



ARMYLOR® PTFE / PFA LINED PIPING AND ACCESSORIES ANSI B16.5



MANUFACTURER OF PTFE/PFA LINED PIPING

Since 1964, the **CARBONE LORRAINE** group has been a pioneer in the transport and storage of corrosive fluids. Experience combined with ongoing improvement and the development of processes and materials have allowed **CARBONE LORRAINE** to offer **ARMYLOR®**, the largest range of lined piping in the world.

ARMYLOR® is a PTFE/PFA lined steel piping system with exceptional anti-corrosion features. The performance of these products is a result of mastering the process of high performance fluorated polymer applications: PTFE/PFA.



ARMYLOR® is the ideal solution for transferring or treating fluids in extreme conditions.



CARBONE LORRAINE, THE WORLD SPECIALIST OF ANTI-CORROSION MATERIALS, ALSO SUPPLIES:

- Graphite equipment: **GRAPHILOR®**, exchangers, columns, rupture discs, etc.
- Reactive metal equipment: exchangers, tanks, etc.



QUALITY SYSTEM

The **CARBONE LORRAINE** site at Pagny-sur-Moselle has **ISO 14001** certification for environmental aspects and **ISO 9001** for quality assurance, and the products manufactured are in conformity with the **DESP 97.23 EC** European directive.

APPLICATION PROCESSES

In 2003, two other processing techniques were introduced to complement the **CARBONE LORRAINE** paste extrusion process, namely iso-moulding and PFA transfer moulding, following the introduction of the 3P lined piping activity.

SERVICE

In order to optimize its reactivity, **CARBONE LORRAINE** has its own welding shop and has a large stock of finished products available.

Most of our subsidiaries stock fittings and can manufacture straight lengths on demand.



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ACCORDING TO ANSI B16.5

■ PTFE/PFA LINED STEEL

ARMYLOR®, a CARBONE LORRAINE registered trademark, is a complete range of PTFE/PFA lined accessories.

The ARMYLOR® products have been specially developed for the transport, treatment or storage of corrosive fluids at high temperatures (piping, columns and reactors, bellows and expansion compensators).

The ARMYLOR® range can also be supplied in conformity with DIN 2848 standard.

The nominal diameters (DN) range from NB 1/2" to NB 24" for accessories and piping elements and above 2 m for columns.

There are 3 types of ARMYLOR® products:

- ■ ■ ARMYLOR® G : standard range
- ■ ■ ARMYLOR® V : vacuum and pressure range
- ■ ■ ARMYLOR® S : special range

The ARMYLOR® products are manufactured in conformity with the PED 97.23 EC European Directive and can be supplied with a stainless steel or low-temperature steel shell.

Special pieces of specific or non standard sizes can be manufactured on request.



1 DEFINITION

The available lining materials for the range are the following:

- >> Virgin or anti static PTFE (polytetrafluorethylene), in accordance with the ASTM D489 & 4895 standards.
- >> Virgin or anti static PFA (perfluoroalkoxy), according to ASTM D 3307** standards.

2 GENERAL CHARACTERISTICS

The values indicated in the following table correspond to virgin material.

These characteristics can vary according to the materials supplied, the transformation processes and their components.

PROPERTIES	Units	PTFE	PFA
Physical			
Density	g/cm ³	2.13 - 2.19	2.12 - 2.17
Water absorption : 24h thickness 3,2 mm	%	< 0.01	0.03
Mechanical			
Tensile strength	Mpa	20 - 40	27 - 32
Elongation at break	%	250 - 500	300 - 500
Modulus of elasticity under elongation	Mpa	350 - 750	650 - 700
Modulus of elasticity under flexural stress	Mpa	440 - 670	590 - 700
Hardness shore D method		50 - 72	60 - 65
Thermal			
Flame propagation		hard	hard
Melting point	°C	327 et 342	300 à 310
Other transitions	°C	-90*, +123,* +27**	-80*, 90*
Maximum service temperature	°C	-200/+260	-150/+260
Temperature of deflection under load (1.82Mpa)	°C	50 - 60	50
Linear elongation coefficient	10 ⁻⁵ / °C	10 - 25	12
Thermal conductivity	Ω / m.K	0.24	0.25
Electrical			
Dielectric constant from 60 Hz to 10 ⁷ Hz		2.2	2.1
Volume resistivity	Ω.cm	10 ¹⁸	10 ¹⁸
Surface resistivity	Ω	10 ¹⁷	10 ¹⁷
Dielectric strength (ép. mm)	KV / mm	36(1)	80(2.3)

*amorphous phase, **crystal phase

3 CHARACTERISTICS CONTROLLED AT RECEPTION

The material certificates of powder manufacturers are checked prior to acceptance of batches.



1 NOMINAL THICKNESSES

CARBONE LORRAINE proposes 3 ranges of ARMYLOR® products: ARMYLOR® G and ARMYLOR® V whose thicknesses are indicated in the table below.

ARMYLOR® S has special thickness for specific temperature vacuum resistance and/or applications.

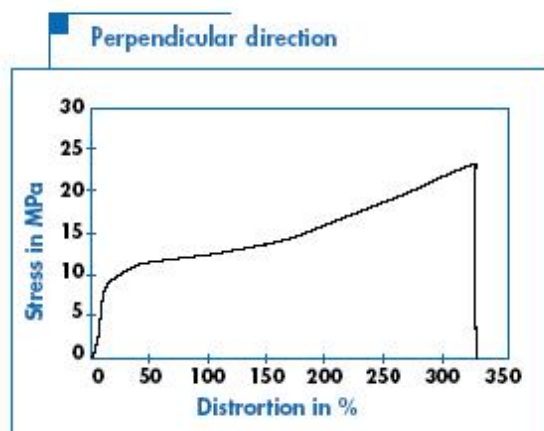
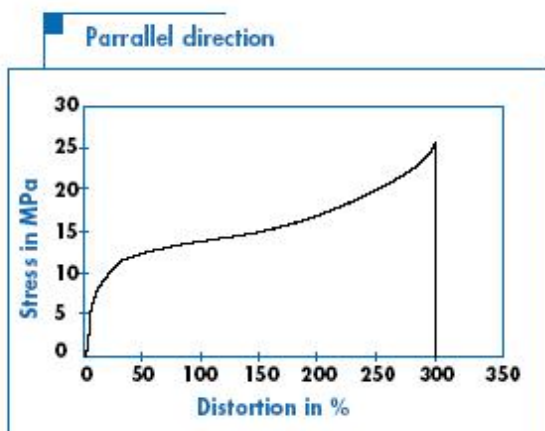
■ ■ ■ PTFE/PFA THICKNESS

DN	Straight Lengths		Elbows		Tees		Conc. / Exc. Red		Instrument tees		Manifolds	
	G	V	G	V	G	V	G	V	G	V	G	V
1/2"	1.8	3.0		3.0		3.0		3.0		3.0		3.0
3/4"	2.0	3.0		3.0		3.0		3.0		3.0		4.0
1"	2.0	3.0		3.3		3.0		3.5		3.0		4.0
1"1/2	2.5	3.0		4.0		3.5		3.5		3.5		6.0
2"	2.5	3.0		4.0		3.5		3.5		3.5		7.0
3"	3.0	3.5	3.5	4.5		4.5		4.0		4.0		9.0
4"	3.0	4.2	4.0	7.5		5.0		5.0		5.0	5.0	10.0
6"	4.0	5.3	5.0	9.5	6.0	10.0	5.0	5.3		6.0	6.0	11.0
8"	4.0	6.2	7.0	10.0	6.0	12.0	6.0	6.2		8.0	7.0	12.0
10"	4.0	7.0	7.0	11.0	7.0	12.0	6.5	7.0	7.0	12.0	7.0	12.0
12"	4.0	8.0	7.0	12.0	7.0	12.0	6.5	8.0	7.0	12.0	7.0	12.0
14"	4.5	8.0	8.0	12.0	8.0		8.0		8.0			
16"	4.5		8.0		8.0		8.0		8.0			
18"	4.5		8.0		8.0		8.0		8.0			
20"	4.5		8.0		8.0		8.0		8.0			
24"	4.5		4.5		4.5		4.5		4.5			

The minimum thickness of the PTFE lining is equal to the nominal thickness minus 10 %.
The thickness at the flare must be lower than the nominal thickness minus 20 %.

2 CHARACTERISTICS CONTROLLED DURING MANUFACTURE

On each batch manufactured, CARBONE LORRAINE checks that the mechanical, physical and electrical properties comply with the table page 6.



Obtaining the elongation at break and tensile strength values, together with the regularity of the graph provides confirmation that the liner sintering has re-established the isotropy of the PTFE, which guarantees a low level of permeability.

Optimum density ensures a balance between a low permeability level and a good distortion during temperature cycles.

Concerning thermoplastics, Melt Flow Index (MFI) conformity ensures molecular chain integrity and excellent "stress crack" resistance.

	MECHANICAL PROPERTIES		PHYSICAL PROPERTIES		
	Tensile strength	Elongation at break	Density		MFI
PTFE Extruded Virgin <i>Test according standard</i>	$\pm 21 \text{ N/mm}^2$ (Sens //) $\pm 17 \text{ N/mm}^2$ (Sens \perp) ASTM D4895	$\pm 250\%$ (Sens //) $\pm 200\%$ (Sens \perp) ASTM D4895	2.14 - 2.19 ASTM D792	2.13 - 2.19 DIN 53749	
ANTI STATIC <i>Test according standard</i>	$\pm 21 \text{ N/mm}^2$ (Sens //) $\pm 17 \text{ N/mm}^2$ (Sens \perp) ASTM D4895	$\pm 250\%$ (Sens //) $\pm 200\%$ (Sens \perp) ASTM D4895	2.13 - 2.19 ASTM D792	2.12 - 2.18 DIN 53749	
PTFE Molding Virgin <i>Test according standard</i>	$\pm 21 \text{ N/mm}^2$ ASTM D4894	$\pm 250\%$ ASTM D4894	2.14 - 2.19 ASTM D792	2.13 - 2.19 DIN 53749	
ANTI STATIC <i>Test according standard</i>	$\pm 21 \text{ N/mm}^2$ ASTM D4894	$\pm 250\%$ ASTM D4894	2.14 - 2.19 ASTM D792	2.12 - 2.18 DIN 53749	
PFA Virgin <i>Test according standard</i>	$\pm 26 \text{ N/mm}^2$ ASTM D3307	$\pm 300\%$ ASTM D3307	2.12 - 2.17 ASTM D792	2.12 - 2.17 DIN 53749	1.3 g/10 mn ASTM D3307
ANTI STATIC <i>Test according standard</i>	$\pm 26 \text{ N/mm}^2$ ASTM D3307	$\pm 300\%$ ASTM D3307	2.11 - 2.17 ASTM D792	2.11 - 2.16 DIN 53749	0.5-1.5 g/10 mn ASTM D3307

The results comply with the ASTM F1545 standard.

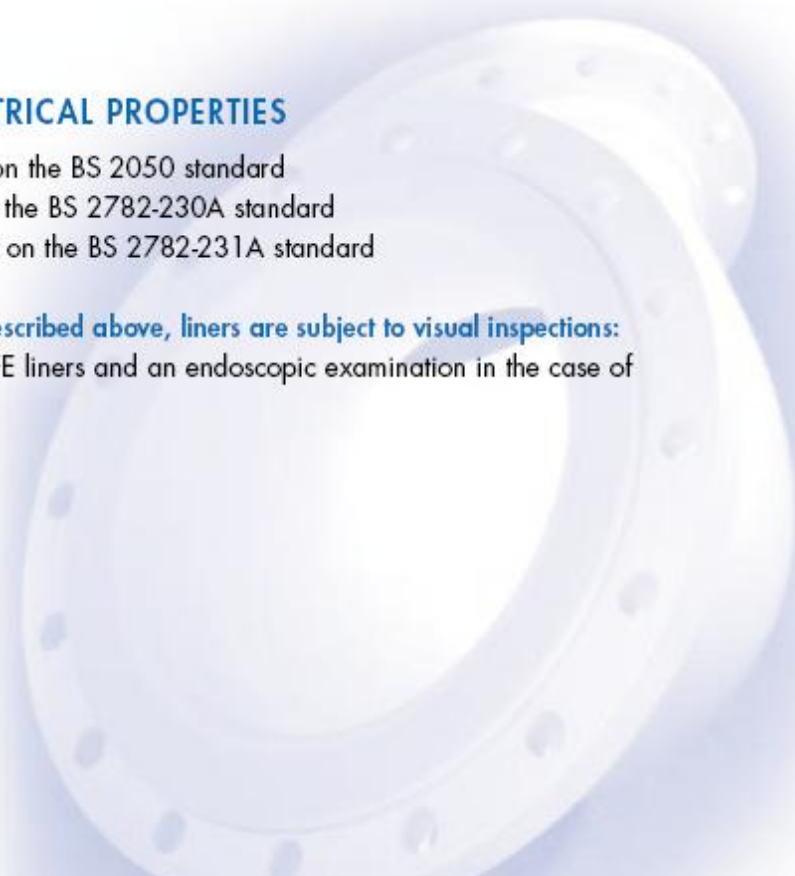
3 ANTI STATIC PTFE/PFA ELECTRICAL PROPERTIES

Transverse resistivity : $< 10^7$ ohm based on the BS 2050 standard

Surface resistivity : $< 10^8$ ohm based on the BS 2782-230A standard

Volume resistivity : $< 10^8$ ohm.cm based on the BS 2782-231A standard

In addition to the properties described above, liners are subject to visual inspections: a light inspection in the case of virgin PTFE liners and an endoscopic examination in the case of anti static liners.



1 PERMEABILITY

Numerous tests have enabled CARBONE LORRAINE to become an expert in the field of permeation.

Several factors have an influence on the phenomenon :

- ■ ■ **The thickness of the lining** is the most significant factor. The curve below shows the sharp decrease in permeability level according to thickness.

