:

Series	LL				L										S									
Outer diameter of tube (mm)	4	5	6	8	6	8	10	12	15	18	22	28	35	42	6	8	10	12	14	16	20	25	30	38
H min. (mm)	24	25	25	26	31	31	33	33	36	38	42	42	48	48	35	35	37	37	43	43	50	54	58	65
L min. (mm)	30	32	32	33	39	39	42	42	15	48	53	53	60	60	44	44	47	47	54	54	63	63	73	82

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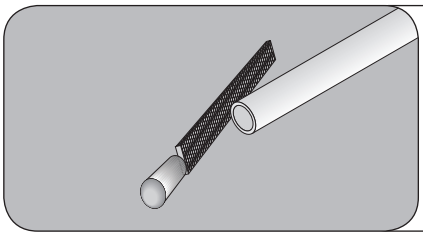
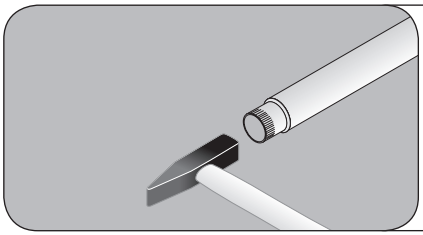
General Preparation



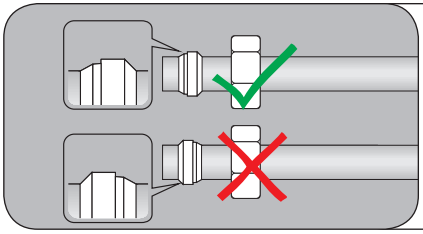
- Deburr tube inside and outside.

Note: do not slant the tube wall! Slightly rounded corner up to 0.2 mm x 45 ° is tolerable.

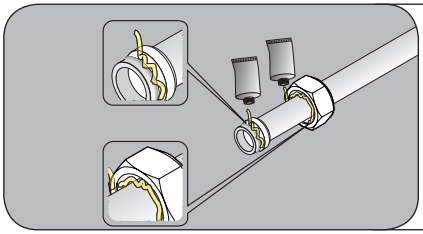


- Tubes with thin walls and soft tubes require reinforcement sleeve.

Further information is provided in table "Assembly with reinforcement Sleeves" starting page 16.

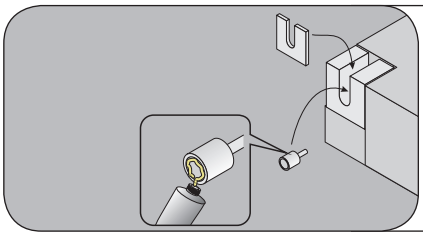


- Slide nut and cutting ring onto tube



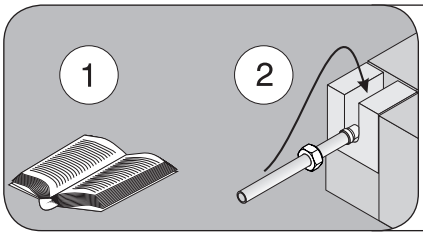
- Apply lubricant on threading of swivel nut and cutting ring.

Installation with preassembly machine



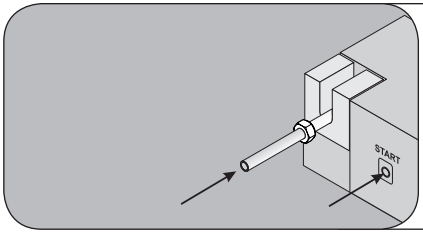
- Insert assembly cone and plate into the preparation machine.
- Apply lubrication to the preassembly cone before every preassembly.

Note: periodically (after approx. every 50 usages) check assembly cone for wear and tear!

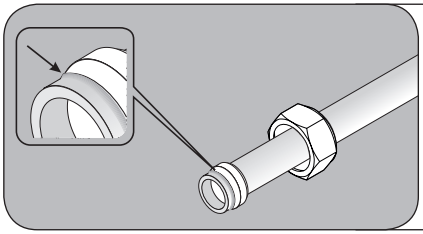


Notice: Read documentation of the preassembly machine before usage!

- Adjust pressure according to the tube diameter.
- Insert prepared tube into the machine.



- Firmly insert pipe
- Press "START" button.
- Firmly insert pipe until machine is finished with the preassembly.



- After preassembly with preassembly machine: check tube end for correct ridge on the tube. **Note:** The cutting ring can be turned but it cannot slide up and down the tube when it is correctly installed!

Final installation in the fitting: see page 9.

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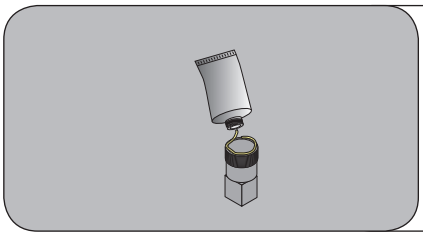
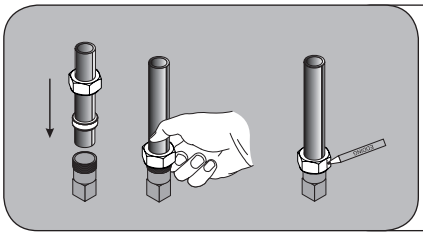
Installation in tempered assembly cone

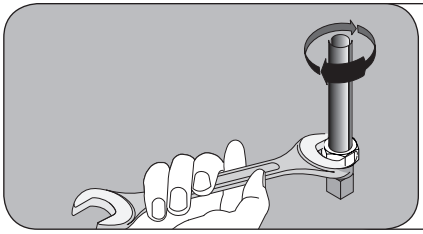


- Fasten assembly cone in vice
- Apply lubrication on cone and cone threading before every preassembly.

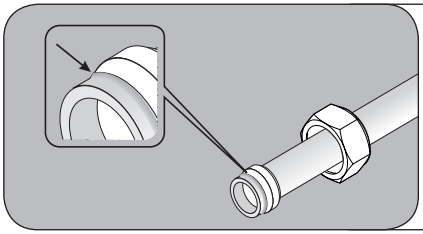
Note: periodically (after approx. every 50 usages) check assembly cone for wear and tear!



- Insert tube with cutting ring and swivel nut into the preassembly cone.
  Note: push tube into the fitting all the way, otherwise the tube connection might leak!
- Tighten swivel nut by hand.
- For control of the according rotations of the nut: mark nut.



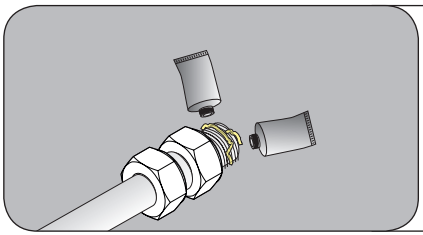
- Tighten swivel nut with spanner approx. 1 1/4 rotations after increase of required force.
- **Note:** The tube itself may not be turned!
- Loosen swivel nut.



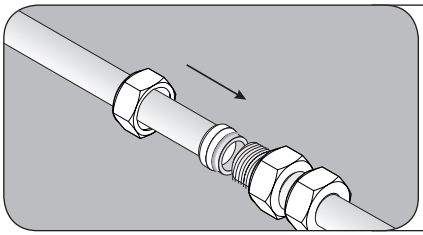
- After preassembly with preassembly cone: check tube end for correct ridge on the tube.
  Note: The cutting ring can be turned but it cannot slide up and down the tube when it is correctly installed!

Final installation in the fitting: see page 9.

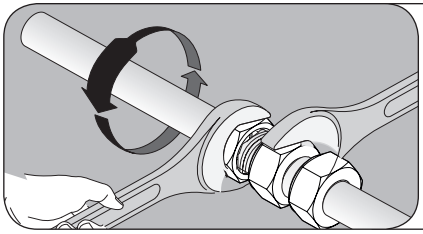
Direct installation in fitting



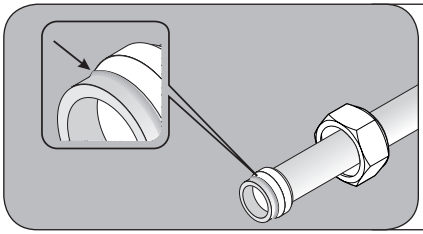
- Apply lubrication on the fitting (threading and cone).



- Insert tube with cutting ring and swivel nut into the fitting. Note: push tube into the fitting all the way, otherwise the tube connection might leak! **Note:** push tube into the fitting all the way, otherwise the tube connection might leak!
- Tighten swivel nut by hand.
- For control of the according rotations of the nut: mark nut.



- Tighten swivel nut with spanner approx. 1 1/2 rotations. Hold fitting with spanner.
  Note: The tube itself may not be turned!
- Loosen swivel nut.



- After preassembly with preassembly machine: check tube end for correct ridge on the tube.
  Note: The cutting ring can be turned but it cannot slide up and down the tube when it is correctly installed!

CAUTION:

- The preassembly of **steel tubes** directly in the fitting is **only recommended as an exception**.
- Preassembly of **stainless steel** tubes directly in the fitting **is not permissible!**

Final installation in the fitting: see page 9.

