CTC
Pipelines System

Offshore and Marine GRE Pipe and Fittings Technical Manual

Changzhou CTC Pipelines System Co., Ltd.

Product Category and Property

Property	BL 16B	BL 16B-C	BL 16B-F	BL 16B-CF
Pressure Rating	1.6MPa （16bar）	1.6MPa （16bar）	1.6MPa（16bar）	1.6MPa（16bar）
Max. Working Temperature	93℃/200℉	93℃/200℉	93℃/200℉	93℃/200℉
Size Range	40~1000mm	40~1000mm	40~1000mm	40~1000mm
Inner Liner	0.5mm Resin rich liner	0.5mm Resin rich liner	0.5mm Resin rich liner	0.5mm Resin rich liner
External Pressure	According with IMO standard	According with IMO standard	According with IMO standard	According with IMO standard
Hydrostatic Pressure Design Basis	ASTM D-2992 （Method B）	ASTM D-2992 （Method B）	ASTM D-2992 （Method B）	ASTM D-2992 （Method B）
Fire-resistance	IMO A.753 （18）Level-3 fire resistance	IMO A.753 （18）Level-3 fire resistance	Jet Fire Resistance in accordance with OTI 95634	Jet Fire Resistance in accordance with OTI 95634
Conductivity	No	≤0.1MΩ/m	No	≤0.1MΩ/m

OFFSHORE / MARINE Applications

Ballast Systems	Bilge Systems	Fuel Oil Systems
Sanitation Lines	Oil-Water Separators	Vent Systems
Sounding Tubes	Tank Washing Systems	Inert Gas Systems
Certain parts of Fire Protection Systems		Vital and non-vital Water Systems

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Product Construction

Pipe

All pipe manufactured by filament winding process using an Amine cured thermosetting resin to impregnate strands of continuous glass filaments.

BL 16B: Standard pipe which is manufactured by filament winding Glass fiber Reinforced Epoxy with an inner resin rich liner. This kind of pipe meets Level-3 fire resistance in accordance with IMO A.753(18).

BL 16B-C: Conductive pipe which is manufactured by inner liner with conductive veil and continuous conductive filaments are utilized throughout the pipe wall. This kind of pipe meets Level-3 fire resistance in accordance with IMO A.753(18).

BL 16B-F: Fireproofing pipe is supplied with a unique reinforced ‘Fire-proof Coat ‘that has been fully qualified for Jet Fire in accordance with OTI 95634.

BL 16B-CF: Conductive fireproofing pipe which is manufactured by inner liner with conductive veil and continuous conductive filaments are utilized throughout the pipe wall and supplied with a unique reinforced ‘Fire-proof coating‘ which has been fully qualified for Jet Fire in accordance with OTI 95634.

All pipe supplied with square-cut ends for using with mechanical coupling or with positive-stop socket joint or matching tapered fittings.

Fittings

Fittings are manufactured by filament winding process using Amine cured epoxy resin. All conductive fittings are manufactured by inner liner with conductive veil and continuous conductive filaments are utilized throughout the wall. All kinds of fittings meet Level-3 fire resistance in accordance with IMO A.753(18). Fireproofing fittings are supplied with a unique reinforced ‘Fire-proof Coat ‘that has been fully qualified for Jet Fire in accordance with OTI 95634.

Fittings include non-conductive and conductive products such as Flange, TEE, Elbow, Coupling, Reducer, Expansion Coupling, Saddle etc.

Some special fittings are manufactured with hand-paste which is excluded in the manual. If needed, please contact your sales executive or plant.

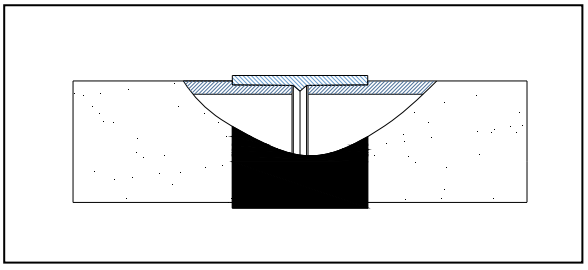
Flanges

Flanges are manufactured by filament winding process using Amine cured epoxy resin. Standard flanges have ANSI B16.5 Class 150 bolt hole patterns. Also flanges complied with ANSI B16.5 (>300Lb), DIN, ISO and JIS are available upon request.

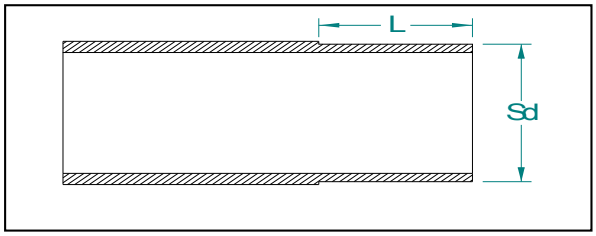
Joint System

Socket Joint：

40 ~ 400mm（1.5″---16″） Use an easily installed socket joint with positive stop up through 16” diameter.



Socket size of pipe



Grinding (Scarf) size of BL 16B/ 16B-C pipe

Nominal Pipe Size		Grinding		Grinding Angle
		Sd Outer Diameter mm	L（Ds） Grinding Length mm	Degrees °
Tolerance		+0/-0.25	+3/-0	0
mm	in			
40	1.5	47.9	34.9	0
50	2	59.7	49.2	0
65	2.5	75.8	49.2	0
80	3	88.5	49.2	0
100	4	113.6	49.2	0
125	5	140.2	60.3	0
150	6	168.0	60.3	0
200	8	219.3	66.7	0
250	10	275.0	73.0	0
300	12	326.7	79.4	0
350	14	354.1	92.1	0
400	16	404.8	104.8	0

450mm~1000mm（18″~40″）Flange: Straight bell and spigot

Grinding(Scarf) size of BL 16B/ 16B-C pipe

Nominal Pipe Size		Grinding		Grinding Angle Degrees °
		Sd outer Diameter mm	L（Ds） Grinding Length mm	
Tolerance		+0/-0.25	+3/-0	0
Mm	in			
450	18	455.6	108.0	0
500	20	506.3	114.3	0
550	22	557.4	123.8	0
600	24	607.8	130.2	0
650	26	683.0	142.9	0
700	28	735.8	155.6	0
750	30	788.4	168.3	0
800	32	841.2	181.0	0
900	36			
1000	40			

450mm~1000mm（18″~40″）other fittings: Tapered bell and spigot

Grinding (Scarf) size of BL 16B/ 16B-C pipe

Nominal Pipe Size		Grinding		Grinding Angle Degrees °
		Sd outer Diameter mm	L（Ds） Grinding Length mm	
Tolerance		+0/-0.25	+3/-0	
450	18	442.7	130.2	2.5
450	18	493.9	142.9	2.5
500	20	542.8	168.3	2.5
550	22	591.2	193.7	2.5
600	24	662.7	193.7	2.5
650	26	712.7	193.7	2.5
700	28	764.7	206.4	2.5
750	30	814.7	219.1	2.5
800	32	442.7	130.2	2.5
900	36			
1000	40			

Pipe Dimensions

BL 16B/16B-C

Nominal Pipe size		I.D. (Inner Diameter)		O.D. (Outer Diameter)		Normal Wall Thickness		Inner liner Thickness		Volume	
mm	in	mm	in	mm	in	mm	in	mm	in	L/m	ft^3/ft
40	1.5	42.2	1.66	49.2	1.94	3.0	0.12	0.5	0.02	1.4	0.02
50	2	53.3	2.10	60.9	2.40	3.3	0.13	0.5	0.02	2.2	0.02
65	2.5	69.1	2.72	77.1	3.04	3.5	0.14	0.5	0.02	3.7	0.04
80	3	81.8	3.22	89.8	3.54	3.5	0.14	0.5	0.02	5.3	0.06
100	4	105.4	4.15	115.0	4.53	4.3	0.17	0.5	0.02	8.7	0.09
125	5	132.1	5.20	141.7	5.58	4.3	0.17	0.5	0.02	13.7	0.15
150	6	159.0	6.26	169.6	6.68	4.8	0.19	0.5	0.02	19.8	0.21
200	8	208.8	8.22	221.8	8.73	6.0	0.24	0.5	0.02	34.2	0.37
250	10	262.9	10.35	278.3	10.96	7.2	0.28	0.5	0.02	54.3	0.58
300	12	312.1	12.29	330.2	13.00	8.5	0.34	0.5	0.02	76.4	0.82
350	14	337.6	13.29	357.6	14.08	9.5	0.37	0.5	0.02	89.5	0.96
400	16	385.8	15.19	408.8	16.10	11.0	0.43	0.5	0.02	116.9	1.26

Nominal Pipe size		I.D. (Inner Diameter)		O.D. (Outer Diameter)		Normal Wall Thickness		Inner liner Thickness		Volume	
mm	in	mm	in	mm	in	mm	in	mm	in	L/m	ft^3/ft
450	18	433.8	17.08	458.8	18.06	12.0	0.47	0.5	0.02	147.7	1.59
500	20	482.1	18.98	509.3	20.05	13.1	0.52	0.5	0.02	182.4	1.96
550	22	530.6	20.89	560.4	22.06	14.4	0.57	0.5	0.02	221.0	2.38
600	24	578.6	22.78	611.0	24.06	15.7	0.62	0.5	0.02	262.8	2.83
650	26	650.0	25.59	686.2	27.02	17.6	0.69	0.5	0.02	331.7	3.57
700	28	700.0	27.56	739.0	29.10	19.0	0.75	0.5	0.02	384.7	4.14
750	30	750.0	29.53	791.6	31.17	20.3	0.80	0.5	0.02	441.6	4.75
800	32	800.0	31.50	844.4	33.24	21.7	0.85	0.5	0.02	502.4	5.41
900	36	900.0	35.43	949.8	37.39	24.4	0.96	0.5	0.02	635.9	6.84
1000	40	1000.0	39.37	1055.2	41.54	27.1	1.07	0.5	0.02	785.0	8.45

