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HEATING | PROCESS HEAT | GAS ENGINES



Axial Compensators
ACO 50 II, ACO 50 EE and ACO 100

Technical data sheet

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1 Description of functions and assortment

1.1 Functional description

The DUNGS Axial Compensators ACO consist of a bellows made of annular rotating shafts. The high flexibility of the shafts ensures all-round mobility despite sufficient pressure resistance.

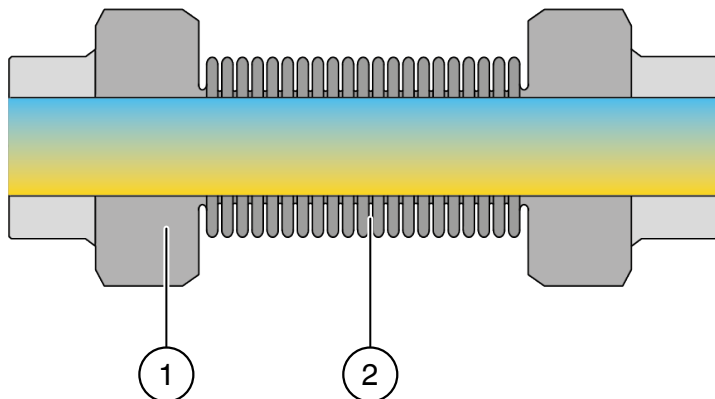
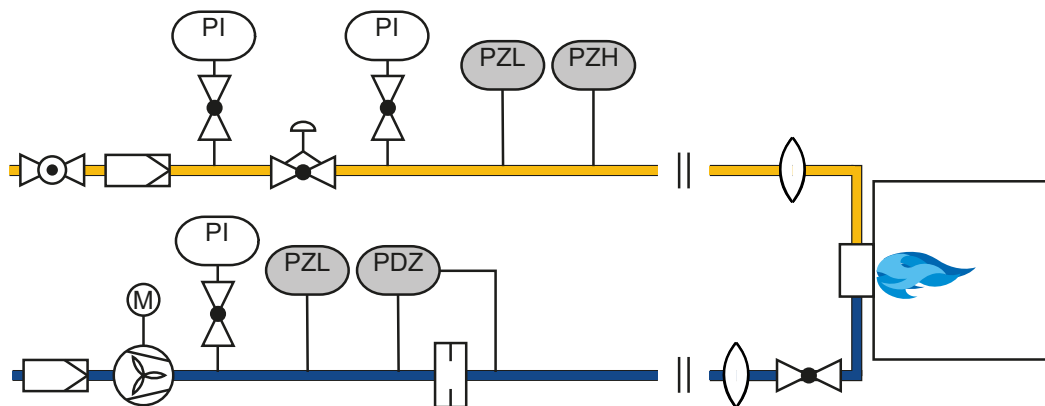


Fig. 1: Functional drawing of Axial Compensator

- 1 Axial Compensator
- 2 Single-layer bellows

1.2 Application example

Compensation of relative movements in burner applications



The Axial Compensators compensate pressure and thermal expansion in the gas and air supply pipes of the burner.

1.3 Product overview "Axial Compensators"

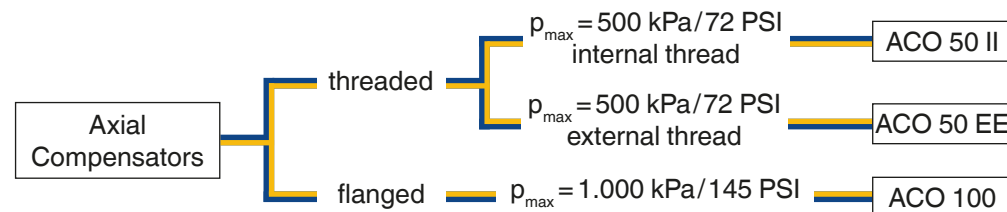


Fig. 2: Product overview Axial Compensators

- Medium: Flammable gas
- Medium: Non-flammable gases/air

1.4 Type code

Product variant	
ACO 50 II	The DUNGS Axial Compensators ACO with threaded connection to prevent vibration transmission in the gas and air pipes. The stainless steel Compensators ensure a stress-free pipe installation and compensate for axial relative movements. Suitable for gases of gas families 1, 2, 3, other neutral gaseous media and hydrogen.
ACO 50 EE	
ACO 100	The DUNGS Axial Compensators ACO with flange connection to prevent vibration transmission in the gas and air pipes. The stainless steel Compensators ensure a stress-free pipe installation and compensate for axial relative movements. Suitable for gases of gas families 1, 2, 3 and other neutral gaseous media.