- ■ ■ **The size of the ions or molecules.** The helium permeability curve shows the ability of a very small molecule such as helium to pass through the PTFE/PFA.

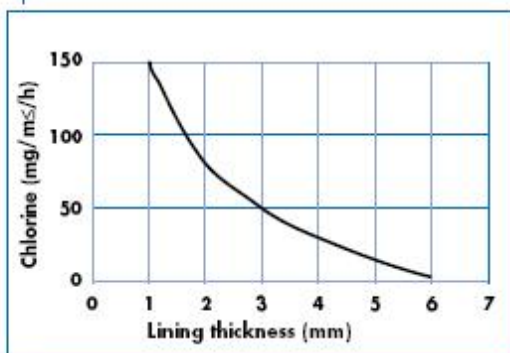
- ■ ■ **The chemical nature of the product :** any chemical similarity between the material passing through and the material passed through increases permeability.

- ■ ■ **Temperature and pressure :** permeation increases with temperature and pressure.

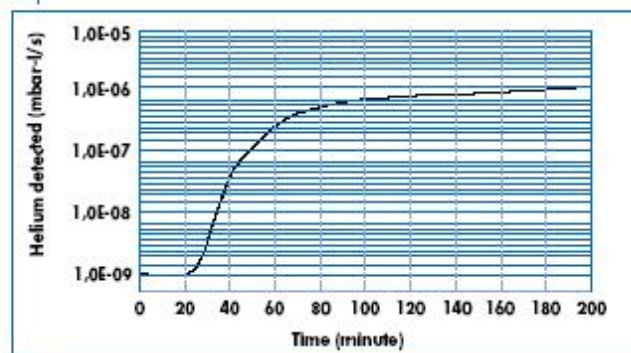
- ■ ■ The extrusion and isostatic moulding have similar level of permeability.

- ■ ■ Examples of permeability curves:

PTFE/PFA permeability curve



Helium permeability PTFE/PFA curve



2 CREEP ON PTFE

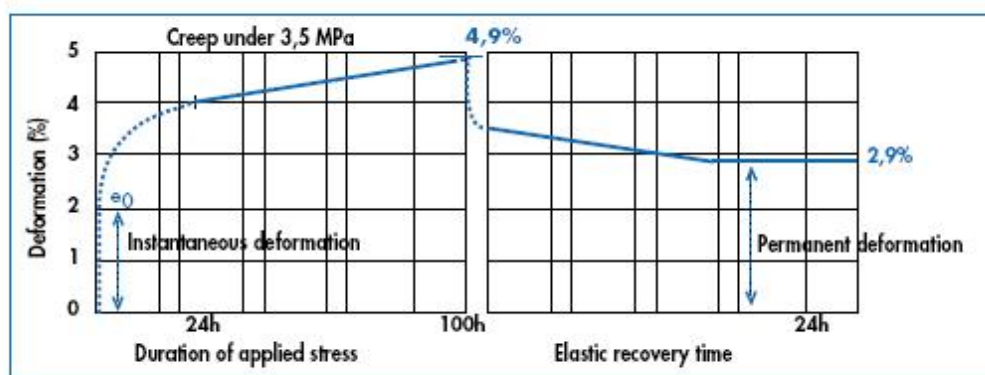
Creep is the deformation of a material over time under the influence of an applied stress. The effect of temperature increases deformation.

In the case shown below, a PTFE sample was placed under a fixed load at a constant temperature. This load leads to the appearance of instantaneous deformation (ϵ_0).

The material continues to deform slowly over the course of time (up to 4.9 % on the graph).

Removal at the load after 100 hours triggers instantaneous elastic recovery. Deformation then continues to decline, tending towards a plateau that is not zero (permanent deformation at 2.9% in this case).

This residual deformation warrants a periodic check on tightening torques.



1 COMPONENTS

The table below shows the various steel or iron components used for the manufacture of our standard pieces. Certificates 3.1b in accordance with EN 10204 are available on demand.

Steel in conformity with the DIN or JIS standards, low temperature or stainless steel can be supplied on request. [Contact us for more information.](#)

DESCRIPTION	PIPE / BODIES		FLANGE / COLLAR	
	STANDARD DIMENSIONAL	GRADE	STANDARD DIMENSIONAL	GRADE
Straight lengths	ANSI B36.10	ASTM 106 Gr B	ANSI B16.5	ASTM A 105
Elbows Welded construction	ANSI B16.9 /ANSI B16.28	ASTM A 234 WPB	ANSI B16.5	ASTM A 105
Elbows Cast steel	ANSI B16.5	ASTM A 216 WCB	ANSI B16.5 (*)	ASTM A 216 WCB
Elbows Ductile iron	ANSI B16.5	ASTM A 369 (60 40 18)	ANSI B16.5 (*)	ASTM A 216 WCB
Tees Welded construction	ANSI B36.10 /ANSI B16.9	ASTM A 106 Gr B ASTM A 234 WPB	ANSI B16.5	ASTM A 105
Tees Cast steel	ANSI B16.5	ASTM A 216 WCB	ANSI B16.5 (*)	ASTM A 216 WCB
Concentric & Eccentric reducer	ANSI B16.9	ASTM A 234 WPB	ANSI B16.5	ASTM A 105
Reducing flange			ANSI B16.5 (*)	ASTM A 516 Gr 60 / P 235 GH-En-10028-
Spacers	ANSI B36.10	ASTM A 106 Gr B	ANSI B16.5 (*)	ASTM A 516 Gr 60 / P 235 GH-En-10028-
Instrument tee Welded construction	CL technical brochure	ASTM A 106 Gr B	ANSI B16.5	ASTM A 105 / ASTM A 516 Gr 60 / P 235 GH-En-10028-
Instrument tee Cast steel	CL technical brochure	ASTM A 216 WCB	ANSI B16.5 (*)	ASTM A 216 WCB

2 WELDING

CARBONE LORRAINE is qualified in accordance with the European standards EN 288.3 (for operational modes) and EN 287.1 (for welders) regarding the A.A.G., M.I.G. & T.I.G., A.D.M. HP 5.3 and ASME IX processes.

These approvals are regularly renewed, either internally or by an external independent body. Audits are carried out in order to ensure that suppliers meet the same requirements. CARBONE LORRAINE is also HPO, SQLO and ASME Stamp 'U' certified.

3 FLARED STUB END

Regarding straight lengths, CARBONE LORRAINE proposes a backing flange obtained by cold shaping at the tube extremity, from NB 1/2" to NB 14". This process is in conformity with PED and has been approved by T.Ü.V.

A loose flange stop can be supplied on request.

4 SPHEROIDAL GRAPHITE DUCTILE IRON (S.G) and cast steel

CARBONE LORRAINE uses S.G. iron according the EN 1563 standard and cast steel according to A316 WCB.

5 VENT HOLES

PTFE and PFA lined piping is fitted with vent holes intended to :

- ■ ■ Prevent any back pressure between the metallic housing and the lining.
- ■ ■ Detect any possible leaks during pressure tests.
- ■ ■ Quickly detect any sign of corrosion.

Straight lengths below 500 mm have one 3 mm diameter vent hole in the middle of the piece.

Those above 500 mm are fitted with two vent holes located about 150 mm from each end.

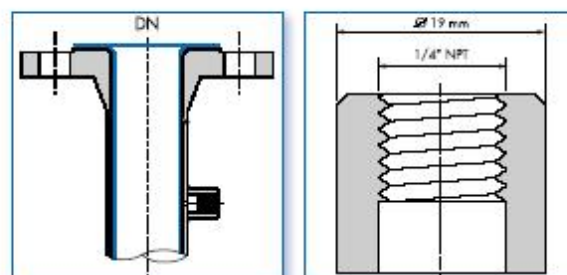
The fittings have at least one 3 mm diameter vent hole. Reducing flanges, blind flanges and spacers do not have any vent holes.

In the case of particular specifications or pipe lagging, couplings can be welded to the vent holes.

6 VENT BOSSES

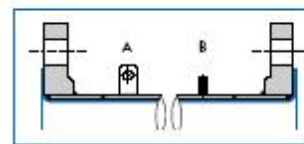
If the vent holes must be identified quickly or when the line is lagged, a coupling can be welded at the vent holes levels.

In the case of different lagging thicknesses, an extension to achieve the size required can be screwed on to the coupling.



7 ELECTRICAL CONTINUITY

The electrical continuity of lined piping can be ensured by connecting the individual elements together by means of conductors linked to earth. Regarding fittings and straight lengths below 500 mm, these are welded in the middle of the steel piece and at about 150 mm from the back side of each flange in the case of straight lengths above 500 mm. CARBONE LORRAINE supplies two types of earth lugs. The standard earth lugs are in stainless steel 304 or 316. Other materials can be supplied on request.



A : Support leg
B : M6 or M8 threaded bolt

8 PAINTING

The standard coating is a primary 40 micron thick zinc silicate primer coating on shot blasted steel, in accordance with the S.A 2.5 cleanliness level.

Other surface preparations, undercoats or topcoats can be applied on request.

9 CHARACTERISTICS CONTROLLED DURING MANUFACTURE

The dimensional inspection is systematically completed by the following additional checks:

- ■ ■ Perpendicularity and positioning of flanges
- ■ ■ Thickness of the painting
- ■ ■ Absence of any protruding element inside the parts that might damage the lining.

CARBONE LORRAINE offers certain optional non-destructive test :

- ■ ■ X-ray of the welding.
- ■ ■ Liquid dye penetrant test performed by COFREND II qualified personnel.



1 DIMENSIONAL TOLERANCES

The lined pieces and their dimensions are indicated in pages 17 to 37.

All the lined pieces are subject to the following tolerances:

5 % for PTFE/PFA flare.

	Tolerance	Dimensional tolerance	Angular tolerance
Straight lengths	0-315 mm	+0 ; -3 mm	-0.5 _j
	315-1000 mm	+0 ; -4 mm	-0.5 _j
	1000-6000 mm	+0 ; -5 mm	-0.5 _j
Connections	DN 25-100	+0 ; -3 mm	-0.5 _j
	DN 125-200	+0 ; -4 mm	-0.5 _j
	DN 250-600	+0 ; -5 mm	-0.5 _j

2 VACUUM RESISTANCE

NB	1/2"	3/4"	1"	1 1/2"	2"	3"	4"	6"	8"	10"	12"	14"	16"
ARMYLOR® G	Vacuum 2 Torr 150° C												
ARMYLOR® V	Vacuum 2 Torr 230° C						Vacuum 2 Torr 150° C						
ARMYLOR® S	Vacuum according to particular specifications												

Unit conversion : 760 Torrs = 760 mmHg = 1 bar = 1 kg/cm² = 10⁵ Pa = 14.5 Psi

3 TEMPERATURE CYCLE TESTS

The pieces tested undergo 100 alternate steam/cold water cycles, according to the ASTM F1545 standard. The steam is absorbed by the lining under the influence of both the temperature level and the pressure. The lining is subject to significant stresses due to the sudden drop in pressure combined with rapid cooling. This test is a qualitative process test.

4 CONTROLS DURING MANUFACTURE

In addition to the numerous internal checks carried out throughout the entire manufacturing process (acceptance of powders, physical properties of the lining, etc.) all piping is subject to the following inspections:

■ 4-1 ■ Dimensional and visual check

The overall dimensions of the straight lengths, the size of the collars, the lining thickness of moulded pieces and the absence of surface defects are checked once the pieces have been produced.

■ 4-2 ■ Electrostatic check test

Each piping element undergoes the electrostatic check in the following conditions:

■ ■ ■ PTFE/PFA : test voltage potential: 5,000 * E volts (*E* = thickness of lining in mm) with a maximum of 25,000 volts.



4-3 Hydrostatic test

This check is carried out on pieces fitted with vent holes, injected or produced from extruded pipes. The standard test pressure is 1.5 times the operational pressure. This test can also be carried out in other conditions (pressure, length of time, number of cycles) on request.

4-4 Pneumatic test

A hot pneumatic test is carried out on isomolding parts and on certain parts manufactured from extruded lines.

5 TRACEABILITY AND MARKING


5-1 TRACEABILITY

In addition to markings relative to hydrostatic and electrostatic checks, traceability, an essential part of the Quality assurance system, is achieved as follows:

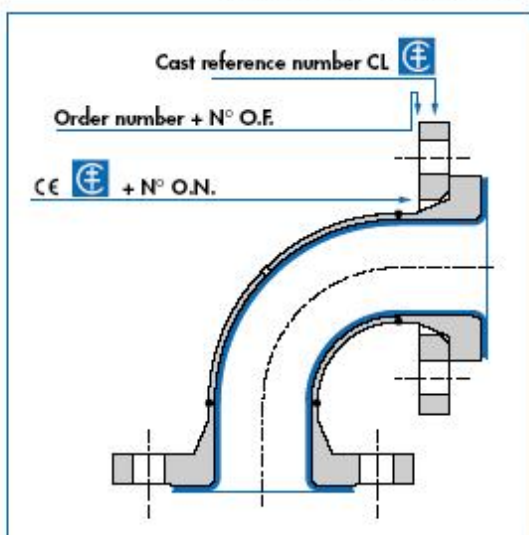
■ ■ ■ **Steel** : The cast reference number is cold stamped on each steel or ductile iron piece.

CARBONE LORRAINE has been approved by the TÜV to indicate the cast number on cut steel pipes.

■ ■ ■ **Finished product** : the following information is stamped on finished piece:

>> the CARBONE LORRAINE,  the order number and the part number (O.F. number)

>> the **CE** +  + O.N. (notified body)



■ ■ ■ **Documentary traceability** : total traceability is ensured regarding both metallic components and lining materials.

5-2 MARKING

Diameter, piece type for fittings or length for straight lengths are marked on the wooden tape or on the plastic tape and protecting the flare.

Additional markings can be included on request.

