Overview

Metal bellows with B-cuff

The design of the weld area for the connecting parts and the selection of the welding method are determined by the total wall thickness of the bellows, i.e. multiply wall thickness by the number of layers. The dimensions for d_4, n_L and s can be found in the bellows tables 6.3 or 6.4.

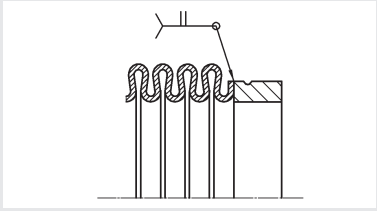


Figure 6.8.1.

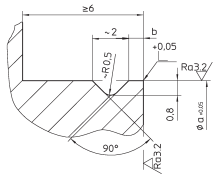
Total wall thickness	Welding method	Geometry of weld lip	Weld diameter	Width of weld lip
mm	–	–	mm	mm
n_L x s ≤ 0.10	Laser	B III	$a = d_4^{\pm 0.05}$	–
0.10 < n_L x s ≤ 0.20	Laser	B III	$a = d_4^{\pm 0.05}$	–
0.10 < n_L x s ≤ 0.20	Laser / Microplasma	B I, B IV	$a = d_4^{\pm 0.05}$	$b = 0{,}4^{+0{,}1/-0}$
0.20 < n_L x s ≤ 0.30	Laser / Microplasma	B I, B IV	$a = d_4^{\pm 0.05}$	$b = (2 \times s)^{+0{,}1/-0}$
0.30 < n_L x s ≤ 0.45	Laser / Microplasma /TIG	B I, B IV	$a = d_4^{\pm 0.05}$	$b = (2 \times s)^{+0{,}1/-0}$
0.45 < n_L x s ≤ 0.90	Microplasma /TIG	B I, B IV	$a = d_4^{\pm 0.05}$	$b = (2 \times s)^{\pm 0{,}1}$
0.90 < n_L x s ≤ 1.20	TIG with weld accessory	B II, B V	$a = d_4^{\pm 0.05}$	$b = (2 \times s)^{\pm 0{,}1}$
0.90 < n_L x s ≤ 1.20	TIG with weld accessory	B II, B V	$a = d_4^{\pm 0.05}$	$b = 2{,}5^{\pm 0{,}1}$

Table 6.8.1.

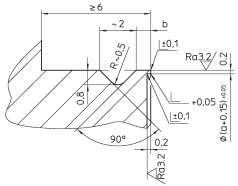
6.8 | Geometry of connecting parts for metal and diaphragm bellows

Geometry designs in the weld seam area

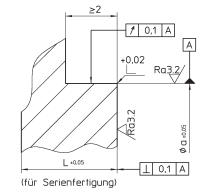
Design B I



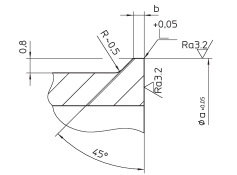
Design B II (also for intermediate rings)



Design B III



Design B IV



Design B V

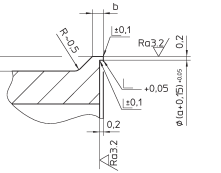


Figure 6.8.2. (values a and b in accordance with Table 6.8.1.)

Metal bellows with S-cuff
S-cuffs can be made for bellows with a maximum of 3 layers and a total wall thickness that is less than or equal to 0.9 mm. The design of the connecting piece is mainly determined by the welding method. The dimensions for d_3, l_2, n_L and s can be found in the bellows tables 6.3 or 6.4.