Features	
ACO	Axial Compensator
XXX	Maximum operating pressure: 50 = 500 kPa/72 PSI 100 = 1,000 kPa/145 PSI
YYY	Nominal size DN: 025 = DN 25 080 = DN 80 032 = DN 32 100 = DN 100 040 = DN 40 125 = DN 125 050 = DN 50 150 = DN 150 065 = DN 65 200 = DN 200
	Nominal size Rp: 05 = 1/2" 12 = 1 1/4" 07 = 3/4" 15 = 1 1/2" 10 = 1" 20 = 2"
ZZ	Thread design: II = Internal/Internal thread EE = External/External thread

Example: Type code for Axial Compensator with threaded connection	Example: Type code for Axial Compensator with flange connection
ACO XXYY ZZ = ACO 5020 EE ACO = Axial Compensator 50 = Maximum operating pressure: 500 kPa/72 PSI 20 = Nominal size Rp 2" EE = External/external thread	ACO XXXYYY = ACO 100025 ACO = Axial Compensator 100 = Maximum operating pressure: 1,000 kPa/145 PSI 025 = Nominal size DN 25

2 Product description

The DUNGS Axial Compensators ACO with threaded or flanged connection to prevent vibration transmission in the gas and air pipes. The stainless steel Compensators ensure a stress-free pipe installation and compensate for axial relative movements. Suitable for gases of gas families 1, 2, 3, other neutral gaseous media and hydrogen.

ACO 50 II

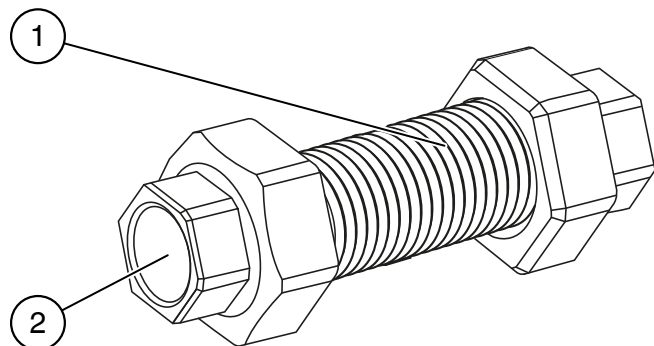


Fig. 3: ACO 50 II with internal thread

- 1 Bellows
- 2 Mounted screw connection with internal thread (flat sealing)

ACO 100

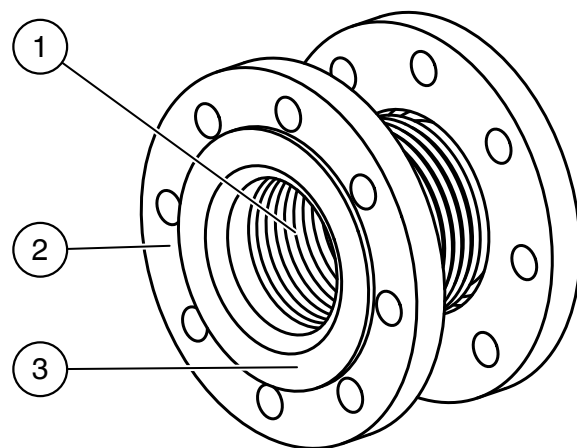


Fig. 5: ACO 100 with flange connection

- 1 Bellows
- 2 Loose flange
- 3 Welded-on welding neck flange

ACO 50 EE

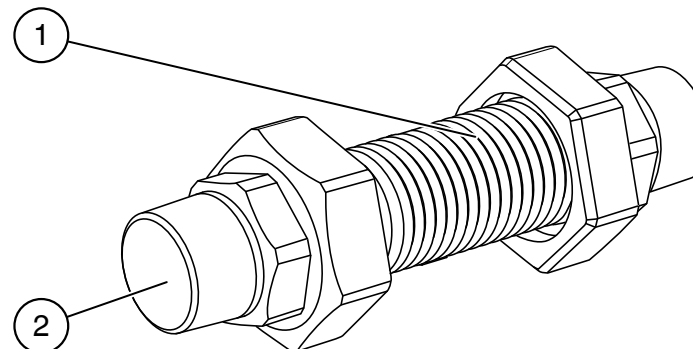


Fig. 4: ACO 50 EE with external thread

- 1 Bellows
- 2 Mounted screw connection with external thread (flat sealing)