Depending on the specific requirements of each customer, other types of markings such as a CARBONE LORRAINE label can be supplied.

6 PACKAGING

Straight lengths can be packed as floor-mounted loads or in wooden crates.

Fittings are packed in wooden boxes or in cardboard boxes on pallets.



The ARMYLOR® lined lengths and fittings are safety products that have been manufactured according to specific standards. The following recommendations will allow for optimum use of our products.

1 PRECAUTIONS

The lined steel elements are delivered with wooden or plastic tapes intended to protect the flare. Only remove these protective tapes at the time of assembly only, and put them back after any inspection prior to assembly or whenever the part is removed from the plant. Once the ends have been removed, the greatest care is required to not damaged the lining.

2 CLEANING

Flared surface must be carefully cleaned prior to connection.

3 BOLT TIGHTENING

The assembly of PTFE/PFA lined piping elements does not require the use of gaskets except when materials of different natures are being coupled or during successive assembly and dismantling operations.

Tightening bolts :

- ■ ■ Insert the washers.
- ■ ■ Clean and grease the bolts.
- ■ ■ Tighten nuts by hands.
- ■ ■ Tighten each bolt using a torque wrench, keeping to the torque values specified in the right table.
- ■ ■ Tightening "opposites" as with any flange connection.

Tightening torque values given are for PTFE/PFA and may vary depending on greasing, the condition of the threaded hole, etc.

Values are given for ANSI 150 lbs flanges.

They are indicated for cold conditions and must always be checked in cold condition, after 24 hours of installation; they should also be checked periodically.

The tightening torque values indicated apply to :

- ■ ■ Class 8.8 steel nuts (resistant to 800N/mm rupture, elasticity limit of 640N/mm)
- ■ ■ 0.12. nut friction coefficient

DN	Nuts mm	Tightening N.m
DN 25	4xM12	30
DN 32	4xM16	45
DN 40	4xM16	60
DN 50	4xM16	80
DN 65	4xM16	100
DN 80	8xM16	60
DN 100	8xM16	70
DN 125	8xM16	90
DN 150	8xM20	130
DN 200	8xM20	180
DN 250	12xM20	160
DN 300	12xM20	210
DN 350	16xM20	260
DN 400	16xM24	330
DN 450	20xM24	290
DN 500	20xM24	330
DN 600	20xM27	460

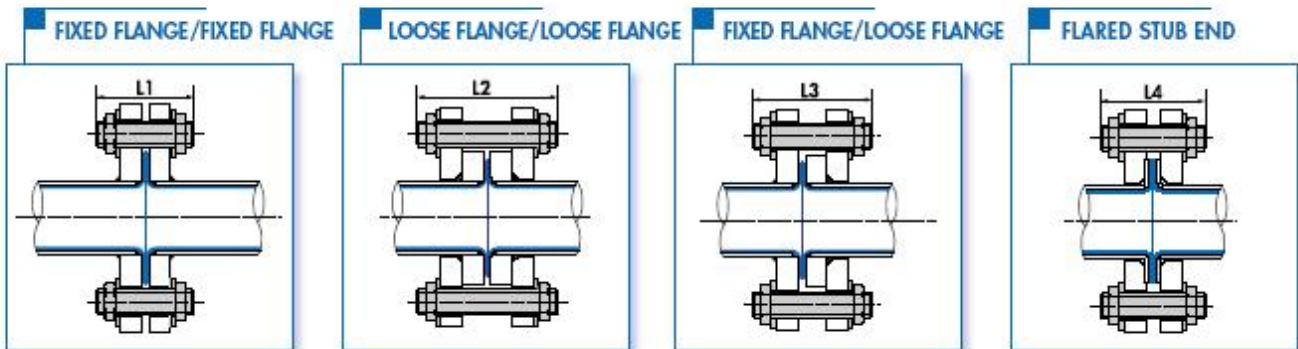


4 BOLT LENGTHS

The table below sets out the recommended screwed rod lengths for the various assemblies.

The dimensions indicated refer to:

- ■ ■ A coupling equal to 1/3 the diameter of the screwed rod.
- ■ ■ A nut height equal to the diameter of the screwed rod.



5 VENT HOLES

Vent holes must not be obstructed by lagging or painting. Where lagging is fitted, vent extensions should be provided. When pipes are put into service for the first time, air or water trapped inside at the time of assembly may escape through the vent holes. It is recommended that, when undertaking periodic inspections of the installation, a check is made that no leak has occurred at the site of the vent holes. The latter also act as corrosion indicators.

6 FIELD FORMING KIT

To facilitate the task of on site assembly, CARBONE LORRAINE has developed a field flaring kit which allows spools to be cut to length on site. CARBONE LORRAINE supplies special PTFE-liner/steel tube lengths for this purpose.

ASA 150

NB	L1	L2	L3	L4
	mm	mm	mm	mm
NB 1/2"	75	95	85	
NB 3/4"	80	100	90	
NB 1"	80	105	90	85
NB 1 1/2"	90	115	100	85
NB 2"	100	125	110	95
NB 3"	110	140	125	105
NB 4"	110	140	125	105
NB 6"	125	165	145	125
NB 8"	135	175	155	130
NB 10"	150	195	175	
NB 12"	155	205	175	
NB 14"	170	220	195	
NB 16"	175	225	195	
NB 18"	185	235	215	
NB 20"	195	245	220	
NB 24"	205	260	230	

ASA 300

NB	L1	L2	L3	L4
	mm	mm	mm	mm
NB 1/2"	80	100	90	
NB 3/4"	90	115	100	
NB 1"	95	120	105	95
NB 1 1/2"	110	140	125	105
NB 2"	110	140	125	105
NB 3"	130	165	145	120
NB 4"	135	180	155	120
NB 6"	150	195	170	135
NB 8"	170	225	195	155
NB 10"	195	255	225	
NB 12"	210	275	240	
NB 14"	215	290	250	
NB 16"	235	315	275	
NB 18"	240	330	285	
NB 20"	245	345	290	
NB 24"	270	380	325	

7 WEIGHT

The weight (kilograms) of each piece is indicated on the corresponding tables. Due to the various construction methods, the weights are guideline values only. The tolerance is +/- 10%.

8 SUPPORTS

Elements must be supported using rings that are independent of the lined pipe. No welding should be performed on lined elements. However, supporting elements may be welded prior to lining.



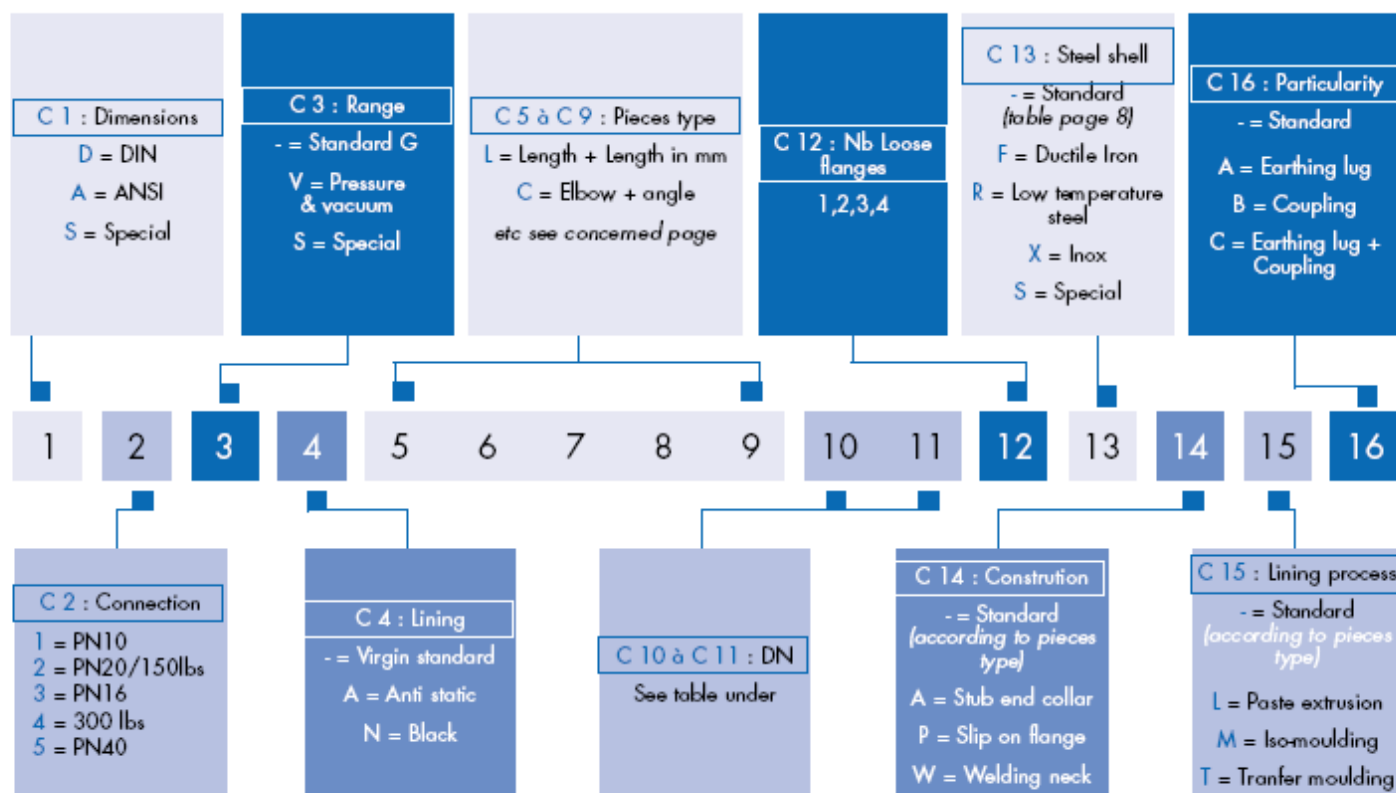
ARMYLOR® RANGE

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Each ARMYLOR® element has a reference, which allow defining it.
 This reference includes 16 alphanumeric characters. The characters 1 to 10 must be informed, the others allow to define some eventual particularity.

The indicated references in the dimensional tables are the ones of the 3PCL standard construction.




REP	NB	REP	NB	REP	NB
H	1/2"	Q	4"	X	16"
J	3/4"	S	6"	Y	18"
K	1"	T	8"	Z	20"
M	1"1/2	U	10"	B	24"
N	2"	V	12"		
P	3"	W	14"		

Example :

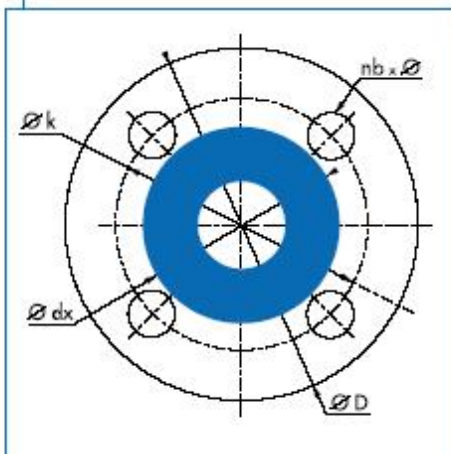
A2-V-L1234T-XW-A	ANSI 150 lbs, vacuum range, 1234 mm straight length, DN 200, inox steel, welding neck, earthing lug.
A2-C45-P-1 :	ANSI 150 lbs, 45° elbow, DN 80, 1 BT
A2-TE--N	ANSI 150 lbs, equal tee, DN 50
A2-RC--QP	ANSI 150 lbs, DN 100x80 concentric reduced



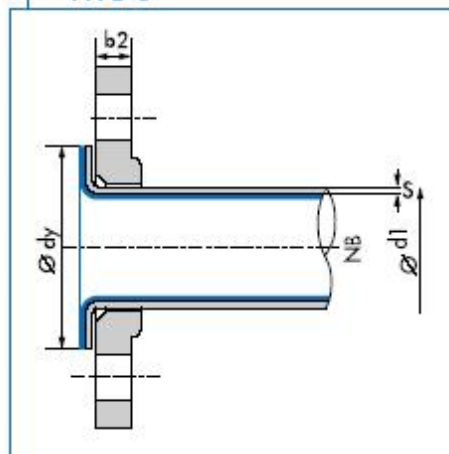
NB	D	dx mini	dy	dz	k	b1	b2	b3	holes		Steel tubes		
											d1	s	
	mm	mm	mm	mm	mm	mm	mm	mm	nbr	Ø		mm	mm
1/2"	89	31		42	60.3	11.1	9.5	10	4	16	1/2	26.7	2.9
3/4"	99	39		52	69.0	12.7	11.1	12	4	16	1/2	26.7	2.9
1"	108	47	51	60	79.4	14.3	12.7	12	4	16	1/2	33.4	3.4
1 1/2"	127	68	72	73	98.4	17.5	15.9	12	4	16	1/2	48.3	3.7
2"	152	87	90	92	120.6	19.0	17.4	14	4	20	5/8	60.3	3.9
3"	191	117	125	127	152.4	23.8	22.2	16	4	20	5/8	88.9	5.5
4"	229	150	155	157	190.5	23.8	22.2	16	8	20	5/8	114.3	6.0
6"	279	203	210	216	241.3	25.4	23.8	18	8	23	3/4	168.3	7.1
8"	343	255	262	270	298.4	28.6	27.0	20	8	23	3/4	219.1	8.2
10"	406	311		324	361.9	30.2	28.6	22	12	26	7/8	273.0	7.8
12"	493	365		381	431.8	32.7	31.1	24	12	26	7/8	323.8	8.4
14"	535	393		413	476.2	34.9	33.3	25	12	29	1	355.6	7.9
16"	597	450		470	539.7	36.5	34.9	25	16	29	1	406.4	7.9
18"	635	514		533	577.8	39.7	38.1	25	16	32	1 1/8	457.2	7.9
20"	699	565		584	635.0	42.9	41.3	25	20	32	1 1/8	508.0	9.5
24"	813	666		692	749.3	47.6	46.0	25	20	35	1 1/4	609.8	9.5

