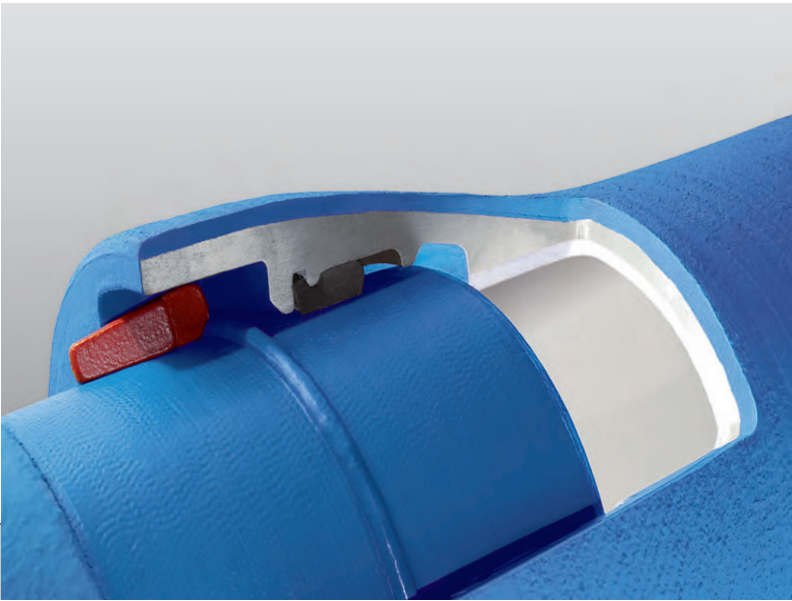
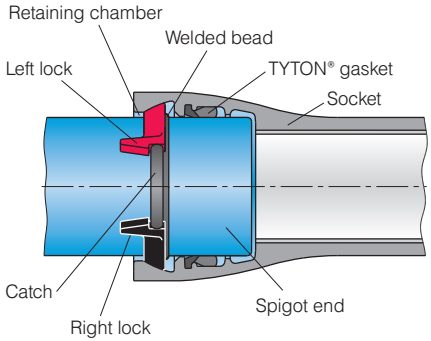
DUKTUS

2 THE POSITIVE LOCKING SYSTEM



This chapter deals only with restrained push-in joints where the restraint is based on a positive locking interengagement.
Positive locking push-in joints can always be recognised by a welded bead on the spigot end and a retaining chamber. The positive locking interengagement between the welded bead and the retaining chamber is obtained by inserting locking segments. This enables forces to be transmitted mechanically between the spigot end and the socket of the next pipe or fitting.



An example of a positive locking joint (a BLS® joint)

Forces may be generated by internal pressure or external tractive forces. Allowable operating pressures (PFA) and allowable tractive forces are specified on the pages below as a function of nominal size. Higher pressures and tractive forces are possible; please check with our Applications Engineering Division.

Duktus supplies the following positive locking push-in joints for **pipes and fittings:**

- **DN 80 to DN 500**

This joint has been a success for decades and can be assembled with a TYTON® gasket. Depending on the nominal size and the nature of the application, locking is from 2 to 4 locks. It is notable principally for its easy and quick assembly, the reliable high operating pressures and tractive forces and the versatility with which it can be used. A clamping ring can be used on cut pipes. This enables the on-site application of a welded bead to be dispensed with in most cases.
Pipes with BLS® joints are available in a laying length of 6 m.
You will find further information on the BLS® joint from p. 51 on.

- **DN 600 to DN 1000**

It is also used a TYTON® gasket. The joint is locked by 9 to 14 locking segments which are inserted through openings in the socket and which are distributed round the circumference of the pipe.
Pipes with BLS® joints are available in a laying length of 6 m.
You will find further information on the BLS® joint from p. 56 on.

Fields of use/advantages

There are almost no limits to the versatility with which pipes and fittings with BLS® joints can be used. The quick and easy assembly and the very high allowable operating pressures and tractive forces for which they can be relied on make them suitable for virtually any conceivable application in the laying of pressure pipelines (for water or sewage).

- urban water supply
- replacement of concrete thrust blocks in conventional open trench laying
- bridge pipelines/above-ground pipelines
- temporary pipelines (for temporary water supplies)
- trenchless installation techniques (HDD, burst lining and press-pull techniques, pipe relining, floating-in, etc.)
- snow-making systems
- turbine pipelines
- laying on steep slopes
- fire-fighting and fire-extinguishing pipelines (FM Approval and German Federal Railways approval)
- crossings below bodies of water/culvert pipelines
- building services
- use in regions at risk of earthquakes or settlement

The very high angular deflectability of up to a maximum of 5° and the rotatability through 360° make these joints suitable even for the laying of complicated and demanding intersections.

PFA
Under EN 545, the allowable operating pressures (PFA) of the BLS® joints have to be stated in manufacturers' catalogues. See the following pages.

PMA = 1.2 x PFA (allowable maximum operating pressure for a short period, e. g. the period of a pressure surge).
PEA = 1.2 x PFA + 5 (allowable site test pressure).

The classification into C classes under EN 545 does **not** apply to positive locking joints. The minimum wall thicknesses therefore differ from those in Table 17 of EN 545 (which applies to non-restrained joints).

Compatibility
There is no compatibility with the positive locking systems used by other manufacturers. For possible solutions in this regard, please get in touch with our Applications Engineering Division.

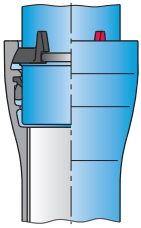
E-mail address: support@vonroll-hydro.world

Clamping ring
The use of clamping rings is possible in the majority of cases on pipes of nominal sizes from DN 80 to DN 500. For details of the fields of use of the rings see p. 53 and for installation instructions see p. 88 on. By using clamping rings it is possible to dispense with the retrospective application of welded beads to pipes which are cut on site.

2.1 Positive locking joints and pipes

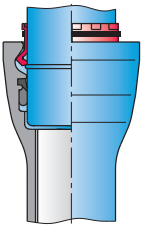
Overview

BLS®



DN 80 to DN 500

BLS®

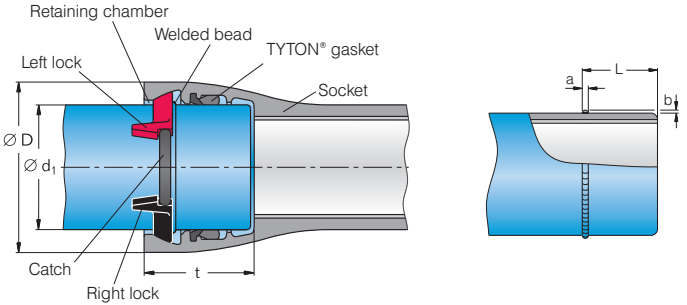


DN 600 to DN 1000

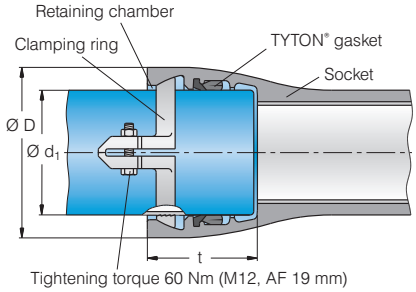
DN	PFA [1] [bar]	Allowable tractive force [3] [kN]	Max. angular deflection [°]
80 [2]	100	115	5
100 [2]	75	150	5
125 [2]	63	225	5
150 [2]	63	240	5
200	42	350	4
250	40	375	4
300	40	380	4
400	30	650	3
500	30	860	3
600	32	1,525	2
700	25	1,650	1.5
800	16/25 [2]	1,460	1.5
900	16/25 [2]	1,845	1.5
1000	10/25 [2]	1,560	1.5