Product features:

- Compensation of thermal expansion
- Compensation of axial relative movements
- Reduction of forces and torques at connections
- Suitable for 100 % hydrogen (thread variants only)

3 Guidelines, standards and approvals

CE-certified

- 2014/68/EU, Pressure Equipment Directive
- DIN 30681

4 Technical data

ACO 50

Technical data for	ACO 50 II	ACO 50 EE
Connection type	Internal thread to DIN EN 10226-1	External thread according to DIN EN 10226-1
Nominal sizes	Rp 1/2" - Rp 2"	R 1/2" - R 2"
Max. Operating pressure	500 kPa/72 PSI	
Medium	Gas family 1, 2, 3, hydrogen H ₂ (dry) and other neutral gaseous media	
Max. Medium temperature	-20 °C...+150 °C/-4 °F ...+302 °F	
Max. Ambient temperature during operation	-20 °C...+150 °C/-4 °F ...+302 °F	
Higher thermal resistance	HTB up to 30 minutes at 650 °C/1202 °F	
Materials	Bellows: 1.4571 Screw connection: Malleable cast iron, galvanised	
Load cycles	Strain values refer to 1,000 load cycles	
Pressure loss	The pressure loss is approximately twice as high as with a smooth-surfaced pipe of the same length	

ACO 100

Technical data	ACO 100
Connection type	Flanges according to DIN EN 1092-1 PN 10
No. of holes in the flange	DN 25 - DN 50: 4 DN 65 - DN 150: 8 DN 200: 12
Nominal sizes	DN 25 - DN 200
Max. operating pressure	1,000 kPa/145 PSI
Medium	Gas family 1, 2, 3 and other neutral gaseous media
Max. Medium temperature	-20 °C...+150 °C/-4 °F...+302 °F
Max. Ambient temperature during operation	-20 °C...+150 °C/-4 °F...+302 °F
Higher thermal resistance	HTB up to 30 minutes at 650 °C/1202 °F
Materials	Bellows: 1.4571 Welding neck flange: 1.4571 Loose flange: 1.0460, galvanised
Load cycles	Strain values refer to 1,000 load cycles
Pressure loss	The pressure loss is approximately twice as high as with a smooth-surfaced pipe of the same length

Temperature reduction factors

The pressure ratings (PN) of the Axial Compensators are classified and approved at a defined maximum temperature of 20 °C/35.6 °F. Nevertheless, the construction of the Compensators is designed for higher temperatures. This means that the maximum operating pressure of the Compensators is reduced at higher operating temperatures based on the temperature reduction factor. The same applies to the permissible movement absorption - the maximum movement absorption at 20 °C/35.6 °F can be found in the order numbers for each version. The temperature reduction factor refers to the weakest material exposed to the operating temperature:

Temperature	Reduction factor operating pressure	Reduction factor for movement absorption
20 °C/35.6 °F	1	1
100 °C/212 °F	0.8	0.97
150 °C/302 °F	0.76	0.95
200 °C/392 °F	0.72	0.93

When selecting the compensator, the temperature reduction factor must be taken into account, considering the operating pressure:

$$\frac{\text{Operating pressure at higher temperature}}{\text{Reduction factor operating pressure}} = \text{Max. Operating pressure (PN)}$$

Example:

A system is operated with an operating pressure of 700 kPa. The maximum operating temperature is 150 °C/302 °F.

At 150 °C/302 °F, a reduction factor of 0.76 applies to the operating pressure.

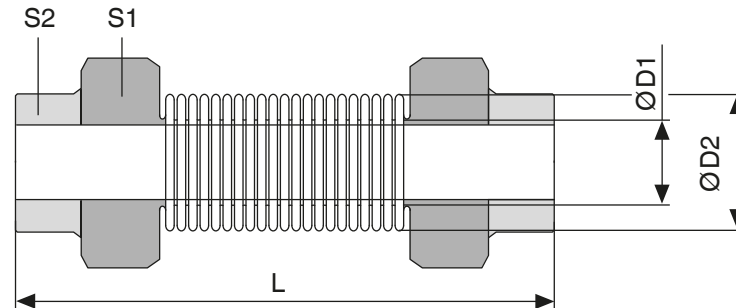
This results in the following equation:

$$\frac{700 \text{ kPa}}{0,76} = 921 \text{ kPa}$$

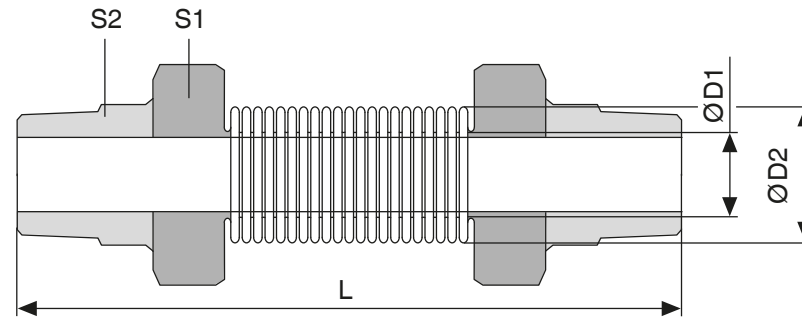
A flanged Axial Compensator (max. operating pressure = 1,000 kPa) can be used,
as 921 kPa (calculated max. operating pressure) ≤ 1,000 kPa (max. operating pressure for ACO 100).

5 Installation dimensions

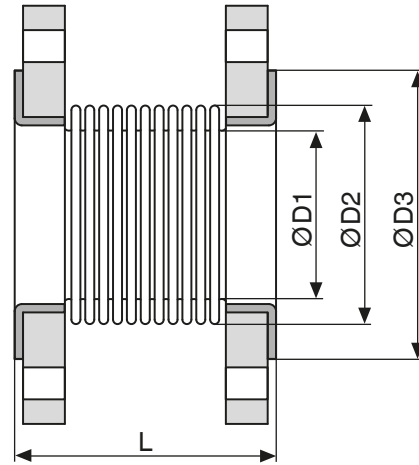
Axial Compensator with internal thread connection



Version	Nominal size	L (±2 mm)	Bellows		Screw connection		Effective Cross-section
			D1	D2	S1	S2	
ACO 5005 II	Rp 1/2"	125 mm (4.92")	15.7 mm (0.62")	27 mm (1.06")	38 mm (1.50")	26 mm (1.02")	3.9 cm ² (0.60 in ²)
ACO 5007 II	Rp 3/4"	135 mm (5.31")	19.5 mm (0.77")	32 mm (1.26")	48 mm (1.89")	31 mm (1.22")	5.5 cm ² (0.85 in ²)
ACO 5010 II	Rp 1"	150 mm (5.91")	24.9 mm (0.98")	39.1 mm (1.54")	53 mm (2.09")	38 mm (1.50")	8.4 cm ² (1.30 in ²)
ACO 5012 II	Rp 1 1/4"	165 mm (6.50")	30.9 mm (1.22)	46.5 mm (1.83")	68 mm (2.68")	48 mm (1.89")	11.3 cm ² (1.75 in ²)
ACO 5015 II	Rp 1 1/2"	190 mm (7.48")	40.4 mm (1.59")	58.4 mm (2.30")	73 mm (2.87")	54 mm (2.13")	20 cm ² (3.10 in ²)
ACO 5020 II	Rp 2"	210 mm (8.27")	49.6 mm (1.95")	69.4 mm (2.73")	88 mm (3.46")	66 mm (2.60")	29 cm ² (4.50 in ²)

Axial Compensator with external thread connection

Version	Nominal size	L (±2 mm)	Bellows		Screw connection		Effective Cross-section
			D1	D2	S1	S2	
ACO 5005 EE	R 1/2"	157 mm (6.18")	15.7 mm (0.62")	27 mm (1.06")	38 mm (1.50")	26 mm (1.02")	3.9 cm ² (0.60 in ²)
ACO 5007 EE	R 3/4"	173 mm (6.81")	19.5 mm (0.77")	32 mm (1.26")	48 mm (1.89")	31 mm (1.22")	5.5 cm ² (0.85 in ²)
ACO 5010 EE	R 1"	194 mm (7.64")	24.9 mm (0.98")	39.1 mm (1.54")	53 mm (2.09")	38 mm (1.50")	8.4 cm ² (1.30 in ²)
ACO 5012 EE	R 1 1/4"	215 mm (8.46")	30.9 mm (1.22)	46.5 mm (1.83")	68 mm (2.68")	48 mm (1.89")	11.3 cm ² (1.75 in ²)
ACO 5015 EE	R 1 1/2"	240 mm (9.45")	40.4 mm (1.59")	58.4 mm (2.30")	73 mm (2.87")	54 mm (2.13")	20 cm ² (3.10 in ²)
ACO 5020 EE	R 2"	270 mm (10.63")	49.6 mm (1.95")	69.4 mm (2.73")	88 mm (3.46")	66 mm (2.60")	29 cm ² (4.50 in ²)