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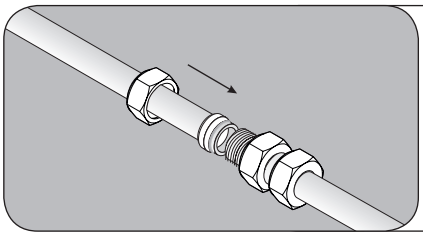
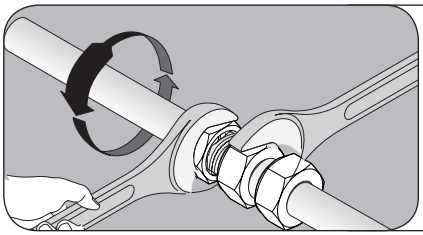
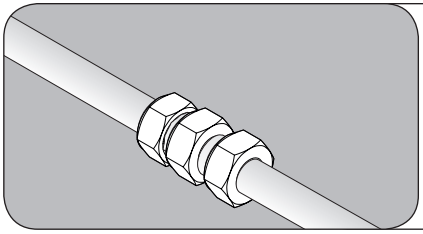
Installation in final location



- Always apply lubrication on nut and cutting ring with stainless steel fittings and steel fittings starting with 20 mm tube diameter.
- Insert preassembled tube with cutting ring and swivel nut into the fitting.

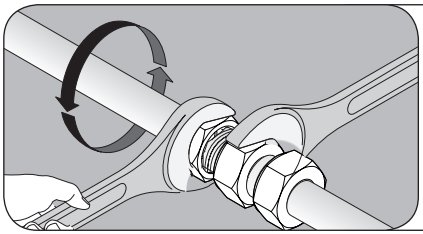


- Hold fitting with spanner.
- Tighten swivel nut with spanner approx. 1/4 rotation beyond sharp increase of force.



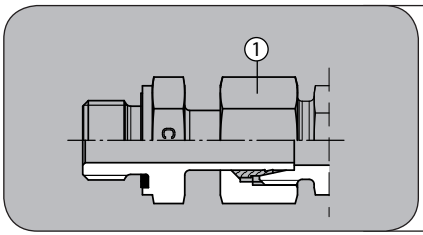
- The installation of the fitting with welding nipple is completed.

Repeated Installation

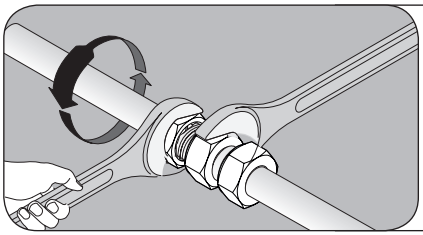


- The swivel nut is tightened without increased force when the installation is repeated.

Prefabricated Shaft-Fitting: Installation in final location



- Apply lubrication on the threading and cone of the fitting.
- Tighten swivel nut (1) by hand until you can feel that it is firmly pressed onto the fitting.



- Hold fitting with spanner.
- Fasten swivel nut (1) 1/4 to 1/3 rotations after sharp increase of required force.

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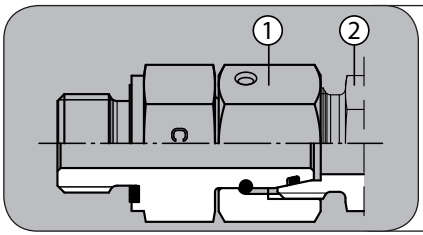
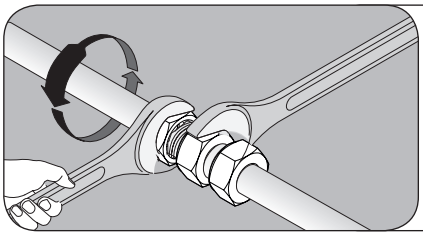
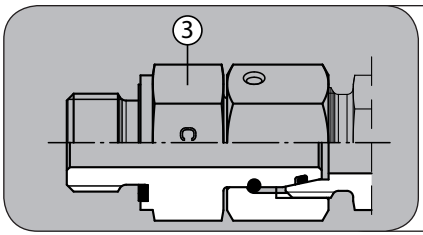
Installation in final location



- Apply lubrication on the threading and cone of the fitting.
- Tighten swivel nut (1) by hand until you can feel that it is firmly pressed onto the fitting.

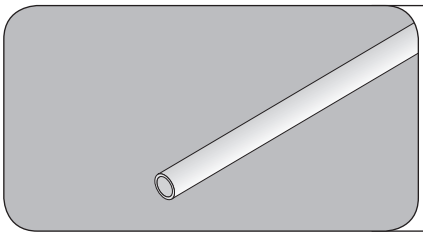


- Hold fitting (2) with spanner.
- Fasten swivel nut (1) 1/4 to 1/3 rotations after sharp increase of required force.

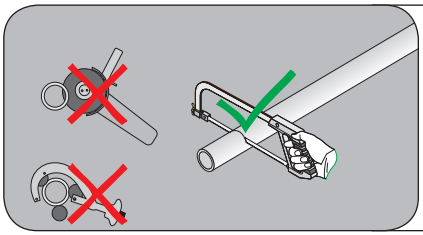


- Install tube side (3) according to respective version of the tube fitting.

Requirements

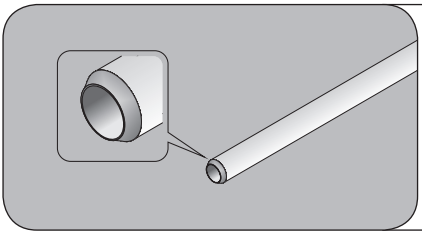


- Use tubes made of weldable steel for steel fittings.
- Use tubes made of weldable stainless steel for stainless steel fittings.



Cutting the tube:

- Use saw.
- Cut in 90 ° angle.
- Angle tolerance of 0.5 ° is tolerable!



- Slant tube end 30 ° for single V-joint. The slant of the tube must resemble slant of the welding nipple.
- The O-ring must be removed when you are welding!

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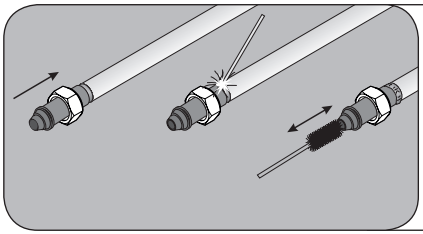
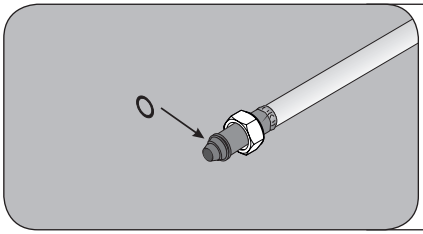
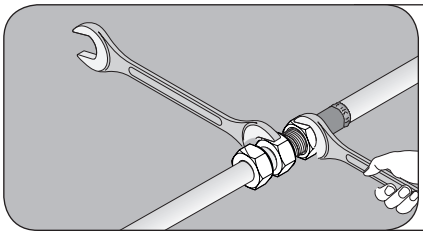
Preparation, Welding and Installation in Final Location



- Slide nut over welding nipple.
- Weld nipple to tube according to applicable regulations.
- **Notice:** remove welding residue inside the tube!



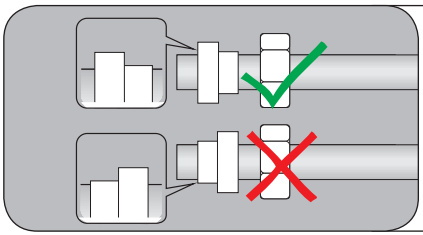
- Apply O-ring, O-ring can be lubricated if necessary.
- For stainless steel fittings: apply lubrication on threading of swivel nut and fitting.



- Tighten swivel nut by hand.
- Tighten swivel nut with spanner approx. 1/4 to 1/3 rotations.

The welding nipple fitting installation is completed.

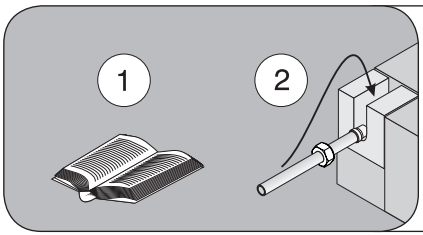
Requirements



Preparation of tube:

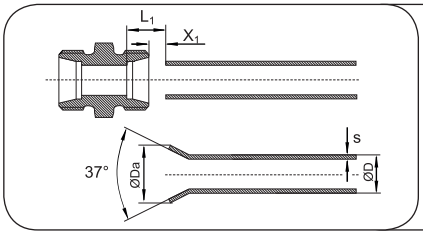
- Cut in 90 ° angle. Angle tolerance of 0.5 ° is tolerable!
- Slide pressure ring and swivel nut on tube as illustrated.

Assembly with flaring machine



Caution: Read documentation of the flaring machine before usage!

- Flare tube with flaring machine.



- Check tube for suitable flare: the diameter of the flare must comply with the values specified in the table below.