* According to ASTM F1545

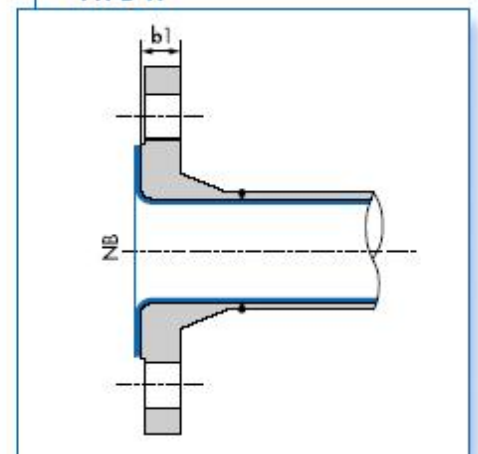
FLANGE (front view)



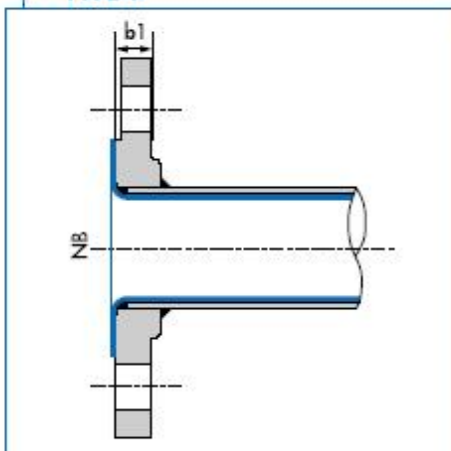
FLARED STUB END TYPE C



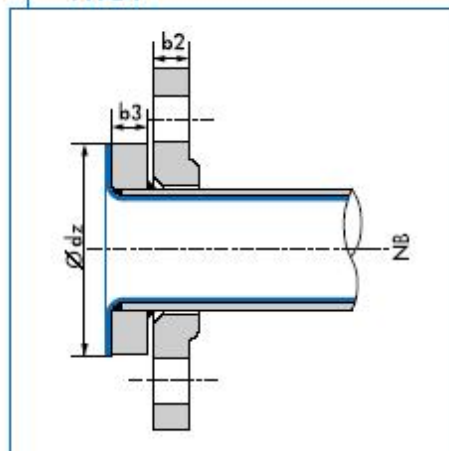
WELDING NECK TYPE W



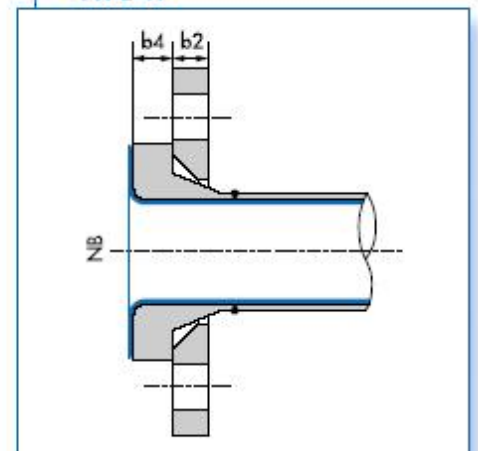
SLIP-ON TYPE P



COLLAR + SLIP ON TYPE P



COLLAR + SLIP ON TYPE W



◆ PN 6/16/20/25... on request



NB	L min mm	L max. mm	Weight (Kg) metre	Pair flanges weight	Référence																													
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16														
1/2"	85	6000	2	0.9	A 2	-	-	L	x	x	x	x	x	H																				
3/4"	85	6000	2	1.3	A 2	-	-	L	x	x	x	x	J																					
1"	85	6000	2	2.1	A 2	-	-	L	x	x	x	K																						
1 1/2"	90	6000	5	3.2	A 2	-	-	L	x	x	x	M																						
2"	100	6000	7	5.1	A 2	-	-	L	x	x	N																							
3"	110	6000	14	9.3	A 2	-	-	L	x	x	P																							
4"	120	6000	19	12.9	A 2	-	-	L	x	x	Q																							
6"	120	6000	34	17.8	A 2	-	-	L	x	x	S																							
8"	130	6000	53	28.2	A 2	-	-	L	x	x	T																							
10"	150	6000	64	38.5	A 2	-	-	L	x	x	U																							
12"	150	6000*	65	60.9	A 2	-	-	L	x	x	V																							
14"	150	3000	85	76.1	A 2	-	-	L	x	x	W																							
16"	150	3000	98	95.2	A 2	-	-	L	x	x	X																							
18"	150	3000	110	108	A 2	-	-	L	x	x	Y																							
20"	160	3000	132	136	A 2	-	-	L	x	x	Z																							
24"	180	3000	161	172	A 2	-	-	L	x	x	B																							

* For vacuum thickness, L max = 4500 xxxx : length in mm

LINING

- > **VIRGIN PTFE :**
NB 1/2" to NB 24"
- > **ANTI STATIC PTFE :**
NB 1/2" to NB 16" : C4 = A

Range and thickness Page 5

Calculation of a straight length's weight :

Ex : NB 1", length 6 meters

$6 \times (\text{weight per meter}) + \text{Flange pair weight} = 6 \times 2 + 2,1 = 17,1 \text{ kg}$

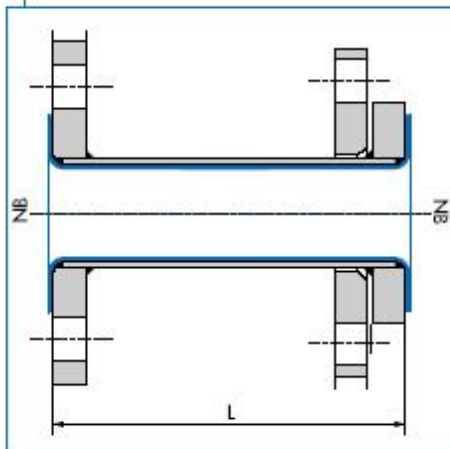
Standard construction : Type C : 3PCL standard to NB 1/2"

Type P : superior standard to NB 14"

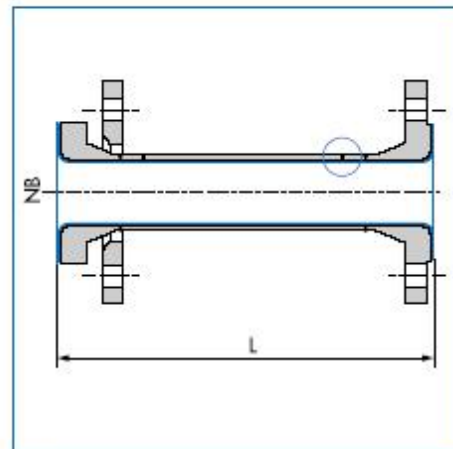
On request : Type W : C14 = W

Type P : NB 1/2" to NB 14" : C14 = P

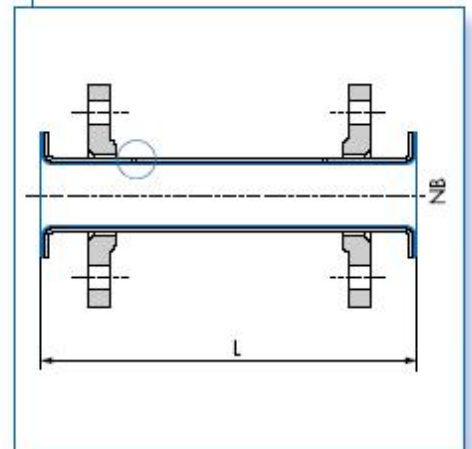
FIXED FLANGE/LOOSE FLANGE TYPE P CONSTRUCTION



FIXED FLANGE/LOOSE FLANGE TYPE W CONSTRUCTION



LOOSE FLANGE TYPE C CONSTRUCTION





NB	L (mm)				Weight (Kg)				Référence															
	$\alpha=90^\circ$	$\alpha=45^\circ$	$\alpha=60^\circ$	$\alpha=30^\circ$	90°	45°	60°	30°	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1/2"	65	44	52	40	1.0	0.9	0.9	0.9	A 2 - - C ? ? ? ? ? H															
3/4"	75	44	72	59	1.4	1.3	1.3	1.3	A 2 - - C ? ? ? ? ? K															
1"	▲ 89	44 ⁽¹⁾	98	77	2.2	2.1	2.1	2.0	A 2 - - C ? ? ? ? ? L															
1 1/2"	▲ 102	57	92	78	3.8	3.4	3.5	3.3	A 2 - - C ? ? ? ? ? M															
2"	▲ 114	64	110	86	5.9	5.3	5.5	5.1	A 2 - - C ? ? ? ? ? N															
3"	▲ 140	76	110	75	11.5	10.0	10.5	9.5	A 2 - - C ? ? ? ? ? P															
4"	165	102	135	90	16.7	14.2	15.1	13.4	A 2 - - C ? ? ? ? ? Q															
6"	203	127	180	110	26.6	21.2	22.9	19.4	A 2 - - C ? ? ? ? ? S															
8"	229	140	235	140	44.3	34.7	37.9	31.6	A 2 - - C ? ? ? ? ? T															
10"	279	165			62.4	48.4			A 2 - - C ? ? ? ? ? U															
12"	305	190			86.3	70.7			A 2 - - C ? ? ? ? ? V															
14"	356	190			117	93.1			A 2 - - C ? ? ? ? ? W															
16"	■ 450	203			156	121			A 2 - - C ? ? ? ? ? X															
18"	■ 475	216			179	138			A 2 - - C ? ? ? ? ? Y															
20"	■ 810**	■ 343*			538	341			A 2 - - C ? ? ? ? ? Z															
24"	■ 974**	■ 412*			693	439			A 2 - - C ? ? ? ? ? B															

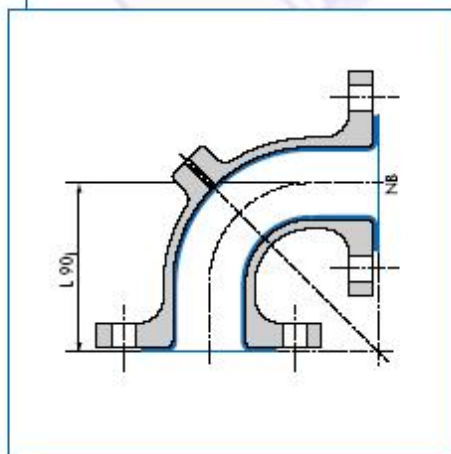
▲ Ductile iron part available * 2 parts construction ** 3 parts construction
 ■ Does not conform to ANSI NB 16.5 standard ?? Angle in degree : 30, 45, 60 or 90 or standard

LININGS

> PTFE : NB 1/2" to NB 24"
 > ANTI STATIC PTFE : NB 1/2" to NB 16" : C4 = A

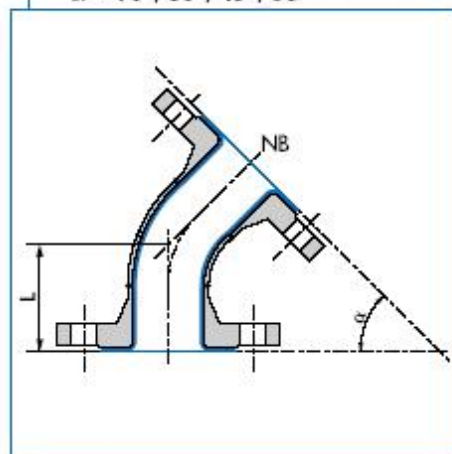
Range and thickness Page 5

DUCTILE IRON ELBOW

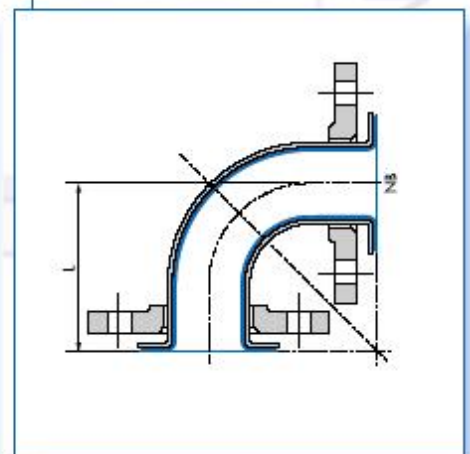


STANDARD FIXED FLANGES ELBOW

$\alpha = 90^\circ/60^\circ/45^\circ/30^\circ$



FLARED STUB END ELBOW



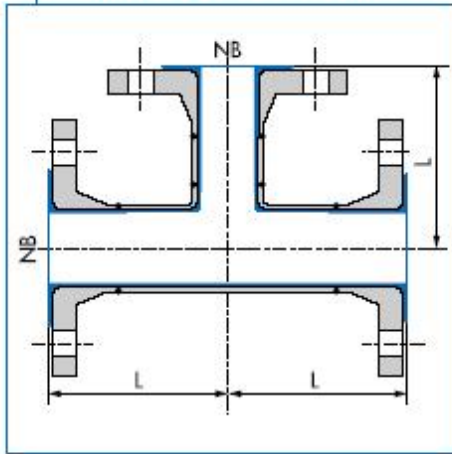
The 30° et 60° elbows proposed by Carbone Lorraine are not included in the ANSI NB 16.5 standard

Standard construction : Type P : NB 1/2" to NB 2"
 Type W : superior NB

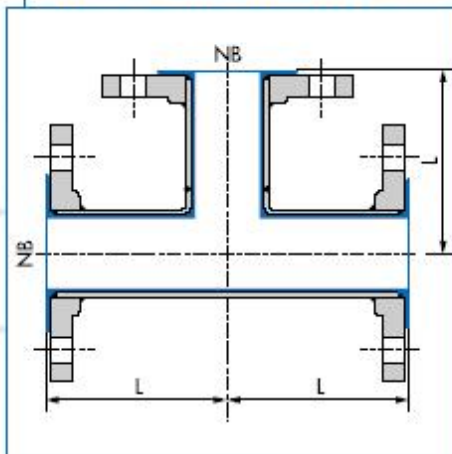
On request :
 - 1 fixed flange + 1 loose flange : C12 = 1
 - 2 loose flanges : C12 = 2
 - ductile iron elbow : C13 = F



