Inoflex - Stainless Steel Corrugated Pipe

Technical Data

KE KELIT®
CLIMATE CONTROL SYSTEMS

Technische Änderungen vorbehalten

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Abb./Fig. D1

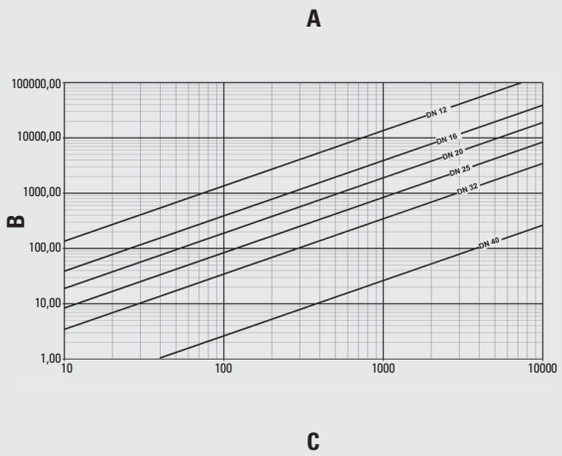


Abb./Fig. 2.1

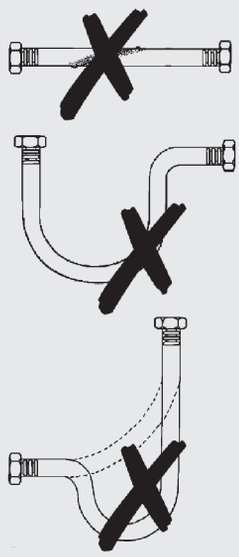


Abb./Fig. 1

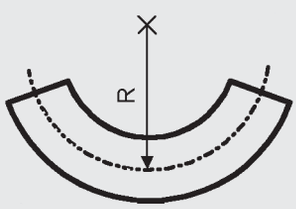


Abb./Fig. 3

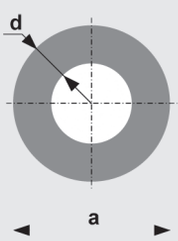
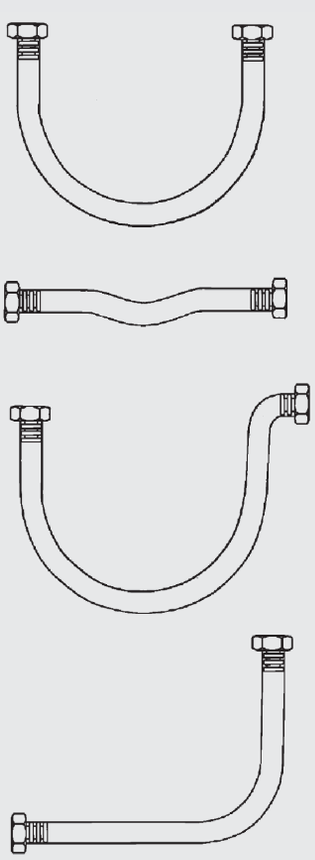


Abb./Fig. 2



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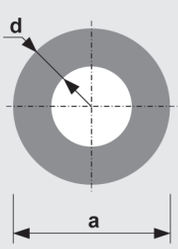
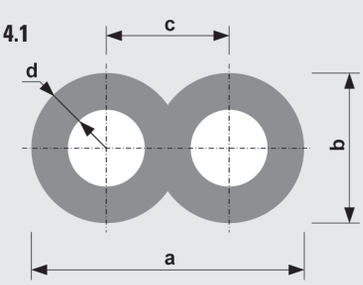


Abb./Fig. 4.1



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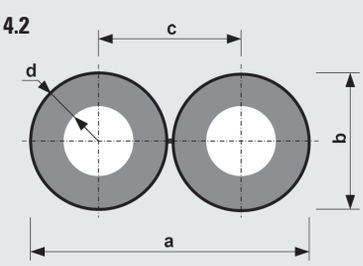