Flared Tube Fitting - Determining Tube Length

d [mm]	6		8			10			12			15			16				18			20			
s [mm]	1	1.5	1	1.5	2	1	1.5	2	1	1.5	2	1.5	2	2.5	1.5	2	2.5	3	1.5	2	2.5	2	2.5	3	3.5
x1 [mm]	1	2	1	2	2.5	1	2	3	1	2	3	1	2	3	0	1	1.5	2.5	0	1	1.5	1	2	3	4
L1 [mm]	8	9	8	9	9.5	8	9	10	8	9	10	8	9	10	8.5	9.5	10	11	7.5	8.5	9	11.5	12.5	13.5	14.5
Da min [mm]	9.1		11.3			13.1			15.3			19.1			20.6				23.2			25.6			
Da max [mm]	10		12			14			16			20			22				24			26.8			

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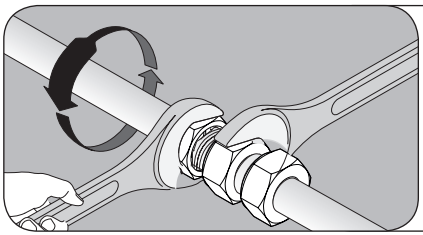
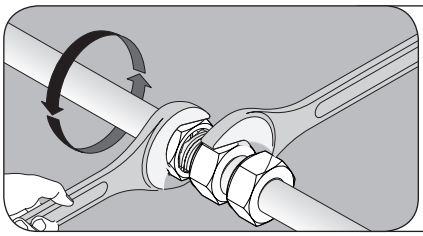
Installation in final location



- Apply threads of the fitting with lubrication
- Insert flare adapter into tube fitting.
- Fasten swivel nut with spanner until the intermediate ring is firmly attached in the shaft. Tighten nut approx. 1/4 to 1/3 rotations after sharp increase of required force.

Repeated Installation



- The swivel nut is tightened without increased force when the installation is repeated.

Flared Tube Fitting - Determining Tube Length

d [mm]	22				25				28			30					35				38				42		
s [mm]	1.5	2	2.5	3	2	2.5	3	4	2	2.5	3	2	2.5	3	4	5	2	2.5	3	4	2.5	3	4	5	2	3	4
x1 [mm]	1	2	3	3.5	1	1.5	2.5	4	1.5	2.5	3	-0.5	0.5	1	3	4.5	1.5	2	3	4.5	0	0.5	2	4	1.5	3	4.5
L1 [mm]	8.5	9.5	10.5	11	13	13.5	14.5	16	9	10	10.5	13	14	14.5	16.5	18	12	12.5	13.5	15	16	16.5	18	20	12.5	14	15.5
Da min [mm]	26.5				31.1				32.7			37					41.8				46				48.8		
Da max [mm]	27.5				33				33.3			38.7					42.7				47.2				49.8		

Assembly with supporting Sleeves

For steel tube in accordance with DIN 2391 made of the material St 37-4 and tubes made austenitic steel e.g. 1.4571

Outer tube diameter [mm]	Tube thickness [mm]							
	0.5	0.75	1	1.5	2	2.5	3	3.5
4	⊙	⊙						
6		●	⊙					
8			⊙		○	○		
10			⊙		○	○	○	
12			●	○	○	○	○	○
14			●	○	○	○	○	○
15			●	○	○	○	○	○
16			●	⊙	○	○	○	○
18			●	⊙	○	○	○	○
20				●	⊙	○	○	○
22			●	⊙	⊙	○	○	○
25					⊙	○	○	○
28				⊙	⊙	○	○	○
30					●	⊙	○	○
35					⊙	⊙	○	○
38						●	⊙	○
42					●	●	⊙	○

- ○ Support sleeve not required
- ⊙ Support sleeve required when the connection is opened often and when the system is subject to intensive wear and tear (vibrations)
- ● Support sleeve definitely required

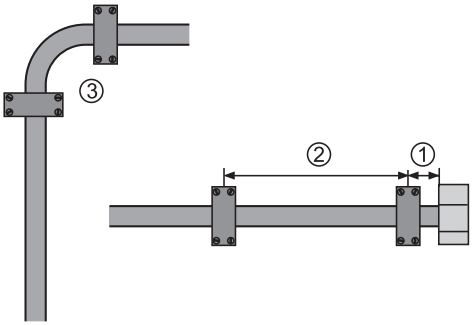
Note:
Tube deformations near the cutting ring can have negative effects on the function of the cutting ring connection. The deformation may not exceed 16 mm with tubes up to an outer diameter of 0.3 mm and 18 mm for tubes starting with an outer diameter of 0.4 mm.

Fixing in place

When fixing the tubes in place:

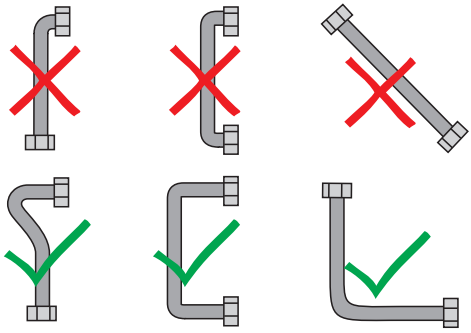
- Use suitable tube clamps
- Attach tube clamps to suitable underground.
- Install tube clamp near the fitting (1).
- See table (2) for distance between tube clamps.
- Install tube clamps before and after bends (3).
- Note distance from the tube clamp to the bend.
- Do not directly connect tubes.

Outer tube diameter [mm]	Distance of tube clamps [m]
6 - 12	1.00
14 - 22	1.20
25 - 30	1.50
35 - 38	2.00
38 - 42	2.70



Requirements for the correct installation of tubes

- Pay attention to the thermal expansion of the tubes.
- Relieve tension with tube curves
- Determine the tube length very carefully.
- Make sure that the components can be easily accessed later on.
- Design the tube system in an organized manner.
- Install the tubes without tension.



Standards

CONEXA fittings are manufactured in accordance with the following standards:

Fittings	International standard	DIN
Fittings with Cutting Ring	ISO 8434-1	DIN 2353
Cutting rings		DIN 3861
Fittings with 24° cone end		DIN 3942-45
Weld fittings		DIN 3865

CONEXA fittings comply with the technical delivery regulations in accordance with DIN 3859-1

			Male Stud Connector		Port	
Standard for fitting	Thread	Seal	International standard	DIN	International standard	DIN
ISO 8434-1	BSP-thread, parallel	Sealing edge	ISO 1179-4	DIN 3852-2 type B	ISO 1179-1	DIN 3852-2 type X
		Retaining ring	ISO 1179-2	DIN 3852-11 type E	ISO 1179-1	DIN 3852-11 Type X
	Metric thread	Sealing edge	ISO 9974-3	DIN 3852-1 type B	ISO 9974-1	DIN 3852-1 type X
		Retaining ring	ISO 9974-2	DIN 3852-11 type E	ISO 9974-1	DIN 3852-11 Type X
		O-Ring	ISO 6149-2/3		ISO 6149-1	
	UN/UNF		ISO 11926-2/3		ISO 11926-1	
	NPT		ANSI / ASME B1.20.1-1983		ANSI / ASME B1.20.1-1983	
	BSP-thread, tapered			DIN 3852-2 type C		DIN 3852-2 type Z
	metric thread, tapered			DIN 3852-1 type C		DIN 3852-1 type Z

CONEXA fittings comply with the applicable standards. Technical changes reserved.
Technical changes reserved.

Materials

The following materials are used for CONEXA products:

CONEXA Precision Fittings	Steel	Stainless steel
Barstock	11SMn30 (1.0715) 11SMnPb30 (1.0718)	X6CrNiMoTi17-12-2 (1.4571)
Form forgings	C35 (1.0501), C45 (1.0503)	X6CrNiMoTi17-12-2 (1.4571)

CONEXA Weld Nipple Fittings	Steel	Stainless steel
Barstock	C15 (1.0401), C22 (1.0402)	X6CrNiMoTi17-12-2 (1.4571)
Form forgings	C15 (1.0401), C22 (1.0402)	X6CrNiMoTi17-12-2 (1.4571)

CONEXA Elastomeric seals	For steel fittings	For stainless steel fittings
O-Rings	NBR (Standard) FKM (optional)	FKM (Standard)
Elastomeric seals	NBR (Standard) FKM (optional)	FKM (Standard)

Coating

The general properties of the material of stainless steel fittings make these resistant to atmospheric attack as well as any inorganic and organic medium (see also "Fluid Compatibility" starting page 26).

Tube fittings made of steel must be protected against erosive corrosion and pitting corrosion by means of a sophisticated coating.

Steel fittings from CONEXA are

- zinc coated by galvanization
- Thick-film passivated Cr(VI)-free
- coated with an additional nano-protection

The resistance of CONEXA fittings in salt spray tests in accordance with ISO 9227 has an average value of:

- Resistance in terms of white rust > 250 h
- Resistance in terms of red rust > 500 h

The Cr(VI)-free passivation of CONEXA products is non-harmful to the environment and complies with the EU-regulation 2000/52/EC.

All steel welding fittings are shipped with a phosphate conversion coating.