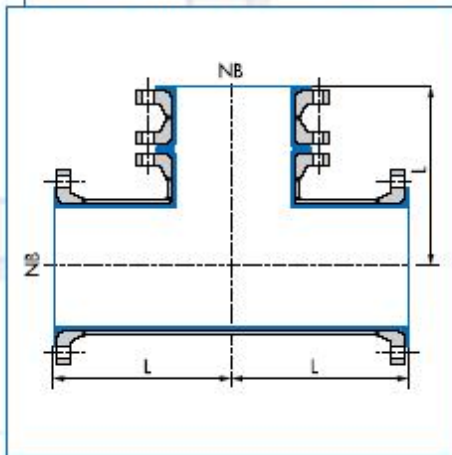
FIXED FLANGES TEE TYPE W



FIXED FLANGES TEE TYPE P



* ISO FIXED FLANGE TYPE W



NB	L mm	Weight Kg	Référence															
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1/2"	65	1.6	A	2	-	-	T	E	-	-	-	-	-	-	-	-	-	-
3/4"	75	2.2	A	2	-	-	T	E	-	-	-	-	-	-	-	-	-	-
▲ 1"	89	3.5	A	2	-	-	T	E	-	-	-	-	-	-	-	-	-	-
▲ 1 1/2"	102	5.9	A	2	-	-	T	E	-	-	-	-	-	-	-	-	-	-
▲ 2"	114	9.2	A	2	-	-	T	E	-	-	-	-	-	-	-	-	-	-
▲ 3"	140	17.9	A	2	-	-	T	E	-	-	-	-	-	-	-	-	-	-
4"	165	26.1	A	2	-	-	T	E	-	-	-	-	-	-	-	-	-	-
6"	203	41.7	A	2	-	-	T	E	-	-	-	-	-	-	-	-	-	-
8"	229	68.8	A	2	-	-	T	E	-	-	-	-	-	-	-	-	-	-
10"	279	96.8	A	2	-	-	T	E	-	-	-	-	-	-	-	-	-	-
12"	305	132	A	2	-	-	T	E	-	-	-	-	-	-	-	-	-	-
14"	356*	215	A	2	-	-	T	E	-	-	-	-	-	-	-	-	-	-
16"	381**	266	A	2	-	-	T	E	-	-	-	-	-	-	-	-	-	-
18"	419**	308	A	2	-	-	T	E	-	-	-	-	-	-	-	-	-	-
20"	457**	396	A	2	-	-	T	E	-	-	-	-	-	-	-	-	-	-
24"	559**	520	A	2	-	-	T	E	-	-	-	-	-	-	-	-	-	-

▲ Ductile iron parts available

LININGS

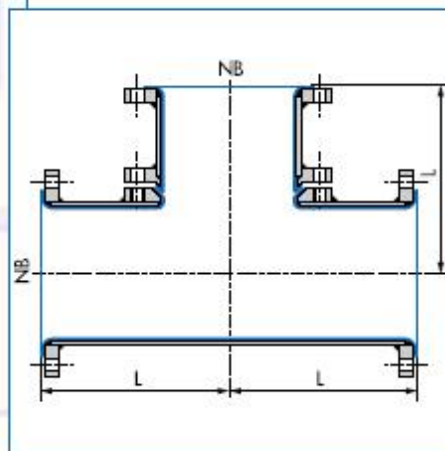
- > PFA : NB 1/2" to NB 3"
- > ANTI STATIC PFA : NB 1/2" to NB 3" : C4 = A
- > PTFE : NB 4" to NB 24"
- > ANTI STATIC PTFE : NB 4" to NB 16" : C4 = A

Range and thickness Page 5

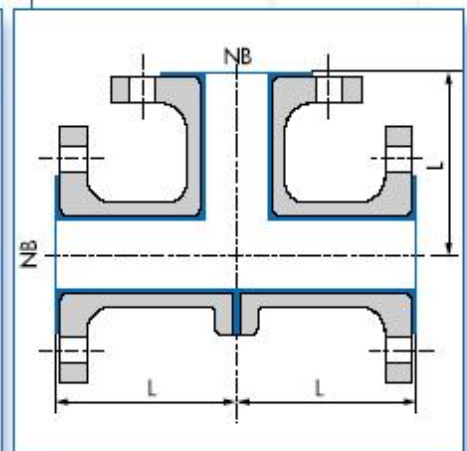
Standard construction : Type P : NB 1/2" to NB 3" and NB 14" to NB 24"
Type W : NB 4" to NB 12"

On request : - 3 loose flanges : C12 = 3
- Ductile iron construction ▲ : C13 = F

** FIXED FLANGES TEE TYPE P



DUCTILE IRON TEE ▲





NB1	NB2	L mm	Weight Kg	Référence																						
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16							
3/4"	1/2"	75	2.0	A	2	-	T	R	-	-	-	J	H													
1"	1/2"	89	2.9	A	2	-	T	R	-	-	-	K	H													
	3/4"	89	3.1	A	2	-	T	R	-	-	-	K	J													
1 1/2"	1/2"	102	4.6	A	2	-	T	R	-	-	-	M	H													
	3/4"	102	4.8	A	2	-	T	R	-	-	-	M	J													
	1"	102	5.2	A	2	-	T	R	-	-	-	M	K													
2"	1/2"	114	6.8	A	2	-	T	R	-	-	-	N	H													
	3/4"	114	7.0	A	2	-	T	R	-	-	-	N	J													
	1"	114	7.4	A	2	-	T	R	-	-	-	N	K													
	1 1/2"	114	8.2	A	2	-	T	R	-	-	-	N	M													
3"	1"	140	13.5	A	2	-	T	R	-	-	-	P	K													
	1 1/2"	140	14.3	A	2	-	T	R	-	-	-	P	M													
	2"	140	15.4	A	2	-	T	R	-	-	-	P	N													

NB2

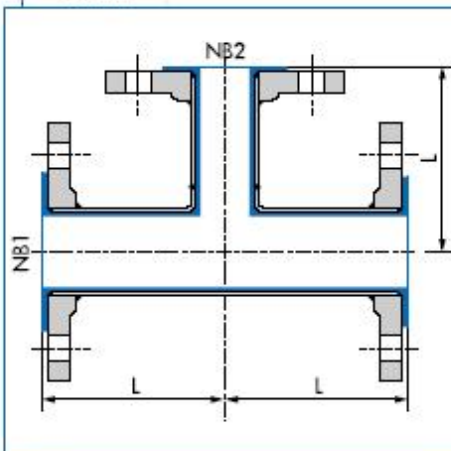
Standard construction : Type P : Fixed flanges
 On request : - 3 loose flanges : C12 = 3

LININGS
 > PFA : NB 3/4" - NB 3"
 > ANTI STATIC PFA : NB 3/4" - NB 3" : C4 = A

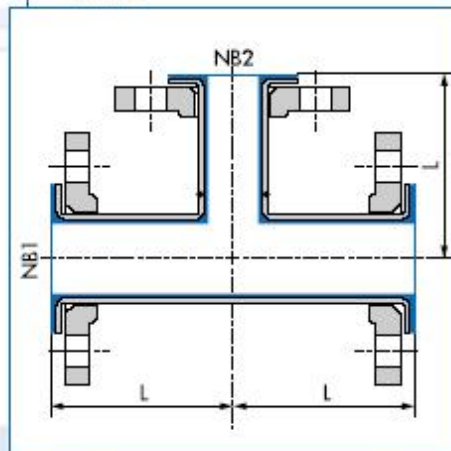
Range and thickness Page 5

NB1

FIXED FLANGES REDUCING TEE TYPE P

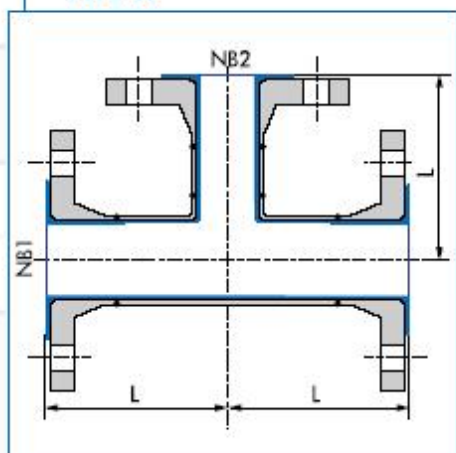


LOOSE FLANGE REDUCING TEE TYPE C

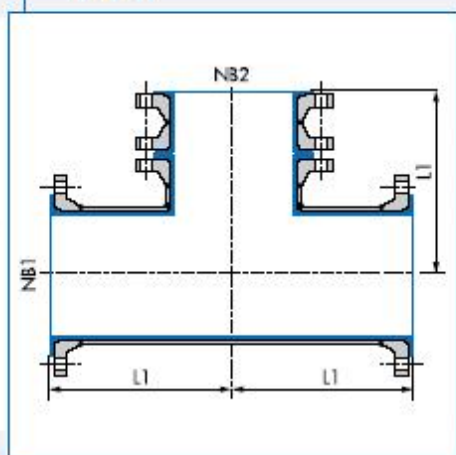




FIXED FLANGES REDUCING TEE TYPE W



FIXED FLANGES REDUCING TEE TYPE W



NB1	NB2	L mm	Weight Kg	Référence																
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
4"	1"	165	19.3	A	2	-	-	T	R	-	-	-	-	-	-	-	-	-	Q	K
	1 1/2"	165	20.2	A	2	-	-	T	R	-	-	-	-	-	-	-	-	-	Q	M
	2"	165	21.2	A	2	-	-	T	R	-	-	-	-	-	-	-	-	-	Q	N
	3"	165	23.9	A	2	-	-	T	R	-	-	-	-	-	-	-	-	-	Q	P
6"	1"	203	30.8	A	2	-	-	T	R	-	-	-	-	-	-	-	-	-	S	K
	1 1/2"	203	31.7	A	2	-	-	T	R	-	-	-	-	-	-	-	-	-	S	M
	2"	203	32.8	A	2	-	-	T	R	-	-	-	-	-	-	-	-	-	S	N
	3"	203	35.6	A	2	-	-	T	R	-	-	-	-	-	-	-	-	-	S	P
	4"	203	37.9	A	2	-	-	T	R	-	-	-	-	-	-	-	-	-	S	Q
8"	1"	229	50.7	A	2	-	-	T	R	-	-	-	-	-	-	-	-	-	T	K
	1 1/2"	229	51.6	A	2	-	-	T	R	-	-	-	-	-	-	-	-	-	T	M
	2"	229	52.7	A	2	-	-	T	R	-	-	-	-	-	-	-	-	-	T	N
	3"	229	55.5	A	2	-	-	T	R	-	-	-	-	-	-	-	-	-	T	P
	4"	229	57.8	A	2	-	-	T	R	-	-	-	-	-	-	-	-	-	T	Q
	6"	229	61.7	A	2	-	-	T	R	-	-	-	-	-	-	-	-	-	T	S
10"	4"	279	78.8	A	2	-	-	T	R	-	-	-	-	-	-	-	-	-	U	Q
	6"	279	83.0	A	2	-	-	T	R	-	-	-	-	-	-	-	-	-	U	S
	8"	279	90.6	A	2	-	-	T	R	-	-	-	-	-	-	-	-	-	U	T
12"	4"	305	104	A	2	-	-	T	R	-	-	-	-	-	-	-	-	-	V	Q
	6"	305	108	A	2	-	-	T	R	-	-	-	-	-	-	-	-	-	V	S
	8"	305	115	A	2	-	-	T	R	-	-	-	-	-	-	-	-	-	V	T
	10"	305	122	A	2	-	-	T	R	-	-	-	-	-	-	-	-	-	V	U
14"	4"	356	145	A	2	-	-	T	R	-	-	-	-	-	-	-	-	-	W	Q
	6"	356*	152	A	2	-	-	T	R	-	-	-	-	-	-	-	-	-	W	S
	8"	356*	165	A	2	-	-	T	R	-	-	-	-	-	-	-	-	-	W	T
	10"	356*	176	A	2	-	-	T	R	-	-	-	-	-	-	-	-	-	W	U
	12"	356*	197	A	2	-	-	T	R	-	-	-	-	-	-	-	-	-	W	V

*2 parts construction

LININGS

- > VIRGIN PTFE : NB 4" to NB 14"
- > ANTI STATIC PTFE : NB 4" to NB 14" : C4 = A

Range and thickness Page 5

Standard construction : Type W : Fixed flanges

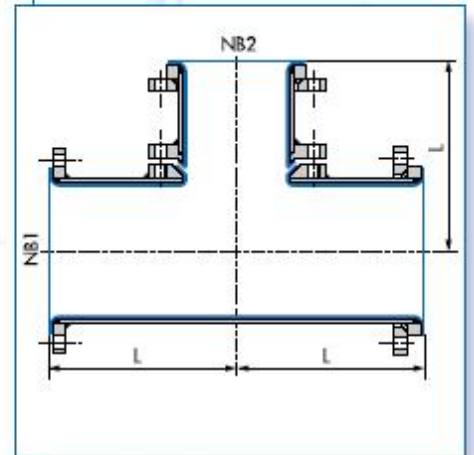
On request : - 3 loose flanges : C12 = 3