Abb./Fig. 5

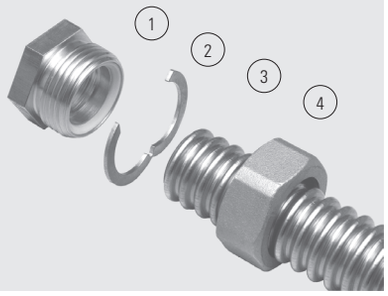


Abb./Fig. 5.1

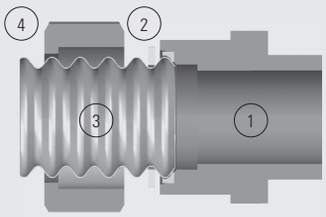


Abb./Fig. 5.2

Abb./Fig. 5.3

Abb./Fig. 5.4

Abb./Fig. 6

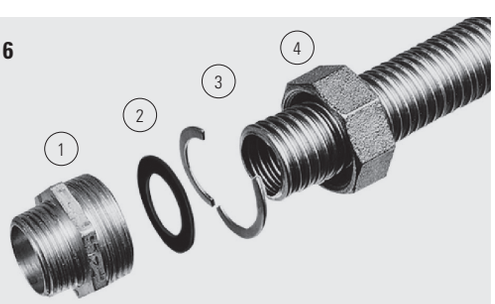
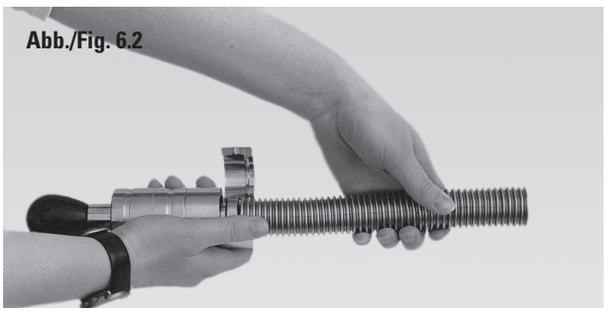


Abb./Fig. 6.1

Abb./Fig. 6.2



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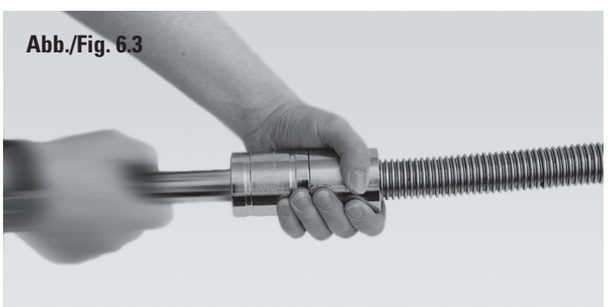

Abb./Fig. 6.4

Abb./Fig. 6.5

Abb./Fig. 7

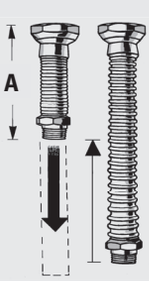

Table of contents

Safety notes

Safety notes

Please follow these safety notes precisely in order to eliminate dangers and damages to people and property.

Target group

These instructions are intended exclusively for authorized experts.

Provisions

During work, observe:

- the legal guidelines for accident prevention
- the legal guidelines for environmental protection
- the trade association's regulations
- the applicable and relevant safety regulations of DIN, EN, DVGW, TRGI, TRF, and VDE, among others
- all applicable regional standards and guidelines

Before use and assembly the suitability from inoflex corrugated pipe is to be checked to!

- Read the assembly instructions before use

- Risk of cutting

- Risk of crushing

- Risk of increased temperature

- Risk of dropping during assembly

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1. Installation notes

During installation and operation, all applicable standards and regulations must be observed and followed!