Pipe Standard Lengths and Weights

BL 16B/16B-C

Pipe Size(Φ)		Length		Weights		ASTM D-2996 Design Codes
mm	in	m	ft	kg/m	lb/ft	
40	1.5	10.0	32.8	1.0	0.7	RTRP-11FW1-2112
50	2	10.0	32.8	1.4	0.9	RTRP-11FW1-2112
65	2.5	10.0	32.8	1.9	1.3	RTRP-11FW1-2112
80	3	10.0	32.8	2.2	1.5	RTRP-11FW1-2113
100	4	11.9	39.0	3.4	2.3	RTRP-11FW1-2113
125	5	11.9	39.0	4.2	2.8	RTRP-11FW1-2113
150	6	11.9	39.0	5.6	3.8	RTRP-11FW1-2116
200	8	11.9	39.0	9.0	6.0	RTRP-11FW1-2116
250	10	11.9	39.0	13.4	9.0	RTRP-11FW1-2116
300	12	11.9	39.0	18.5	12.4	RTRP-11FW1-2116
350	14	11.9	39.0	22.3	15.0	RTRP-11FW1-2116
400	16	11.9	39.0	29.3	19.7	RTRP-11FW1-2116
450	18	11.9	39.0	35.8	24.0	RTRP-11FW1-2116
500	20	11.9	39.0	43.2	29.0	RTRP-11FW1-2116
550	22	11.9	39.0	52.1	35.0	RTRP-11FW1-2116
600	24	11.9	39.0	61.8	41.5	RTRP-11FW1-2116
650	26	11.9	39.0	77.5	52.1	RTRP-11FW1-2116
700	28	11.9	39.0	89.9	60.4	RTRP-11FW1-2116
750	30	11.9	39.0	102.8	69.0	RTRP-11FW1-2116
800	32	11.9	39.0	117.0	78.6	RTRP-11FW1-2116
900	36	11.9	39.0	147.6	99.2	RTRP-11FW1-2116
1000	40	11.9	39.0	181.8	122.1	RTRP-11FW1-2116

Pipe External Pressure

BL 16B/16B-C，BL 16B-F/16B-CF

Nominal Pipe Size		Inner Diameter		Hydrostatic Pressure Rating		Vacuum/ External Pressure @ Ambient Tem			
						Ultimate Collapse Pressure		Rated Pressure	
mm	in	mm	in	Bar	MPa	Bar	MPa	Bar	MPa
40	1.5	42.2	1.66	16	1.6	164.7	16.47	54.9	5.49
50	2	53.3	2.10	16	1.6	114.9	11.49	38.3	3.83
65	2.5	69.1	2.72	16	1.6	67.0	6.70	22.3	2.23
80	3	81.8	3.22	16	1.6	41.9	4.19	14.0	1.40
100	4	105.4	4.15	16	1.6	37.2	3.72	12.4	1.24
125	5	132.1	5.20	16	1.6	19.6	1.96	6.5	0.65
150	6	159	6.26	16	1.6	15.9	1.59	5.3	0.53
200	8	208.8	8.22	16	1.6	13.9	1.39	4.6	0.46
250	10	262.9	10.35	16	1.6	12.2	1.22	4.1	0.41
300	12	312.1	12.29	16	1.6	12.0	1.20	4.0	0.40
350	14	337.6	13.29	16	1.6	13.3	1.33	4.4	0.44
400	16	385.8	15.19	16	1.6	13.8	1.38	4.6	0.46
450	18	433.8	17.08	16	1.6	12.7	1.27	4.2	0.42
500	20	482.1	18.98	16	1.6	12.1	1.20	4.0	0.40
550	22	530.6	20.89	16	1.6	12.0	1.20	4.0	0.40
600	24	578.6	22.78	16	1.6	12.1	1.20	4.0	0.40
650	26	650.0	25.59	16	1.6	12.0	1.20	4.0	0.40
700	28	700.0	27.56	16	1.6	12.1	1.20	4.0	0.40
750	30	750.0	29.53	16	1.6	12.0	1.20	4.0	0.40
800	32	800.0	31.50	16	1.6	12.1	1.20	4.0	0.40
900	36	900.0	35.43	16	1.6				
1000	40	1000.0	39.37	16	1.6				

Properties of Pipe Sections based on Minimum Reinforced Wall

BL 16B/16B-C

Pipe Size		Inner Diameter		Minimum Outer Diameter		Minimum Cross Sectional Area		Minimum Moment of Inertia	
mm	in	mm	in	mm	in	mm2	in2	mm4 x105	in4
40	1.5	42.2	1.66	49.2	1.94	502	0.8	1.32	0.32
50	2	53.3	2.10	60.9	2.40	682	1.1	2.79	0.67
65	2.5	69.1	2.72	77.1	3.04	918	1.4	6.15	1.48
80	3	81.8	3.22	89.8	3.54	1077	1.7	9.93	2.39
100	4	105.4	4.15	115.0	4.53	1661	2.6	25.3	6.07
125	5	132.1	5.20	141.7	5.58	2063	3.2	48.4	11.6
150	6	159	6.26	169.6	6.68	2734	4.2	92.4	22.2
200	8	208.8	8.22	221.8	8.73	4394	6.8	255	61.2
250	10	262.9	10.35	278.3	10.96	6542	10.1	599	144
300	12	312.1	12.29	330.2	13.00	9076	14.1	1171	281
350	14	337.6	13.29	357.6	14.08	10914	16.9	1649	396
400	16	385.8	15.19	408.8	16.10	14347	22.2	2834	681
450	18	433.8	17.08	458.8	18.06	17519	27.2	4366	1049
500	20	482.1	18.98	509.3	20.05	21168	32.8	6506	1563
550	22	530.6	20.89	560.4	22.06	25522	39.6	9501	2283
600	24	578.6	22.78	611.0	24.06	30257	46.9	13391	3217
650	26	650.0	25.59	686.2	27.02	37971	58.9	21201	5094
700	28	700.0	27.56	739.0	29.10	44055	68.3	28529	6854
750	30	750.0	29.53	791.6	31.17	50342	78.0	37415	8989
800	32	800.0	31.50	844.4	33.24	57314	88.8	48466	11644
900	36	900.0	35.43	949.8	37.39	72314	112.1	77382	18591
1000	40	1000.0	39.37	1055.2	41.54	89056	138.0	117634	28262

Typical Physical Properties

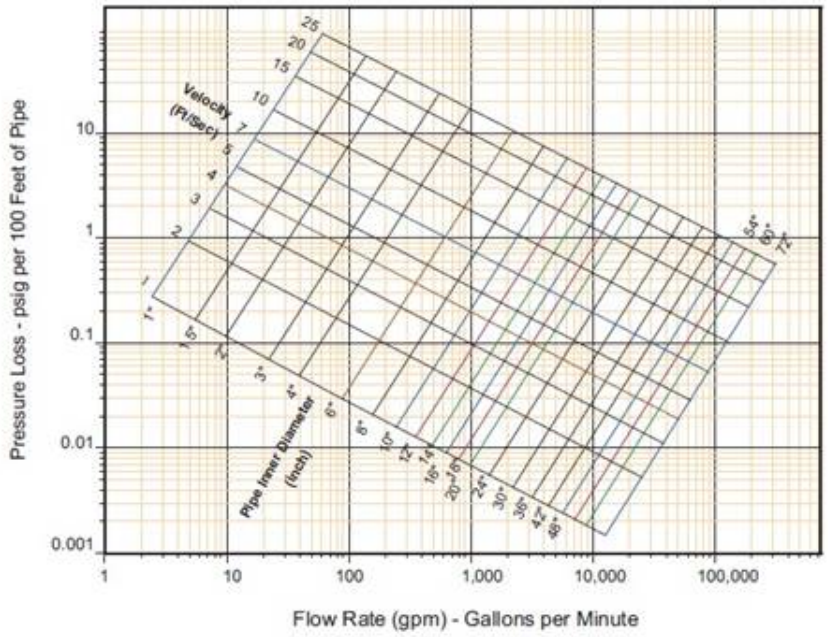
BL 16B/16B-C

Property	Test Standard	Value（psi）		Value（MPa）	
		75℉	200℉	24℃	93℃
Axial Tension：	ASTM D2105				
Ultimate Stress		10,300	7.680	71	52.9
Design Stress		2.575	1.920	17.8	13.2
Modulus of Elasticity		1.80×10^6	1.16×10^6	12411	7977
Axial Compression：	ASTM D695				
Ultimate Stress		33,300	20,383	230.0	140.5
Design Stress		8,300	5,090	57.4	35.1
Modulus of Elasticity		1.26×10^6	0.66×10^6	8687	4550
Hoop Tension：	ASTM D-2290				
Ultimate Stress		31000		213.9	
Modulus of Elasticity (long term)		3.6×10^6		23250	
Beam Bending：	ASTM D2925				
Ultimate Stress		23,000	17,166	159	118.331
Design Stress (1)		2,900	2,145	20.0	14.8
Modulus of Elasticity (long term)		2.18×10^6	1.29×10^6	15031	8894
Hydrostatic Burst ：	ATSM D1599				
Ultimate Tensile Stress		46,300	47,990	319	330
Hydrostatic Design	ASTM D2992				
Hoop Tensile Stress	Procedure B		17322		119
Static 175,000 hours life（20 years）LCL			14723		101.4
Poisson Ratio		0.38		0.38	
Coefficient of linear Thermal expansion	ASTM D696	1.01×10^{-5}in/in/℉		1.82×10^{-5}mm/mm℃	
Thermal Conductive	ASTM D177	0.23BTU/(ft)/(hr)/ (℉)		0.14W/(m)/(℃)	
Specific Gravity	ASTM D792	2.0		2.0	
Flow Factor-SF Hazen-Williams Coefficient		150		150	

(1) Beam bending design stress is 1/8 of ultimate to account for combined stress.

Figure 1.0 Fiberglass Pipe Pressure Loss Curves for Water

Basis: Specific Gravity of 1.0 and Viscosity of 1.0 cps



Support

The engineering analysis must be performed to determine the support spacing for the pipeline system. The support spacing is calculated with continuous beam equations and the pipe bending modulus derived from long-term beam bending tests.

Proper pipe support spacing depends on the temperature and weight of the fluid carried in the pipe. When the pipe support spacing is being designed, the beam mid-span deflection should be limited to 12.5mm (1/2”) and bending stresses to less than or equal to 1/8 of ultimate bending stress. On the other side, while there is insulation layer or heat tracing on the pipe system, the additional weight should be considered. Restrained (anchored) piping systems operating at elevated temperatures often result in guide spacing requirements which are more stringent than simple unrestrained pipeline system. The maximum guide spacing should restrict the support / guide spacing requirements for the system. At the changes in direction, the pipe support spans require special attention. The following tables show the spacing requirements for supported fittings at changes in direction. The requirements must be followed to properly design the pipeline system.

Seven basic rules as below should be followed when designing pipeline system supports, anchors and guides.

1） Do not exceed the recommended support span.

2） Once valves and heavy in-line equipment, the supports should be installed both vertical and horizontal pipeline independently.

3） Protect pipe from external abrasion.

4） Avoid point contact loads.

5） When handling, transporting, initial layout and final installed position, need to avoid excessive bending.