1) PFA: allowable operating pressure; PMA = 1.2 x PFA; PEA = 1.2 x PFA + 5 – higher PFA's on enquiry, 2) Wall-thickness class K10 under EN 545:2006; 3) DN 80 to DN 250 with high-pressure lock – higher tractive forces on enquiry

BLS® joint
DN 80 to DN 500



BLS® joint with clamping ring
DN 80 to DN 500



Notes on the use of BLS® joints

- trenchless installation of DN 80 to DN 250 size pipes only with high-pressure lock
- for installation instructions see p. 85
- higher pressures are possible, e. g. for snow-making systems or turbine pipelines

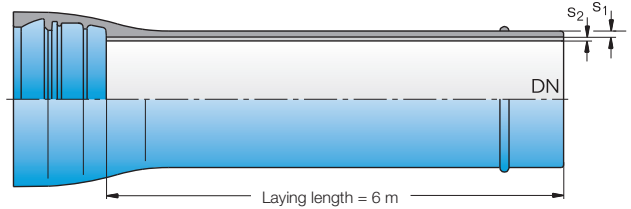
Notes on the use of clamping rings

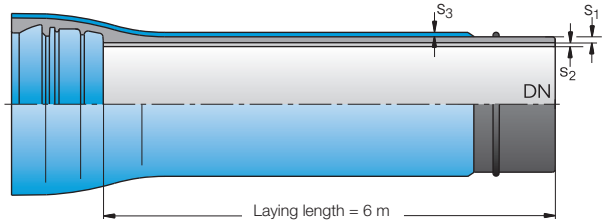
- as a replacement for the welded bead, e. g. on pipes cut on site
- up to PFA of 16 bars in double socket bends, socket spigot-bends, 90° flange socket duckfoot bends and 90° duckfoot bends with side outlets; higher PFA's on enquiry
- not in above-ground pipelines or buried pipelines subject to pulsating pressures
- not in trenchless installation techniques
- tightening torque of bolts: see marker tag.
- for installation instructions see p. 88

DN	Dimensions[1] [mm]						Weight [kg]				PFA [2] [bar]			Number of locks [3]	Allowable tractive force [4] [kN]	Max. angular deflection [°]	Min. radius [5] [m]	Assembly time [6] [min]
	d_1	D	t	L	a	b	Set of locks	High-pressure lock	Clamping ring	Gasket	Without high-pressure lock	With high-pressure lock	Clamping ring					
80	$98^{+1}_{-2.7}$	156	127	86	8	5	0.4	0.3	0.9	0.13	100	110	45	2	115	5	69	5
100	$118^{+1}_{-2.8}$	182	135	91	8	5	0.4	0.4	1.0	0.16	75	100	45	2	150	5	69	5
125	$144^{+1}_{-2.8}$	206	143	96	8	5	0.6	0.5	1.4	0.19	63	100	45	2	225	5	69	5
150	$170^{+1}_{-2.9}$	239	150	101	8	5	0.8	0.6	1.7	0.22	63	75	45	2	240	5	69	5
200	$222^{+1}_{-3.0}$	293	160	106	9	5,5	1.1	0.8	2.2	0.37	42	63	45	2	350	4	86	6
250	$274^{+1}_{-3.1}$	357	165	106	9	5,5	1.5	1.2	2.7	0.48	40	44	45	2	375	4	86	7
300	$326^{+1}_{-3.3}$	410	170	106	9	5,5	2.7	–	3.6	0.67	40	–	30	4	380	4	86	8
400	$429^{+1}_{-3.5}$	521	190	115	10	6	4.4	–	6.0	1.1	30	–	30	4	650	3	115	10
500	$532^{+1}_{-3.8}$	636	200	120	10	6	5.5	–	7.2	1.6	30	–	30	4	860	3	115	12

1) Tolerances are possible, 2) PFA: allowable operating pressure; PMA = 1.2 x PFA; PEA = 1.2 x PFA + 5 – higher PFA's on enquiry, 3) Plus high-pressure lock if required with DN 80 to DN 250 sizes

4) Higher tractive forces on enquiry, 5) Min. radius of curves (6 m pipe), which results from the angular deflection possible at the sockets – applies to both open trench and trenchless laying, 6) Approx. assembly time of the joint not including any protection it may be given





External coatings

- Cement mortar coating (Duktus ZMU)
- Zinc coating with finishing layer
- Zinc-aluminium coating with finishing layer (Zinc PLUS coating)
- WKG insulation
- ZMU PLUS cement mortar coating

Internal coatings

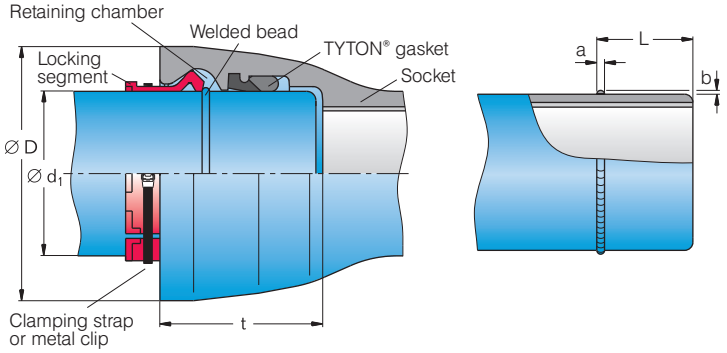
- Blast furnace cement
- High-alumina cement

For notes on the fields of use of the coatings see chapter 6

DN	Dimensions [mm] [4]			Total weight [kg]			PFA [1] [bar]			Number of locks [5]	Allowable tractive force [6] [kN]	Max. angular deflection [°]	Min. radius [7] [m]	Assembly time [8] [min]
	s_1 Ductile iron	s_2 Cement mortar lining	s_3 Cement mortar coating	pipe [2]	pipe + cement mortar coating [3]		Without high-pressure lock	With high-pressure lock	Clamping ring [9]					
80	4.7	4	5	96.7	116.2		100	110	45	2	115	5	69	5
100	4.7	4	5	120.3	144.3		75	100	45	2	150	5	69	5
125	4.8	4	5	156.4	184.4		63	100	45	2	225	5	69	5
150	4.7	4	5	192.0	225.0		63	75 [10]	45	2	240	5	69	5
200	4.8	4	5	248.3	291.3		42	63	45	2	350	4	86	6
250	5.2	4	5	330.3	382.3		40	44	45	2	375	4	86	7
300	5.6	4	5	424.9	487.9		40	–	30	4	380	4	86	8
400	6.4	5	5	624.9	706.9		30	–	30	4	650	3	115	10
500	7.2	5	5	839.9	940.9		30	–	30	4	860	3	115	12