Axial Compensator with flange connection

Version	Nominal size	L (±3 %)	Bellows		Loose flange	Effective Cross-section
			D1	D2	D3	
ACO 100025	DN 25	60 mm (2.36")	25 mm (0.98")	39 mm (1.54")	68 mm (2.68")	8 cm ² (1.24 in ²)
ACO 100032	DN 32	65 mm (2.56")	32 mm (1.26")	46 mm (1.81")	78 mm (3.07")	12 cm ² (1.86 in ²)
ACO 100040	DN 40	75 mm (2.95")	40 mm (1.57")	58 mm (2.28")	88 mm (3.46")	19 cm ² (2.95 in ²)
ACO 100050	DN 50	95 mm (3.74")	50 mm (1.97")	69 mm (2.72")	102 mm (4.02")	28 cm ² (4.34 in ²)
ACO 100065	DN 65	110 mm (4.33")	65 mm (2.56")	87 mm (3.43")	122 mm (4.80")	46 cm ² (7.13 in ²)
ACO 100080	DN 80	125 mm (4.92")	80 mm (3.15")	104 mm (4.06")	138 mm (5.43")	66 cm ² (10.23 in ²)
ACO 100100	DN 100	150 mm (5.91")	100 mm (3.94")	127 mm (5.00")	158 mm (6.22")	100 cm ² (15.50 in ²)
ACO 100125	DN 125	175 mm (6.89")	125 mm (4.92")	155 mm (6.10")	188 mm (7.40")	153 cm ² (23.72 in ²)
ACO 100150	DN 150	200 mm (7.87")	150 mm (5.91")	184 mm (7.24")	212 mm (8.35")	218 cm ² (33.79 in ²)
ACO 100200	DN 200	240 mm (9.45")	200 mm (7.87")	235 mm (9.25")	268 mm (10.55")	371 cm ² (57.51 in ²)

6 Installation position

The product can be installed in any direction in gas and air pipes. A flow direction is not defined as the Axial Compensators do not have an inner guide tube.



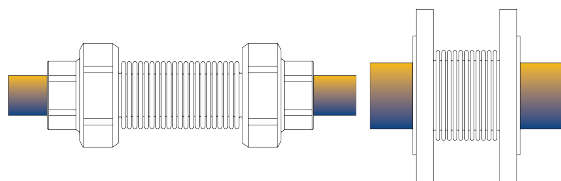
CAUTION

The Axial Compensators must not be hindered in their natural position and movement during installation.

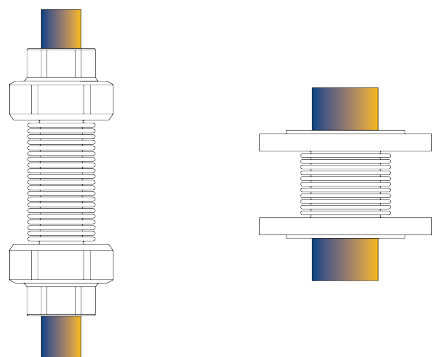
Obstruction of movement or torsional loading can lead to damage to the Compensator, leaks or premature failure.

Ensure that no torsion acts on the bellows during installation and operation.

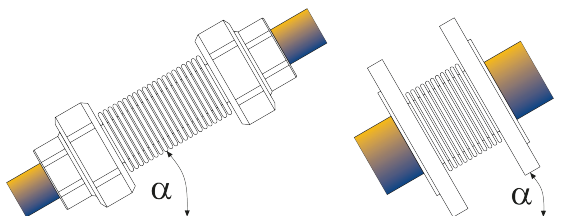
Example: Horizontal installation position



Example: Vertical installation position



Example: Intermediate installation position



7 Order numbers

ACO 50 II

The DUNGS Axial Compensators ACO with threaded connection to prevent vibration transmission in the gas and air pipes. The stainless steel Compensators ensure a stress-free pipe installation and compensate for axial relative movements. Suitable for gases of gas families 1, 2, 3, other neutral gaseous media and hydrogen.