Welded through

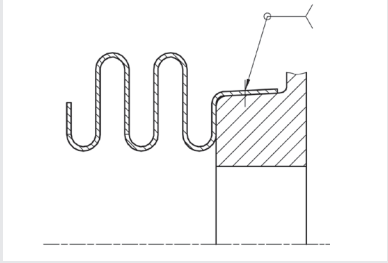


Figure 6.8.3.a

Welded on edge

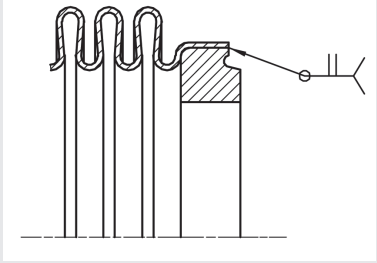


Figure 6.8.3.b

6.8 | Geometry of connecting pieces for metal and diaphragm bellows

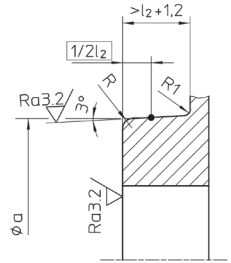
Total wall thickness	Welding method and position	Process	Cuff diameter	Weld diameter	Width of weld lip	Edge radius
mm	–	–	mm	mm	mm	mm
$n_L \times s \leq 0.4$	Laser pressed on and welded through (6.8.3.a)	S I	35 m $d_3 \leq 75$ *	$a = (d_3 + 0.3)^{\pm 0.05}$	–	R = 1.0
$n_L \times s \leq 0.45$	Laser welded on edge (6.8.3.b)	S II	$d_3 \leq 32$ $32 < d_3 \leq 115$ $115 < d_3$	$a = (d_3 + 0.1)^{\pm 0.05}$ $a = (d_3 + 0.3)^{\pm 0.05}$ $a = (d_3 + 0.5)^{\pm 0.05}$	–	R = 0.5 R = 1.0 R = 1.5
$0.1 < n_L \times s \leq 0.3$	Microplasma welded on edge (6.8.3.b)	S III	$d_3 \leq 32$ $32 < d_3 \leq 115$ $115 < d_3$	$a = (d_3 + 0.1)^{\pm 0.05}$ $a = (d_3 + 0.3)^{\pm 0.05}$ $a = (d_3 + 0.5)^{\pm 0.05}$	$b = (2 \times n_L \times s)^{+0.1/-0}$	R = 0.5 R = 1.0 R = 1.5
$0.3 < n_L \times s \leq 0.9$	Microplasma or TIG welded on edge (6.8.3.b)	S III	$d_3 \leq 32$ $32 < d_3 \leq 115$ $115 < d_3$	$a = (d_3 + 0.1)^{\pm 0.05}$ $a = (d_3 + 0.3)^{\pm 0.05}$ $a = (d_3 + 0.5)^{\pm 0.05}$	$b = (2 \times n_L \times s)^{+0.1/-0}$	R = 0.5 R = 1.0 R = 1.5

Table 6.8.2.

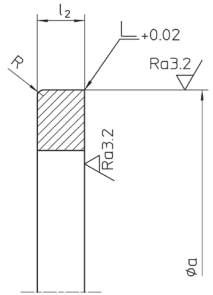
** Other dimensions with special tools*

6.8 | Geometry of connecting pieces for metal and diaphragm bellows

Design S I



Design S II



Design S III

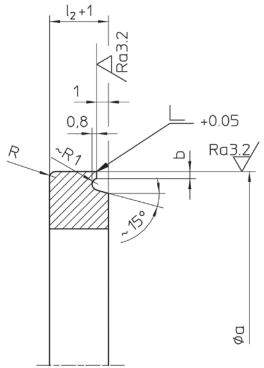


Figure 6.8.4. (values a, b and R in accordance with Table 6.8.2., l_2 in accordance with Tables 6.3. or 6.4.)

Metal bellows with J-cuff

The welding method determines the connection geometry for J-cuffs (with or without weld lip). The dimensions for d_3, l_2, n_L and s can be found in the bellows tables 6.3 or 6.4.

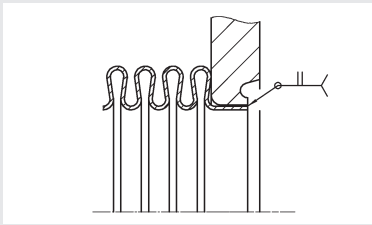
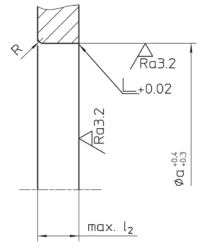


Figure 6.8.5.