1) PFA: allowable operating pressure; PMA = 1.2 x PFA; PEA = 1.2 x PFA + 5 – higher PFA's on enquiry,
2) Theoretical weight per pipe inc. cement mortar lining, zinc (zinc-aluminium) and finishing layer, 3) Theoretical weight per pipe inc. cement mortar coating & lining and zinc,
4) s_1 = min. dimension, s_2/s_3 = nominal dimensions. Note that tolerances are possible

5) Plus high-pressure lock if required with DN 80 to DN 250 sizes, 6) Higher tractive forces on enquiry,
7) Min. radius of curves, which results from the angular deflection possible at the sockets – applies to both open trench and trenchless laying, 8) Approx. assembly time of the joint, not including any protection it may be given, 9) See notes on the use of clamping rings, p. 90 ff, 10) s_{min} = 5 mm



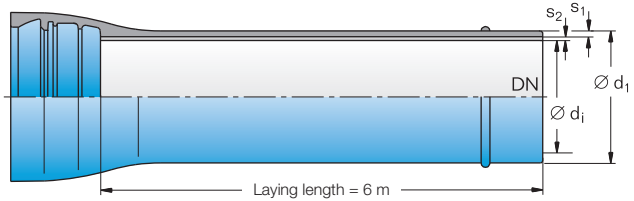
Notes on the use of BLS® joints

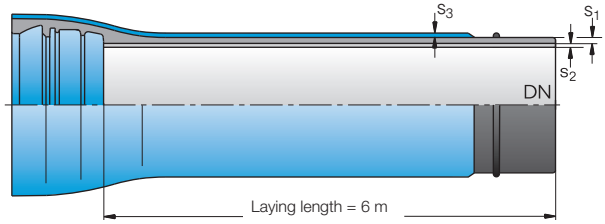
- trenchless installation only with metal clips
- for installation instructions see p. 94
- higher pressures are possible, e. g. for snow-making systems or turbine pipelines

DN	Dimensions [mm] [1]						Weight [kg]			Number of locks	PFA [2] [bar]	Allowable tractive force [3] [kN]	Max. angular deflection [°]	Min. radius [4] [m]	Assembly time [5] [min]
	d_1	D	t	L	a	b	Set of locks	Gasket							
600	635 $^{+1}_{-4.0}$	732	175	116	9	6	9	2.3		9	32	1,525	2.0	172	15
700	738 $^{+1}_{-4.3}$	849	197	134	9	6	11	4.3		10	25	1,650	1.5	230	16
800	842 $^{+1}_{-4.5}$	960	209	143	9	6	14	5.2		10	16/25 [6]	1,460	1.5	230	17
900	945 $^{+1}_{-4.8}$	1,073	221	149	9	6	13	6.3		13	16/25 [6]	1,845	1.5	230	18
1000	1,048 $^{+1}_{-5.0}$	1,188	233	159	9	6	16	8.3		14	10/25 [6]	1,560	1.5	230	20

1) Tolerances are possible. 2) PFA: allowable operating pressure; PMA = 1.2 x PFA; PEA = 1.2 x PFA + 5 – higher PFA's on enquiry. 3) Higher tractive forces on enquiry

4) Min. radius of curves. which results from the angular deflection possible at the sockets – applies to both open trench and trenchless laying. 5) Approx. assembly time of the joint. not including any protection it may be given. 6) Wall-thickness class K 10 under EN 545:2006





External coatings

- Cement mortar coating (Duktus ZMU)
- Zinc coating with finishing layer
- Zinc-aluminium coating with finishing layer (Zinc PLUS)
- WKG insulation

Internal coatings

- Blast furnace cement
- High-alumina cement

For notes on the fields of use of the coatings see chapter 6

DN	Dimensions [mm] [4]			Weight [kg]			Number of locks	PFA [1] [bar]	Allowable tractive force [5] [kN]	Max. angular deflection [°]	Minimum radius [6] [m]	Assembly time [7] [min]
	s_1	Cement mortar lining s_2	Cement mortar coating s_3	6 m pipe [2]	6 m pipe + cement mortar coating [3]							
600	8.0	5	5	1,118.6	1,239.6		9	32	1,525	2.0	172	15
700	8.8	6	5	1,410.1	1,550.1		10	25	1,650	1.5	230	16
800	9.6	6	5	1,768.0	1,928.0		10	16/25 [8]	1,460	1.5	230	17
900	10.4	6	5	2,131.3	2,310.3		13	16/25 [8]	1,845	1.5	230	18
1000	11.2	6	5	2,524.4	2,723.4		14	10/25 [8]	1,560	1.5	230	20

1) PFA: allowable operating pressure; PMA = 1.2 x PFA; PEA = 1.2 x PFA + 5 – higher PFA's on enquiry, 2) Theoretical weight per pipe inc. cement mortar lining, zinc (zinc-aluminium) and epoxy finishing layer, 3) Theoretical weight per pipe inc. cement mortar lining & coating and zinc,
4) s_1 = min. dimension, s_2/s_3 = nominal dimensions. Tolerances are possible

5) Higher tractive forces on enquiry, 6) Min. radius of curves, which results from the angular deflection possible at the sockets – applies to both open trench and trenchless laying, 7) Approx. assembly time of the joint not including any protection it may be given, 8) Wall-thickness class K 10 under EN 545:2006

Compatibility
There is no compatibility with positive locking systems used by other manufacturers. For possible solutions in this regard, please get in touch with our Applications Engineering Division.

E-mail address: support@vonroll-hydro.world

Laying lengths
Except where otherwise noted, the laying lengths L_u of fittings conform to the A series in EN 545.

Flanged fittings (see chapter 5)
When ordering flanged fittings, it is essential to give the PN pressure rating required. Accessories such as hex-head bolts, nuts, washers and gaskets must be obtained from specialist suppliers.

Coating
Except where otherwise specified, all the fittings shown below are provided internally and externally with an epoxy coating at least 250 µm thick.
The coating complies with EN 14 901 and meets the requirements of the Quality Association for the Heavy Duty Corrosion Protection of Powder Coated Valves and Fittings (GSK).
All fittings to EN 545, Annex D.2.3., can thus be installed in soils of any desired corrosiveness.

For notes on the fields of use of the coating see chapter 6.