6） Avoid excessive vertical run loading. Vertical loads should be supported sufficiently to minimize bending stresses at outlets or changes in direction.

7） Provide enough axial and lateral ultimate stress to ensure line stability during rapid changes in flow.

Pipe Maximum Support Spacing

The maximum support spacing in following table is based on pipeline full of water (1 kg/ cm^3). Any additional weight on the pipeline system such as valves, flanges and others are further considered.

BL 16B/16B-C @ 21°C

Nominal Pipe Size		**Point load @ 21°C**		**Even load @ 21°C**	
		16B/16B-C/16B-F		**16B/16B-C/16B-F**	
（mm）	（in）	（m）	（ft）	（m）	（ft）
40	1.5	2.9	9.5	3.7	12.2
50	2	3.1	10.2	4.0	13.1
65	2.5	3.3	10.8	4.2	13.8
80	3	3.5	11.5	4.5	14.8
100	4	4.0	13.1	5.1	16.7
125	5	4.2	13.8	5.4	17.7
150	6	4.5	14.8	5.7	18.7
200	8	5.1	16.7	6.0	20.0
250	10	5.8	19.0	6.0	20.0
300	12	6.0	20.0	6.0	20.0
350	14	6.0	20.0	6.0	20.0
400	16	6.0	20.0	6.0	20.0
450	18	6.0	20.0	6.0	20.0
500	20	6.0	20.0	6.0	20.0
550	22	6.0	20.0	6.0	20.0
600	24	6.0	20.0	6.0	20.0
650	26	6.0	20.0	6.0	20.0
700	28	6.0	20.0	6.0	20.0
750	30	6.0	20.0	6.0	20.0
800	32	6.0	20.0	6.0	20.0
900	36	6.0	20.0	6.0	20.0
1000	40	6.0	20.0	6.0	20.0

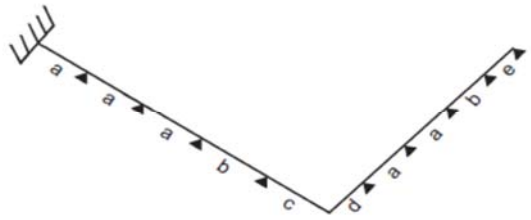
Support Spacing vs. Specific Gravity fluid

Specific Gravity	2.00	1.50	1.25	1.00	0.75
Multiplier	0.85	0.92	0.95	1.00	1.07

For Example: 150mm 16B @ 21℃ with 1.5 specific gravity fluid, the maximum support spacing =5.7×0.92=5.22m

Piping Span Adjustment Factors With Unsupported Fitting at Change in Direction

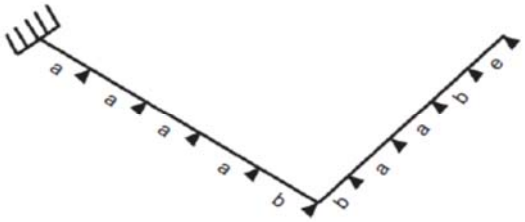
	Span Type	Factor
a	Continuous interior or fixed end spans	1.00
b	Second span from simple supported end or unsupported fitting	0.80
c + d	Sum of unsupported spans at fitting	≤ 0.75*
e	Simple supported end span	0.67



* For example: If continuous support span is 10 ft., c + d must not exceed 7.5 ft. (c = 3 ft. and d = 4.5 ft. would satisfy this condition).

Piping Span Adjustment Factors With Supported Fitting at Change in Direction

	Span Type	Factor
a	Continuous interior or fixed end spans	1.00
b	Span at supported fitting or span adjacent to a simple supported end	0.80
e	Simple supported end span	0.67



Water (Fluid) Hammer

A pressure surge will occur when fluid flow in a pipeline system is abruptly changed during events such as rapid pump startup or a quick closing valve. This pressure surge can be significantly reduced by controlling pump startup and valve closure speed.

The maximum pressure surge in psi caused by water hammer can be calculated by multiplying the fluid velocity in ft/sec times the constant listed in ‘Fluid (Water) Hammer Constants) table as below. The peak pressure for the system will equal the water hammer surge plus the operating pressure at the time the water hammer occurred.

Water (Fluid) Hammer Constants（Constants are valid for water at 21°C）

Nominal Pipe Size		Constants
（mm）	（in）	BL 16B series
40	1.5	44
50	2	37
65	2.5	35
80	3	33
100	4	29
125	5	28
150	6	27
200	8	27
250	10	27
300	12	27
350	14	27
400	16	27
450	18	27
500	20	27
550	22	27
600	24	27
650	26	27
700	28	27
750	30	27
800	32	27
900	36	
1000	40	

Thermal Expansion

The effects of thermal gradients on pipeline system should be significantly considerred in each pipeline system stress analysis and design. Pipeline movements due to thermal expansion or contraction may cause high pressure or even buckle a pipeline if improperly restained. Several pipeline system designs are used to manage thermal expansion and contraction in above ground pipeline system.

The following recommendation listed according to economic preference:

1） Use of inherent flexibilities in directional changes
2） Restraining axial movements and guiding to prevent buckling
3） Use expansion loops to absorb thermal movements
4） Use mechanical expansion joints to absorb thermal movements

To perform a thermal analysis the following information is required:

1） Isometric layout of pipeline system
2） Physical and material properties of pipe

3） Design temperatures
4） Installation temperature (Final tie in temperature)
5） Terminal equipment load limits
6） Support movements
A comprehensive review of temperature effects on fiberglass pipe, please refer to our ‘Engineering and Pipeline Design Guide’.

Branching Table

For BL 16B/16B-C and BL 16B-F pipe，the relative joint methods for branching listed as below table：

Main line size

Branch Diameter	Size	50	65	80	100	125	150	200	250	300	350	400	450	500	550	600	650	700	750	800	900	100
	40	RT	RT	ORT	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
	50	T	RT	RT	ORT	ORT	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
	65		T	RT	RT	ORT	ORT	ORT	O	O	O	O	O	O	O	O	O	O	O	O	O	O
	80			T	RT	RT	ORT	ORT	O	O	O	O	O	O	O	O	O	O	O	O	O	O
	100				T	RT	RT	ORT	O	O	O	O	O	O	O	O	O	O	O	O	O	O
	125					T	RT	RT	ORT	O	O	O	O	O	O	O	O	O	O	O	O	O
	150						T	RT	RT	ORT	ORT	ORT	ORT	ORT	ORT	ORT	ORT	ORT	ORT	ORT	ORT	ORT
	200							T	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT
	250								T	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT
	300									T	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT
	350										T	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT
	400											T	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT
	450												T	RT	RT	RT	RT	RT	RT	RT	RT	RT
	500													T	RT	RT	RT	RT	RT	RT	RT	RT
	550														T	RT	RT	RT	RT	RT	RT	RT
	600															T	RT	RT	RT	RT	RT	RT
	650																T	RT	RT	RT	RT	RT
	700																	T	RT	RT	RT	RT
	750																		T	RT	RT	RT
	800																			T	RT	RT
	900																				T	RT
	1000																					T

T-Equal Tee RT-Reducing Tee O-Outlet Saddle ORT-Outlet Saddle or Reducing Tee

Hydrostatic Testing

Hydrostatic testing should be performed to evaluate the structural integrity of a new pipeline system installation. Experience showed that testing to 1.5 times the anticipated maximum design pressure of a system provides a high degree of confidence in the pipeline system. In any case, the test pressure should not exceed 1.5 times the maximum design pressure of any component in the pipeline system.
Hydrostatic testing should not be undertaken until all permanent supports, anchors and guides are properly installed according to the design specifications. Do not attempt to pressure test a system supported by temporary support device.
When hydrostatic testing, open air vents to prevent air resistance in lines as the system is slowly filled with water. Then the vents should be closed and the system slowly pressurized to the test pressure. Allow the system to stabilize for 15-30 minutes, then, inspect the system for leaks. Upon completion of hydrostatic test, relieve the pressure on the system slowly, open vents and drains to allow for drainage of the system at all. If a flange connection leak occurs, do not attempt to tighten up bolts while the system is pressurized. The hydrostatic test should be repeated after any re-work is performed.
The other test process, please refer to CTC Pipelines System Offshore-Marine Pipe Installation Handbook.

Approvals

All GRE pipe and fittings applied to Offshore and Marine should get approvals as below list according to customer's requirements.

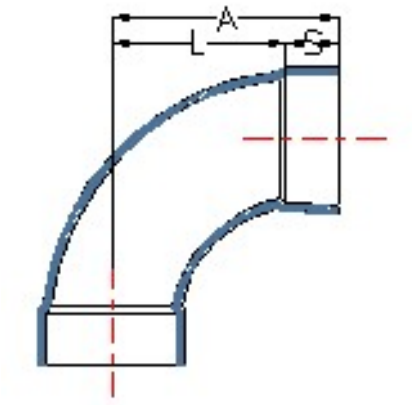
ABS	BV
CCS	DNV
GL	KR
LR	NK
RINA	API

Unit Converter

1Psi	=	6895Pa	=	0.07031 kg/cm*2		
1bar	=	10*5Pa	=	14.5Psi	=	1.02kg/cm*2
1Mpa	=	1n/mm*2	=	145Psi	=	10.2kg/cm*2
1inch			=	25.4mm		
1°C			=	5*(°F – 32)/9		
1Btu.in/ft*2h°F			=	0.1442W/mk		

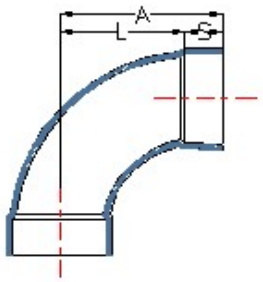
Fittings

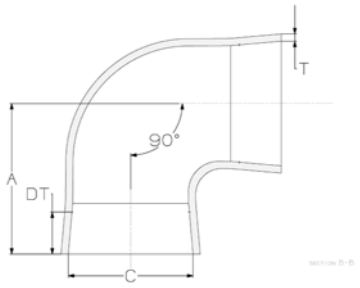
Elbow 90° LR
BL16B / BL16B-C



Nominal Pipe Size		L		A		S		Wt
mm	in	mm	in	mm	in	mm	in	Kg
40	1.5	76.2	3.00	108.0	4.25	31.8	1.25	0.8
50	2	76.2	3.00	122.2	4.81	46.0	1.81	1.3
65	2.5	95.3	3.75	141.3	5.56	46.0	1.81	1.6
80	3	114.3	4.50	160.3	6.31	46.0	1.81	2.2
100	4	152.4	6.00	198.4	7.81	46.0	1.81	3.4
125	5	190.5	7.50	247.7	9.75	57.2	2.25	5.7
150	6	228.6	9.00	285.8	11.25	57.2	2.25	8.1
200	8	304.8	12.00	368.3	14.50	63.5	2.50	15.2
250	10	381.0	15.00	450.9	17.75	69.9	2.75	26.9
300	12	457.2	18.00	533.4	21.00	76.2	3.00	36.9

