Inpal

Pre-insulated Pipelines

ISOPAL

This brochure is to be introduced to consulting organisations as well as project managers, all information relative to pre-insulated pipe networks by Inpal industries. This will encompass all the necessary data to use for concepting, buying specifications and the objectives for achieving a profitable and reliable network.

This technical information can only be viewed as an indicative and informative tool. This document does not at any price disclose an offer to the client. Only the Inpal Industries Terms and Conditions do prevail as binding legal contractual documents.
Hence, any information disclosed hereafter are liable to be modified at anytime and without prior notice in view of the research results aiming at improving the quality of our products.

However, we ought to remind you that network life optimization as well as profitability depend on its conception and installation, whose tasks have to be carried out by the Consulting Department and the installer, and this in accordance with the standards recommended by Inpal Industries.

Therefore, it is the full responsability of the installer as well as the contract organisation to operate the network well and the compatibility of the Inpal Industries products to meet up with the contracting specific conditions.

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ISOPAL

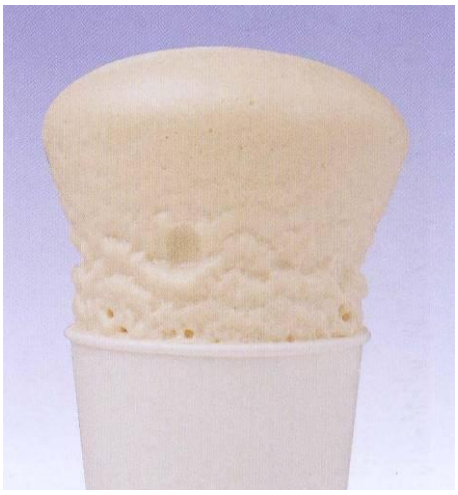
OVERVIEW

Overview

The Isopal flexible pipe systems are adequatly designed to domestic connection works for network extensions, or for avoiding buildings obstacles, trees or other utility networks. They can also be used for the complete realization of networks for low temperature with small DN. Due to the small pipe bending radius, it is imperative to respect the installation recommendations in order to get a straight connnection to the substation through the building by surrounding the obstacles. Isopal can be supplied in lengths to facilitate some cost synergies by avoiding practically no junctions, but also for civils and installation. Therefore Isopal is an adequate solution for district heating schemes either in towns or in estates.

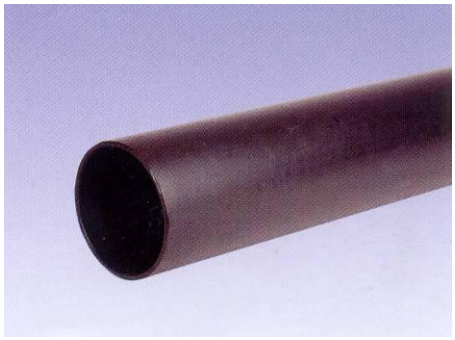
Thermal insulation

The flexible pipes are insulated with a polyurethane foam semi rigid (PUR) and is made with two components: A= polyol and B= Isocyanate. The application of the two components is continuous during the manufacturing process, hence producing a chemical reaction exothermal. The result of this operation does produce a high quality insulation λ_{PUR} maxi = 0,027 W/mK, for a reduced pipe.
Isopal only uses a PUR foam which does not affect the CO2 emissions, therefore free from. The agent does blow inside the pipe with cyclopentane. This high quality insulation does offer excellent ODP and GWP values equal to zero.



Outer casing

The outer casing for the flexible pipes is made of straight DBPE, which has proved its mechanical properties.
The low density polyethylene is a viscous pastic material resistant to chocks and breakage to minus 50C. It is extruded without welding continuously on a semi rigid foam during the manufacturing process.
The quality, dimensions as well as masses are meeting the DIN 8073 and DIN 8072 certifications, with thermal conductivity λ_{PEBD} = 0,35 W/mK.
The DBPE outer casing is resistant to weater conditions and UV rays as well as nearly all chemical components in the soil. This material is highly recommended by the international standards and probably one of the best material for buried pipe network.