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VON ARMATUREN UND FORMSTÜCKEN

Allowable operating pressure (PFA)

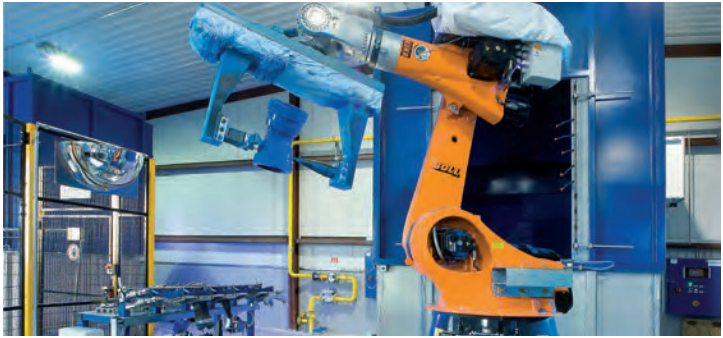
(except where otherwise stated)

DN	PFA [bar]	
	BLS®	Flanged
80–250	100	PFA = PN
300	85	
400	30	
500	30	
600	40	
700	25	
800	25	
900	25	
1000	25	

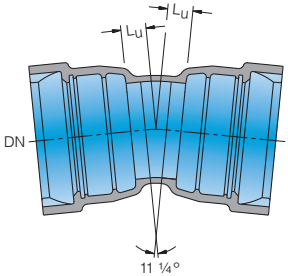
- PFA: maximum allowable operating pressure in bars
- PMA = 1.2 x PFA (allowable maximum operating pressure for a short period, e. g. the period of a pressure surge)
- PEA = 1.2 X PFA + 5 (allowable site test pressure)

Scope of supply

The fittings supplied by Duktus include all the gaskets, locks and other securing components required for all the sockets. For flanged joints, the gaskets, bolts, nuts and washers are not included in the scope of supply.

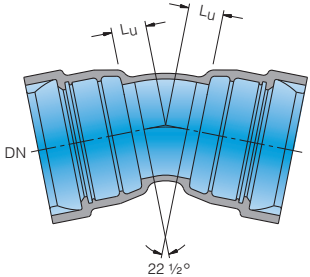


MMK 11 fittings
11¼° double socket bends
to EN 545



DN	Dimensions [mm] L_u	PFA [bar]	Weight [kg] ~
BLS®			
80	30	100	10.1
100	30		14
125	35		18.6
150	35		23.3
200	40		38.2
250	50		52.3
300	55	85	70.4
400	65	30	116
500	75		171.5
600	85	40	186
700	95	25	277
800	110		378
900	120		532
1000	130		614

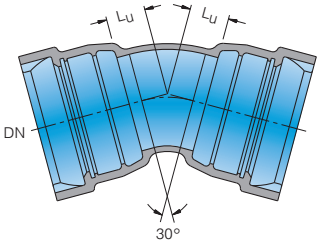
MMK 22 fittings
22½° double socket bends
to EN 545



DN	Dimensions [mm] L_u	PFA [bar]	Weight [kg] ~
BLS®			
80	40	100	10.2
100	40		14.3
125	50		19.4
150	55		24.3
200	65		39.2
250	75		56.9
300	85	85	78.6
400	110	30	125.5
500	130		197
600	150	40	215.5
700	175	25	320
800	195		458
900	220		594
1000	240		723

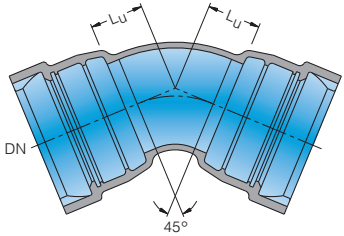
MMK 30 fittings
30° double socket bends
to DIN 28 650

DUKTUS



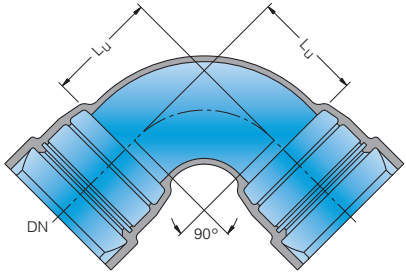
DN	Dimensions [mm] L_u	PFA [bar]	Weight [kg] ~
BLS®			
80	45	100	10.4
100	50		14.7
125	55		20.3
150	65		25.2
200	80		41.4
250	95		59.3
300	110	85	79.9
400	140	30	137
500	170		205.5
600	200	40	230
700	230	25	333
800	260		473
900	290		635
1000	320		809

MMK 45 fittings
45° double socket bends
to EN 545



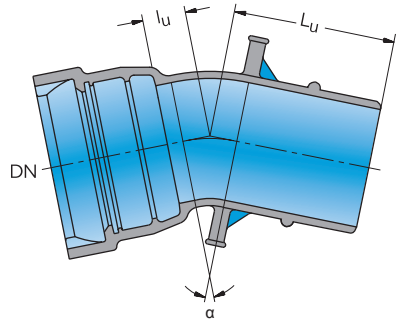
DN	Dimensions [mm] L_u	PFA [bar]	Weight [kg] ~
BLS®			
80	55	100	11
100	65		14.7
125	75		20.8
150	85		26.3
200	110		41.5
250	130		65.1
300	150	85	86.4
400	195	30	149.5
500	240		227
600	285	40	261
700	330	25	376
800	370		548
900	415		716
1000	460		879

MMQ fittings
90° double socket bends
to EN 545



DN	Dimensions [mm] L_u	PFA [bar]	Weight [kg] ~
BLS®			
80	100	100	11.6
100	120		15.9
125	145		22.4
150	170		28.9
200	220		55.1
250	270		76
300	320	85	94.5
400	430	30	200.5

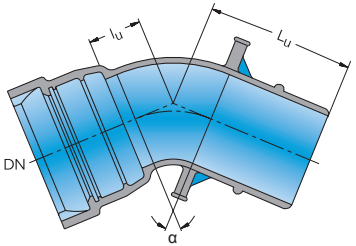
MK 11 and MK 22 fittings
11¼° and 22½° single socket bends
to manufacturer's standard



DN	Dimensions [mm] l_u	Dimensions [mm] L_u	PFA [bar]	Weight [kg] ~
BLS®; α = 11¼°				
80	30	175	100	8.4
100	30	185		11.1
125	35	200		15.1
150	35	210		20.1
200	40	230		32.7
250	50	250		51
300	55	270	85	71
400	65	375	63	125
500	75	405	50	220

DN	Dimensions [mm] l_u	Dimensions [mm] L_u	PFA [bar]	Weight [kg] ~
BLS®; α = 22½°				
80	40	185	100	8.7
100	40	195		11.6
125	50	215		15.9
150	55	230		21.5
200	65	255		35.3
250	75	275		53
300	85	300	85	73
400	110	420	63	138.8
500	130	460	50	220

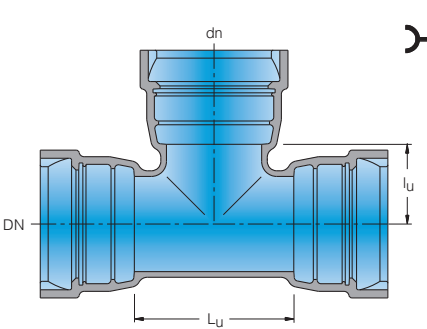
MK 30 and MK 45 fittings
30° and 45° single socket bends
to manufacturer's standard



DN	Dimensions [mm] l_u	Dimensions [mm] L_u	PFA [bar]	Weight [kg] ~
BLS®; α = 30°				
80	45	190	100	8.9
100	50	205		11.9
125	55	220		16.2
150	65	240		22.4
200	80	270		36.5
250	95	295		57
300	110	320	85	82
400	140	450	63	157.2
500	170	495	50	224