NB1	NB2	L mm	Weight Kg	Référence																								
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16									
16"	4"	381*	177	A	2	-	-	T	R	-	-	-	-	X	Q													
	6"	381*	183	A	2	-	-	T	R	-	-	-	-	X	S													
	8"	381*	196	A	2	-	-	T	R	-	-	-	-	X	T													
	10"	381*	207	A	2	-	-	T	R	-	-	-	-	X	U													
	12"	381*	228	A	2	-	-	T	R	-	-	-	-	X	V													
	14"	381**	246	A	2	-	-	T	R	-	-	-	-	X	W													
18"	8"	419*	225	A	2	-	-	T	R	-	-	-	-	Y	T													
	10"	419	236	A	2	-	-	T	R	-	-	-	-	Y	U													
	12"	419	257	A	2	-	-	T	R	-	-	-	-	Y	V													
	14"	419	276	A	2	-	-	T	R	-	-	-	-	Y	W													
20"	8"	457	281	A	2	-	-	T	R	-	-	-	-	Z	T													
	10"	457	292	A	2	-	-	T	R	-	-	-	-	Z	U													
	12"	457	313	A	2	-	-	T	R	-	-	-	-	Z	V													
	14"	457	332	A	2	-	-	T	R	-	-	-	-	Z	W													
	16"	457	352	A	2	-	-	T	R	-	-	-	-	Z	X													
	18"	457	364	A	2	-	-	T	R	-	-	-	-	Z	Y													
24"	10"	559	380	A	2	-	-	T	R	-	-	-	-	B	U													
	12"	559	401	A	2	-	-	T	R	-	-	-	-	B	V													
	14"	559	421	A	2	-	-	T	R	-	-	-	-	B	W													
	16"	559	441	A	2	-	-	T	R	-	-	-	-	B	X													
	18"	559	455	A	2	-	-	T	R	-	-	-	-	B	Y													

NB2

FIXED FLANGES REDUCING TEE TYPE P



LININGS

Standard construction : Type P : Fixed flanges

On request : - 3 loose flanges : C12 = 3

> PTFE : NB 16" to NB 24"

> ANTI STATIC PTFE : NB 16" : C4 = A

Range and thickness Page 5



NB1	NB2	∅ D	b	NB1				NB2				Type	Weight	Référence																						
				∅ k1	Holes	←	←	∅ k2	Holes	←	←			Kg		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16					
		mm	mm	mm	nb	∅	UNC	mm	nb	UNC																										
3/4"	1/2"	98	35	69.8	4 x	1/2"		60.3	4 x	1/2"	C	1.9	A 2	.	B	R	.	.	.	.	J	H														
1"	1/2"	108	35	79.4	4 x	1/2"		60.3	4 x	1/2"	C	2.1	A 2	.	B	R	.	.	.	.	K	H														
	3/4"	108	35	79.4	4 x	1/2"		69.8	4 x	1/2"	C	2.0	A 2	.	B	R	.	.	.	.	K	J														
1 1/2"	1/2"	127	35	98.4	4 x	1/2"		60.3	4 x	1/2"	B	4.1	A 2	.	B	R	.	.	.	.	M	H														
	3/4"	127	35	98.4	4 x	1/2"		69.8	4 x	1/2"	B	4.0	A 2	.	B	R	.	.	.	.	M	J														
	1"	127	35	98.4	4 x	1/2"		79.4	4 x	1/2"	B	3.9	A 2	.	B	R	.	.	.	.	M	K														
2"	1/2"	152	35	120.6	4 x	5/8"		60.3	4 x	1/2"	B	4.8	A 2	.	B	R	.	.	.	.	N	H														
	3/4"	152	35	120.6	4 x	5/8"		69.8	4 x	1/2"	B	4.8	A 2	.	B	R	.	.	.	.	N	J														
	1"	152	35	120.6	4 x	5/8"		79.4	4 x	1/2"	B	4.7	A 2	.	B	R	.	.	.	.	N	K														
	1 1/2"	152	35	120.6	4 x	5/8"		98.4	4 x	1/2"	C	4.5	A 2	.	B	R	.	.	.	.	N	M														
3"	1/2"	190	35	152.4	4 x	19		60.3	4 x	1/2"	A	6.7	A 2	.	B	R	.	.	.	.	P	H														
	3/4"	190	35	152.4	4 x	19		69.8	4 x	1/2"	A	6.6	A 2	.	B	R	.	.	.	.	P	J														
	1"	190	35	152.4	4 x	5/8"		79.4	4 x	1/2"	B	6.5	A 2	.	B	R	.	.	.	.	P	K														
	1 1/2"	190	35	152.4	4 x	5/8"		98.4	4 x	1/2"	B	6.2	A 2	.	B	R	.	.	.	.	P	M														
	2"	190	35	152.4	4 x	5/8"		120.6	4 x	5/8"	C	6.0	A 2	.	B	R	.	.	.	.	P	N														
4"	1/2"	229	45	190.5	8 x	19		60.3	4 x	1/2"	A	11	A 2	.	B	R	.	.	.	.	Q	H														
	3/4"	229	45	190.5	8 x	19		69.8	4 x	1/2"	A	20	A 2	.	B	R	.	.	.	.	Q	J														
	1"	229	45	190.5	8 x	19		79.4	4 x	1/2"	A	11	A 2	.	B	R	.	.	.	.	Q	K														
	1 1/2"	229	45	190.5	8 x	19		98.4	4 x	1/2"	A	11	A 2	.	B	R	.	.	.	.	Q	M														
	2"	229	45	190.5	8 x	5/8"		120.6	4 x	5/8"	B	10	A 2	.	B	R	.	.	.	.	Q	N														
	3"	229	45	190.5	8 x	5/8"		152.4	4 x	5/8"	B	10	A 2	.	B	R	.	.	.	.	Q	P														

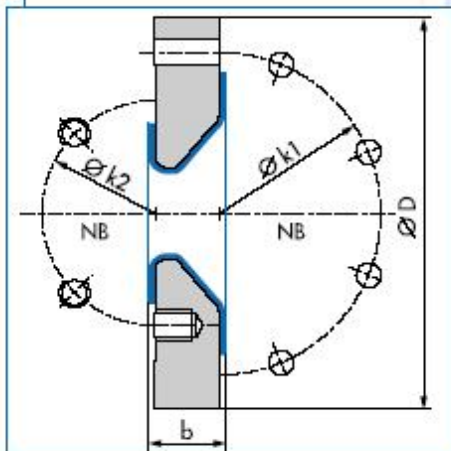
* cylindrical bore

LININGS

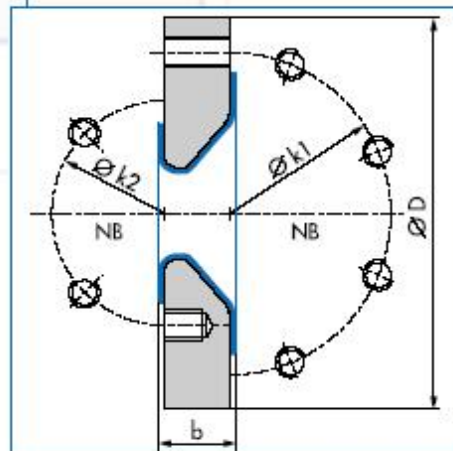
- > PTFE : NB 3/4" to NB 4"
- > ANTI STATIC PTFE : NB 3/4" to NB 4" : C4 = A

Range and thickness Page 5

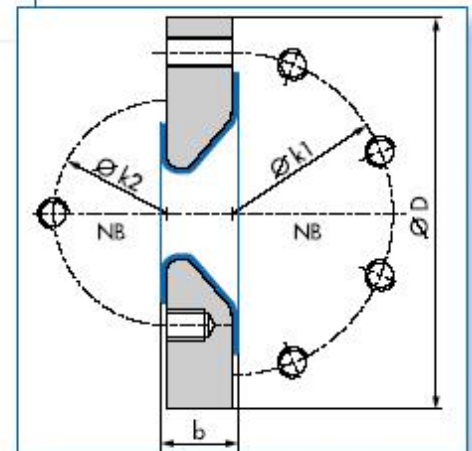
TAPPED HOLE/THROUGH HOLE TYPE A



TAPPED HOLES TYPE B



TAPPED HOLES ON CENTER-LINE/OFF CENTER-LINE TYPE C





NB1	NB2	L mm	E mm	Weight Kg	Référence																																							
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16																								
1"	1/2"	114	3.4	1.6	A	2	.	R	?	12"	6"	356	75	53.1	A	2	.	R	?
	3/4"	114	3.4	1.8	A	2	.	R	?		8"	356	51	61.2	A	2	.	R	?		
1 1/2"	1/2"	114	10	2.3	A	2	.	R	?	14"	6"	406	91	66.7	A	2	.	R	?		
	3/4"	114	10	2.5	A	2	.	R	?		8"	406	67	75.3	A	2	.	R	?				
2"	1"	114	7.0	2.9	A	2	.	R	?	16"	10"	406	41	82.1	A	2	.	R	?		
	3/4"	127	4.6	3.5	A	2	.	R	?		12"	406	16	92.7	A	2	.	R	?				
3"	1 1/2"	127	5.7	4.6	A	2	.	R	?	18"	8"	457	92	90.4	A	2	.	R	?			
	2"	152	20	7.2	A	2	.	R	?	.	.	.	.	.	.	.	.	.	.	.		10"	457	66	97.5	A	2	.	R	?	.	.	.	.	.	.	.	.	.
4"	2"	152	14	8.2	A	2	.	R	?	20"	12"	457	41	108	A	2	.	R	?			
	1 1/2"	178	32	9.5	A	2	.	R	?	.	.	.	.	.	.	.	.	.	.	.		14"	457	25	120	A	2	.	R	?	.	.	.	.	.	.	.	.
6"	2"	178	26	10.5	A	2	.	R	?	24"	10"	483	92	108	A	2	.	R	?				
	3"	178	13	13.1	A	2	.	R	?	.	.	.	.	.	.	.	.	.	.	.		12"	483	66	118	A	2	.	R	?	.	.	.	.	.	.	.	.
8"	3"	229	40	17.6	A	2	.	R	?	24"	14"	483	51	130	A	2	.	R	?				
	4"	229	26	19.9	A	2	.	R	?	.	.	.	.	.	.	.	.	.	.	.		16"	483	25	142	A	2	.	R	?	.	.	.	.	.	.	.	.
10"	4"	279	52	28.5	A	2	.	R	?	24"	18"	508	91	139	A	2	.	R	?				
	6"	279	25	32.6	A	2	.	R	?	.	.	.	.	.	.	.	.	.	.	.		20"	508	76	152	A	2	.	R	?							
12"	6"	305	76	35.7	A	2	.	R	?	24"	16"	508	51	163	A	2	.	R	?				
	8"	305	52	40.0	A	2	.	R	?	.	.	.	.	.	.	.	.	.	.	.		18"	508	25	172	A	2	.	R	?							
14"	8"	305	27	47.6	A	2	.	R	?	24"	20"	610	51	226	A	2	.	R	?				
	1 1/2"	356	46	51.6	A	2	.	R	?																								

? = C : Centric reducer

? = E : Eccentric reducer

LININGS

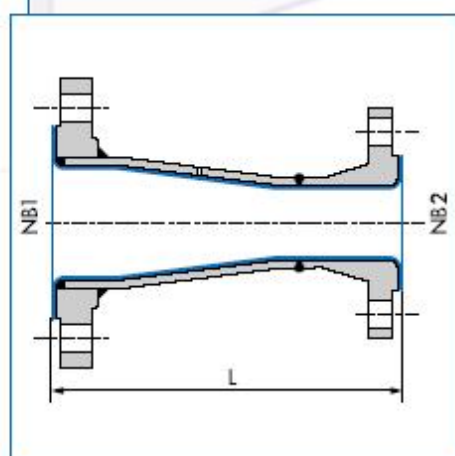
- > **PTFE** : NB 3/4" to NB 24"
- > **ANTI STATIC PTFE** : NB 3/4" to NB 16" : C4 = A

Range and thickness Page 5

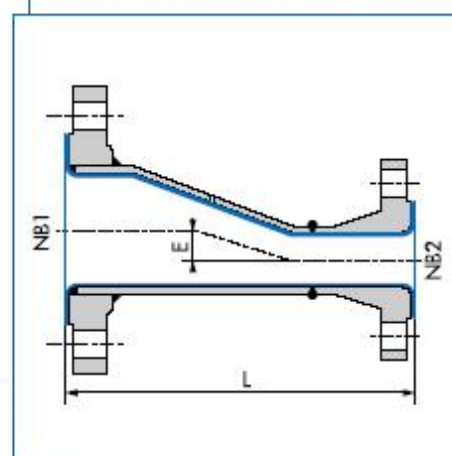
Standard construction : Type W : Fixed flanges