Steel fittings from CONEXA are zinc-galvanized and passivated in Cr(VI)-free solutions as well as they are sealed with an additional nano-coating. The cathodic protection of the separated zinc layer is drastically enhanced by the passivation and the additional coating.

The right part in the right position

The selection of the fitting type must take all feasible conditions into account. The internal end external factors that should definitively considered are listed in the following: The internal end external factors that should definitively considered are listed in the following:

Temperatures

- Ambient temperature
- Temperature of the medium under normal operation
- Temperature of the medium when system shut down

Pressure

- System pressure
- Pressure surges

Medium

- Chemical properties
- Viscosity
- State of matter

Flow volume

- Average flow volume
- Fluctuating flow volume
- Tube size

Assembly

- Serial fabrication of installation directly at system
- Available space on site
- Properties of the used tubes

Ambient conditions

- Temperatures
- Humidity
- Vibrations
- Atmosphere

Furthermore the following factors can be relevant for the selection of the fitting type:

- Applicable standards and regulations
- Specifications by the end customer
- Application type (e.g. mobile or stationary)

Selection of the material

When selecting the material for the fitting and the seal pay attention to the following:

Temperatures

- The material for the tube and the fitting must be selected according to the temperatures

Ambient conditions

- The material for the tube and the fitting must be sufficiently resistant in terms of corrosion

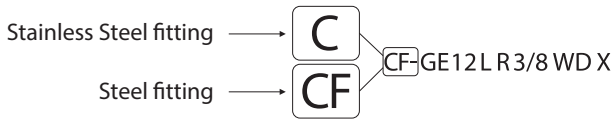
Medium

- (See also "fluid compatibility“ Seite)

When selecting the material for the fitting and the tube pay attention to the following:

	Material	
Tube	**Steel**	**Stainless steel**
Fitting	**Steel**	**Stainless steel**
Pressure	+++	+++
Temperature	++	+++
Corrosion (Surrounding)	+	+++
Corrosion (Media)	+	+++

CONEXA Ordering code for fitting material:



Selection of the type of tube connection

The tube connection must be resistant in terms of load and the ambient conditions at the system. Furthermore the requirements in terms of the regulations and standards at the system site. Furthermore the requirements in terms of the regulations and standards at the system site.

Pressure

- System pressure
- Pressure surges

Assembly

- Serial fabrication of installation directly at system
- Required space in system
- Properties of the used tubes

Type	Cutting Ring Fitting DPR	Cutting Ring Fitting DPR	Flared Tube Fitting BO	Welding Fitting SKA
Seal	**Metal**	**Elastomeric seal**	**Elastomeric seal**	**Elastomeric seal**
Pressure resistance	+++	++	+++	+++
ISO Standards	ISO 8434-1	-	-	ISO 8434-1
Other standards	DIN 2353 DIN 3861	-	DIN 3949	DIN 2353 DIN 3865
Tube material	Steel, stainless steel	Steel, stainless steel	Steel, stainless steel	Weldable steel, weldable stainless steel

Selection of the material for the seals

The material for the seal must be selected taking the following factors into account:

Temperatures

- The material must be selected according to the temperatures

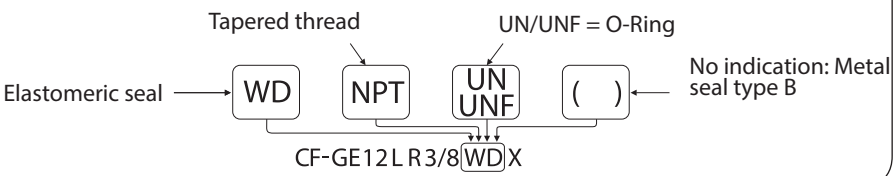
Medium

- The material resistant to the medium. (See also fluid compatibility“ starting page 26).

Seal	Metal	NBR	FKM
Pressure resistance	++	+++	+++
Resistance against low temperatures	+++	++	+
Resistance against high temperatures	+++	+	++
Resistance against aggressive Medium*	+++	+	++
Reliability	+	+++	+++
First installation and repeated installation	Simple	Very simple	Very simple
Exchanging of seal	Only complete part	Simple	Simple

* Resistance of the different materials towards the different fluids is specified in „Fluid Compatibility“.

CONEXA ordering code for seal:



The right series

The series is selected according to the expected pressure in the system while sometimes the available space on site is taken into account.

Pressure

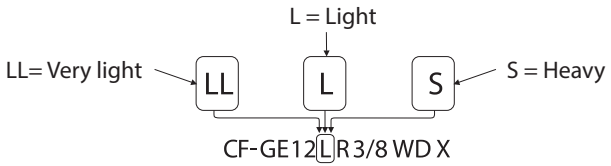
- System pressure
- Pressure surges

Assembly

- Required space in system

Series	LL (very light)	L (light)	S (heavy)
Pressure resistance	100 bar	160 - 500 bar	250 - 800 bar
Heavy duty applications	+	++	+++
Required space	Minimal	Low	High
Required torque	Very low	Normal	High

CONEXA Ordering code for series:



The correct stud connector

When selecting the type of male stud connectors the following must be considered:

Temperatures

- Use seal based on elastomeric material, when the temperature allows this

Pressure

- System pressure
- Pressure surges

Type	Male Stud Connector with O-ring (Type F)	Male stud connector with elastomeric seal (Type E)	Male stud connector with sealing edge (Type B)	Male stud connector with retaining ring (Type A)	Male stud connector with tapered thread (Type C)
Thread	Metric	Metric	Metric	Metric	Metric
Standard thread	M 16X1,5 DIN 13-21/-22	M 16X1,5 DIN 13-21/-22	M 16X1,5 DIN 13-21/-22	M 16X1,5 DIN 13-21/-22	M 16X1,5, tapered. DIN 158
Pressure resistance	++	++	++	+	+
Sealing performance	+++	+++	++	++	+
Sealing agent	Not required	Not required	Not required	Not required	Definitely required
Use	High pressure hydraulics	High pressure hydraulics, gaseous medium	Aggressive media; extreme temperatures	Pneumatics	Limited requirements

Type	Male Stud Connector with O-ring (Type F)	Male stud connector with elastomeric seal (Type E)	Male stud connector with sealing edge (Type B)	Male stud connector with retaining ring (Type A)	Male stud connector with tapered thread
Thread	UN/UNF thread	BSPP	BSPP	BSPP	BSPT
Standard thread	3/4 - 16 UNF ISO 725, ANSI B 1.1	G 1/4A DIN EN ISO 228-1	G1/4A DIN EN ISO 228-1	G1/4A DIN EN ISO 228-1	R1/4 (short)
Pressure resistance	++	++	++	+	+
Sealing performance	+++	+++	++	++	+
Sealing agent	Not required	Not required	Not required	Not required	Definitely required
Use	High pressure hydraulics	High pressure hydraulics, gaseous medium	Aggressive media; extreme temperatures	Pneumatics	Limited requirements

Type	Male stud connector with tapered thread *	Male stud connector with tapered thread
Thread	BSPT	NPT
Standard thread	R1/4, DIN 2999-1 ISO 7	G1/2-14 NPT ANSI B1.20.1
Pressure resistance	+	+++
Sealing performance	+	+
Sealing agent	Definitely required	Definitely required
Use	Limited requirements	

* Only upon special request

Fluid Compatibility

The material of the fitting and the material for the seal must be selected according to the medium and the location!

The data listed below is a recommendation for static seals such as o-rings and profile sealing rings in tube fittings.

This is based on experience and specifications supplied by the manufacturer.

This table is therefore only a guideline.

Medium	Fitting material		Seal material		
	Steel	Stainless steel	NBR	FKM	EPDM
Acetone	2	1	3	3	1
Acetylene	2	1	3	3	2
Ammonia liquid	2	1	2	3	1
Ammonia gas, cold	1	1	1	3	1
Aral, Vitam BAF	1	1	1	1	3
Argon	1	1	1	1	1
Asphalt	3	1	2	1	3
ASTM-oil, No.1	1	1	1	1	3
ASTM-oil, No.2	1	1	1	1	3
ASTM-oil, No.3	1	1	1	1	3
ASTM-oil, No.4	1	1	2	1	3
ATF oil	1	1	1	1	3
Ethanol (Ethylacohol)	1	1	1	3	1
Ether	1	1	3	3	2
Gasoline	2	1	3	1	3
Benzene	1	1	3	1	3
Brake fluid	1	1	3	3	1
Butane	1	1	1	1	3
Castrol, Biotec HVX	1	1	1	1	3
	Suitability: 1 = resistant 2 = limited resistance 3 = not resistant X = no information NBR = e.g. Perbunan (trademark of Bayer) FKM = e.g.. Viton (trademark of DuPont) EPDM = ethylene propylene diene monomer				