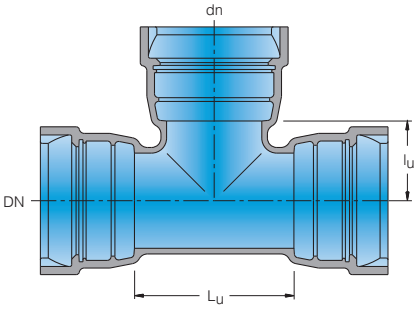
DN	Dimensions [mm] l_u	Dimensions [mm] L_u	PFA [bar]	Weight [kg] ~
BLS®; α = 45°				
80	55	200	100	9.1
100	65	220		12.3
125	75	240		17
150	85	260		24.2
200	110	300		39.7
250	130	335		60.5
300	150	365	85	87.3

MMB fittings
All-socket tees with 90° branch
to EN 545



DN	dn	Dimensions [mm]		PFA [bar]	Weight [kg] ~
		L_u	l_u		
BLS®					
80	80	170	85	100	16.1
100	80	170	95		20.0
	100	190	95		22.4
125	80	170	105		25.1
	100	195	110		28.1
	125	225	110		31.0
150	80	170	120		33.6
	100	195	120		34.5
	125	255	125		39.0
	150	255	125		41.1
200	80	175	145		46.2
	100	200	145		47.3
	125	255	145		50.0
	150	255	150		54.3
	200	315	155		63.1
250	80	180	170		72.0
	100	200	170		63.9
	125	230	175		78.0
	150	260	175		70.6
	200	315	180		77.8
	250	375	190		89.1

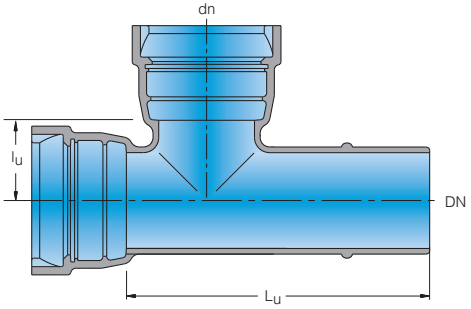
DUKTUS



DN	dn	Dimensions [mm]		PFA [bar]	Weight [kg] ~
		L_u	l_u		
BLS®					
300	80	180	195	85	93.0
	100	205	195		80.2
	150	260	200		88.6
	200	320	205		96.6
	300	435	220		127.4
400*	400	560	280	30	236.0
500*	500	800	400		396.8

* To manufacturer's standard

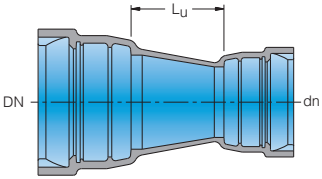
MB-fittings
Single socket tees with 90° socket branch
to manufacturer's standard



DN	dn	Dimensions [mm]		PFA [bar]	Weight [kg] ~
		L_u	l_u		
BLS®					
400	80	680	270	63	179.5
	300	680	270		211.5

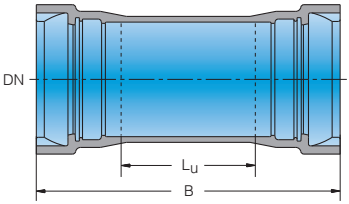
MMR fittings
Double socket tapers
to EN 545

DUKTUS



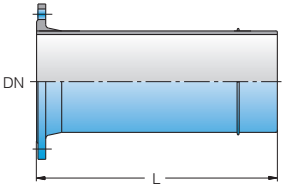
DN	dn	L_u [mm]	PFA [bar]	Weight [kg] ~
BLS®				
100	80	90	100	12.3
125	80	140		15.9
	100	100		16.7
150	80	190		19.9
	100	150		20.8
	125	100		21.0
200	100	250		29.6
	150	150		30.4
250	150	250		45.3
	200	150		46.7
300	150	350	85	57.0
	200	250		58.9
	250	150		62.8
400*	300	260	30	111.0
500*	400	260		156.0

* To manufacturer's standard



DN	L_u [mm]	B [mm]	PFA [bar]	Weight [kg] ~
BLS®				
80	160	415	100	13.4
100	160	430		16.0
125	175	460		24.0
150	180	480		30.5
200	180	500		45.5
250	190	520		66.5
300	200	540	85	83.5
400	210	590	30	115.0
500	220	720		210.0

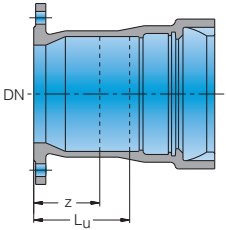
There are cases where collars with BLS® joints cannot be fully slid on.
They must be used only with TYTON® gaskets.



DN	L [mm]	Weight [kg]					
		PN 10	PN 16	PN 25	PN 40	PN 63	PN 100
BLS®							
80	350	7.5				11.9	11.2
100	360	8.5		10.4		14.1	15.7
125	370	12.4		13.1	14.3	20.0	22.8
150	380	19.3		21.0	21.0	31.9	28.0
200	400	25.2	25.2	26.0	30.8	46.6	55.4
250	420	35.1	35.2	37.7	45.4	–	–
300	440	46.0	44.8	49.1	62.0	–	–
400	480	104.0	109.0	114.0	154.0*	–	–
500	500	146.0	156.0	161.0	–	–	–
600	560	134.3	160.3	174.3	235.3	–	–
700	600	180.6	195.6	229.6	–	–	–
800	600	228.0	247.0	296.0	–	–	–
900	600	348.0	359.0	–	–	–	–
1000	600	503.0	538.0	–	–	–	–

* Take note of the PFA of the BLS® joint

EU fittings
Flanged sockets
to EN 545



DN	L_u [mm]	z [mm]	Weight [kg]					
			PN 10	PN 16	PN 25	PN 40	PN 63	PN 100
BLS®								
80	130	90	10.2				12.3	–
100	130	90	12.2		12.7		16.3	20.7
125	135	95	15.5		17.0	17.0	26.8	–
150	135	95	19.9		22.1	22.1	31.5	33.4
200	140	100	28.7	28.9	29.6	34.6	49.0	56.4
250	145	105	40.6	39.7	44.3	51.9	67.5	86.4
300	150	110	52.3	52.1	56.1	69.9	84.9	120.0
400	160	120	90.0	89.0	102.0	127.5	–	–
500	170	130	125.0	140.5	151	162.0*	–	–
600	180	140	137.5	167.5	173.5	209.0*	–	–
700	190	150	202.0	248.0	278.0	–	–	–
800	200	160	269.5	270.0	316.0	–	–	–
900	210	170	347.0	370.0	427.0	–	–	–
1000	220	180	439.0	464.0	549.0	–	–	–

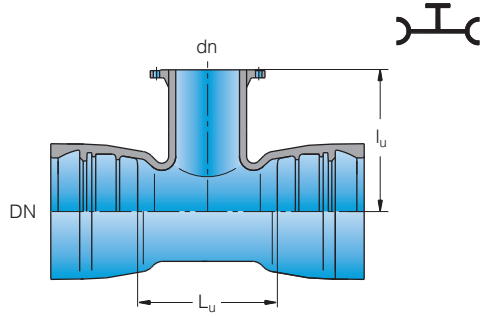
L_u = laying length in the locked state
z = mean laying length (when used without a welded bead)
* Take note of the PFA of the BLS® joint