- The inoflex stainless steel corrugated pipe can be installed in heating, solar, and sanitary areas.
- The place of installation must be frost-proof and provide sufficient protection against mechanical damage. In addition, the influence of and/or contact with aggressive media (e.g. any forms of halogen compounds, especially Chlorides, and ferritic materials) must be excluded.
- For testing and cleaning, do not use any aggressive means that corrode the material. Any residue of used testing and cleaning fluids must be removed.
- Any kind of vibrating effect (axial and radial) must be avoided due to the risk of material fatigue.
- The inoflex stainless steel corrugated pipe may not be used to compensate vibrations or loads. Fittings and components must be arranged so that no prohibited forces or deformations can be transferred to the inoflex stainless steel corrugated pipe.
- The corrugated pipe must be free of torsional stresses when installed. If possible, position longitudinal welding seams of the pipe in the neutral bending zone.
- Do not use inoflex stainless steel corrugated pipes as a protective line or return line; this must be observed when designing potential equalization measures.
- Inoflex stainless steel corrugate pipe may not be used as vibration or strain compensation. Fittings and components must be arranged so that no nonpermitted forces or deformations can be transferred to the inoflex stainless steel corrugated pipe.
- If additional attachment points are needed, it must be ensured that no contact is made with the metal by using rubber or plastic intermediate bearings (sound absorption isolation). The requirements on sound absorption must be adhered to with appropriate means according to the installation situation.
- They extend permanently, depending on the internal pressure, as per the specifications below. This behavior must be taken into account when choosing the length and in all length adjustments during installation.
- It must be ensured that the corrugated pipe does not protrude and in case of directional changes, the minimum bending radius must be observed.
- All screw connection elements must always be designed to be freely accessible.
- In case of wall and ceiling penetrations, suitable pipe seals must be used.
- The fire prevention regulations must be observed.

2. Applicability

Applicability

- **Heating, ventilation, air conditioning and refreshing (HVCAR)**
  NPS 3/8" - NPS 1" 392°F 232 psi
  NPS 1 1/4" 230°F 145 psi
- **Solar**
  NPS 3/8" - NPS 1" 392°F 232 psi
- **Sanitary**
  NPS 3/8" - NPS 3/4" PN 145 psi
  (Drinking water)

Used with FixLock screw joint system

2.1 Materials

Corrugated pipes
The inoflex stainless steel corrugated pipe is made of stainless steel (Mat. No. 1.4404)

Screw connections
The screw connection parts are made of brass (Mat. No. CuZn40Pb2) and have their own seal ring made of PTFE (FixLock).
A flat gasket is used with the flat-sealing screw joint.

2.2 Determinig dynamic pressure drop

pR = l x R
pR = Pressure drop of the inoflex stainless steel corrugated pipe [Pa]
l = corrugated pipe length [m]
R = pressure drop of the straight mounted corrugated pipe per meter [Pa/m]

Example:
Stainless steel corrugated pipe DN20 (NPS 3/4")
Length = 3m (9.84 ft); volume flow = 100 l/h (0.37 gal/min)
pR = 3m x 200 Pa/m = 600 Pa ~ 6 mbar (pR = 9.84 ft x 3.05 Pa/ft = 30 Pa)

see Diagram Fig. D1
A: Corrugated tube DN12-DN40, pressure loss in relation to flow rate*
B: Pressure loss [Pa/m]
C: Flow [l/hr]
*straight tube, 1 m

2.3 Permissible operating temperature and pressure

With the selection of insulation materials, please observe all other usage guidelines and notes of the respective manufacturer in addition to the maximum continuous operating temperature.

The following specifications relate to the pure „inoflex" corrugated pipe system!

NPS / mm Dimension	**12 /** 3/8"	**15/16 /** 1/2"	**20 /** 3/4"	**25 /** 1"	**32 /** 1 1/4"	**40 /** 1 1/2"
max permissible operating pressure at 68°F (at 20°C), and a linear expansion of (psi/bar) [1)]	232 / 16	232 / 16	232 / 16	232 / 16	145 / 10	58 / 4
max zulässige Betriebstemperatur (°F/°C)	392 / 200	392 / 200	392 / 200	392 / 200	230 / 110	230 / 110
permissible operating temperature (°F/°C) [1)]	1.1	1.2	2.2	3.9	2.0	
DVGW approval for FixLock/DN12-20						
Gasket	**Approved for domestic water**			**No DVGW certification!**		

[1)] Under changing temperatures the corresponding reduction ratios for the determination of the maximum operating pressure have to be used maintaining the average elastic linear expansion.