ISOPAL

Technical data

ISOPAL PIPE

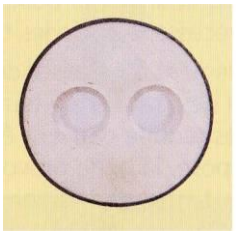
The **Isopal** pipe consists of **PE-Xa**, basic material **PE**, general material requirements acc. to DIN 16892 and DIN 16893, resistant to water and chemical materials. **Isopal** is available in monopipe or twinpipe. This heating pipe has a red organic barrier against the diffusion of oxygen in vinylethylic alcohol.

The **P**oly**E**thylene is a cross between carbon and oxygen molecules. To obtain the cross Polyethylene (**X**), some H-atoms will be removed out of the molecule chains, irreversible carbon-connections will develop, which will form a cross link between the chains. During extrusion of **PE** peroxide (**a**) will be added, the oxygen will bind the hydrogen atoms. The mechanical high resistant, but not weldable material **PE-Xa** comes into being.

For sanitary applications, we use some pipes dedicated to ordinary heating networks

Connection techniques

The connection of PE-Xa pipes is made in buried sections preferably with press connections and connection pieces. For connections inside the buildings or in wells, as well as sanitary installations, screwed connections may be used.



Operating Conditions

Maximum permanent operating temperature: 80° C
Maximum operating temperature: 95° C
Maximum operating pressure *p*: 6 bars
Maximum operating pressure p: 10 bars
Leak detecting: general **without** Possible liquids: Potable- and heat-water, chemicals as well as other material resistant liquids
Technical data PE-Xa
Property Unit Value Property Unit Value

Volume weight ρ	kg/dm³	938
Elastic modulus *E*	N/mm²	600
Tensile stress *Rm*	N/mm²	≥ 20
Thermal conductivity λ	W/(m•K)	0,38
Yield stress *Re*	N/mm²	17
Specific heat capacity *c*	kJ/(kg•K)	2,3
Wall roughness *k*	mm	0.01
Thermal expansion coeff.	α	2.01 • 10_4

Single Pipe Heating - 6 bar

DIMENSIONS PE-XA PIPE			Casing outside Ø D_a [mm]	Crown Length **L** [m] maxi	Crown outside Ø d_R [mm]	Bending radius **r** [m]	Weight without water **G** [kg/m]
Type	Inside Ø d_a [mm]	Wall thickness **s** [mm]					
H-20	16.2	1,9	75	549	2530 +/- 50	0,7	0,95
H-25	20,4	2,3	75	549	2530 +/- 50	0,7	0,95
H-25*	20,4	2,3	90	410	2530 +/- 50	0,7	1,00
H-32	26,2	2,9	75	549	2530 +/- 50	0,8	1,05
H-32*	26,2	2,9	90	410	2530 +/- 50	0,8	1,10
H-40	32,6	3,7	90	410	2530 +/- 50	0,8	1,40
H-40*	32,6	3,7	110	282	2530 +/- 50	0,8	1,90
H-50	40,8	4,6	110	282	2530 +/- 50	0,9	2,10
H-50*	40,8	4,6	125	154	2530 +/- 50	0,9	2,25
H-63	51,4	5,8	125	154	2530 +/- 50	1,0	2,75
H-63*	51,4	5,8	140	92	2530 +/- 50	1,0	3,00
H-75	51,4	6,8	140	92	2530 +/- 50	1,1	3,60
H-75*	61,4	6,8	160	80	2530 +/- 50	1,1	4,25
H-90	73,6	8,2	160	80	2530 +/- 50	1,2	4,70

(*) Thicker insulation series

Double Pipe Heating - 6 bar

DIMENSIONS PE-XA PIPE			Casing outside Ø D_a [mm]	Crown Length **L** [m] maxi	Crown outside Ø d_R [mm]	Bending radius **r** [m]	Weight without water **G** [kg/m]
Type	Inside Ø d_a [mm]	Wall thickness **s** [mm]					
H-20+20	16,2	1.9	90	410	2250 +/- 50	0,9	1,31
H-25+25	20,4	2,3	90	410	2250 +/- 50	0,9	1,77
H-32+32	26,2	2,9	110	282	2250 +/- 50	0,9	1,87
H-40+40	32,6	3,7	125	154	2250 +/- 50	1,0	2,50
H-50+50	40,8	4,6	160	80	2250 +/- 50	1,2	3,83