MMA fittings
Double socket tees with flanged branch
to EN 545

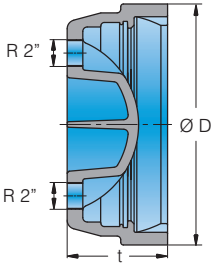
DUKTUS

DN	dn	L_u [mm]	l_u [mm]	Weight [kg]			
				PN 10	PN 16	PN 25	PN 40
BLS®							
80	80	170	165	15.8			
100	80	170	175	20.5			
	100	190	180	21.9		–	
125	80	170	190	24.8			
	100	195	195	27.6		–	
	125	255	200	–		–	–
150	80	170	205	30.6			
	100	195	210	33.0		–	
	150	225	220	39.0		–	–
200	80	175	235	45.4			
	100	200	240	46.8		–	
	150	250	250	51.6		–	–
	200	315	260	–	57.0	–	–
250	80	180	265	56.0			
	100	200	270	57.5		–	
	150	260	280	63.5		–	–
	200	315	290	–	71.5	–	–
	250	375	300	–	–	–	–
300	80	180	295	76.6			
	100	205	300	81.2		–	
	150	260	310	80.0		–	–
	200	320	320	–	–	–	–
	300	435	340	110.0	–	–	–
400	150	270	370	148.0		152.0	152.0
	200	440	380	170.0	171.0	173.0	–
	300	440	400	191.0	192.0	197.0	–
	400	560	420	200.0	205.0	217.0	–
500	200	450	440	192.5	192.5	194.5	–
	300	450	460	205.0	205.0	211.0	–
	400	565	480	297.0	303.0	315.0	–
	500	680	500	338.0	362.0	363.0	372*

* Take note of the PFA of the BLS® joint

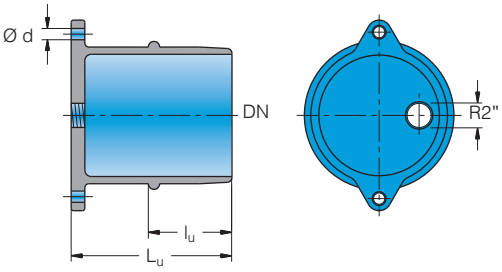


DN	dn	L_u [mm]	l_u [mm]	Weight [kg]		
				PN 10	PN 16	PN 25
BLS®						
600	150	570	490	237.0		238.0
	200		500	254.0	254.0	247.0
	300		520	266.0	266.0	272.0
	400		540	279.0	284.0	296.0
	600	800	580	376.5	401.0	415.0
800	150	1045	580	657.0		645.0
	200		585	667.0	667.0	655.0
	400		615	695.0	682.0	693.0
	600		645	745.0	770.0	784.0
	800		675	791.0	809.0	855.0
900	100	475	630	540.0	592.0	598.0
	125		635	541.0	593.0	594.0
	150		640	543.0	594.0	600.0
	200		645	546.0	596.0	603.0
	250		655	550.0	599.0	608.0
	300		660	555.0	603.0	613.0
1000	100	480	690	672.0	738.0	745.0
	125		695	673.0	738.0	746.0
	150		700	675.0	739.0	747.0
	200		705	678.0	741.0	750.0
	250		715	682.0	741.0	750.0
	300		720	687.0	748.0	760.0



DN	t [mm]	D [mm]	PFA [bar]	Weight [kg]
BLS® O fittings				
400	225	540	30	117
500	240	650	30	170

P plugs
Socket plugs
to manufacturer's standard



DN	L_u [mm]	l_u [mm]	d [mm]	PFA [bar]	Weight [kg]
BLS® P plugs					
80	170	86	M 12	100	4.1
100	175	91	M 12		4.4
125	195	96	M 16		6.7
150	200	101	M 16		9.2
200	210	106	M 16		14.5
250	250	106	M 20		27.2
300	300	106	M 20		49.4

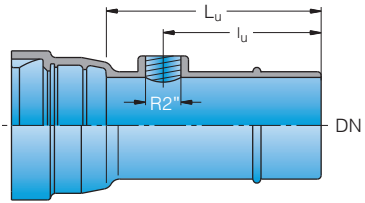
GL fittings (GDR fittings)
Plain ended pipe pieces
with two welded beads
to manufacturer's standard

Other lengths available on enquiry

DN	Weight [kg] PFA [bar] 10	16	25	30	40	63	100	Coating internal/ external
BLS® L_1 = 400 mm or 800 mm								
80	7.6 or 15.4							Epoxy/ Epoxy
100	9.5 or 18.8							
125	12.0 or 25.0							
150	15.6 or 31.0							
200	22.0 or 44.0 [1]							
BLS® L_1 = 800 mm								
250	44.6					66.7		Epoxy/ Epoxy
300	55.8			56.8		98.0		
400	81.3				–			
500	104.0							
600	127.6 [2]				–	–	–	Cement mortar/zinc + epoxy
700	164.1			–	–	–	–	
800	201.8		219.6	–	–	–	–	
900	240.4		263.2	–	–	–	–	
1000	283.4	310.4		–	–	–	–	

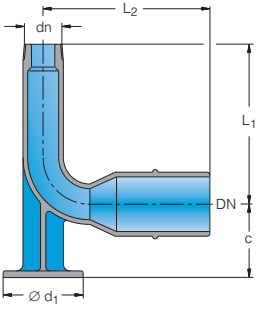
1) PFA of 100 with high-pressure lock 2) Max. PFA of 32

HAS fittings (A fittings)
House service connection fittings
with outlet with 2” female thread
to manufacturer’s standard

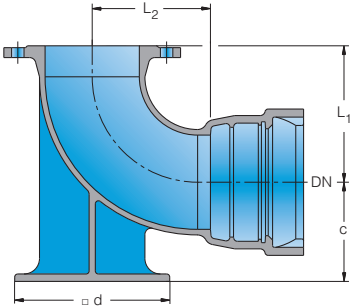


DN	L_u [mm]	l_u [mm]	PFA [bar]	Weight [kg]
BLS® HAS fittings				
80	305	215	100	10.5
100	315	225		13.8
125	325	235		17.8
150	340	250		23.1
200	355	265		34.8
250	370	275		54
300	380	285	85	72

ENH fittings
90° duckfoot bends for hydrants
with male threaded outlet
to manufacturer's standard



DN	dn [“]	L_1 [mm]	L_2 [mm]	c [mm]	d_1	PFA [bar]	Weight [kg]
BLS® ENH fittings							
80	1.5	240	250	110	120	100	7.3
80	2.0	240	250	110	120	100	7.3

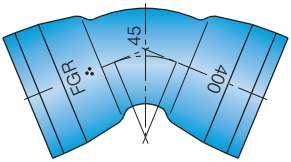


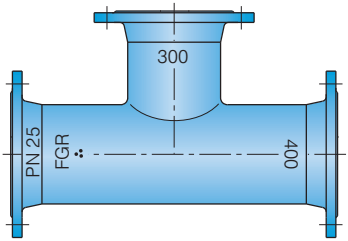
DN	Dimensions [mm]				Weight [kg]			
	L_1	L_2	c	d	PN 10	PN 16	PN 25	PN 40
BLS® EN fittings								
80	165	145	110	180	16.4			
100	180	158	125	200	22.6		–	

Marking of fittings

DUKTUS

All fittings produced by member companies of the “Fachgemeinschaft Gussrohrsysteme/ European Association for Ductile Iron Pipe Systems (FGR/EADIPS)” carry the “FGR” mark indicating that all the guidelines required for the award of the “FGR Quality Mark” have been complied with.
As well as this, all fittings are marked with their nominal sizes and bends are marked with their respective angles.
Flanged fittings have the pressure ratings PN 16, 25 or 40 cast or stamped onto them. No pressure rating appears on flanged fittings for PN 10 or on any socket fittings.
To identify their material as “ductile cast iron”, fittings are marked with three raised dots arranged in a triangle (∴) on their outer surface.
In special cases, there may be further markings which are specified as needing to be applied.