Version: internal/internal thread, max. operating pressure Pmax: 500 kPa/72 PSI

Version	Order number	Nominal size	Movement absorption ± axial [mm]	Spring rate ± 30 % [N/mm]	Weight
ACO 5005 II	306948	Rp 1/2"	12	11	0.4 kg 0.88 lbs
ACO 5007 II	306949	Rp 3/4"	14	20	0.5 kg 1.1 lbs
ACO 5010 II	306950	Rp 1"	17	28	0.6 kg 1.32 lbs
ACO 5012 II	306952	Rp 1 1/4"	17	25	1.0 kg 2.2 lbs
ACO 5015 II	306953	Rp 1 1/2"	18	43	1.4 kg 3.09 lbs
ACO 5020 II	306954	Rp 2"	21	40	2.0 kg 4.41 lbs

ACO 50 EE

The DUNGS Axial Compensators ACO with threaded connection to prevent vibration transmission in the gas and air pipes. The stainless steel Compensators ensure a stress-free pipe installation and compensate for axial relative movements. Suitable for gases of gas families 1, 2, 3, other neutral gaseous media and hydrogen.

Version: external/external thread, max. operating pressure Pmax: 500 kPa/72 PSI

Version	Order number	Nominal size	Movement absorption ± axial [mm]	Spring rate ± 30 % [N/mm]	Weight
ACO 5005 EE	306955	R 1/2"	12	11	0.4 kg 0.88 lbs
ACO 5007 EE	306956	R 3/4"	14	20	0.6 kg 1.32 lbs
ACO 5010 EE	306957	R 1"	17	28	0.8 kg 1.76 lbs
ACO 5012 EE	306958	R 1 1/4"	17	25	1.3 kg 2.87 lbs
ACO 5015 EE	306959	R 1 1/2"	18	43	1.6 kg 3.53 lbs
ACO 5020 EE	306960	R 2"	21	40	2.3 kg 5.07 lbs

AC 100

The DUNGS Axial Compensators ACO with flange connection to prevent vibration transmission in the gas and air pipes. The stainless steel Compensators ensure a stress-free pipe installation and compensate for axial relative movements. Suitable for gases of gas families 1, 2, 3 and other neutral gaseous media.

Version: Flange connection, max. operating pressure Pmax: 1,000 kPa/145 PSI

Version	Order number	Nominal size	Movement absorption ± axial [mm]	Spring rate ± 30 % [N/mm]	Weight
ACO 100025	306961	DN 25	6	49	2.3 kg 5.07 lbs
ACO 100032	306962	DN 32	7	47	3.4 kg 7.50 lbs
ACO 100040	306963	DN 40	8	81	4.0 kg 8.82 lbs
ACO 100050	306964	DN 50	10	66	4.7 kg 10.36 lbs
ACO 100065	306966	DN 65	12	49	5.9 kg 13.01 lbs
ACO 100080	306968	DN 80	14	83	6.9 kg 13.23 lbs
ACO 100100	306969	DN 100	17	69	7.8 kg 17.20 lbs
ACO 100125	306970	DN 125	21	93	10.2 kg 22.49 lbs
ACO 100150	306971	DN 150	25	83	13.0 kg 28.66 lbs
ACO 100200	306972	DN 200	32	89	17.3 kg 38.14 lbs

8 Further information

Further information

➔ www.dungs.com

Technical changes reserved.

8.1 Conversion of measurement units

Base unit		Target unit
1 bar 1 mbar	= =	1000 mbar 0.001 bar
1 mbar 1 Pa	= =	100 Pa 0.01 mbar
1 mbar 1 in.W.C.	= =	0.40 in.W.C. 2.49 mbar
1 Pa 1 in.W.C.	= =	0.0040 in.W.C. 249 Pa
1 PSI 1 in.W.C.	= =	27.7 in.W.C. 0.036 PSI
1 PSI 1 bar	= =	0.069 bar 14.5 PSI
1 mm 1"	= =	0.04" 25.4 mm
1 lb-in 1 Nm	= =	0.11 Nm 8.85 lb-in
1 m ³ /h 1 ft ³ /h	= =	35.31 ft ³ /h 0.028 m ³ /h
1 l 1 ft ³	= =	0.035 ft ³ 28.31 l
1 kg 1 lbs	= =	2.20 lbs 0.45 kg

9 Glossary/List of abbreviations

Gases of the gas families 1, 2, 3	Gas family 1: Hydrogen-rich gases, e.g. town and district gas
	Gas family 2: Methane-rich gases, e.g. natural gas
	Gas family 3: Liquid gases, e.g. propane and butane
HTB	Higher thermal load capacity
PDZ	Pressure switch (safety-relevant) for measuring differential pressure.
PI	Pressure Indicator
PZH	Pressure switch for upper limit (safety-relevant)
PZL	Pressure switch for lower limit (safety-relevant)

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