Single Pipe Sanitary - 10 bar

DIMENSIONS PE-XA PIPE			Casing outside Ø D_a [mm]	Crown Length **L** [m] maxi	Crown outside Ø d_R [mm]	Bending radius **r** [m]	Weight without water **G** [kg/m]
Type	Inside Ø d_a [mm]	Wall thickness **s** [mm]					
S-20	14,4	2,8	75	549	2530 +/- 50	0,7	0,95
S-25	18,0	3,5	75	549	2530 +/- 50	0,7	0,95
S-25*	18,0	3,5	90	410	2530 +/- 50	0,7	1,10
S-32	23,2	4,4	75	549	2530 +/- 50	0,8	1,05
S-32*	23,2	4,4	90	410	2530 +/- 50	0,8	1,21
S-40	29,0	5,5	90	410	2530 +/- 50	0,8	1,40
S-40*	29,0	5,5	110	282	2530 +/- 50	0,8	1,70
S-50	36,2	6,9	110	282	2530 +/- 50	0,9	2,10
S-50*	36,2	6,9	125	154	2530 +/- 50	0,9	2,47
S-63	45,8	8,6	125	154	2530 +/- 50	1,0	2,75
S-63*	45,8	8,6	140	92	2530 +/- 50	1,0	3,30

Double Pipe Sanitary - 10 bar

DIMENSIONS PE-XA PIPE			Casing outside Ø D_a [mm]	Crown Length **L** [m] maxi	Crown outside Ø d_R [mm]	Bending radius **r** [m]	Weight without water **G** [kg/m]
Type	Inside Ø d_a [mm]	Wall thickness **s** [mm]					
S-25+20	18,0/14,4	3,5/2,8	90	410	2530 +/- 50	0,9	1,41
S-32+20	23,2/14,4	4,4/2,8	110	282	2530 +/- 50	0,9	1,95
S-40+25	29,0/18,0	5,5/3,5	125	154	2530 +/- 50	1,0	2,53
S-50+32	36,2/23,2	6,9/4,4	140	92	2530 +/- 50	1,1	3,45
S-63+40	45,8/29,0	8,7/4,4	160	80	2530 +/- 50	1,2	4,40

Isopal particularities

The manufacturing process of **Isopal** is made of composites which are waterproof on a longitudinal level, which means the quality of the three materials (PE-Xa, PUR-foam, PELD) are close to perfection.

At increasing temperature the E-module of the medium pipe is getting smaller and will cause only very slight tension. Because of soil-embedding the tension will be additionally reduced and in case of a compound system like **Isopal**, the axial heat extension will be nearly totally suppressed.

That means, **Isopal** pipes may be designed without expansion components and at building entries without anchors, due to the compound.

Technical characteristics of ISOPAL Heating

Heat Loss + Capacity, Single Pipe Heating - 6 bar

TYPE	Dimensions					Heat loss			
	Flow Speed (m3/h)	Speed (m/s)	Transmitted Capacity P in kW at spread			Coefficient Kr in W/m-k	Q per metre in W/m at average temperature TM		
			20 K	30 K	40 K		70° C	60° C	50° C
H-25	0,941	0,8	22	33	44	0,1430	20,01	17,15	14,30
H-32	1,941	1,0	45	68	90	0,1805	25,28	21,66	18,05
H-40	3,305	1,1	77	115	154	0,1878	26,30	22,54	18,78
H-50	5,177	1,1	120	181	241	0,1933	27,06	23,19	19,33
H-63	8,964	1,2	209	313	417	0,2187	30,61	26,24	21,87
H-75	13,857	1,3	322	483	645	0,2395	33,53	28,74	23,95
H-90	22,974	1,5	534	802	1069	0,2568	35,96	30,82	25,68
H-110	36,644	1,6	852	1279	1705	0,2947	41,25	35,36	29,47