BLS® joints DN 80 to DN 500

Applicability

These installation instructions apply to ductile iron pipes and fittings of DN 80 to DN 500 nominal sizes with restrained BLS® push-in joints.

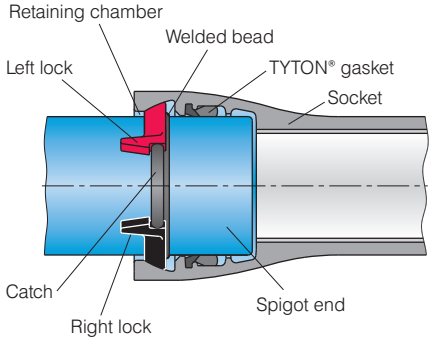
For recommendations for transport, storage and installation, see p. 289 ff. For laying tools and other accessories, see Chapter 7.

For very high internal pressures and trenchless installation techniques (e. g. the press-pull, rocket plough or HDD techniques), an additional high pressure lock should be used in pipes of DN 80 to DN 250 nominal sizes (see the section entitled “High pressure lock” on p. 94).

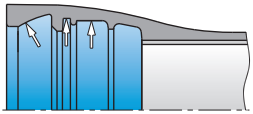
The number of joints to be restrained should be decided on in accordance with DVGW Merkblatt GW 368 (see p. 301 ff).

For allowable tractive forces for trenchless installation techniques, see p. 108 or DVGW Arbeitsblätter GW 320-1, 321, 322-1, 322-2, 323 and 324.

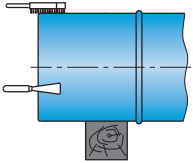
Construction of the joint



Cleaning



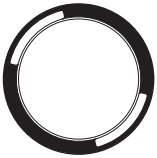
Clean the surfaces of the seating for the gasket, the retaining groove and the retaining chamber which are indicated by the arrows and remove any excess paint (paint humps, bubbles or pimples) from them. Use a scraper (e. g. a bent screwdriver) to clean the retaining groove.



Clean the spigot end. Remove any fouling and any excess paint (paint humps, bubbles or pimples).

Positions of the openings in the socket end-face when the pipe is in the pipeline trench

DN 80 to DN 250



DN 300 to DN 500

For inserting the locks or bolting on the clamping ring, it is advisable for the openings in the end-face of the socket to be positioned as shown.
For fittings, the position of the openings will depend on the particular installation situation.
For WKG pipes with trace heating, care must be taken to see that the heating cable is positioned at the bottom of the pipe.

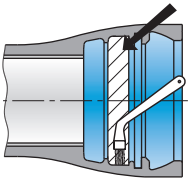
Inserting the gasket

Lubricant should be used below TYTON® gaskets. For this purpose, carefully wipe a thin film of the lubricant supplied with the pipes by the manufacturer over the sealing surface identified by the oblique lines.

Note: Do not put any lubricant in the retaining groove (the narrow groove)!

In hot, dry weather (summer) apply the lubricant immediately prior to installation, as it can dry out.

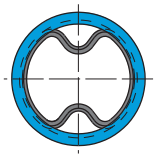
In cold weather (winter), store the lubricant and seal warm until use, thus a much simpler assembly is given.



Clean the gasket and make a loop in it so that it is heart-shaped.

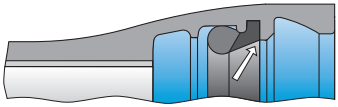
Fit the gasket into the socket so that the hard-rubber claw on the outside engages in the retaining groove in the socket.
Then press the loop flat.

If you have any difficulty in pressing the loop flat, pull out a second loop on the opposite side. These two small loops can then be pressed flat without any difficulty.

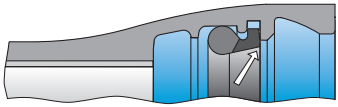


The inner edge of the hard-rubber claw of the gasket must not project below the locating collar.

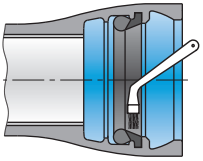
Right



Wrong



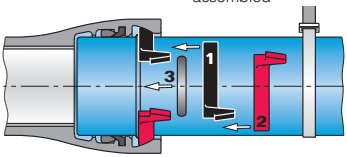
Apply a thin layer of lubricant to the gasket.



Spigot end with welded bead

Apply a thin layer of lubricant to the cleaned spigot end – and particularly to the bevel – and then pull or push the spigot end into the socket until it is in abutment with the end-wall of the socket. Pipes must not be in a deflected angular position when they are being pushed in or the locks are being inserted.

Do not remove whatever is being used to lift the pipe until the joint has been fully assembled



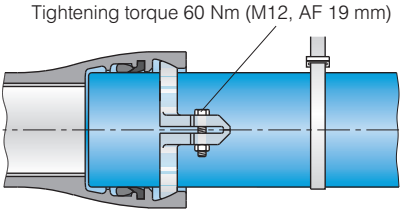
1) Insert the “right” lock in the opening in the socket and slide it to the right as far as possible.

2) Insert the “left” lock in the opening in the socket and slide it to the left as far as possible.

3) Press the catch into the opening in the socket.
On pipes of DN 300 size and above, steps 1 to 3 have to be carried out twice because 2x2 locks and 2 catches are used in this case.

Spigot end without a welded bead
First insert the two halves of the clamping ring into the retaining chamber separately and then connect them together loosely with the two bolts.

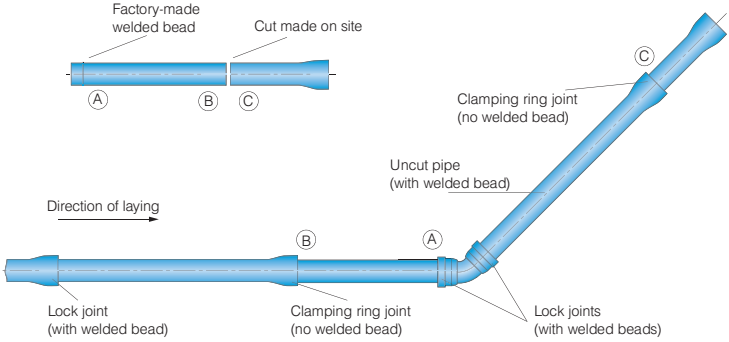
Mark the depth of insertion (the depth of the socket) on the spigot end.
Apply lubricant to the cleaned spigot end – and particularly to the bevel – and then pull or push it in until it is fully home in the socket. Pipes must not be at an angular deflection when they are being pulled in. After the pulling-in, the mark previously made on the spigot end should be almost in line with the end-face of the socket.
Pull the clamping ring towards the end-face of the socket as far as possible and then tighten the bolts with a torque wrench. Attention – model change! 60 Nm only applies for new zinc coated (colour = silver) clamping rings.