On request :
 - 1 fixed flange/1 loose flange :
 C12 = 1

CONCENTRIC REDUCER TYPE W



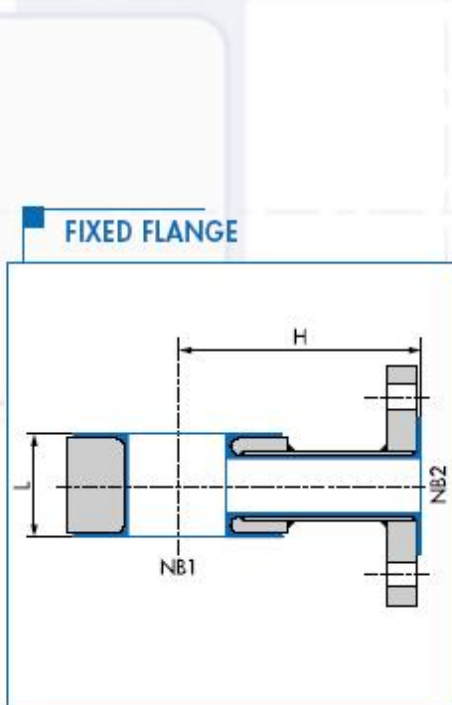
ECCENTRIC REDUCER TYPE W





NB1	NB2	L	H	Weight	Référence																NB1	NB2	L	H	Weight	Référence																
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
		mm	mm	kg																			mm	mm	kg																	
1"	1/2"	50	89	1.9	A 2 - - P I - - - K H																8"	1/2"	50	229	10	A 2 - - P I - - - T H																
	3/4"	50	89	1.9	A 2 - - P I - - - K J																	3/4"	50	229	10	A 2 - - P I - - - T J																
	1"	50	89	2.0	A 2 - - P I - - - K K																	1"	50	229	10	A 2 - - P I - - - T K																
1"1/2	1/2"	50	102	2.7	A 2 - - P I - - - M H																10"	1"1/2	75	229	16	A 2 - - P I - - - T M																
	3/4"	50	102	2.8	A 2 - - P I - - - M J																	2"	90	229	17	A 2 - - P I - - - T N																
	1"	50	102	3.0	A 2 - - P I - - - M K																	12"	1"	50	279	24	A 2 - - P I - - - U K															
	1"1/2	75	102	4.6	A 2 - - P I - - - M M																		1"1/2	75	279	26	A 2 - - P I - - - U M															
2"	1/2"	50	114	4.7	A 2 - - P I - - - N H																14"	2"	90	279	27	A 2 - - P I - - - U N																
	3/4"	50	114	4.8	A 2 - - P I - - - N J																	16"	1"	50	305	26	A 2 - - P I - - - V K															
	1"	50	114	5.0	A 2 - - P I - - - N K																		1"1/2	75	305	29	A 2 - - P I - - - V M															
	1"1/2	75	114	8.4	A 2 - - P I - - - N M																	2"	90	305	30	A 2 - - P I - - - V N																
	2"	90	114	9.9	A 2 - - P I - - - N N																	18"	1"	50	356	41	A 2 - - P I - - - W K															
3"	1/2"	50	140	5.7	A 2 - - P I - - - P H																20"		1"1/2	75	356	44	A 2 - - P I - - - W M															
	3/4"	50	140	5.8	A 2 - - P I - - - P J																		2"	90	356	45	A 2 - - P I - - - W N															
	1"	50	140	6.0	A 2 - - P I - - - P K																	24"	1"	50	381	46	A 2 - - P I - - - X K															
	1"1/2	75	140	11	A 2 - - P I - - - P M																1"1/2		75	381	48	A 2 - - P I - - - X M																
	2"	90	140	12	A 2 - - P I - - - P N																2"	90	381	50	A 2 - - P I - - - X N																	
4"	1/2"	50	165	6.7	A 2 - - P I - - - Q H																18"	1"	50	419	51	A 2 - - P I - - - Y K																
	3/4"	50	165	6.8	A 2 - - P I - - - Q J																	20"	1"1/2	75	419	54	A 2 - - P I - - - Y M															
	1"	50	165	7.0	A 2 - - P I - - - Q K																		2"	90	419	55	A 2 - - P I - - - Y N															
	1"1/2	75	165	12	A 2 - - P I - - - Q M																	24"	1"	50	457	60	A 2 - - P I - - - Z K															
6"	1/2"	50	203	8.9	A 2 - - P I - - - S H																24"		1"1/2	75	457	63	A 2 - - P I - - - Z M															
	3/4"	50	203	9.0	A 2 - - P I - - - S J																		2"	90	457	64	A 2 - - P I - - - Z N															
	1"	50	203	10	A 2 - - P I - - - S K																	24"	1"	100	559	69	A 2 - - P I - - - B K															
	1"1/2	75	203	15	A 2 - - P I - - - S M																1"1/2		150	559	72	A 2 - - P I - - - B M																
	2"	90	203	16	A 2 - - P I - - - S N																2"	150	559	73	A 2 - - P I - - - B N																	

* Assembly only possible using 4 bolts



LININGS

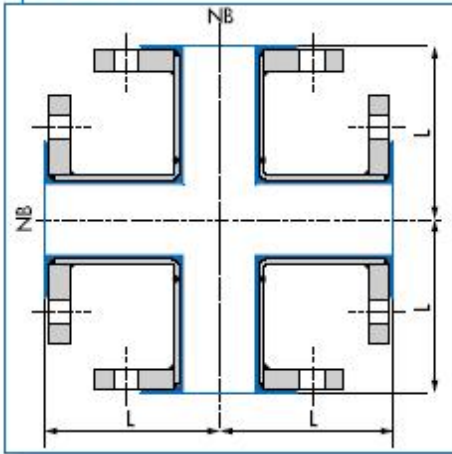
- > PFA : NB 1" to NB 8"
- > ANTI STATIC PFA : NB 1" to NB 8" : C4 = A
- > PTFE : NB 10" to NB 24"
- > ANTI STATIC PTFE : NB 10" to NB 16" : C4 = A

Range and thickness Page 5

For dimensions \geq DN250, length H according to NFE 29260 is also available on request



**FIXED FLANGES CROSS
TYPE P**



NB	L mm	Weight Kg	Référence															
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1/2"	65	2.1	A	2	-	-	x	E	-	-	-	-	-	-	-	-	-	H
3/4"	75	2.9	A	2	-	-	x	E	-	-	-	-	-	-	-	-	-	J
1"	89	4.6	A	2	-	-	x	E	-	-	-	-	-	-	-	-	-	K
1 1/2"	102	7.8	A	2	-	-	x	E	-	-	-	-	-	-	-	-	-	M
2"	114	12.1	A	2	-	-	x	E	-	-	-	-	-	-	-	-	-	N
3"	140	23.6	A	2	-	-	x	E	-	-	-	-	-	-	-	-	-	P
4"	165	34.2	A	2	-	-	x	E	-	-	-	-	-	-	-	-	-	Q
6"	203	53.9	A	2	-	-	x	E	-	-	-	-	-	-	-	-	-	S
8"	229	88.2	A	2	-	-	x	E	-	-	-	-	-	-	-	-	-	T
10"	279*	124	A	2	-	-	x	E	-	-	-	-	-	-	-	-	-	U
12"	305*	169	A	2	-	-	x	E	-	-	-	-	-	-	-	-	-	V
14"	356**	300	A	2	-	-	x	E	-	-	-	-	-	-	-	-	-	W
16"	381**	371	A	2	-	-	x	E	-	-	-	-	-	-	-	-	-	X
18"	419**	427	A	2	-	-	x	E	-	-	-	-	-	-	-	-	-	Y
20"	457**	547	A	2	-	-	x	E	-	-	-	-	-	-	-	-	-	Z
24"	559**	712	A	2	-	-	x	E	-	-	-	-	-	-	-	-	-	B

* Assembly only possible using 4 bolts ** In 2 parts

LININGS

- > **PFA** : NB 1/2" to NB 3"
- > **ANTI STATIC PFA** : NB 1/2" to NB 3" : C4 = A
- > **PTFE** : NB 4" to NB 24"
- > **ANTI STATIC PTFE** : NB 4" to NB 16" : C4 = A

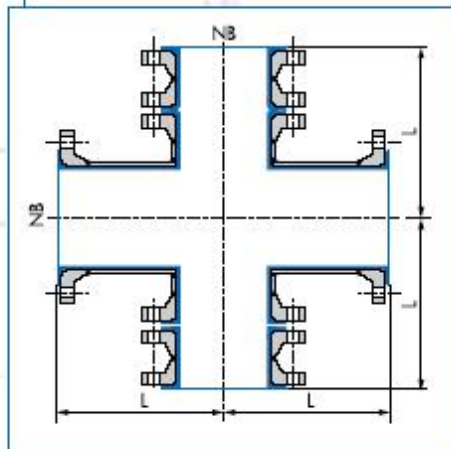
Range and thickness Page 5

Standard construction : Type P : NB 1/2" to NB 3"
and NB 18" to NB 24"

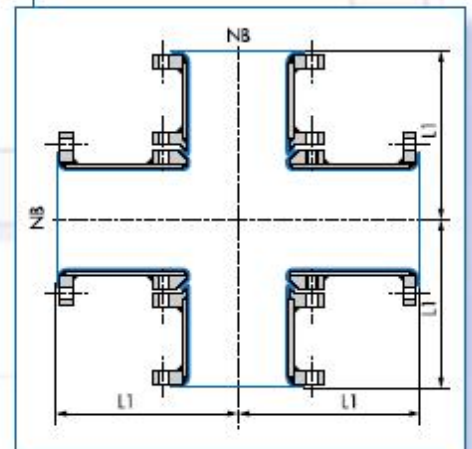
Type W : NB 4" to NB 16"

On request : - 4 loose flanges : C12 = 4

*** ISO FIXED FLANGES CROSS
TYPE W**

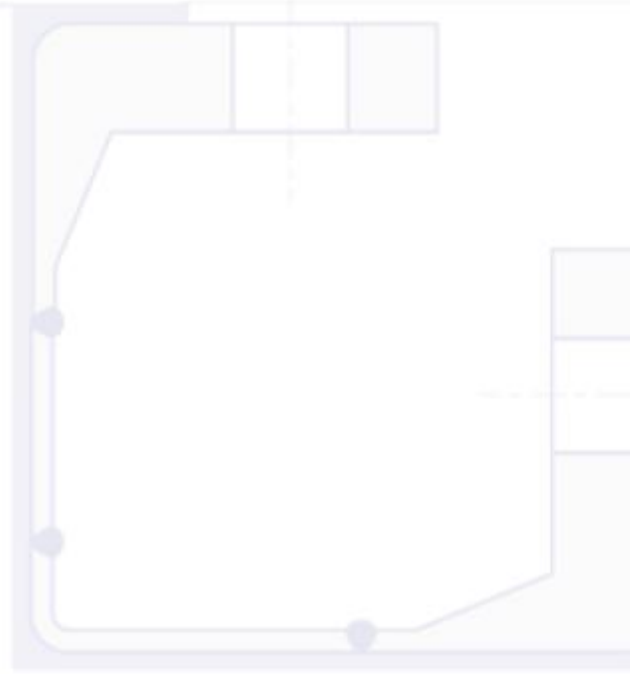


**** FIXED FLANGES CROSS
TYPE P**





NB1	NB2	L	Weight	Référence															
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
3/4"	1/2"	75	2.0	A	2	.	x	R	.	.	.	J	H						
1"	1/2"	89	2.9	A	2	.	x	R	.	.	.	K	H						
	3/4"	89	3.1	A	2	.	x	R	.	.	.	K	J						
1 1/2"	1/2"	102	4.6	A	2	.	x	R	.	.	.	M	H						
	3/4"	102	4.8	A	2	.	x	R	.	.	.	M	J						
	1"	102	5.2	A	2	.	x	R	.	.	.	M	K						
2"	1/2"	114	6.8	A	2	.	x	R	.	.	.	N	H						
	3/4"	114	7.0	A	2	.	x	R	.	.	.	N	J						
	1"	114	7.4	A	2	.	x	R	.	.	.	N	K						
	1 1/2"	114	8.2	A	2	.	x	R	.	.	.	N	M						
3"	1"	140	13.5	A	2	.	x	R	.	.	.	P	K						
	1 1/2"	140	14.3	A	2	.	x	R	.	.	.	P	M						
	2"	140	15.4	A	2	.	x	R	.	.	.	P	N						

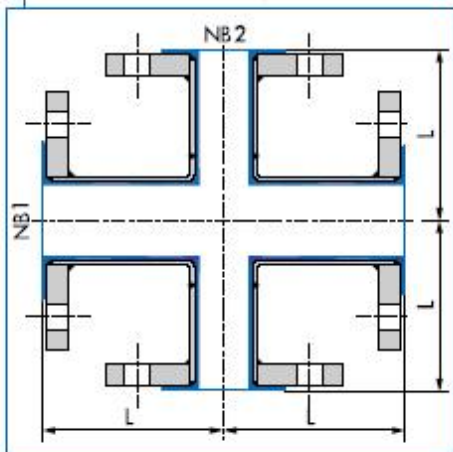


LININGS

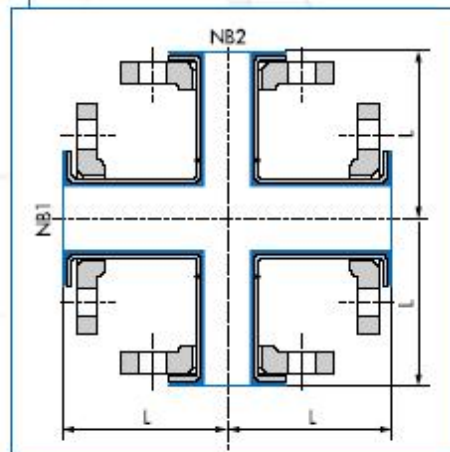
> PFA: NB 3/4" to NB 3"
 > ANTI STATIC PFA : NB 3/4" to NB 3" : C4 = A