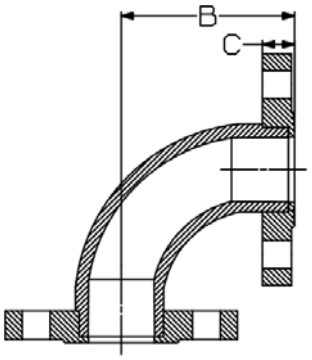
Elbows 90° SR
BL16B / BL16B-C





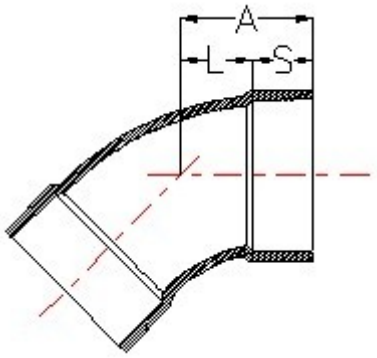
Nominal Pipe Size		L	A	S	Wt
mm	in	mm	mm	mm	Kg
100	4	101.6	147.6	46.0	2.9
125	5	127.0	184.2	57.2	4.7
150	6	152.4	209.6	57.2	6.5
200	8	165.1	228.6	63.5	11.2
250	10	196.9	266.7	69.9	20.9
300	12	228.6	304.8	76.2	27.5
350	14	317.5	406.4	88.9	42.5
400	16	342.9	444.5	101.6	49.5
450	18	381.0	508.0	127.0	68.7
500	20	406.4	546.1	139.7	
550	22	431.8	596.9	165.1	
600	24	457.2	647.7	190.5	
650	26	622.3	812.8	190.5	
700	28	647.7	838.2	190.5	
750	30	673.1	876.3	203.2	
800	32	723.9	939.8	215.9	
900	36				
1000	40				

Elbow - FLG 90º， F x F
BL16B / BL16B-C



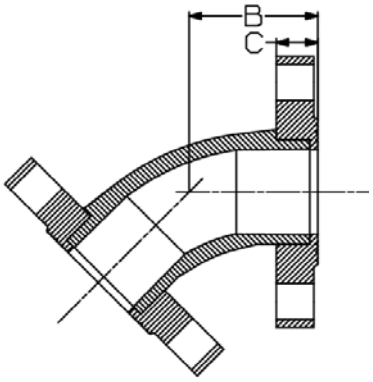
Nominal Pipe Size		B	C	Wt
mm	in	mm	mm	Kg
40	1.5	101.6	33.8	1.8
50	2	114.3	49.0	3.3
65	2.5	127.0	49.0	4.6
80	3	139.7	49.0	5.2
100	4	165.1	49.0	7.3
125	5	190.5	61.2	11.6
150	6	203.2	61.2	13.7
200	8	228.6	67.5	23.9
250	10	279.4	73.9	38.1
300	12	304.8	82.2	52.4
350	14	355.6	94.9	75.6
400	16	381.0	107.6	97.0

Elbow 45°
BL16B / BL16B-C



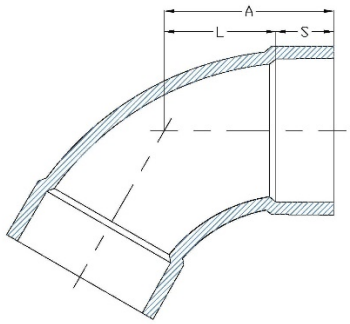
Nominal Pipe Size		L		A		S		Wt
mm	in	mm	in	mm	in	mm	in	Kg
40	1.5	28.6	1.13	60.3	2.38	31.8	1.25	0.5
50	2	34.9	1.38	81.0	3.19	46.0	1.81	0.9
65	2.5	44.5	1.75	90.5	3.56	46.0	1.81	1.2
80	3	50.8	2.00	96.8	3.81	46.0	1.81	1.4
100	4	63.5	2.50	109.5	4.31	46.0	1.81	2.3
125	5	79.4	3.13	136.5	5.38	57.2	2.25	3.6
150	6	95.3	3.75	152.4	6.00	57.2	2.25	4.5
200	8	76.2	3.00	139.7	5.50	63.5	2.50	7.0
250	10	88.9	3.50	158.8	6.25	69.9	2.75	10.9
300	12	101.6	4.00	177.8	7.00	76.2	3.00	14.1
350	14	120.7	4.75	209.6	8.25	88.9	3.50	24.2
400	16	139.7	5.50	241.3	9.50	101.6	4.00	26.7
450	18	177.8	7.00	304.8	12.00	127.0	5.00	36.0
500	20	190.5	7.50	330.2	13.00	139.7	5.50	
550	22	203.2	8.00	368.3	14.50	165.1	6.50	
600	24	215.9	8.50	406.4	16.00	190.5	7.50	
650	26	266.7	10.50	457.2	18.00	190.5	7.50	
700	28	279.4	11.00	469.9	18.50	190.5	7.50	
750	30	292.1	11.50	495.3	19.50	203.2	8.00	
800	32	317.5	12.50	533.4	21.00	215.9	8.50	
900	36							
1000	40							

Elbow - FLG 45°， F x F
BL16B / BL16B-C



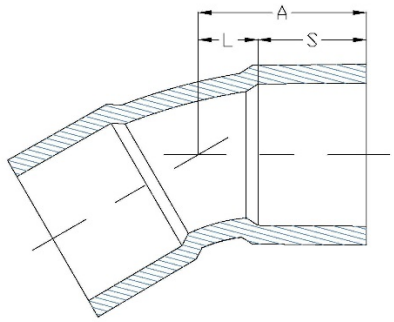
Nominal Pipe Size		B	C	Wt
mm	in	mm	mm	Kg
40	1.5	57.2	33.8	1.5
50	2	63.5	49.0	3.0
65	2.5	76.2	49.0	4.0
80	3	76.2	49.0	4.4
100	4	101.6	49.0	6.6
125	5	114.3	61.2	10.6
150	6	127.0	61.2	12.1
200	8	139.7	67.5	20.0
250	10	165.1	73.9	28.3
300	12	190.5	82.2	41.8
350	14	190.5	94.9	58.5
400	16	203.2	107.6	77.0

Elbow 60°
BL16B / BL16B-C



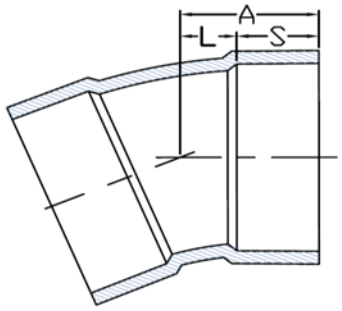
Nominal Pipe Size		L	A	S	Wt
mm	in	mm	mm	mm	Kg
40	1.5	15.3	64.7	31.8	0.5
50	2	44.5	90.5	46.0	1.0
65	2.5	57.2	103.2	46.0	1.3
80	3	69.9	115.9	46.0	1.7
100	4	88.9	134.9	46.0	2.8
125	5	114.3	171.5	57.2	4.9
150	6	133.4	190.5	57.2	6.3
200	8	117.5	181.0	63.5	9.4
250	10	146.1	215.9	69.9	15.8
300	12	165.1	241.3	76.2	21.4
350	14	177.8	266.7	88.9	28.1
400	16	203.2	304.8	101.6	33.7
450	18	183.8	535.6	114.3	63.3
500	20				
550	22				
600	24				
650	26				
700	28				
750	30				
800	32				
900	36				
1000	40				

Elbow 30°
BL16B / BL16B-C



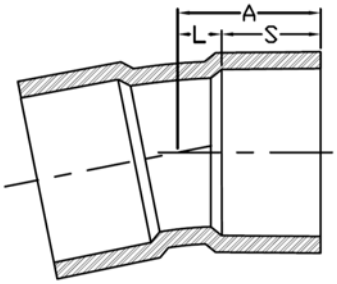
Nominal Pipe Size		L	A	S	Wt
mm	in	mm	mm	mm	Kg
40	1.5	15.3	47.1	31.8	0.4
50	2	25.4	71.4	46.0	0.8
65	2.5	31.8	77.8	46.0	0.9
80	3	38.1	84.1	46.0	1.1
100	4	44.5	90.5	46.0	1.8
125	5	50.8	108.0	57.2	2.9
150	6	57.2	114.3	57.2	3.6
200	8	63.5	127.0	63.5	6.3
250	10	76.2	146.1	69.9	10.2
300	12	88.9	165.1	76.2	13.9
350	14	95.3	184.2	88.9	18.4
400	16	108.0	209.6	101.6	22.0
450	18	183.8	323.5	114.3	36.3
500	20				
550	22				
600	24				
650	26				
700	28				
750	30				
800	32				
900	36				
1000	40				

Elbow 22.5°
BL16B / BL16B-C



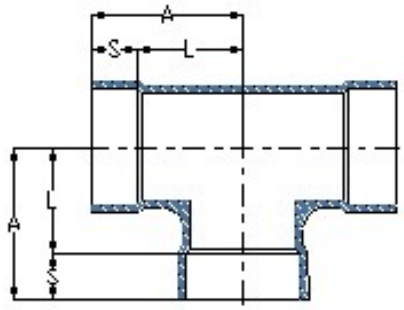
Nominal Pipe Size		L	A	S	Wt
mm	in	mm	mm	mm	Kg
40	1.5	11.4	43.1	31.8	0.3
50	2	12.7	58.7	46.0	0.6
65	2.5	19.1	65.1	46.0	0.8
80	3	25.0	71.0	46.0	1.0
100	4	31.8	77.8	46.0	1.5
125	5	38.1	95.3	57.2	2.6
150	6	44.5	101.6	57.2	3.2
200	8	57.2	120.7	63.5	5.9
250	10	69.9	139.7	69.9	9.7
300	12	76.2	152.4	76.2	12.8
350	14	82.6	171.5	88.9	17.1
400	16	88.9	190.5	101.6	20.0
450	18	108.0	235.0	127.0	26.4
500	20	114.3	254.0	139.7	
550	22	120.7	285.8	165.1	
600	24	127.0	317.5	190.5	
650	26	133.4	323.9	190.5	
700	28	139.7	330.2	190.5	
750	30	146.1	349.3	203.2	
800	32	152.4	368.3	215.9	
900	36				
1000	40				

