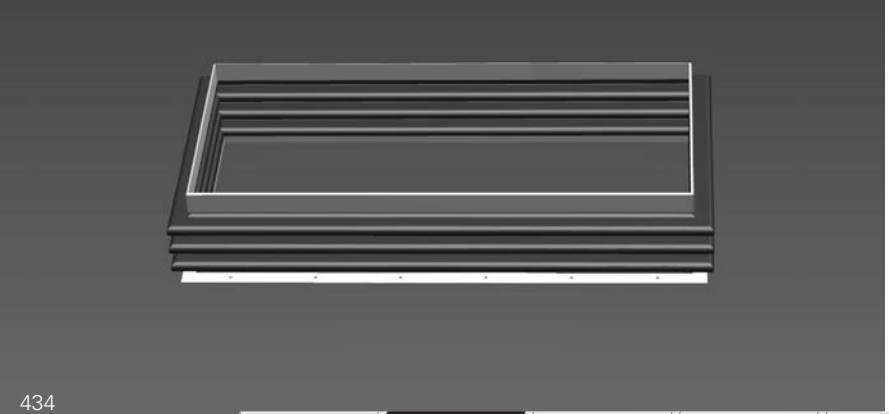


Type XOZ

Designation
The designation consists of two parts:
1. the series, defined by 3 letters
2. the nominal size, defined by 11 digits

Example:
Type XOZ: HYDRA rectangular expansion joint

Standard version/materials:
multi-ply bellows: 1.4541
operating temperature: up to 300°C

Designation (example):

XOZ □□ . □□□□ . □□□□ . □

- Connections (see below for alternatives)
- Profile shape (1 or 2)
- Corner shape (0 or 1)
- Inside dimension b_1 in mm
- Inside dimension b_2 in mm
- No. of corrugations n_W

Order text to Pressure Equipment Directive 97/23/EC

Please state the following with your order:
- for standard versions
  -> order number
- for different materials
  -> designation
  -> details of materials

According to the Pressure Equipment Directive 97/23/EC, the following information is required for testing and documentation:

Type of pressure equipment according to Art. 1:
- vessel volume V [l]

_____

- piping – nominal size DN

_____

Medium property according to Art. 9:
- group 1 – dangerous
- group 2 – all other fluids

State of medium:
- gaseous or liquid, if pD > 0.5 bar
- liquid, if pD < 0.5 bar

Design data:

max. allowable pressure PS [bar]

_____

max./min. allowable temperature TS [°C]

_____

test pressure PT [bar]

_____

Optional:

category _____

Note: Tell us the dimensions that deviate from the standard dimensions and we can match the expansion joint to your specification.

Design and choice of expansion joints
The values in the table below each apply to one corrugation. The necessary number of corrugations nw is dependent on the movement:

No. of corrugations n_W

(7.5) $n_W = 2\delta_{RT}/2\delta_{WN}$

Axial movement, cold, $2\delta_{RT}$ in mm
Axial movement per corrugation $2\delta_{WN}$ in mm
(see table for nominal movements

The nominal movement, the corrugated length and the adjusting-force rate of the multi-corrugation expansion joint are dependend on the selected number of corrugations (rounded up to an integer number):

Corrugated length / in mm

(7.6) $l = l_W \cdot n_W$

Length of individual corrugations l_W in mm
No. of corrugations n_W

The length of the rims or the conection parts must be taken into account when determining the total length L_O of the complete expansion joint.