[*] Permanent plastic deformation must be expected at permissible operating pressures of 10 bar (145 psi) and above.

[2)] Dimensions DN12, DN15 and DN20 (NPS 3/8", 1/2" and 3/4") are suitable for use in drinking water systems with DVGW certification. Maximum permissible operating pressure: PN10 (145 psi). At higher operating temperatures, the operating pressure should be specified according to the temperature reduction factor kt.

Dimensions DN12, 15 and 20 (NPS 3/8", 1/2" and 3/4") DVGW certified for use in potable water pipeworks. Permissible operating pressure: PN 10 bar (145 psi). At higher operating temperatures, the operating pressure should be specified according to the temperature reduction factor kt:

p = pzul. 20°C x kt
p = Allowable operating pressure [bar]
pzul. 20°C = Allowable operating pressure at 20°C [bar]
kt = Temperature reduction factor

Temperature in °C	20	50	100	150	200
Temperature reduction factor kt	1,00	0,89	0,80	0,75	0,69

Example: Stainless steel corrugated DN20 (NPS 3/4") — operating temperature = 100°C — p = 10 bar (145 psi) x 0,80 = 8 bar (116 psi)

3. Bending radii

The smallest possible bending radius corresponds to the midline of the inoflex stainless steel corrugated pipe. The beginning and end of the bend should be removed approx. 1 x DN (NPS) from the bordering screw connection parts.

Dimension	**(DN)**	**12**	**16**	**20**	**25**	**32**	**40**
	(NPS)	**3/8″**	**1/2″**	**3/4″**	**1″**	**1 1/4″**	**1 1/2″**
Smallest possible Bending radius R in:	**(mm)**	**20**	**25**	**30**	**35**	**40**	**50**
	(inch)	**0.8**	**1.0**	**1.2**	**1.4**	**1.6**	**2.0**

see Fig. 1

3.1 Permissible installation situations

see Fig. 2 and 2.1

With short distances and observance of the bending radii.

4. Dimensions

Please refer to the price list for more information on the dimensions and lengths of pre-assembled pipes.

5. Transport and storage

To be stored in a clean and dry environment, protected from mechanical stress and protected from contact with ferritic materials. Use the largest possible bending radii when storing in cartons and avoid approaching the smallest permissible bending radius.

6. Insulation

6.1 Solar heating / Sanitary

Description:
- highly flexible closed-cell construction
- available as single or double-pipe insulation

Application ranges (temperature limits):
max. media temperature: + 105°C (+ 221°F)
min. media temperature: - 40°C (- 104°F)

Thermal conductivity as per German DIN EN μ ≥ 4000 ISO 8497:
≤ 0.038 W/(m*K) at a mid-temperature of 0°C (32°F)

Fire behavior:
B2, normal inflammability
(as per German DIN 4102)

Practical fire behavior:
self-extinguishing, does not conduct fire,
does not drip in a fire

Steam diffusion resistance factor:
μ ≥ 4000

6.2 Insulation / Dimensions

Single pipe
Dimensions of insulation without protective film

Dimension	**without film** a (mm/inch)	**without film** d (mm/inch)
DN12 / NPS 3/8"	42 / 1.7	13 / 0.5
DN16 / NPS 1/2"	48 / 1.9	13 / 0.5
DN20 / NPS 3/4"	48 / 1.9	13 / 0.5
DN25 / NPS 1"	54 / 2.1	13 / 0.5
DN32 / NPS 1 1/4"	61 / 2.4	13 / 0.5

Slight dimensional differences can occur due to the elastic behavior of the material used. Subject to change without notice.