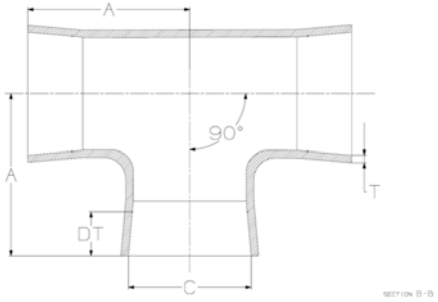
Elbow 11.25°
BL16B / BL16B-C



Nominal Pipe Size		L	A	S	Wt
mm	in	mm	mm	mm	Kg
40	1.5	5.6	37.4	31.8	0.3
50	2	7.5	53.5	46.0	0.7
65	2.5	9.4	55.4	46.0	0.7
80	3	11.3	57.3	46.0	0.8
100	4	15.9	61.9	46.0	1.2
125	5	19.1	76.2	57.2	2.0
150	6	25.4	82.6	57.2	2.5
200	8	31.8	95.3	63.5	4.4
250	10	38.1	108.0	69.9	7.1
300	12	47.6	123.8	76.2	9.9
350	14	54.0	142.9	88.9	13.5
400	16	60.3	161.9	101.6	16.1
450	18	69.9	209.6	114.3	22.3
500	20				
550	22				
600	24				
650	26				
700	28				
750	30				
800	32				
900	36				
1000	40				

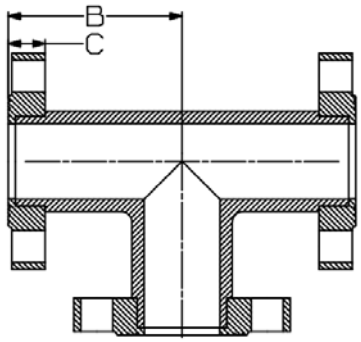
EQ TEE
BL16B / BL16B-C





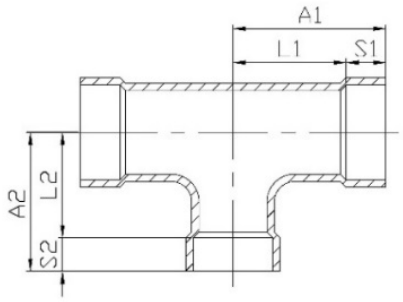
Nominal Pipe Size		L		A		S		Wt
mm	in	mm	in	mm	in	mm	in	Kg
40	1.5	57.2	2.25	88.9	3.50	31.8	1.25	1.1
50	2	63.5	2.50	109.5	4.31	46.0	1.81	1.7
65	2.5	76.2	3.00	122.2	4.81	46.0	1.81	2.2
80	3	85.7	3.38	131.8	5.19	46.0	1.81	3.1
100	4	104.8	4.13	150.8	5.94	46.0	1.81	4.3
125	5	123.8	4.88	181.0	7.13	57.2	2.25	6.9
150	6	142.9	5.63	200.0	7.88	57.2	2.25	8.0
200	8	165.1	6.50	228.6	9.00	63.5	2.50	13.8
250	10	196.9	7.75	266.7	10.50	69.9	2.75	24.7
300	12	228.6	9.00	304.8	12.00	76.2	3.00	31.8
350	14	266.7	10.50	355.6	14.00	88.9	3.50	45.2
400	16	292.1	11.50	393.7	15.50	101.6	4.00	60.8
450	18	342.9	13.50	469.9	18.50	127.0	5.00	83.1
500	20	355.6	14.00	495.3	19.50	139.7	5.50	
550	22	381.0	15.00	546.1	21.50	165.1	6.50	
600	24	406.4	16.00	596.9	23.50	190.5	7.50	
650	26	438.2	17.25	628.7	24.75	190.5	7.50	
700	28	463.6	18.25	654.1	25.75	190.5	7.50	
750	30	489.0	19.25	692.2	27.25	203.2	8.00	
800	32	514.4	20.25	730.3	28.75	215.9	8.50	
900	36							
1000	40							

EQ TEE - FLG，F x F x F
BL16B / BL16B-C



Nominal Pipe Size		B	C	Wt
mm	in	mm	mm	Kg
40	1.5	101.6	33.8	2.9
50	2	114.3	49.0	5.3
65	2.5	127.0	49.0	6.9
80	3	139.7	49.0	8.5
100	4	165.1	49.0	11.7
125	5	190.5	61.2	18.6
150	6	203.2	61.2	20.4
200	8	228.6	67.5	33.6
250	10	279.4	73.9	51.4
300	12	304.8	82.2	70.8
350	14	355.6	94.9	105.3
400	16	381.0	107.6	143.8

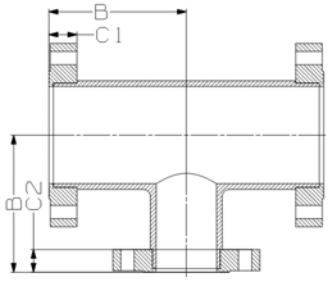
RED TEE
BL16B / BL16B-C



Nominal Pipe Size		L1	L2	A1	A2	S1	S2	Wt
mm	in	mm	mm	mm	mm	mm	mm	Kg
50x40	2x1.5	63.5	60.3	109.5	92.1	46.0	31.8	1.7
65x50	2.5x2	76.2	69.9	122.2	115.9	46.0	46.0	2.2
65x40	2.5x1.5	76.2	66.7	122.2	98.4	46.0	31.8	2.1
80x65	3x2.5	85.7	82.6	131.8	128.6	46.0	46.0	3.1
80x50	3x2	85.7	76.2	131.8	122.2	46.0	46.0	3.0
80x40	3x1.5	85.7	73.0	131.8	104.8	46.0	31.8	3.0
100x80	4x3	104.8	98.4	150.8	144.5	46.0	46.0	4.3
100x65	4x2.5	104.8	95.3	150.8	141.3	46.0	46.0	4.2
100x50	4x2	104.8	88.9	150.8	134.9	46.0	46.0	4.2
125x100	5x4	123.8	117.5	181.0	163.5	57.2	46.0	6.7
125x80	5x3	123.8	111.1	181.0	157.2	57.2	46.0	6.5
125x65	5x2.5	123.8	108.0	181.0	154.0	57.2	46.0	6.4
150x125	6x5	142.9	136.5	200.0	193.7	57.2	57.2	7.9
150x100	6x4	142.9	130.2	200.0	176.2	57.2	46.0	7.6
150x80	6x3	142.9	123.8	200.0	169.9	57.2	46.0	7.5
200x150	8x6	165.1	155.6	228.6	212.7	63.5	57.2	13.5
200x125	8x5	165.1	149.2	228.6	206.4	63.5	57.2	13.3
200x100	8x4	165.1	142.9	228.6	188.9	63.5	46.0	13.0
250x200	10x8	196.9	184.2	266.7	247.7	69.9	63.5	24.1
250x150	10x6	196.9	174.6	266.7	231.8	69.9	57.2	23.8
250x125	10x5	196.9	171.5	266.7	228.6	69.9	57.2	23.5
300x250	12x10	228.6	215.9	304.8	285.8	76.2	69.9	31.0
300x200	12x8	228.6	203.2	304.8	266.7	76.2	63.5	30.2
300x150	12x6	228.6	193.7	304.8	250.8	76.2	57.2	29.8
350x300	14x12	266.7	257.2	355.6	333.4	88.9	76.2	44.2
350x250	14x10	266.7	244.5	355.6	314.3	88.9	69.9	43.2
400x250	16x10	292.1	269.9	393.7	339.7	101.6	69.9	56.1
400x350	16x14	292.1	292.1	393.7	381.0	101.6	88.9	60.0

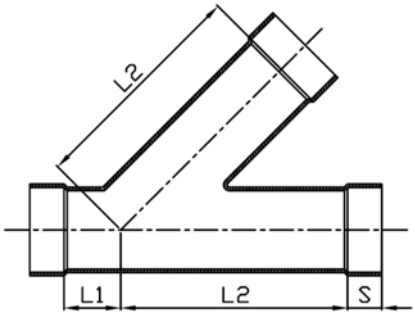
400x300	16x12	292.1	282.6	393.7	358.8	101.6	76.2	58.8
450x400	18x16	342.9	330.2	469.9	419.1	127.0	101.6	79.8
450x350	18x14	342.9	330.2	469.9	406.4	127.0	88.9	79.0
500x450	20x18	355.6	342.9	495.3	469.9	139.7	127.0	
500x400	20x16	355.6	342.9	495.3	431.8	139.7	101.6	
550x500	22x20	381.0	368.3	546.1	508.0	165.1	139.7	
550x450	22x18	381.0	368.3	546.1	495.3	165.1	127.0	
600x550	24x22	406.4	393.7	596.9	558.8	190.5	165.1	
600x500	24x20	406.4	393.7	596.9	533.4	190.5	139.7	
650x600	26x24	438.2	425.5	628.7	616.0	190.5	190.5	
650x550	26x22	438.2	425.5	628.7	590.6	190.5	165.1	
700x650	28x26	463.6	450.9	654.1	641.4	190.5	190.5	
700x600	28x24	463.6	450.9	654.1	641.4	190.5	190.5	
750x700	30x28	489.0	476.3	692.2	666.8	203.2	190.5	
750x650	30x26	489.0	476.3	692.2	666.8	203.2	190.5	
800x750	32x30	514.4	501.7	730.3	704.9	215.9	203.2	
800x700	32x28	514.4	501.7	730.3	692.2	215.9	190.5	