Axial adjusting-force rate of one corrugation $C_{\delta W}$ in N/mm

(7.7) $C_{\delta W} = C_{\delta E} / n_W + 2(b_1 + b_2)C_{\delta l}$

Adjusting-force rate of four corners $C_{\delta E}$ in N/mm
Adjusting-force rate for 1 mm profile length $C_{\delta l}$ in N/mm Length of sides b_1, b_2 in mm

Adjusting-force rate of complete expansion joint C_δ in N/mm

(7.8) $C_\delta = C_{\delta W}/n_W$

Connections/type series

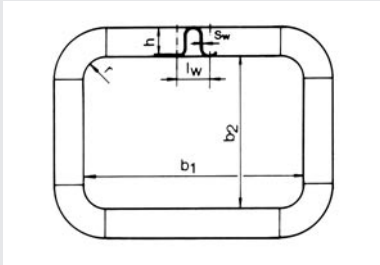
Connection parts	Type series
None	XOZ
Flanges	XFZ
Weld ends	XRZ
Other	XSZ

Fig. 7.9

Profile file shape	Corner shape	Nominal axial movement per corrugation	Max. in-side dimension (in relation to profile)	Cold pressure	Corrugation profile			Max. no. of corrugations	Corner inside radius	Adjusting-force rate per corrugation		Rec. angle flange acc. to DIN 1029
					Corrugation height	Corrugation length	Wall thickness			Four corners	Profile per 1mm	
–	–	$2\delta_N$	b	p_0	h	l_W	s_N	n_W	r	$c_{\delta E}$	$c_{\delta I}$	
–	–	mm	mm	bar	mm	mm	mm	–	mm	N/mm	N/mm²	
Small profile 1	Rounded corner 0	10	1000	1	50	50	1.0	7	25	1400	1.8	L 60x40
	Bevelled corner 1	8							–	1800		
Standard profile 2	Rounded corner 0	20	3700	2*)	100	100	2.0	5	50	2000	0.5	L 100x65
	Bevelled corner 1	16							–	3800		

*) The permissible cold pressure p_0 is dependent on the inside dimension and must be reduced as shown in Fig. 9.35 for b > 2000.

See overleaf to order text!



Type XOZ

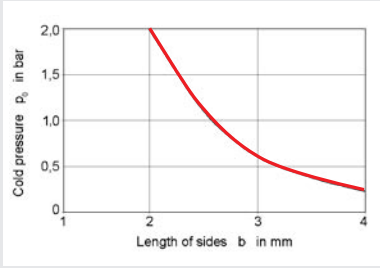


Fig. 7.10 Permissible cold pressure for profile 2

Axial expansion joints for vacuum technology

Expansion joints for vacuum systems are usually designed using single-ply bellows with relatively thin walls; their small adjusting forces and moments place only a very slight load on the connecting flanges, which is essential to ensure absolute tightness of the flange connections during operation.

The bellows can be welded to the connecting flanges without a crevice and vacuum-tight due to the use of special "rim weld seams".

High to very high leak tightness levels must be achieved; they can be verified by means of He.-leak tightness tests. The minimum leakage rate which can be demonstrated is 10^{-10} mbar·l·s^{-1}.

Flanges are used predominantly for the connections:

DN 16-50 Small flanges according to DIN 28 403

DN 63-500 Clamp flanges according to DIN 28 404

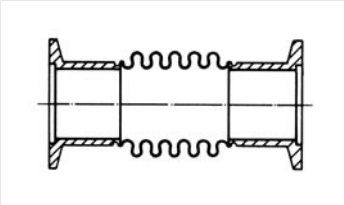


Fig. 7.11 Axial expansion joint with small flanges

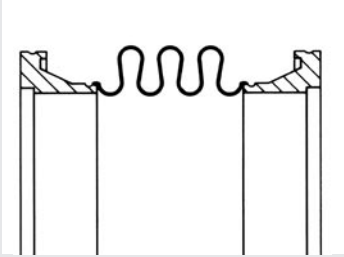


Fig. 7.12 Axial expansion joint with clamp flanges

The vacuum expansion joints can be designed on request with total lengths and movement adapted to specific applications.

Axial expansion joints for heating and ventilating installations

We have developed a series of axial expansion joints especially for the needs of heating and sanitary engineering; the different types of connection are adapted to specific assembly conditions:

- Weld ends
- Rotary or fixed flanges, drilled accordig to DIN
- Screwed nipples with pipe thread, male or female.