see Fig. 3

6.3 Solar insulation

Description:
- Highly flexible closed-cell construction
- available as single-pipe insulation
- free of PVC and FCKW
- UV and ozone resistant
- available as single or double-pipe insulation – double-pipe insulation with cable duct
- optionally available with foil cladding as protection against mechanical stress
- optionally available with a sensor cable

Application ranges (temperature limits):
max. media temperature: + 150°C (up to + 175°C for short periods)
+ 302°F (up to + 347°F for short periods)
min. media temperature: - 40°C (- 104°F)

Thermal conductivity as per German DIN EN ISO 8497:
≤ 0.038 W/(m*K) at a mid-temperature of 0°C (32°F)

Fire behavior:
B2, normal inflammability (as per German DIN 4102), Euro class E

Practical fire behavior
(tested as per German DIN EN 13501-01):
self-extinguishing, does not conduct fire, does not drip in a fire

Steam diffusion resistance factor:
μ ≥ 3000

6.4 Insulation / Dimensions

Dimension	**without film** a (mm/inch)	**without film** d (mm/inch)	**with film** a (mm/inch)	**with film** d (mm/inch)
DN12 / NPS 3/8"	42 / 1.7	13 / 0.5	-	-
DN16 / NPS 1/2"	56 / 2.2	19 / 0.7	48 / 1.9	13 / 0.5
DN20 / NPS 3/4"	60 / 2.4	19 / 0.7	54 / 2.1	13 / 0.5

Single pipe
Dimensions of insulation

see Fig. 4

Dimension	a (mm/inch)	b (mm/inch)	c (mm/inch)	d (mm/inch)
DN12 / NPS 3/8"	92 / 3.6	52 / 2.0	41 / 1.6	14 / 0.6
DN16 / NPS 1/2"	92 / 3.6	52 / 2.0	41 / 1.6	14 / 0.6
DN20 / NPS 3/4"	106 / 4.2	58 / 2.3	48 /1.9	14 / 0.6

Double pipe
Dimensions of insulation without protective film

see Fig. 4.1

Dimension	a (mm/inch)	b (mm/inch)	c (mm/inch)	d (mm/inch)
DN12 / NPS 3/8"	94 / 3.6	47 / 1.9	47 / 1.9	14 / 0.6
DN16 / NPS 1/2"	108 / 4.3	54 / 2.1	54 / 2.1	14 / 0.6
DN20 / NPS 3/4"	120 / 4.7	60 / 2.4	60 / 2.4	14 / 0.6

Doppelstrang
Dimensions of insulation without protective film

see Fig. 4.2

Slight dimensional differences can occur due to the elastic behavior of the material used.
Subject to change without notice.

7. FixLock connection

toolless union nut joint/connection

Components:
1 FixLock adaptor (male nut with PTFE sealing)
2 Stainless steel clip
3 Stainless steel corrugated pipe
4 Union nut (female)
see Fig. 5

Installation steps: All components must be free of dirt prior to installation! **see Fig. 5.1**

1. Use a pipe cutter to cut the pipe between the corrugations. **see Fig. 5.2**

2. Slide the union nut over the pipe (thread facing the pipe end) and fit the stainless steel clip. **see Fig. 5.3**
Note: No face has to be made at the pipe end.

3. Install pinch screw part with special molded gasket and firmly tighten screw connection.
Please ensure the correct position of the molded gasket! **see Fig. 5.4**

Please do not forget to check for leak tightness after the pipe network is completed!

8. Flat face connection

Components:
1 Flat face adapter (double nipple)
2 Fibre washer
3 Stainless steel clip
4 Union nut (female) **see Fig. 6**

Installation steps: All components must be free of dirt prior to installation!

1. Use a pipe cutter to cut the pipe between the corrugations. **see Fig. 6.1**
2. Slide the union nut over the pipe (thread facing the pipe end). To get a strong joint the face needs to be formed of two corrugations.
3. Use the flange hammer to make the flat face as shown in **Fig. 6.2** and **6.3**.
4. To break the edges inside the pipe use the pipe flaring tool provided with the flange hammer.
5. With the stainless steel clip fitted right behind the flat face of the pipe assemble the flat face joint with the fibre washer and the union nut as shown in **Fig. 6.4**.