RED TEE - FLG，F x F x F
BL16B / BL16B-C



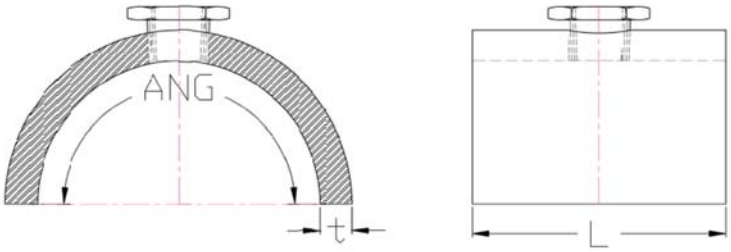
Nominal Pipe Size		B	C1	C2	Wt
mm	in	mm	mm	mm	Kg
50x40	2x1.5	114.3	49.0	33.8	4.7
65x50	2.5x2	127.0	49.0	49.0	6.5
65x40	2.5x1.5	127.0	49.0	33.8	5.9
80x65	3x2.5	139.7	49.0	49.0	8.3
80x50	3x2	139.7	49.0	49.0	8.0
80x40	3x1.5	139.7	49.0	33.8	7.3
100x80	4x3	165.1	49.0	49.0	11.1
100x65	4x2.5	165.1	49.0	49.0	10.9
100x50	4x2	165.1	49.0	49.0	10.6
125x100	5x4	190.5	61.2	49.0	17.2
125x80	5x3	190.5	61.2	49.0	16.6
125x65	5x2.5	190.5	61.2	49.0	16.5
150x125	6x5	203.2	61.2	61.2	20.1
150x100	6x4	203.2	61.2	49.0	18.7
150x80	6x3	203.2	61.2	49.0	18.1
200x150	8x6	228.6	67.5	61.2	31.2
200x125	8x5	228.6	67.5	61.2	30.9
200x100	8x4	228.6	67.5	49.0	29.5
250x200	10x8	279.4	73.9	67.5	49.7
250x150	10x6	279.4	73.9	61.2	47.3
250x125	10x5	279.4	73.9	61.2	47.0
300x250	12x10	304.8	82.2	73.9	76.5
300x200	12x8	304.8	82.2	67.5	64.7
300x150	12x6	304.8	82.2	61.2	62.3
350x300	14x12	355.6	94.9	82.2	98.5
350x250	14x10	355.6	94.9	73.9	94.2
400x350	16x14	381.0	107.6	94.9	135.7
400x300	16x12	381.0	107.6	82.2	128.9

45º LATERALS
BL16B / BL16B-C



Nominal Pipe Size		L1	L2	S	Wt
mm	in	mm	mm	mm	Kg
40	1.5	50.8	177.8	31.8	2.2
50	2	63.5	203.2	46.0	3.3
65	2.5	63.5	241.3	46.0	4.2
80	3	76.2	254.0	46.0	6.0
100	4	76.2	304.8	46.0	8.2
125	5	88.9	342.9	57.2	12.6
150	6	88.9	368.3	57.2	14.0
200	8	114.3	444.5	63.5	25.2
250	10	127.0	520.7	69.9	44.7
300	12	139.7	622.3	76.2	59.1

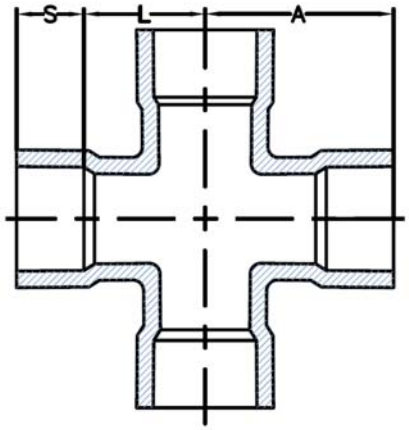
NPT Saddles
BL16B / BL16B-C



Nominal Pipe Size		L	t	Angle	Wt
mm	in	mm	mm	degree	Kg
50	2	120	16	180	0.2
65	2.5	120	16	180	0.2
80	3	120	16	180	0.3
100	4	120	16	180	0.5
125	5	120	16	180	0.6
150	6	120	16	180	0.7
200	8	120	16	120	0.8
250	10	120	16	120	1.0
300	12	120	16	90	0.9
350	14	120	16	90	1.0
400	16	120	16	90	1.1
450	18	120	16	90	1.6
500	20	120	16	90	
550	22	120	16	60	
600	24	120	16	60	

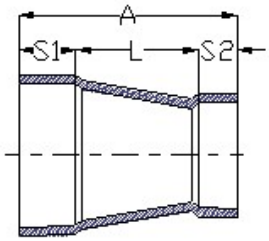
Note: Threaded outlet in 3/8”,1/2” and 3/4”

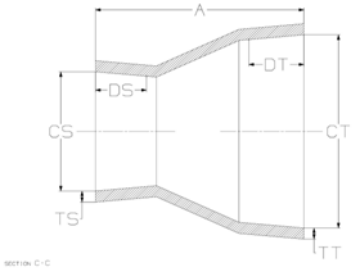
Cross
BL16B / BL16B-C



Nominal Pipe Size		L	A	S	Wt
mm	in	mm	mm	mm	Kg
40	1.5	57.2	88.9	31.8	1.5
50	2	63.5	109.5	46.0	2.2
65	2.5	76.2	122.2	46.0	2.9
80	3	85.7	131.8	46.0	4.1
100	4	104.8	150.8	46.0	5.7
125	5	123.8	181.0	57.2	9.2
150	6	142.9	200.0	57.2	10.7
200	8	165.1	228.6	63.5	18.4
250	10	196.9	266.7	69.9	32.9
300	12	228.6	304.8	76.2	42.5

Concentric Reducer
BL16B / BL16B-C

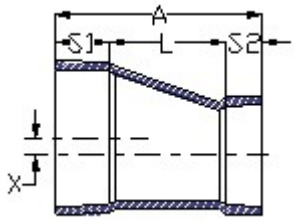




Nominal Pipe Size						L		A		S1		S2		Wt
mm			in			mm	in	mm	in	mm	in	mm	in	Kg
50	x	40	2	x	1.5	31.8	1.25	109.5	4.31	46.0	1.81	31.8	1.25	0.8
65	x	50	2.5	x	2	38.1	1.50	130.2	5.13	46.0	1.81	46.0	1.81	0.9
65	x	40	2.5	x	1.5	50.8	2.00	128.6	5.06	46.0	1.81	31.8	1.25	0.9
80	x	65	3	x	2.5	50.8	2.00	142.9	5.63	46.0	1.81	46.0	1.81	1.1
80	x	50	3	x	2	63.5	2.50	155.6	6.13	46.0	1.81	46.0	1.81	1.2
80	x	40	3	x	1.5	76.2	3.00	154.0	6.06	46.0	1.81	31.8	1.25	1.4
100	x	80	4	x	3	63.5	2.50	155.6	6.13	46.0	1.81	46.0	1.81	1.4
100	x	65	4	x	2.5	69.9	2.75	161.9	6.38	46.0	1.81	46.0	1.81	1.6
100	x	50	4	x	2	76.2	3.00	168.3	6.63	46.0	1.81	46.0	1.81	1.7
125	x	100	5	x	4	76.2	3.00	179.4	7.06	57.2	2.25	46.0	1.81	2.1
125	x	80	5	x	3	101.6	4.00	204.8	8.06	57.2	2.25	46.0	1.81	2.3
125	x	65	5	x	2.5	127	5.00	230.2	9.06	57.2	2.25	46.0	1.81	2.5
150	x	125	6	x	5	76.2	3.00	190.5	7.50	57.2	2.25	57.2	2.25	3.2
150	x	100	6	x	4	101.6	4.00	204.8	8.06	57.2	2.25	46.0	1.81	3.2
150	x	80	6	x	3	139.7	5.50	242.9	9.56	57.2	2.25	46.0	1.81	3.8
200	x	150	8	x	6	101.6	4.00	222.3	8.75	63.5	2.50	57.2	2.25	4.9
200	x	125	8	x	5	139.7	5.50	260.4	10.25	63.5	2.50	57.2	2.25	5.4
200	x	100	8	x	4	152.4	6.00	261.9	10.31	63.5	2.50	46.0	1.81	5.3
250	x	200	10	x	8	127	5.00	260.4	10.25	69.9	2.75	63.5	2.50	8.9
250	x	150	10	x	6	171.5	6.75	298.5	11.75	69.9	2.75	57.2	2.25	9.3
250	x	125	10	x	5	177.8	7.00	304.8	12.00	69.9	2.75	57.2	2.25	9.5
300	x	250	12	x	10	127	5.00	273.1	10.75	76.2	3.00	69.9	2.75	11.1
300	x	200	12	x	8	190.5	7.50	330.2	13.00	76.2	3.00	63.5	2.50	12.0
300	x	150	12	x	6	203.2	8.00	336.6	13.25	76.2	3.00	57.2	2.25	12.2
350	x	300	14	x	12	88.9	3.50	254.0	10.00	88.9	3.50	76.2	3.00	11.9
350	x	250	14	x	10	152.4	6.00	311.2	12.25	88.9	3.50	69.9	2.75	13.5
400	x	350	16	x	14	139.7	5.50	330.2	13.00	101.6	4.00	88.9	3.50	15.6
400	x	300	16	x	12	165.1	6.50	342.9	13.50	101.6	4.00	76.2	3.00	16.3

450	x	400	18	x	16	139.7	5.50	368.3	14.50	127.0	5.00	101.6	4.00	19.4
450	x	350	18	x	14	215.9	8.50	431.8	17.00	127.0	5.00	88.9	3.50	21.7
500	x	400	20	x	18	152.4	6.00	419.1	16.50	139.7	5.50	127.0	5.00	
500	x	350	20	x	16	215.9	8.50	457.2	18.00	139.7	5.50	101.6	4.00	
550	x	450	22	x	20	152.4	6.00	457.2	18.00	165.1	6.50	139.7	5.50	
550	x	400	22	x	18	235.0	9.25	527.1	20.75	165.1	6.50	127.0	5.00	
600	x	500	24	x	22	152.4	6.00	508.0	20.00	190.5	7.50	165.1	6.50	
600	x	450	24	x	20	235.0	9.25	565.2	22.25	190.5	7.50	139.7	5.50	
650	x	550	26	x	24	190.5	7.50	571.5	22.50	190.5	7.50	190.5	7.50	
650	x	500	26	x	22	279.4	11.00	635.0	25.00	190.5	7.50	165.1	6.50	
700	x	600	28	x	26	152.4	6.00	533.4	21.00	190.5	7.50	190.5	7.50	
700	x	550	28	x	24	282.6	11.13	663.6	26.13	190.5	7.50	190.5	7.50	
750	x	650	30	x	28	152.4	6.00	546.1	21.50	203.2	8.00	190.5	7.50	
750	x	600	30	x	26	247.7	9.75	641.4	25.25	203.2	8.00	190.5	7.50	
800	x	700	32	x	30	152.4	6.00	571.5	22.50	215.9	8.50	203.2	8.00	
800	x	650	32	x	28	247.7	9.75	654.1	25.75	215.9	8.50	190.5	7.50	