Fluid Compatibility

Medium	Fitting material		Seal material		
	Steel	Stainless steel	NBR	FKM	EPDM
Chlorine (dry)	3	1	3	1	X
Steam	2	1	3	3	1
DEA, Econa E22	1	1	1	X	3
DEA, Econa E46	1	1	1	X	3
Diesel fuel	1	1	1	1	3
Pressurized air	1	1	1	1	1
ECOOL	1	1	1	1	X
Natural gas	2	1	1	1	3
Fossil oil	1	1	2	1	3
ESSO, Univis 13	1	1	1	1	3
ESSO, Univis 26	1	1	1	1	3
ESSO, Univis 32	1	1	1	1	3
ESSO, Univis 46	1	1	1	1	3
FINA, Biohydran RS 38	1	1	1	1	3
FRAGOL, Hydrolub 125	1	1	1	X	3
Freon 11	X	X	2	2	3
Freon 12	1	3	2	1	3
Freon 22	3	1	3	2	3
Transmission oil	1	1	1	1	3
Glycerine	2	1	1	1	1
Glycol (ethylene glycol)	1	1	1	1	1
Domestic fuel oil	1	1	1	1	3
Helium	1	1	1	1	1

Suitability:
1 = resistant
2 = limited resistance
3 = not resistant
X = no information

NBR = e.g. Perbunan (trademark of Bayer)
FKM = e.g.. Viton (trademark of DuPont)
EPDM = ethylene propylene diene monomer

Fluid Compatibility

Medium	Fitting material		Seal material		
	Steel	Stainless steel	NBR	FKM	EPDM
Houghton Safe 1120	1	1	3	1	1
Houghton Safe 620	1	1	1	2	1
Hydraulic oil, mineral	1	1	1	1	3
Hydrolube	1	1	1	1	1
Iodine	3	1	2	1	2
Kerosene	1	1	1	1	3
Carbon dioxide	1	1	1	2	1
Carbon monoxide	1	1	1	1	1
Carbonic acid	3	1	2	1	1
Air (without oil)	1	1	1	1	1
Seawater	3	2	1	1	1
Methane	1	1	1	1	3
Methanol	1	1	3	3	1
MIL-F-8192 (JP-9)	1	1	3	1	3
MIL-H-5606	1	1	1	1	3
MIL-H-6083	1	1	1	1	3
MIL-H-7083	1	1	1	2	1
MIL-H-8446 (MLO-8515)	1	1	2	1	3
MIL-L-2104 & 2104B	1	1	1	1	3
MIL-L-7808	2	1	2	1	3
Mineral oils	1	1	1	1	3
Natural as, unprocessed	3	1	3	3	3
Neon	3	1	1	1	1
Ozone	1	1	3	1	1
Crude Oil	1	1	1	1	3
Phosphoric acid	3	3	3	1	2
Plantohyd 32 S	1	1	1	X	3

Suitability:
1 = resistant
2 = limited resistance
3 = not resistant
X = no information

NBR = e.g. Perbunan (trademark of Bayer)
FKM = e.g.. Viton (trademark of DuPont)
EPDM = ethylene propylene diene monomer

Fluid Compatibility

Medium	Fitting material		Seal material		
	Steel	Stainless steel	NBR	FKM	EPDM
Plantohyd 40 N	1	1	1	1	3
Propane	1	1	1	1	3
R 134 A	1	1	3	3	1
Flue gas	3	1	3	2	X
Raw oil	2	1	2	1	3
Nitric acid	3	1	3	2	3
Hydrochloric acid	3	2	3	1	2
Saltwater (NaCl)	X	1	1	1	1
Oxygen (gas, cold)	3	1	3	3	3
Lubricating oil SAE 10, 20, 30, 40, 50	1	1	1	1	3
Cutting oil	1	1	1	3	1
Sulfur dioxide	3	1	3	3	1
Sulfuric acid	3	2	3	1	3
Soap solutions	3	1	1	1	1
SHELL, Naturelle HF-E-46	1	1	1	1	3
SHELL, Tellus Oil DO 32	1	1	1	1	3
Silicon oils	1	1	1	1	1
Skydrol 500	1	1	3	3	1
Skydrol 7000	1	1	3	2	1
Nitrogen	1	1	1	1	1
Turpentine	2	1	1	1	3
Toluene	1	1	3	2	3
Trichloroethane	2	1	3	1	3
Water	2	1	1	2	1
Hydrogen	3	1	3	3	3
Hydrogen peroxide	3	1	3	1	2
Xylene	1	1	3	1	3
	Suitability: 1 = resistant 2 = limited resistance 3 = not resistant X = no information NBR = e.g. Perbunan (trademark of Bayer) FKM = e.g., Viton (trademark of DuPont) EPDM = ethylene propylene diene monomer				

Installation-torques for male stud connectors with BSPP thread in accordance with:

- ISO 1179-2
- DIN 3852-2/11

Series	Outer tube diameter	Thread	Male Stud Connector			Banjo fitting	Blanking plug
			Type A [Nm]	Type B [Nm]	Type E [Nm]	WH / TH [Nm]	VSTI Type E [Nm]
L	6	G 1/8 - A	9	18	18	18	12
	8	G 1/4 - A	35	35	35	45	30
	10	G 1/4 -A	35	35	35	45	30
	12	G 3/8 - A	45	70	70	70	50
	15	G 1/2 - A	65	140	90	120	80
	18	G 1/2 - A	65	100	90	120	80
	22	G 3/4 - A	90	180	180	230	135
	28	G 1 - A	150	330	310	320	200
	35	G 1 1/4 - A	240	540	450	540	360
	42	G 1 1/2 - A	290	630	540	700	450
	6	G 1/4 - A	35	55	40	45	30
	8	G 1/4 - A	35	55	40	45	30
	10	G 3/8 - A	45	90	80	70	50
	12	G 3/8 - A	45	90	80	70	50
	14	G 1/2 - A	65	150	115	120	80
	16	G 1/2 - A	65	130	115	120	80
	20	G 3/4 - A	90	270	180	230	135
	25	G 1 - A	150	340	310	320	200
	30	G 1 1/4 - A	240	540	450	540	360
	38	G 1 1/2 - A	290	700	540	700	450

- Tolerance for torques: + 10 %
- Lubricate threads
- Torque specified here for steel fittings,
- Use upper range for stainless steel fittings.

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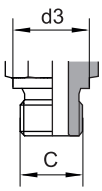
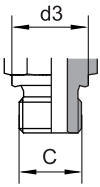
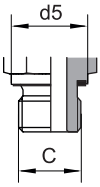
Installation-torques for metric male stud connectors in accordance with:

- ISO 9974-2/3
- DIN 3852-1/11
- DIN ISO 6149-2/3

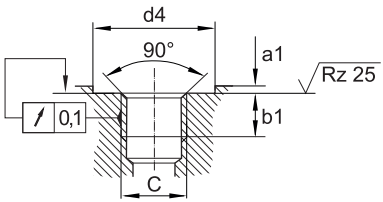
Series	Outer tube diameter	Thread	Male Stud Connector				Banjo fitting	Blanking plug
			Type A [Nm]	Type B [Nm]	Type E [Nm]	Type F [Nm]	WH / TH [Nm]	VSTI Type E [Nm]
L	6	M 10 x 1.0	9	18	18	15	18	12
	8	M 12 x 1.5	20	30	25	25	45	25
	10	M 14 x 1.5	35	45	45	35	55	35
	12	M 16 x 1.5	45	65	55	40	80	50
	15	M 18 x 1.5	55	80	70	45	100	65
	18	M 22 x 1.5	65	140	125	60	140	90
	22	M 26 x 1.5	90	190	180	100	320	135
	28	M 33 x 2.0	150	340	310	160	360	225
	35	M 42 x 2.0	240	500	450	210	540	360
	42	M 48 x 2.0	290	630	540	210	700	360
S	6	M 12 x 1.5	20	35	40	35	45	25
	8	M 14 x 1.5	35	55	40	45	55	35
	10	M 16 x 1.5	45	70	70	55	80	50
	12	M 18 x 1.5	55	110	90	70	100	65
	14	M 20 x 1.5	55	150	125	80	125	80
	16	M 22 x 1.5	65	170	135	100	135	90
	20	M 27 x 2.0	90	270	180	170	320	170
	25	M 33 x 2.0	150	410	310	310	360	225
	30	M 42 x 2.0	240	540	450	330	540	360
	38	M 48 x 2.0	290	700	540	420	700	360

- Tolerance for torques: + 10 %
- Lubricate threads
- Torque specified here for steel fittings,
- Use upper range for stainless steel fittings.