The connection parts are made of C-steel as standard, whilst the corrugated metal bellows are made of stainless steel 1.4541; they provide excellent corrosion resistance for reliable operation extending over several decades. The expansion joints are designed accordingly for 10000 full stress cycles (in contrast with the standard range), as necessary in heating and ventilating installations on account of the more frequent temperature changes.

Guide sleeves are provided in some designs; they simplify flush installation, though they cannot replace slide points or anchors.
Designs with an external protective sleeve are pretensioned in the factory; assembly errors are thereby precluded to a large extent and the thermal insulation is simpler to install.

Nominal diameters: DN 15-100
Nominal pressures: PN 6-25

The exact dimensions and performance data are specified in a separate publication No. 3300 "Expansion joints for heating and ventilating installations".

Fig. 7.13 Expansion joints for heating and ventilating installations

High pressure metal bellows and expansion joints

Our standard ranges include expasion oints with nominal pressure ratings which are fully adequate under normal circumstances for pipeline construction/ plant engineering and construction.

If a higher nominal pressure is necessary in individual cases, for example in heat exchangers, individually designed expansion joints can also be supplied. If the combined requirements of pressure and movement cause the technical limits to be reached when pressure is applied to the expansion joints internally, it is sometimes possible to use reinforcing rings or to apply pressure to the bellows externally (see also Chapter 8, “Special designs”).

In addition, metal bellows, such as those used as stern seals in valves, must often be designed for high pressures, which are generally applied externally.

Fig. 7.14 High-pressure bellows

Available options

The graph below provides an overview of the available options with regard to multi-ply high-pressure bellows with lyre-shaped corrugations. It shows the maximum pressure values which can be achieved when the pressure is applied externally. Additional tools are necessary for some nominal diameters in the shaded area.

If the pressure is applied intenally, the pressure values which are achieved are almost identical if the low movement values mean that only a few corrugations are necessary. If larger movements are involved, the permissible pressure is reduced for stability reasons.

Please consult us should you require further details.

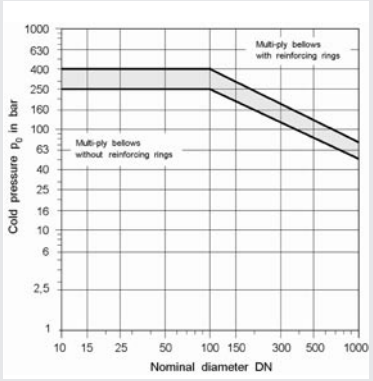


Fig. 7.15 Maximum pressure of multi-ply, metal bellows made of 1.4541 (lyre-shaped corrugations)

HYDRAWELD thin-walled, cylindrical pipes

Thin-walled, cylindrical pipes with a longitudinal seam weld are available with any diameter; the diameters have close tolerances.

If desired, we can provide cylinders with rim diameters, beads or corrugations, or further processthem to produce containers.

Fig. 7.16 Thin-walled, cylindrical pipe, with longitudinal seam weld

Available options

The table below specifies the length which can be supplied for 1.4541 and 1.4571; they also apply to materials with similar strength characteristic values. The supplied lengths may have to be reduced for materials whose charcteristic values are very different from those specified here

Special materials can also be used in addition to the stainless steels, 1.4541 and 1.4571; almost all the stainless steels and special alloys listed in Appendix A are available.

HYDRAWELD stainless-steel pipes with fixed diameters are available in longer sizes (up to approx. 6 m) in the diameter range DN 5 – 150.

Please contact us if you require further information.

Available lengths

Diameter Range	Length, dependend on wall thickness, in mm Valid for stainless steel 1.4541 and 1.4571			
d_i	Standard wall thickness s_N in mm			
mm	0.3	0.5	0.7	1.0
40 - 60	600	400	250	200
61 - 80	800	800	600	400
81 - 90	1200	800	600	400
91 - 110	1200	1200	800	800
111 - 150	1200	1200	1200	800
151 - 1000	1200	1200	1200	1200

Fig. 7.17