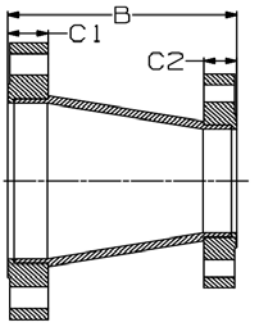
Eccentric Reducer
BL16B / BL16B-C



Nominal Pipe Size						L		A		S1		S2		Wt
mm			in			mm	in	mm	in	mm	in	mm	in	Kg
50	x	40	2	x	1.5	31.8	1.25	109.5	4.31	46.0	1.81	31.8	1.25	0.8
65	x	50	2.5	x	2	38.1	1.50	130.2	5.13	46.0	1.81	46.0	1.81	0.9
65	x	40	2.5	x	1.5	50.8	2.00	128.6	5.06	46.0	1.81	31.8	1.25	0.9
80	x	65	3	x	2.5	50.8	2.00	142.9	5.63	46.0	1.81	46.0	1.81	1.1
80	x	50	3	x	2	63.5	2.50	155.6	6.13	46.0	1.81	46.0	1.81	1.2
80	x	40	3	x	1.5	76.2	3.00	154.0	6.06	46.0	1.81	31.8	1.25	1.4
100	x	80	4	x	3	63.5	2.50	155.6	6.13	46.0	1.81	46.0	1.81	1.4
100	x	65	4	x	2.5	69.9	2.75	161.9	6.38	46.0	1.81	46.0	1.81	1.6
100	x	50	4	x	2	76.2	3.00	168.3	6.63	46.0	1.81	46.0	1.81	1.7
125	x	100	5	x	4	76.2	3.00	179.4	7.06	57.2	2.25	46.0	1.81	2.1
125	x	80	5	x	3	101.6	4.00	204.8	8.06	57.2	2.25	46.0	1.81	2.3
125	x	65	5	x	2.5	127	5.00	230.2	9.06	57.2	2.25	46.0	1.81	2.5
150	x	125	6	x	5	76.2	3.00	190.5	7.50	57.2	2.25	57.2	2.25	3.2
150	x	100	6	x	4	101.6	4.00	204.8	8.06	57.2	2.25	46.0	1.81	3.2
150	x	80	6	x	3	139.7	5.50	242.9	9.56	57.2	2.25	46.0	1.81	3.8
200	x	150	8	x	6	101.6	4.00	222.3	8.75	63.5	2.50	57.2	2.25	4.9
200	x	125	8	x	5	139.7	5.50	260.4	10.25	63.5	2.50	57.2	2.25	5.4
200	x	100	8	x	4	152.4	6.00	261.9	10.31	63.5	2.50	46.0	1.81	5.3
250	x	200	10	x	8	127	5.00	260.4	10.25	69.9	2.75	63.5	2.50	8.9
250	x	150	10	x	6	171.5	6.75	298.5	11.75	69.9	2.75	57.2	2.25	9.3
250	x	125	10	x	5	177.8	7.00	304.8	12.00	69.9	2.75	57.2	2.25	9.5
300	x	250	12	x	10	127	5.00	273.1	10.75	76.2	3.00	69.9	2.75	11.1
300	x	200	12	x	8	190.5	7.50	330.2	13.00	76.2	3.00	63.5	2.50	12.0
300	x	150	12	x	6	203.2	8.00	336.6	13.25	76.2	3.00	57.2	2.25	12.2
350	x	300	14	x	12	88.9	3.50	254.0	10.00	88.9	3.50	76.2	3.00	11.9
350	x	250	14	x	10	152.4	6.00	311.2	12.25	88.9	3.50	69.9	2.75	13.5
400	x	350	16	x	14	139.7	5.50	330.2	13.00	101.6	4.00	88.9	3.50	15.6
400	x	300	16	x	12	165.1	6.50	342.9	13.50	101.6	4.00	76.2	3.00	16.3
450	x	400	18	x	16	139.7	5.50	368.3	14.50	127.0	5.00	101.6	4.00	19.4

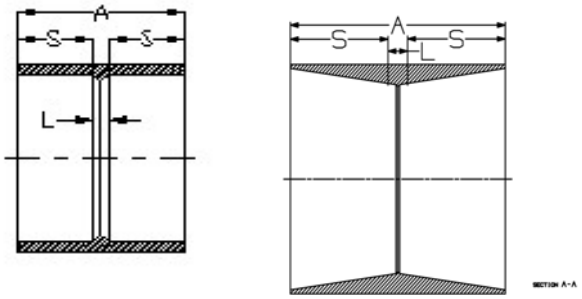
450	x	350	18	x	14	215.9	8.50	431.8	17.00	127.0	5.00	88.9	3.50	21.7
500	x	400	20	x	18	152.4	6.00	419.1	16.50	139.7	5.50	127.0	5.00	
500	x	350	20	x	16	215.9	8.50	457.2	18.00	139.7	5.50	101.6	4.00	
550	x	450	22	x	20	152.4	6.00	457.2	18.00	165.1	6.50	139.7	5.50	
550	x	400	22	x	18	235.0	9.25	527.1	20.75	165.1	6.50	127.0	5.00	
600	x	500	24	x	22	152.4	6.00	508.0	20.00	190.5	7.50	165.1	6.50	
600	x	450	24	x	20	235.0	9.25	565.2	22.25	190.5	7.50	139.7	5.50	
650	x	550	26	x	24	190.5	7.50	571.5	22.50	190.5	7.50	190.5	7.50	
650	x	500	26	x	22	279.4	11.00	635.0	25.00	190.5	7.50	165.1	6.50	
700	x	600	28	x	26	152.4	6.00	533.4	21.00	190.5	7.50	190.5	7.50	
700	x	550	28	x	24	282.6	11.13	663.6	26.13	190.5	7.50	190.5	7.50	
750	x	650	30	x	28	152.4	6.00	546.1	21.50	203.2	8.00	190.5	7.50	
750	x	600	30	x	26	247.7	9.75	641.4	25.25	203.2	8.00	190.5	7.50	
800	x	700	32	x	30	152.4	6.00	571.5	22.50	215.9	8.50	203.2	8.00	
800	x	650	32	x	28	247.7	9.75	654.1	25.75	215.9	8.50	190.5	7.50	

Concentric Reducer - FLG，F x F
BL16B / BL16B-C



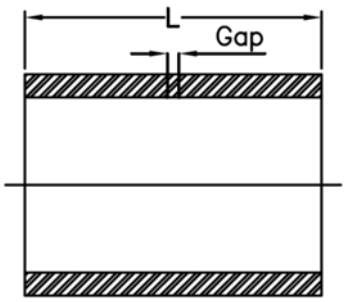
Nominal Pipe Size		B	C1	C2	Wt
mm	in	mm	mm	mm	Kg
50x40	2x1.5	109.5	49.0	33.8	2.5
65x50	2.5x2	130.2	49.0	49.0	3.5
65x40	2.5x1.5	128.6	49.0	33.8	2.9
80x65	3x2.5	142.9	49.0	49.0	4.3
80x50	3x2	155.6	49.0	49.0	4.0
80x40	3x1.5	154.0	49.0	33.8	3.6
100x80	4x3	155.6	49.0	49.0	5.3
100x65	4x2.5	161.9	49.0	49.0	5.4
100x50	4x2	168.3	49.0	49.0	5.1
125x100	5x4	179.4	61.2	49.0	8.0
125x80	5x3	204.8	61.2	49.0	7.6
125x65	5x2.5	230.2	61.2	49.0	7.7
150x125	6x5	190.5	61.2	61.2	10.8
150x100	6x4	204.8	61.2	49.0	9.4
150x80	6x3	242.9	61.2	49.0	9.4
200x150	8x6	222.3	67.5	61.2	15.2
200x125	8x5	260.4	67.5	61.2	15.4
200x100	8x4	261.9	67.5	49.0	13.9
250x200	10x8	260.4	73.9	67.5	23.3
250x150	10x6	298.5	73.9	61.2	21.3
250x125	10x5	304.8	73.9	61.2	21.2
300x250	12x10	273.1	82.2	73.9	31.6
300x200	12x8	330.2	82.2	67.5	30.8
300x150	12x6	336.6	82.2	61.2	28.6
350x300	14x12	254.0	94.9	82.2	43.6
350x250	14x10	311.2	94.9	73.9	40.8
400x350	16x14	330.2	107.6	94.9	62.1
400x300	16x12	342.9	107.6	82.2	56.0

Coupling
BL16B / BL16B-C



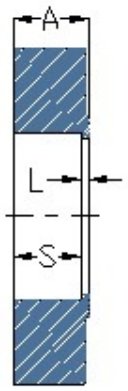
Nominal Pipe Size		L		A		S		Wt
mm	in	mm	in	mm	in	mm	in	Kg
40	1.5	10	0.39	73.5	2.89	31.8	1.25	0.4
50	2	10	0.39	102.1	4.02	46.0	1.81	0.5
65	2.5	10	0.39	102.1	4.02	46.0	1.81	0.6
80	3	10	0.39	102.1	4.02	46.0	1.81	0.7
100	4	10	0.39	102.1	4.02	46.0	1.81	0.9
125	5	10	0.39	124.3	4.89	57.2	2.25	1.2
150	6	10	0.39	124.3	4.89	57.2	2.25	1.7
200	8	15	0.59	142.0	5.59	63.5	2.50	2.8
250	10	15	0.59	154.7	6.09	69.9	2.75	4.7
300	12	15	0.59	167.4	6.59	76.2	3.00	6.2
350	14	20	0.79	197.8	7.79	88.9	3.50	8.0
400	16	20	0.79	223.2	8.79	101.6	4.00	9.0
450	18	34.6	1.36	288.6	11.36	127.0	5.00	11.4
500	20	50.8	2.00	330.2	13.00	139.7	5.50	
550	22	50.8	2.00	381.0	15.00	165.1	6.50	
600	24	50.8	2.00	431.8	17.00	190.5	7.50	
650	26	50.8	2.00	431.8	17.00	190.5	7.50	
700	28	50.8	2.00	431.8	17.00	190.5	7.50	
750	30	50.8	2.00	457.2	18.00	203.2	8.00	
800	32	50.8	2.00	482.6	19.00	215.9	8.50	
900	36							
1000	40							

Nipples
BL16B / BL16B-C



Nominal Pipe Size		L	Gap	Wt
mm	in	mm	mm	Kg
40	1.5	66.5	3	0.1
50	2	95.1	3	0.1
65	2.5	95.1	3	0.2
80	3	95.1	3	0.2
100	4	95.1	3	0.3
125	5	117.3	3	0.5
150	6	117.3	3	0.7
200	8	130.0	3	1.2
250	10	142.7	3	2.0
300	12	155.4	3	3.1
350	14	180.8	3	4.2
400	16	206.2	3	6.8
450	18	304.0	50	11.5
500	20	329.4	50	
550	22	380.2	50	
600	24	431.0	50	
650	26	431.0	50	
700	28	431.0	50	
750	30	456.4	50	
800	32	481.8	50	
900	36			
1000	40			