Male Stud Connectors, ports

Male Stud Connector	Male Stud Connector	Male Stud Connector
Type A	Type B	Type E
Seal with sealing ring (DIN 7603)	Seal with sealing edge	Seal with sealing ring (elastomeric seal)
Metric thread:	**Metric thread:**	**Metric thread:**
DIN 3852-1	ISO 9974-3 / DIN 3852-1	ISO 9974-2 / DIN 3852-11
BSP-thread:	**BSP-thread:**	**BSP-thread:**
DIN 3852-2	ISO 1179-4 / DIN 3852-2	ISO 1179-2 / DIN 3852-11
		

Port
Type X
Metric thread:
ISO 9974-1 / DIN 3852-1
BSP-thread:
ISO 1179-1 / DIN 3852-2



C	M 8x1	M 10x1	M 12x1.5	M 14x1.5	M 16x1.5	M 18x1.5	M 20x1.5	M 22x1.5	M 26x1.5	M 27x2	M 33x2	M 42x2	M 48x2
d3 -0.4	12.0	14.0	17.0	19.0	21.0	23.0	25.0	27.0	31.0	32.0	39.0	49.0	55.0
d5 -0.2	-	13.9	16.9	18.9	21.9	23.9	25.9	26.9	31.9	31.9	39.9	49.9	54.9
d4 min.	13	15.0	18.0	20.0	23.0	25.0	27.0	28.0	33.0	33.0	41.0	51.0	56.0
d4 +0.4 min	17.0	20.0	20.0	21.5	24.5	27.5	30.0	31.5	36.5	37.5	45.0	55.0	62.5
b1 max.	8.0	8.0	12.0	12.0	12.0	12.0	14.0	14.0	16.0	16.0	18.0	20.0	22.0
a1	1.0	1.0	1.5	1.5	1.5	2.0	2.0	2.5	2.5	2.5	2.5	2.5	2.5

C	G 1/8	G 1/4	G 3/8	G 1/2	G 3/4	G1	G1 1/4	G1 1/2
d3 -0.4	14.0	18.0	22.0	26.0	32.0	39.0	49.0	55.0
d5 -0.2	13.9	18.9	21.9	26.9	31.9	39.9	49.9	54.9
d4 min.	15.0	20.0	23.0	28.0	33.0	41.0	51.0	56.0
d4 +0.4	17.0	21.5	25.5	30.0	37.0	47.0	58.0	63.5
b1 min.	8.0	12.0	12.0	14.0	16.0	18.0	20.0	22.0
a1 max.	1.0	1.5	2.0	2.5	2.5	2.5	2.5	2.5

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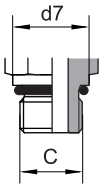
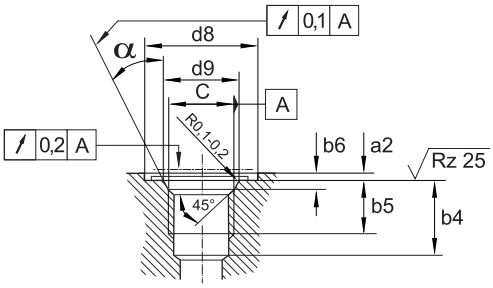
Male Stud Connectors, ports

Male Stud Connector
Seal with O-ring
Metric thread:
ISO 6149-2 and 3
UN/UNF-thread:
ISO 11926-2 and 3



Port
Metric thread:
ISO 6149-1
UN/UNF-thread:
ISO 11926-1



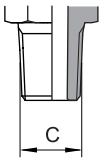
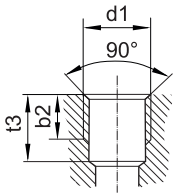
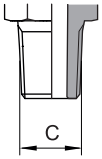
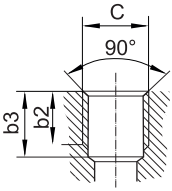
ISO 6149

C	M 10x1	M 12x1.5	M 14x1.5	M 16x1.5	M 18x1.5	M 20x1.5	M 22x1.5	M 26x1.5	M 27x2	M 33x2	M 42x2	M 48x2
d7 +/- 0.2	13.8	16.8	18.8	21.8	23.8	26.8	26.8	30.9	31.8	40.8	49.8	54.8
d8 min.	20	23	25	28	30	32	34	37	40	49	60	66
d9 +0.1	11.1	13.8	15.8	17.8	19.8	21.8	23.8	29.05	29.4	35.4	44.4	50.4
b4 min	11.5	14	14	15.5	17	17	18	18.5	22	22	22.5	25
b5 min.	10	11.5	11.5	13	14.5	14.5	15.5	16	19	19	19.5	22
b6 +0,4	1.6	2.4	2.4	2.4	2.4	2.4	2.4	3.1	3.1	3.1	3.1	3.1
a2 max.	1	1.5	1.5	1.5	2	2	2	2	2	2.5	2.5	2.5
α +/- 1°	12°	15°	15°	15°	15°	15°	15°	15°	15°	15°	15°	15°

ISO 11926

C	7/16"-20 UNF	1/2"-20 UNF	9/16"-18 UNF	3/4"-16 UNF	7/8"-14 UNF	1 1/16"-12 UN	1 5/16"-12 UN	1 5/8"-12 UN	1 7/8"-12 UN
d7 SAE J 514	16	17	17.6	22.3	25.5	31.9	38.2	48	55
d8 min.	21	23	25	30	34	41	49	58	65
d9 +/- 0,05	12.45	14.05	15.7	20.65	24	29.2	35.55	43.55	49.9
b4 min	14	14	15.5	17.5	20	23	23	23	23
b5 min.	11.5	11.5	12.7	14.3	16.7	19	19	19	19
b6 +0,4	2.4	2.4	2.5	2.5	2.5	3.3	3.3	3.3	3.3
a2 max.	1.6	1.6	1.6	2.4	2.4	2.4	3.2	3.2	3.2
α +/- 1°	12°	12°	12°	15°	15°	15°	15°	15°	15°

Male Stud Connectors, Ports

Male Stud Connector	Port	Male Stud Connector	Port
Type C	Type Z	NPT tapered thread	NPT tapered
Metric thread:	**Metric thread:**	**NPT:**	**NPT:**
DIN 3852-1	DIN 3852-1	ANSI/ASME B1.20.1-1983	ANSI/ASME B1.20.1-1983
BSP-thread:	**BSP-thread:**	**NPTF:**	**NPTF:**
DIN 3852-2	DIN 3852-2	ANSI/ASME B1.20.3-1976	ANSI/ASME B1.20.3-1976
			

Metric, tapered

C	M 8x1 KEG	M 10x1 KEG	M 12x1.5 KEG	M 14x1.5 KEG	M 16x1.5 KEG	M 18x1.5 KEG	M 20x1.5 KEG	M 22x1.5 KEG
d1	M 8x1	M 10x1	M 12x1.5	M 14x1.5	M 16x1.5	M 18x1.5	M 20x1.5	M 22x1.5
b2 min. [mm]	5.5	5.5	8.5	8.5	8.5	8.5	10.5	10.5
t3 min. [mm]	10.0	10.0	13.5	13.5	13.5	13.5	15.5	15.5

BSP - thread, tapered

C	R 1/8	R 1/4	R 3/8	R 1/2
d1	Rp 1/8	Rp 1/4	Rp 3/8	Rp 1/2
b2 min. [mm]	5.5	8.5	8.5	10.5
t3 min. [mm]	8.5	12.5	12.5	16.5

NPT - Thread

C	1/8 NPT	1/4 NPT	3/8 NPT	1/2 N PT	3/4 NPT	1 NPT	1 1/4 NPT	1 1/2 NPT
b2 min. [mm]	6.9	10.0	10.3	13.6	14.1	16.8	17.3	17.3
b3 min. [mm]	11.6	16.4	17.4	22.6	23.1	27.8	28.3	28.3

When the ports have a metric ISO thread in accordance with DIN 13 the sealing is only given when a liquid or elastic sealant is used !

Inside tube diameter

When the tube diameter is to small the flow velocity is increased which results in turbulence, increased temperatures and a pressure reduction. This then results in an increased energy demand for the entire system and increased conditions (temperature of the fluid, cavitation). This can result in premature wear and tear of the system.

A tube diameter that is to high increases the stress on the system and increases costs. We recommend to take the following flow velocities into account in hydraulic systems:

Pressure line	Return line	Suction line
3 to 5 m/s	2 to 4 m/s max.	1 m/s max.

The following formula can be used in order to determine the inside diameter of the tube:

$$\text{Inside tube diameter [mm]} = 4.61 \times \sqrt{\frac{\text{Flow rate [l/min]}}{\text{Flow velocity [m/s]}}}$$

Tube thickness

The following page illustrates the nominal pressure of the tube depending on the wall thickness. The nominal pressure is calculated with the following formula:

$$p = 10\ K \cdot \ln\left(\frac{DA}{DI}\right) \cdot \frac{1}{S}\ [bar]$$

K: Tensile strength [N/mm²] **DA**: Ø Outside [mm] **DI**: Ø Inside [mm] **S**: Safety correction value

This formula is used in DIN ISO 10763 and is takes the tangential forces on the inside of the tube into account. Using DIN ISO 1073 in general results in reduced nominal pressures compared with DIN 2413. Using DIN ISO 10763 is recommended due to the fact that the results are more precise which is essential for a 4-fold system safety.