Notes on clamping ring joints

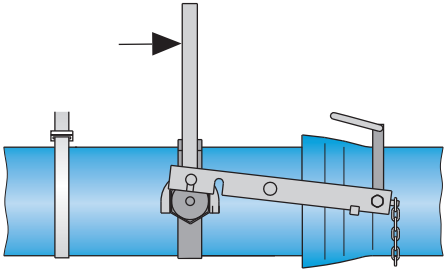
Care should be taken to see that clamping ring joints are **not** used in above-ground pipelines or pipelines subject to pulsations or for **trenchless installation techniques.** For single socket bends, double socket bends, 90° flange socket duckfoot bends and 90° duckfoot bends with side outlets, the PFA is a maximum of 16 bars. Please enquire for PFA's of more than 16 bars.
For connections at bends where the operating pressure is > 16 bars, an adaptor, a piece of cut pipe with two spigot ends, is turned through 180° so that the end carrying the welded bead mates with the socket of the bend.

Before the remaining, socketed, piece of the cut pipe is installed, an uncut pipe is laid. The spigot end of the piece of cut pipe, which does not carry a welded bend, is then inserted in the socket of the uncut pipe.
Our Applications Engineering Division should be consulted before clamping rings are used in culvert or bridge pipelines and before joints using them are laid on steep slopes, in casing tubes or pipes, in utility tunnels or in above-ground pipelines or pipelines subject to pulsations. Clamping rings should not be used in these cases or in trenchless installation techniques. The pieces of adapter pipe required should be provided with welded beads.



Locking

Pull or push the pipe out of the socket, e. g. with a laying tool, until the locks or the clamping ring are firmly in abutment in the retaining chamber.
The joint is now restrained.

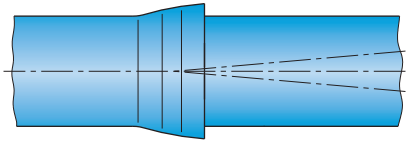


Angular deflection

Once the joint has been fully assembled, pipes and fittings can be deflected angularly as follows:

DN	80	to	DN 150	– max. of 5°
DN	200	to	DN 300	– max. of 4°
DN	400	and	DN 500	– max. of 3°

For a pipe length of 6 m, 1° of angular deflection causes the axis of the pipe to lie approx. 10 cm off the axis of the pipe or fitting installed previously, i.e. 3° = 30 cm.



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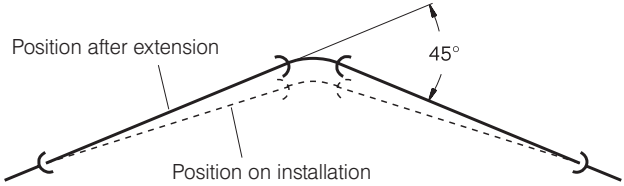
Note on installation

Make sure that, as a function of the internal pressure and the tolerances on joints, it is possible for extensions of up to about 8 mm to occur.
To allow for the travel of the pipeline when it extends when pressure is applied, joints at bends should be set to the maximum allowable angular deflection in the negative direction.

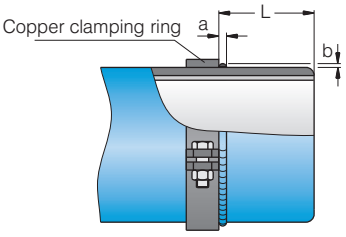


Cutting of pipes

Ensure that the pipes are suitable for cutting (see p. 364). If pipes have to be cut on site, the welded bead required for the BLS® push-in joint has to be applied using an electrode as specified by the pipe manufacturer. The welding work should be done in accordance with Merkblatt DVS 1502 or the technical recommendations for welding given from p. 367 on.

The distance between the end of the spigot end and the welded bead and the size of the welded bead must be as shown in the table below.
Electrode type, e. g. Castolin 7330-EC, UTP FN 86, ESAB OK 92.58, Gricast 31 or 32.
The electrode diameter should be 3.2 mm below DN 400 and 4.0 mm at DN 400 and above.
For electrode consumption see p. 102

DN	80	100	125	150	200	250	300	400	500
L	86±4	91±4	96±4	101±4	106±4	106±4	106±4	115±5	120±5
a	8±2	8±2	8±2	8±2	9±2	9±2	9±2	10±2	10±2
b	$5^{+0.5}_{-1}$	$5^{+0.5}_{-1}$	$5^{+0.5}_{-1}$	$5^{+0.5}_{-1}$	$5{,}5^{+0.5}_{-1}$	$5{,}5^{+0.5}_{-1}$	$5{,}5^{+0.5}_{-1}$	$6^{+0.5}_{-1}$	$6^{+0.5}_{-1}$



To ensure that there is a good welded bead at a uniform distance from the end, a copper welding guide must be fastened to the spigot end at the specified distance from the end (see Table) as a guide for application. The area to be welded must be bright metal. Any fouling or zinc coating must be removed by filing or grinding.
When the welding guide is removed, the cut edge of the spigot end should be matched to the form of an original spigot end and the area of the welded bead should be cleaned. Finally, the appropriate protective coating should be applied to both these areas.

Disassembly
Push the pipe as far as possible into the socket along its axis. Remove the catch through the opening in the socket end-face. Slide the locks round and remove them through the opening. If a high-pressure lock is fitted, slide it round from the bottom of the pipe to the opening with a flat object (e. g. a screwdriver) and remove it.

Disassembly of clamping ring joints

Push the pipe into the socket along its axis until it is in abutment.
Remove the clamping bolts and then loosen the halves of the clamping ring by hitting them with a hammer. Ensure that the halves of the clamping ring remain loose during disassembly (if necessary by again hitting them with a hammer as the spigot end is pulled out). They can also be stopped from jamming on the spigot end during disassembly by inserting a square steel bar between the lugs at the ends of the halves. Do not under any circumstances hit the socket or the barrel of the pipe with the hammer!

High-pressure lock

An additional high-pressure lock should be used whenever very high internal pressures are expected (e. g. in the case of turbine pipelines) and whenever trenchless installation techniques are used (e. g. the press-pull, rocket plough or horizontal directional drilling techniques).
Before the left and right locks are inserted, the high-pressure lock is inserted in the retaining chamber through the opening in the end-face of the socket and is positioned at the bottom of the pipe. The locks can then be inserted and the high-pressure lock is thus situated between their flat ends. The locks are then fixed in place in the usual way with the catch.
The illustration below shows a fully assembled BLS® socket with a high-pressure lock. The high-pressure lock can be used for pipes of nominal sizes from DN 80 to DN 250.