Please do not forget to check for leak tightness after the pipe network is completed!

9. Inoflexi-Product information

Description:
Corrugated pipe made of rust-proof stainless steel with welded connections (material: 1.4404 /1.4305). One side with cone-shaped male screw, other side flat sealing with loose gland nut (gland nut made of Ms 58). The corrugated pipe is compressed in the delivered condition (basic length). Production and inspection according to the UNI-CIG 7129-72 standard.

10. Inoflexi-Installation notes

- Do not apply any compressive, tensile or torsional stresses!
- „inoflexi" connection pipes may only be used in heating applications (not to be used in sanitary or solar applications).
- For adjustment during installation, the pipe can belinearly expanded by up to 100% and bent in multiple directions (be aware of expansion due to the internal pressure).
- „inoflexi connection pipes" may only be used in heatingsystems! (Do not use in sanitary or solar systems).
- "inoflexi – connection pipes" are thin-walled compared to "inoflex – stainless steel corrugated pipes" and are re-annealed. They are permanently stretched according to the internal pressure as referred to in the following table. This characteristic must be taken into account when selecting the length and all length adjustments for installation purposes. Example: If a pipe is stretched by 10% for fitting during installation, the maximum pressure that may be imparted is that pressure level that will stretch the unstretched pipe by 10 %. At higher pressure levels the pipe will stretch further and all lower pressure levels will have no effect. In order to prevent an uncontrolled stretching, related to pressure, once the pipe is installed - the pipe should be stretched at a minimum level, which is greater than the pressure level used for stretching found in the table.
- The extension/stretching should not exceed 100%; the stretching on the outside of the pipe on bending must be approximately taken into account!
- At higher flow velocities, vibrations can occur as a result of turbulences, which can cause noises and material fatigue. The values given in the following for the maximum flow are only indicative values, as the flow behavior is also determined by the pipe layout.
- The information given below regarding the operating pressure, operating temperature and bending radii applies.
- For all other information, see „inoflex corrugated stainlesssteelpipe".

All the relevant norms and regulations must be observed during installation and operation.
For special notes, see „inoflex" stainless steel corrugated pipe and the following points.

11. Inoflexi-Applicability

Applicability: „inoflexi connection pipes“ may only be used in heating systems! (Do not use in sanitary or solar systems).
A Basic length **see Fig. 7**

The following table applies at 20°C (68°F).

DN	Pressure in bar / psi											Burst pressure in bar
	1	2	3	4	5	6	8	10	12	14	16	
	Elongation as a percentage											
12	1	2	3	4	5	9	14	22	50	85	90	150
16	1	2	4	7	10	15	35	90	120	140	160	100
20	2	4	7	15	30	55	105	130	***	***	***	90
25	1	3	5	10	20	35	85	125	***	***	***	80
32	3	10	25	40	70	80	90	105	***	***	***	65
40	6	15	35	50	80	90	105	***	***	***	***	55
50	7	55	80	105	120	130	***	***	***	***	***	50

We strongly advise against use in the **grey** area!

Flow rates – Maximum flow rates for water (indicative values):

DN / NPS	**Flow in l/h (gal/min)**
12 / 3/8“	300 (1.3)
16 / 1/2“	1500 (6.6)
20 / 3/4“	2500 (11)
25 / 1“	4000 (17.6)
32 / 1 1/4“	6000 (26.4)
40 / 1 1/2“	10000 (44)
50 / 2“	15000 (66.1)

12. Inoflexi-Dimensions

Please refer to the price list for more information on the dimensions and lengths of pre-assembled pipes.

13. Inoflexi-Transport and Storage

See „inoflex stainless steel pipe“, however, „inoflexi connection pipes“ are delivered unbent and unstretched!

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