Range and thickness Page 5

FIXED FLANGES REDUCING CROSS
TYPE P



FLARED STUB END CROSS





NB1	NB2	L1 mm	Weight Kg	Référence																
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
4"	1"	165	19.3	A	2	.	.	x	R	.	.	.	.	.	.	.	.	.	Q	K
	1 1/2"	165	20.2	A	2	.	.	x	R	.	.	.	.	.	.	.	.	.	Q	M
	2"	165	21.2	A	2	.	.	x	R	.	.	.	.	.	.	.	.	.	Q	N
	3"	165	23.9	A	2	.	.	x	R	.	.	.	.	.	.	.	.	.	Q	P
6"	1"	203	30.8	A	2	.	.	x	R	.	.	.	.	.	.	.	.	.	S	K
	1 1/2"	203	31.7	A	2	.	.	x	R	.	.	.	.	.	.	.	.	.	S	M
	2"	203	32.8	A	2	.	.	x	R	.	.	.	.	.	.	.	.	.	S	N
	3"	203	35.6	A	2	.	.	x	R	.	.	.	.	.	.	.	.	.	S	P
	4"	203	37.9	A	2	.	.	x	R	.	.	.	.	.	.	.	.	.	S	Q
8"	1"	229	50.7	A	2	.	.	x	R	.	.	.	.	.	.	.	.	.	T	K
	1 1/2"	229	51.6	A	2	.	.	x	R	.	.	.	.	.	.	.	.	.	T	M
	2"	229	52.7	A	2	.	.	x	R	.	.	.	.	.	.	.	.	.	T	N
	3"	229	55.5	A	2	.	.	x	R	.	.	.	.	.	.	.	.	.	T	P
	4"	229	57.8	A	.	.	.	x	R	.	.	.	.	.	.	.	.	.	T	Q
	6"	229	61.7	A	2	.	.	x	R	.	.	.	.	.	.	.	.	.	T	S
10"	4"	279	78.8	A	2	.	.	x	R	.	.	.	.	.	.	.	.	.	U	Q
	6"	279*	83.0	A	2	.	.	x	R	.	.	.	.	.	.	.	.	.	U	S
	8"	279*	90.6	A	2	.	.	x	R	.	.	.	.	.	.	.	.	.	U	T
12"	4"	305*	104	A	2	.	.	x	R	.	.	.	.	.	.	.	.	.	V	Q
	6"	305*	108	A	2	.	.	x	R	.	.	.	.	.	.	.	.	.	V	S
	8"	305*	115	A	2	.	.	x	R	.	.	.	.	.	.	.	.	.	V	T
	10"	305*	122	A	2	.	.	x	R	.	.	.	.	.	.	.	.	.	V	U
14"	4"	356*	145	A	2	.	.	x	R	.	.	.	.	.	.	.	.	.	W	Q
	6"	356*	152	A	2	.	.	x	R	.	.	.	.	.	.	.	.	.	W	S
	8"	356*	165	A	2	.	.	x	R	.	.	.	.	.	.	.	.	.	W	T
	10"	356*	176	A	2	.	.	x	R	.	.	.	.	.	.	.	.	.	W	U
	12"	356*	197	A	2	.	.	x	R	.	.	.	.	.	.	.	.	.	W	V

* 3 parts construction

LININGS

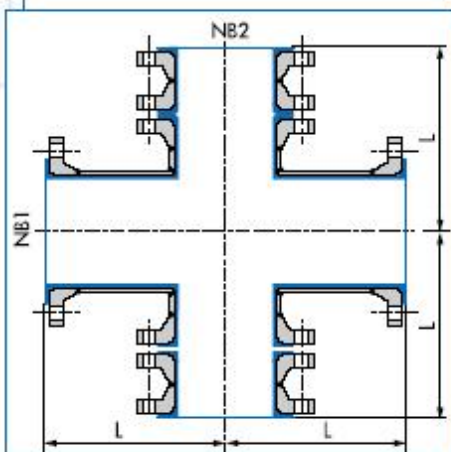
- > **PFA** : NB 4" to NB 14"
- > **ANTI STATIC PFA** : NB 4" to NB 14" : C4 = A

Range and thickness Page 5

Standard construction : Type P : Fixed flanges

On request : - 4 loose flanges : C12 = 4

ISO FIXED FLANGES REDUCING CROSS TYPE W





NB1	NB2	L mm	Weight Kg	Reference																						
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16							
16"	4"	381	177	A	2	.	.	x	R	.	.	.	X	Q												
	6"	381	183	A	2	.	.	x	R	.	.	.	X	S												
	8"	381	196	A	2	.	.	x	R	.	.	.	X	T												
	10"	381	207	A	2	.	.	x	R	.	.	.	X	U												
	12"	381	228	A	2	.	.	x	R	.	.	.	X	V												
	14"	381	246	A	2	.	.	x	R	.	.	.	X	W												
18"	8"	419	225	A	2	.	.	x	R	.	.	.	Y	T												
	10"	419	236	A	2	.	.	x	R	.	.	.	Y	U												
	12"	419	257	A	2	.	.	x	R	.	.	.	Y	V												
	14"	419	276	A	2	.	.	x	R	.	.	.	Y	W												
20"	8"	457	281	A	2	.	.	x	R	.	.	.	Z	T												
	10"	457	292	A	2	.	.	x	R	.	.	.	Z	U												
	12"	457	313	A	2	.	.	x	R	.	.	.	Z	V												
	14"	457	332	A	2	.	.	x	R	.	.	.	Z	W												
	16"	457	352	A	2	.	.	x	R	.	.	.	Z	X												
	18"	457	364	A	2	.	.	x	R	.	.	.	Z	Y												
24"	10"	559	380	A	2	.	.	x	R	.	.	.	B	U												
	12"	559	401	A	2	.	.	x	R	.	.	.	B	V												
	14"	559	421	A	2	.	.	x	R	.	.	.	B	W												
	16"	559	441	A	2	.	.	x	R	.	.	.	B	X												
	18"	559	455	A	2	.	.	x	R	.	.	.	B	Y												
	20"	559	487	A	2	.	.	x	R	.	.	.	B	Z												

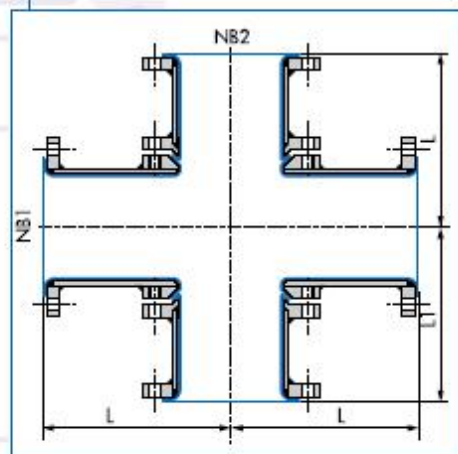
Standard construction : Type W : Fixed flanges
 On request : - 4 loose flanges : C12 = 4

LININGS

> PTFE : NB 18" to NB 24"
 > ANTI STATIC PTFE : NB 18" : C4 = A

Range and thickness Page 5

INJECTED FIXED FLANGES REDUCING CROSS TYPE W



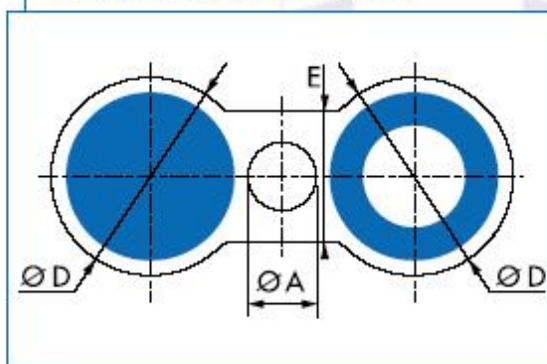
NB	ØD	C	E	ØA	b	Weight	Référence																											
	mm						mm	mm	mm	mm	Kg	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16							
1/2"	44	60	35	16	14	0.2	A	2	.	0	B	.	.	.	H																			
3/4"	53	70	35	16	14	0.2	A	2	.	0	B	.	.	J																				
1"	63	78	35	16	14	0.3	A	2	.	0	B	.	.	K																				
1 1/2"	82	98	50	16	14	0.4	A	2	.	0	B	.	.	M																				
2"	101	121	50	19	14	0.6	A	2	.	0	B	.	.	N																				
3"	133	152	60	19	14	0.9	A	2	.	0	B	.	.	P																				
4"	171	191	50	19	18	1.6	A	2	.	0	B	.	.	Q																				
6"	219	241	60	22	18	3.7	A	2	.	0	B	.	.	S																				
8"	276	298	70	22	21	5.6	A	2	.	0	B	.	.	T																				
10"	336	362	65	26	21	10.7	A	2	.	0	B	.	.	U																				
12"	406	432	70	26	23	15.5	A	2	.	0	B	.	.	V																				
14"	441	476	70	29	26	27.2	A	2	.	0	B	.	.	W																				
16"	505	540	70	29	28	34.8	A	2	.	0	B	.	.	X																				
18"	540	578	70	32	28	49.9	A	2	.	0	B	.	.	Y																				
20"	597	635	65	32	33	55.1	A	2	.	0	B	.	.	Z																				
24"	708	750	75	35	39	73.7	A	2	.	0	B	.	.	B																				

LININGS

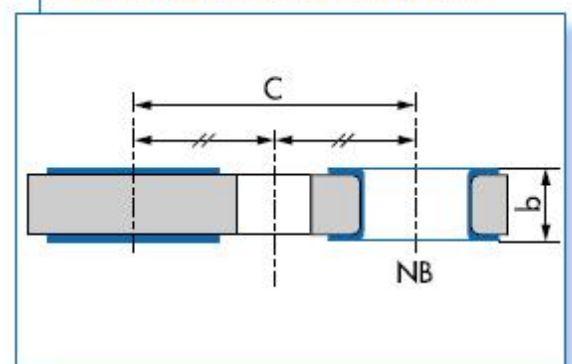
> PTFE : NB 3/4" to NB 24"
 > ANTI STATIC PTFE : NB 3/4" to NB 16" ; C4 = A

Range and thickness Page 5

SPECTACLE BLIND (front view)



SPECTACLE BLIND (sectional view)





NB	ØD	b	Weight	Référence															
				mm	mm	Kg	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1/2"	89	14	0.3	A 2 - - B P - - - H															
3/4"	98	16	0.5	A 2 - - B P - - - J															
1"	108	17	0.9	A 2 - - B P - - - K															
1 1/2"	127	18	1.3	A 2 - - B P - - - M															
2"	152	22	2.4	A 2 - - B P - - - N															
3"	190	27	4.9	A 2 - - B P - - - P															
4"	229	27	6.9	A 2 - - B P - - - Q															
6"	279	28	11	A 2 - - B P - - - S															
8"	343	32	19	A 2 - - B P - - - T															

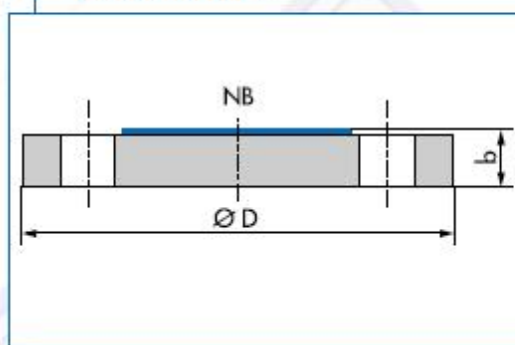
NB	ØD	b	Weight	Référence															
				mm	mm	Kg	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
10"	406	34	28	A 2 - - B P - - - U															
12"	482	36	45	A 2 - - B P - - - V															
14"	533	39	58	A 2 - - B P - - - W															
16"	597	40	76	A 2 - - B P - - - X															
18"	635	44	92	A 2 - - B P - - - Y															
20"	698	47	119	A 2 - - B P - - - Z															
24"	813	52	181	A 2 - - B P - - - B															

LININGS

- > PTFE : NB 1/2" to NB 24"
- > ANTI STATIC PTFE : NB 1/2" to NB 16" : C4 = A

Range and thickness Page 5

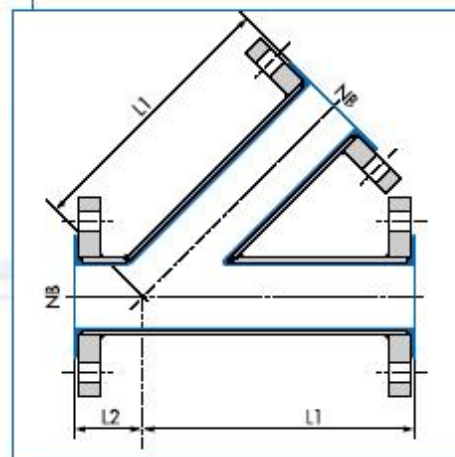
BLIND FLANGES



LATERAL TEES

NB	L1	L2	Weight	Référence															
				mm	mm	Kg	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1"	146	44	3.7	A 2 - - T L - - - K															
1 1/2"	178	51	6.5	A 2 - - T L - - - M															
2"	203	64	10	A 2 - - T L - - - N															
3"	254	76	21	A 2 - - T L - - - P															
4"	305	76	31	A 2 - - T L - - - Q															
6"	368	89	52	A 2 - - T L - - - S															
8"	445	114	91	A 2 - - T L - - - T															

LATERAL TEES TYPE P



LININGS

- > PFA : NB 1" to NB 4"
- > ANTI STATIC PFA : NB 1" to NB 4" : C4 = A
- > PTFE : NB 6" to NB 8" : C4 = A
- > ANTI STATIC PTFE : NB 6" to NB 8" : C4 = A

Range and thickness Page 5

Standard construction : Type P : Fixed flanges



NB1	NB2	H	L1
		mm	mm
1"	1"	89	89
1 1/2"	1"	102	102
	1 1/2"	102	102
2"	1"	114	114
	1 1/2"	114	114
	2"	114	114
3"	1"	140	140
	1 1/2"	140	140
	2"	140	140
	3"	140	140
4"	1"	165	165
	1 1/2"	165	165
	2"	165	165
	3"	165	165
	4"	165	165
6"	1"	203	203
	1 1/2"	203	203
	2"	203	203
	3"	203	203
	4"	203	203
	6"	203	203

NB1	NB2	H	L1
		mm	mm
8"	1 1/2"	229	229
	2"	229	229
	3"	229	229
	4"	229	229
	6"	229	229
	8"	229	229
10"	1 1/2"	279	279
	2"	279	279
	3"	279	279
	4"	279	279
	6"	279	279
	8"	279	279
	10"	279	279
12"	3"	305	305
	4"	305	305
	6"	305	305
	8"	305	305
	10"	305	305
	12"	305	305

DRAWING ABOVE IS SHOWN AS AN EXAMPLE :
other manifold configurations on request: number,
DN and inclination of the branches.

L max : 1,5 meter

LININGS

> PTFE : NB 1" to NB 12"
> ANTI STATIC PTFE : NB 1" to NB 12" : C4 = A

Range and thickness Page 5

FIXED FLANGES MANIFOLDS TYPE W