Important information for selection of the tube and subsequent processing:

- A reliable tube system assembly can only be given when seamless precision steel tubes type St 37.4 or St 52.4 (steel) or e.g. 1.4571 (stainless steel) are used. Take DIN 2391-1 into account for tolerances.
- Bend tubes correctly (maintain roundness, stick to bending radius limitations)
- Keep temperature range in mind (e.g. higher temperatures reduce the nominal pressure rating of stainless steel tubes)
- Keep thermal expansion of the tube in mind
- Pay attention to external conditions such as tube weight

Permissible pressures for stainless steel tubes, 1.4571
(calculated values in accordance with DIN ISO 10763 , safety correction value S = 4)

Outer tube diameter [mm]	Wall thickness [mm]	Pressure [bar]
4	0.5	259
4	1	624
5	0.5	201
5	1	460
6	1	365
6	1.5	624
6	2	989
8	1	259
8	1.5	423
8	2	624
8	2.5	883
10	1	201
10	1.5	321
10	2	460
10	2.5	624
10	3	825
12	1	164
12	1.5	259
12	2	365
12	2.5	485
12	3	624
12	3.5	788
14	2	303
14	2.5	398
14	3	504
14	3.5	624
14	4	763
15	1.5	201
15	2	279
15	2.5	365
15	3	460
16	2	259
16	2.5	337
16	3	423
18	1.5	164
18	2	226
18	2.5	293
18	3	365

Outer tube diameter [mm]	Wall thickness [mm]	Pressure [bar
20	2	201
20	2.5	259
20	3	321
20	3.5	388
20	4	460
22	1.5	132
22	2	181
22	2.5	232
22	3	287
22	3.5	345
25	2	157
25	2.5	201
25	3	247
25	4	347
25	5	460
28	2	139
28	2.5	177
28	3	217
28	3.5	259
30	2	129
30	3	201
30	4	279
30	5	365
30	6	460
32	2	120
32	2.5	153
32	3	187
35	2	109
35	2.5	139
35	3	169
35	4	234
35	5	303
38	2	100
38	3	155
38	4	213
38	5	275
38	6	342
42	2	90
42	3	139
42	4	190
42	5	245

Temperatures

Permissible operating temperature depending on the fitting material:

Fittings:

- **Steel** (DIN 3859-1): -40°C to +120°C
- **Stainless Steel** (DIN 3859-1): -60°C to 100°C

(The nominal pressures PN apply for a temperature range from -20° to +120°C. Higher temperatures and mechanical stress result in reduced pressures).

Seals:

- **NBR:** -25°C to +100°C
- **FPM:** -15°C to +200°C
- **PTFE:** -100°C to +250°C

When different materials for the fittings and the seals are combined the highest of the respective lowest temperatures and the lowest of the respective highest temperature applies.

Ambient temperature:

With seal material NBR -35°C

With seal material FPM -25°C

Storage

Storage of fittings with elastomeric seals must be done in accordance with DIN 7716.

The fittings with elastomeric seals must be stored in a cool, dry and dust-free environment. The fittings with elastomeric seals must be protected from direct light, bright artificial lighting (UV-radiation) and ozone. The fittings with elastomeric seals must be protected from direct light, bright artificial lighting (UV-radiation) and ozone.

Pressure ratings, permissible operating pressures

The pressures PN listed in this document are nominal pressures in accordance with DIN 2401. The nominal pressures apply for normal operating conditions (max. 120 °C, constant load) and are specified as tolerable operating pressures with 4-fold safety.

The operating pressure must be assumed to be lower while maintaining the safety when

- the fittings are subject to heavy load
- there are higher temperatures (over 120 °C)
- the fitting is subject to significant pressure surges

The specified permissible load always refers to the fitting. The pressure ratings specified by the tube manufacturer apply for the tubes. The pressure ratings specified by the tube manufacturer apply for the tubes.

Permissible operating pressures

The nominal pressures PN specify the maxim permissible operating pressures including pressure surges. Higher temperatures and mechanical stress result in reduced pressures. Higher temperatures and mechanical stress result in reduced pressures.

The nominal pressure of a combination of fittings is defined by the fitting with the lowest pressure rating.

Please Note

The pressures for the different series are available in the following tables:

Series	LL			L									
Outer diameter of tube [mm]	4	6	8	6	8	10	12	15	18	22	28	35	42
Steel [bar]	100			315 - 500						160 - 400			
Stainless Steel [bar]	100			315						160			

Series	S									
Outer diameter of tube [mm]	6	8	10	12	14	16	20	25	30	38
Steel [bar]	630 - 800					400				315-400
Stainless Steel [bar]	630					400				250

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Pressure reduction, depending on temperature

Any usage beyond the permissible operating temperatures result in accordingly reduced pressure ratings. The reduction of the pressure ratings depends on the material and the temperature. The material of the fitting and the seal must be selected according to the operating temperature.

Fitting Material	Temperature [° C]													
	-60	-40	-35	-25	+20	+50	+100	+120	+150	+175	+200	+250	+300	+400
Steel fitting		0%							11%	19%		28%		
Steel tube		0%							19%			27%		
Stainless Steel fitting	0%							11%			20%		30%	
Stainless Steel Tubes	0%					5.5%	11.5%	21.5%				29%		34%
Brass Fitting	35%													
Seal material NBR														
Seal material FKM														
Seal material EPDM[1]														

Permissible operating temperature
Permissible ambient temperature
Temperature not permissible

[1] EPDM is not compatible with oil and it is not a standard product

Pressure drop in tube systems

Determining the pressure drop is essential for the overall system design and specification of the pumps. The pressure drop can be determined with measurements within the real system - it often is better to identify the pressure drops in the planning phase. The calculation of the pressure drops in tube systems is described in the following. The CONEXA engineering team will be gladly at your service when you encounter any questions.

Used Values:

Inside tube diameter	d [m]
Tube length	L [m]
Cinematic viscosity (depending on temperature)	$\nu(T)$ [m^2/s]
Density of the fluid (depending on temperature)	$\rho(T)$ [kg/m^2]
Pressure	p [Pa]
Flow rate	$\dot{V}$ [m^2/s]
Flow velocity	c [m/s]
Reynolds' number	Re
Tube friction factor	λ
Pressure drop coefficient	ζ

Laminar or turbulent flow

The determination of the pressure drop greatly depends on wether the flow is laminar or turbulent. The tube friction factor is calculated with two different formulas, depending on wether a laminar or turbulent flow is present. The tube friction factor is calculated with two different formulas, depending on wether a laminar or turbulent flow is present.

Laminar flow = reduced pressure drop

Turbulent flow = significantly increased pressure drop

Calculation of the Reynolds' number:

Reynolds' number $Re = \frac{c \cdot d}{\nu(T)}$

Reynolds' number Re < 2320 laminar flow	Reynolds' number Re > 2320 turbulent flow
Calculation of tube friction factor λ:	
$\lambda = \frac{64}{Re}$ (for Re < 2320)	$\lambda = \frac{0.3164}{\sqrt[4]{Re}}$ (for Re ≥ 2320)

The pressure drop inside the tube is specified with the value Δp while it is computed as follows:

$$\Delta p = \lambda \cdot \frac{L}{d} \cdot \frac{p(T) \cdot c^2}{2} \text{ [Pa]}$$

Individual resistance of the components in the system

The total pressure drop is the sum of the pressure drop in the tubes and the pressure drop of the different components in the system. The individual pressure drop of the different components is determined with the following characteristic values:

Calculation of the individual pressure drop:

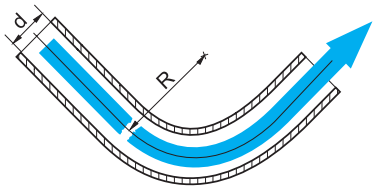
$$\Delta p = \zeta \cdot \rho(T) \cdot \frac{c^2}{2} \ [Pa]$$

The pressure drop coefficients for the different components are specified in the following. They are the average values for the entire type.

Pressure drop coefficient for bends

The pressure drop depends on the ratio of the inner diameter to the radius of the bend:

Bend radius / Tube diameter	Pressure drop coefficient
$\frac{R}{d} = 2$	$\zeta = 0.21$
$\frac{R}{d} = 4$	$\zeta = 0.14$
$\frac{R}{d} \leq 6$	$\zeta = 0.11$

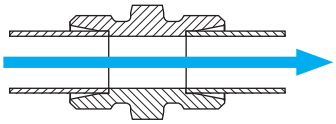


Pressure drop coefficient for straight fittings

e.g: C-G, C-GE, C-EGE

The pressure drop for straight fittings is minimal or even negligible. In general one can assume the following pressure drop coefficient: In general one can assume the following pressure drop coefficient:

Straight fitting	$\zeta = 0.01 \ldots 0.05$

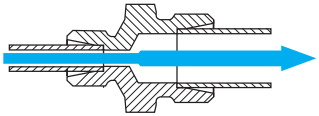


Pressure drop coefficient for reducers, extension in direction of the flow

e.g.: C-RED, C-GR, C-KOVO,

The pressure drop coefficient of extensions with a reduction in direction of the flow is determined as follows:

$$\zeta = \left(\frac{A_2}{A_1} - 1\right)^2$$



A_1 = cross section of the opening
A_2 = cross section of the exit

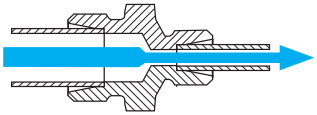
Specifying a value here does not make sense due to the fact that the pressure drop coefficient can be anywhere between 1.5 and 5000.