Total wall thickness	Welding method and position	Process	Cuff diameter	Weld diameter	Width of weld lip	Edge radius
mm	–	–	mm	mm	mm	mm
$n_L \times s \leq 0.45$	Laser	J I	$d_3 \leq 10$ $10 < d_3 \leq 50$ $50 < d_3$	$a = (d_3 + 2 \times n_L \times s)^{+0.2/+0.3}$	–	R = 0.35 R = 1.0 R = 1.5
$0.1 < n_L \times s \leq 0.3$	Microplasma	J II	$d_3 \leq 10$ $10 < d_3 \leq 50$ $50 < d_3$	$a = (d_3 + 2 \times n_L \times s)^{+0.3/+0.4}$	–	R = 0.35 R = 1.0 R = 1.5
$0.3 < n_L \times s \leq 0.9$	Microplasma or TIG	J II	$d_3 \leq 10$ $10 < d_3 \leq 50$ $50 < d_3$	$a = (d_3 + 2 \times n_L \times s)^{+0.3/+0.4}$	$b = (2 \times n_L \times s)^{+0.1/-0}$	R = 0.35 R = 1.0 R = 1.5
$0.9 < n_L \times s \leq 2.4$	TIG with additional work material	J II	$d_3 \leq 10$ $10 < d_3 \leq 50$ $50 < d_3$	$a = (d_3 + 2 \times n_L \times s)^{+0.3/+0.4}$	$b = (2 \times n_L \times s)^{+0.1/-0}$	R = 0.35 R = 1.0 R = 1.5

Table 6.8.3.

Design J I



Design J II

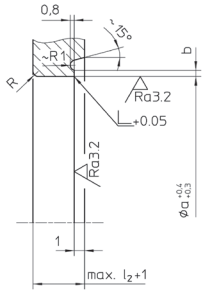


Figure 6.8.6. (values a, b and R in accordance with Table 6.8.3., l_2 in accordance with Tables 6.3. or 6.4.)

Metal bellows

Connecting pieces for diaphragm bellows may be welded at the outside or inside diameter with the microplasma welding method. The dimensions for D_A, d_i, and l_W are indicated in diaphragm bellows tables 6.6 or 6.7.

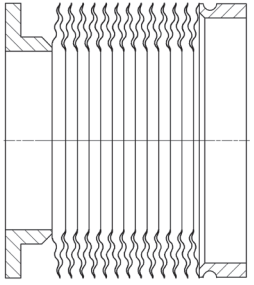
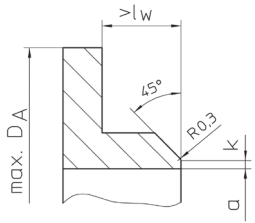


Figure 6.8.7.

Welding position	Bellows inside diameter	Weld diameter	Width of weld lip	Edge dimensions
–	mm	mm	mm	mm
at inside diameter	$d_i \le 60$ $60 < d_i \le 100$ $100 < d_i$	$a = d_i^{+0.1/-0}$ $a = d_i^{+0.15/-0}$ $a = d_i^{+0.2/-0}$	$b = 0.4^{+0.1/-0}$ $b = 0.5^{+0.1/-0}$ $b = 0.6^{+0.1/-0}$	$k = \max\left\{\frac{0.9}{\frac{D_A - d_i}{24}} - 0.2\right.$
at outside diameter	$D_A \le 80$ $80 < D_A \le 140$ $140 < D_A$	$a = (D_A - 0.15)^{+0.1/-0}$ $a = (D_A - 0.15)^{+0.15/-0}$ $a = (D_A - 0.15)^{+0.15/-0.05}$	$b = 0.4^{+0.1/-0}$ $b = 0.5^{+0.1/-0}$ $b = 0.6^{+0.1/-0}$	$k = \max\left\{\frac{0.9}{\frac{D_A - d_i}{24}} - 0.2\right.$

Table 6.8.4.

Connecting piece for inside diameter



Connecting piece for outside diameter

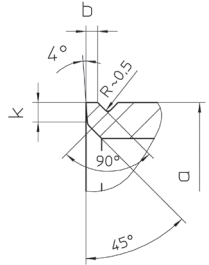


Figure 6.8.8. (values a, b and k in accordance with Table 6.8.2., D_A in accordance with Tables 6.6. or 6.7.)