Flanges
BL16B / BL16B-C

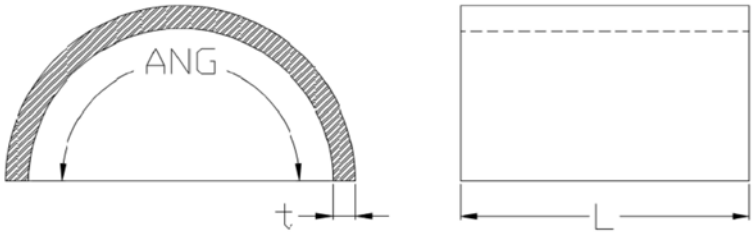


Nominal Pipe Size		L		A		S		Wt
mm	in	mm	in	mm	in	mm	in	Kg
40	1.5	4.0	0.16	35.8	1.41	31.8	1.25	0.9
50	2	5.0	0.20	51.0	2.01	46.0	1.81	1.7
65	2.5	5.0	0.20	51.0	2.01	46.0	1.81	2.3
80	3	5.0	0.20	51.0	2.01	46.0	1.81	2.5
100	4	5.0	0.20	51.0	2.01	46.0	1.81	3.4
125	5	6.0	0.24	63.2	2.49	57.2	2.25	4.8
150	6	6.0	0.24	63.2	2.49	57.2	2.25	5.3
200	8	6.0	0.24	69.5	2.74	63.5	2.50	8.2
250	10	6.0	0.24	75.9	2.99	69.9	2.75	11.4
300	12	8.0	0.31	84.2	3.31	76.2	3.00	17.9
350	14	8.0	0.31	96.9	3.81	88.9	3.50	25.8
400	16	8.0	0.31	109.6	4.31	101.6	4.00	35.4
450	18	10.0	0.39	114.8	4.52	104.8	4.13	37.7
500	20	10.0	0.39	121.1	4.77	111.1	4.38	
550	22	10.0	0.39	130.7	5.14	120.7	4.75	
600	24	10.0	0.39	137.0	5.39	127.0	5.00	
650	26	12.0	0.47	151.7	5.97	139.7	5.50	
700	28	12.0	0.47	164.4	6.47	152.4	6.00	
750	30	12.0	0.47	177.1	6.97	165.1	6.50	
800	32	12.0	0.47	189.8	7.47	177.8	7.00	
900	36							
1000	40							

Blind Flanges
BL16B / BL16B-C

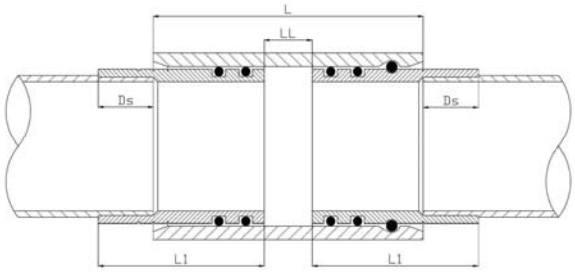
Nominal Pipe Size		A	Wt
mm	in	mm	Kg
40	1.5	25.0	0.6
50	2	25.0	0.8
65	2.5	30.0	1.3
80	3	30.0	1.5
100	4	35.0	2.5
125	5	35.0	3.1
150	6	40.0	4.2
200	8	45.0	6.9
250	10	50.0	10.5
300	12	60.0	17.4
350	14	65.0	22.8
400	16	75.0	30.9
450	18	80.0	35.0
500	20	85.0	
550	22	90.0	
600	24	95.0	
650	26	100.0	
700	28	105.0	
750	30	110.0	
800	32	115.0	
900	36		
1000	40		

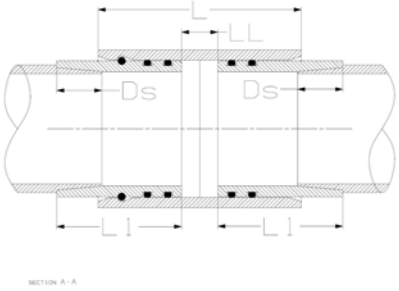
Blank Saddles
BL16B



Nominal Pipe Size		L	t	Angle	Wt
mm	in	mm	mm	degree	Kg
40	1.5	80	10	180	0.2
50	2	80	10	180	0.2
65	2.5	80	10	180	0.2
80	3	80	10	180	0.3
100	4	100	12	180	0.5
125	5	100	12	180	0.6
150	6	100	12	180	0.7
200	8	100	14	180	1.1
250	10	120	14	180	1.5
300	12	120	14	180	1.9
350	14	150	14	180	2.5
400	16	150	14	180	2.9
450	18	150	16	180	4.3
500	20	150	16	180	
550	22	150	16	180	
600	24	150	16	180	
650	26	180	16	180	
700	28	180	16	180	
750	30	180	16	180	
800	32	200	16	180	
900	36				
1000	40				

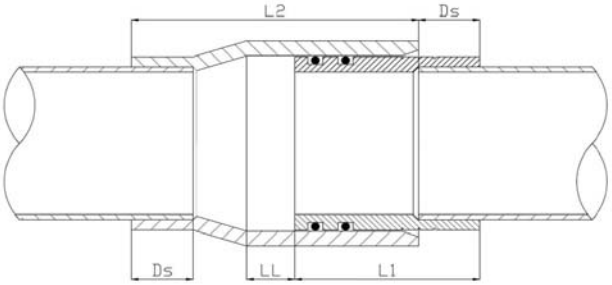
Expansion Coupling
BL16B / BL16B-C

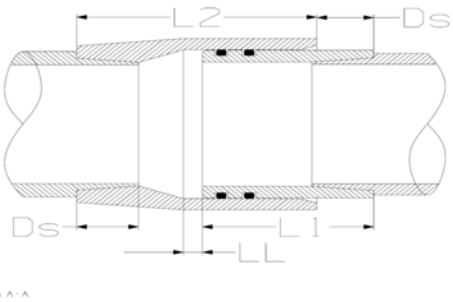




Nominal Pipe Size		LL		L		L1		Ds		O-ring Size	Key Size	Wt
mm	in	mm	in	mm	in	mm	in	mm	in	mm	mm	Kg
50	2	50	1.97	228.0	8.98	135.0	5.32	46.0	1.81	7x65	6x330	3.3
65	2.5	50	1.97	228.0	8.98	135.0	5.32	46.0	1.81	7x80	6x380	4.9
80	3	50	1.97	228.0	8.98	135.0	5.32	46.0	1.81	7x92.5	6x420	5.5
100	4	50	1.97	228.0	8.98	135.0	5.32	46.0	1.81	7x118	6x500	6.1
125	5	50	1.97	280.0	11.02	172.2	6.78	57.2	2.25	10x145	10x600	10.6
150	6	50	1.97	280.0	11.02	172.2	6.78	57.2	2.25	10x170	10x690	14.5
200	8	50	1.97	280.0	11.02	178.5	7.03	63.5	2.50	10x224	10x850	17.5
250	10	50	1.97	340.0	13.39	214.9	8.46	69.9	2.75	12x276	12x1050	33.6
300	12	50	1.97	340.0	13.39	221.2	8.71	76.2	3.00	12x325	12x1210	40.7
350	14	50	1.97	340.0	13.39	233.9	9.21	88.9	3.50	12x355	12x1300	48.1
400	16	50	1.97	340.0	13.39	246.6	9.71	101.6	4.00	12x406	12x1470	67.0
450	18	50	1.97	410.0	16.14	294.3	11.59	114.3	4.50	15x455	15x1620	94.0
500	20											
550	22											
600	24											
650	26											
700	28											
750	30											
800	32											
900	36											
1000	40											

DOFxDOM
BL16B / BL16B-C





Nominal Pipe Size		LL		L1		L2		Ds		O-ring Size	Wt
mm	in	mm	in	mm	in	mm	in	mm	in	mm	Kg
50	2	50	1.97	135.0	5.32	210.0	8.27	46.0	1.81	7x65	2.5
65	2.5	50	1.97	135.0	5.32	210.0	8.27	46.0	1.81	7x80	3.7
80	3	50	1.97	135.0	5.32	210.0	8.27	46.0	1.81	7x92.5	4.2
100	4	50	1.97	135.0	5.32	210.0	8.27	46.0	1.81	7x118	4.5
125	5	50	1.97	172.2	6.78	267.2	10.52	57.2	2.25	10x145	7.2
150	6	50	1.97	172.2	6.78	267.2	10.52	57.2	2.25	10x170	10.3
200	8	50	1.97	178.5	7.03	283.5	11.16	63.5	2.50	10x224	13.1
250	10	50	1.97	214.9	8.46	319.9	12.59	69.9	2.75	12x276	25.2
300	12	50	1.97	221.2	8.71	326.2	12.84	76.2	3.00	12x325	31.3
350	14	50	1.97	233.9	9.21	348.9	13.74	88.9	3.50	12x355	36.8
400	16	50	1.97	246.6	9.71	366.6	14.43	101.6	4.00	12x406	50.0
450	18	50	1.97	294.3	11.59	445.2	17,53	114.3	4.50	15x455	69.0
500	20										
550	22										
600	24										
650	26										
700	28										
750	30										
800	32										
900	36										
1000	40										

ASTM D-5685 Design Codes for Fittings			
Nominal Pipe Size		16B	16B-C
mm	in		
40-400	1.5-16	RTRF-11F2E	RTRF-11F2E
450-1000	18-40	RTRF-11F1E	RTRF-11F1E

ASTM D-4024 Design Codes for Flanges			
Nominal Pipe Size		16B	16B-C
mm	in		
40	1.5	RTR-113D-442	RTR-113D-442
50	2	RTR-113D-442	RTR-113D-442
65	2.5	RTR-113D-442	RTR-113D-442
80	3	RTR-113D-442	RTR-113D-442
100	4	RTR-113D-442	RTR-113D-442
125	5	RTR-113D-442	RTR-113D-442
150	6	RTR-113D-442	RTR-113D-442
200	8	RTR-113D-445	RTR-113D-445
250	10	RTR-113D-445	RTR-113D-445
300	12	RTR-113D-445	RTR-113D-445
350	14	RTR-113D-445	RTR-113D-445
400	16	RTR-113D-445	RTR-113D-445
450	18	RTR-113D-445	RTR-113D-445
500	20	RTR-113D-445	RTR-113D-445
550	22	RTR-113D-445	RTR-113D-445
600	24	RTR-113D-445	RTR-113D-445
650	26	RTR-113D-445	RTR-113D-445
700	28	RTR-113D-445	RTR-113D-445
750	30	RTR-113D-445	RTR-113D-445
800	32	RTR-113D-445	RTR-113D-445
900	36	RTR-113D-445	RTR-113D-445
1000	40	RTR-113D-445	RTR-113D-445

Remark：

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