Pressure drop coefficient for reducers, reduction in direction of the flow

e.g.: C-RED, C-GR, C-KOVO

The pressure drop coefficient of extensions with an extension in direction of the flow is determined as follows:

Cross section of the exit (A_2) / cross section of the opening (A_1)	Pressure drop coefficient
$A_2/A_1 = 0{,}8$	$\zeta = 0.15$
$A_2/A_1 = 0{,}6$	$\zeta = 0.25$
$A_2/A_1 = 0{,}4$	$\zeta = 0.35$
$A_2/A_1 = 0{,}2$	$\zeta = 0.42$



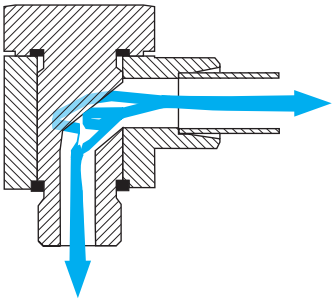
A_1 = cross section of the opening
A_2 = cross section of the exit

Pressure drop coefficient for banjo fittings

e.g.: C-WH-M, C-WH-R

The position of the internal screw has significant impact on the pressure drop coefficient. The position of this internal screw cannot be predicted beforehand. Due to this the pressure drop coefficient is therefore specified as a possible range:

Type	Pressure drop coefficient
C-WH	$\zeta = 3 \ldots 6$



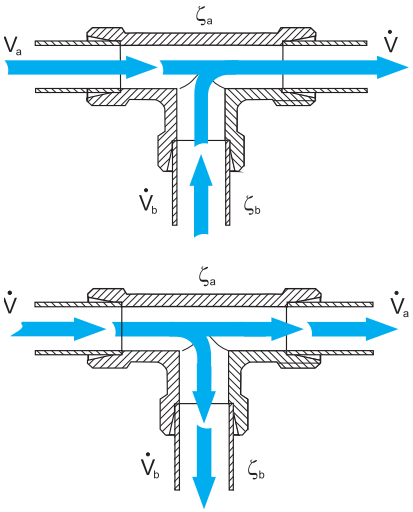
Pressure drop coefficient for manifolds,

e.g.: C-K, C-TE, C-T, C-ET, C-EVT, C-EVL

With manifolds it depends on the fact wether the manifold is used in order to divide a flow or in order to join a flow:

Degree of division (divided flow volume / total flow volume)	Drop coefficient ζ with divided flow		Drop coefficient ζ with joined flow	
$\dot{V}_b / \dot{V}$	ζ_a	ζ_b	ζ_a	ζ_b
0.6	0.07	0.95	0.40	0.47
0.8	0.20	1.10	0.50	0.73
1.0	0.35	1.30	0.60	0.92

(Index „a“: straight direction of flow in the fitting)
(Index „b“: division within the fitting)



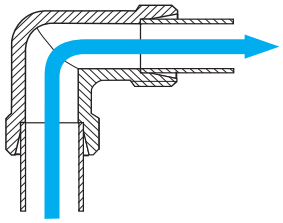
Pressure drop coefficient for elbow fittings

e.g.: C-W, C-EW

One can assume the following pressure drop coefficient for elbow fittings:

Elbow fitting	ζ < 1 *

* CONEXA elbow fittings (such as e.g. C-W) are manufactured without reduction of the cross section in the fitting starting with the size 10-L/12-S.

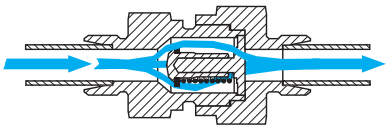


Pressure drop coefficient for non-return valves

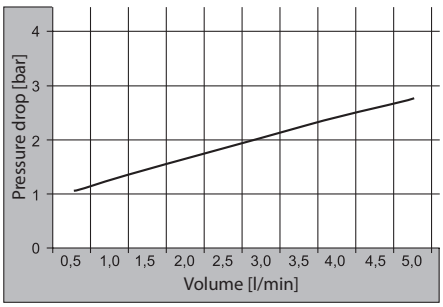
C-RHD, C-RHDI, C-RHV, C-RHZ

The pressure drop coefficient for non-return valves in fully opened position can be assumed as follows:

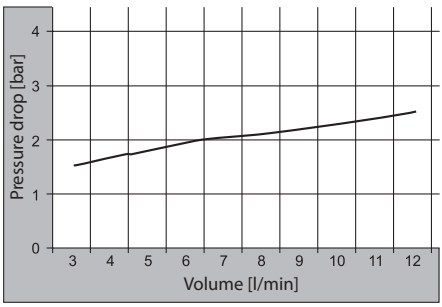
Non-return valve C-RHD, C-RHDI, C-RHV, C-RHZ	ζ = 5.0



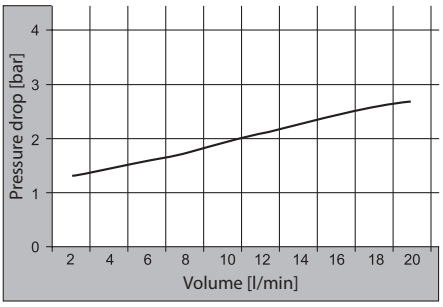
Pressure drop in CONEXA non-return valves



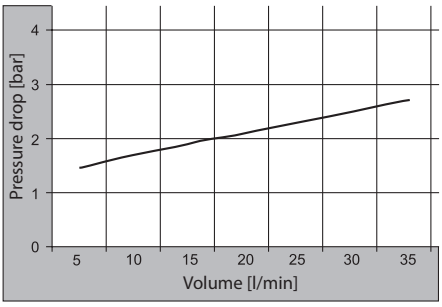
Tube connection 06-L / 06-S and 08-S
Inside thread G1/4" and G1/8"
DN 3.5 mm



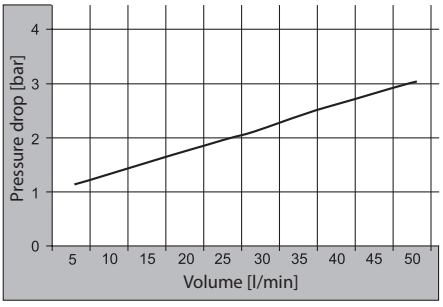
Tube connection 08-L / 10-S
DN 5.5 mm



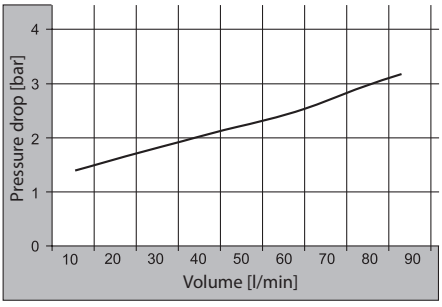
Tube connection 10-L / 12-S
Inside thread G3/8"
DN 7.5 mm



Tube connection 12-L / 14-S
DN 9.5 mm



Tube connection 15-L / 16-S
Inside thread G1/2"
DN 11.5 mm



Tube connection 18-L / 20-S
Inside thread G3/4"
DN 15.0 mm

Based on valves with a tripping pressure of 1 bar
Permissible fluid speed V_{max} = 8 m/s
Fluid: Hydraulic oil

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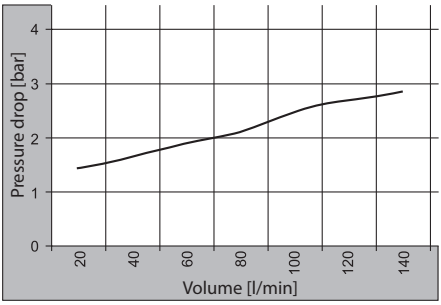
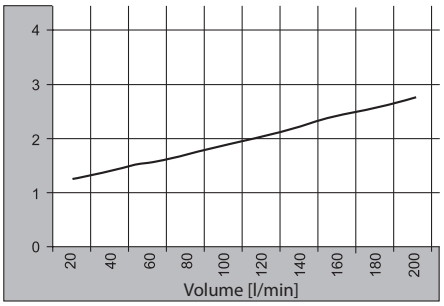
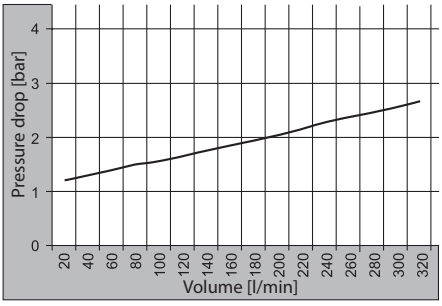
Pressure drop in CONEXA non-return valves



Tube connection 22-L / 20-S
Inside thread G1"
DN 19.0 mm



Tube connection 28-L / 30-S
Inside thread G1 1/4"
DN 24.0 mm



Tube connection 35-L and 42-L / 38-S
Inside thread G1 1/2"
DN 29.0 mm

Based on valves with a tripping pressure of 1 bar
Permissible fluid speed V_{max} = 8 m/s
Fluid: Hydraulic oil

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CE-THR-01-EN-4912