Heat Loss + Capacity, Double Pipe Heating - 6 bar

TYPE	Dimensions					Heat loss			
	Flow Speed (m3/h)	Speed (m/s)	Transmitted Capacity P in kW at spread			Coefficient Kr in W/m-k	Q per metre in W/m at average temperature TM		
			20 K	30 K	40 K		70° C	60° C	50° C
H-25+25	0,941	0,8	22	33	44	0,2187	15,31	13,12	10,93
H-32+32	1,941	1,0	45	68	90	0,2425	16,98	14,55	12,13
H-40+40	3,305	1,1	77	11i	154	0,2774	19,42	16,64	13,87
H-50+50	5,177	1,1	120	181	241	0,2566	17,96	15,40	12,83
H-63+63	8,964	1,2	209	313	417	0,3132	21,92	18,79	15,66

The mentioned data are based on :

- A thermal capacity [cm] of the water of 4187 J/(kgxK),
- a soil covering height [ÜH] of 0,60 m
- a thermal conductivity of the soil [λE] of 1,2 W/(mxK)
- a medium soiltemperature[TE] of 10° C
- and for single pipes on a medium pipe distance of 100 mm.
- The flow speed [w]has to be determined specifically.
- **$T_M = (T_{VL} + T_{RL}) : 2 - T_E$.**
  Example: (80° + 60°) : 2 – 10° = 60 K average temperature.

Admissible Operating Overpressure [pB] in bar

Duration	Permanent Operating Temperature TB in °C								
	10°	20°	30°	40°	50°	60°	70°	80°	90°
1 year	17,9	15,8	14,0	12,5	11,1	9,9	8,9	8,0	7,2
5 years	17,5	15,5	13,8	12,2	10,9	9,7	8,7	7,8	7,0
10 years	17,4	15,4	13,7	12,1	10,8	9,7	8,6	7,7	6,9
25 years	17,2	15,2	13,5	12,0	10,7	9,5	8,5	7,6	-
50 years	17,1	15,1	13,4	11,9	10,6	9,5	8,5	-	-

The mentioned data are corresponding to DIN 16893 for flow medium water with a safety factor of S_D = 1,25.

TECHNICAL OPERATION DATA

Heat Loss + Capacity, Single Pipe Sanitary – 10 bar

TYPE	Dimensions						Heat loss			
	Flow Speed (m3/h)	Speed (m/s)	Flow Speed (m3/h)	Speed (m/s)	Flow Speed (m3/h)	Speed (m/s)	Coefficient Kr in W/m-k	Q per metre in W/m at average temperature TM T_m		
								60° C	50° C	40°C
S-25	1,191	1,3	1,374	1,5	1,557	1,7	0,1419	17,03	14,19	11,35
S-32	1,978	1,3	2,283	1,5	2,587	1,7	0,1789	21,47	17,89	14,31
S-40	3,091	1,3	3,567	1,5	4,042	1,7	0,1861	22,33	18,61	14,89
S-50	4,817	1,3	5,558	1,5	6,299	1,7	0,1914	22,97	19,14	15,31
S-63	7,643	1,3	8,819	1,5	9,995	1,7	0,2163	25,95	21,63	17,30
S-75	10,878	1,3	12,551	1,5	14,225	1,7	0,2366	28,40	23,66	18,93

Heat Loss + Capacity, Double Pipe Sanitary - 10 bar

TYPE	Dimensions						Heat loss			
	Flow Speed (m3/h)	Speed (m/s)	Flow Speed (m3/h)	Speed (m/s)]	Flow Speed (m3/h)	Speed (m/s)	Coefficient Kr in W/m-k	Q per metre in W/m at average temperature TM		
								60° C	50° C	40°C
S-25+20	0,762	1,3	1,374	1,5	1,557	1,7	0,2046	12,27	10,23	8,18
S-32+20	1,978	1,3	2,283	1,5	2,587	1,7	0,2122	12,73	10,61	8,49
S-40+25	3,091	1,3	3,567	1,5	4,042	1,7	0,2356	14,14	11,78	9,43
S-50+32	4,817	1,3	5,558	1,5	6,299	1,7	0,2786	16,72	13,93	11,14

- A thermal capacity [cm] of the water of 4187 J/(kgxK),
- a soil covering height [ÜH] of 0,60 m
- a thermal conductivity of the soil [λE] of 1,2 W/(mxK)
- a medium soiltemperature[TE] of 10° C
- and for single pipes on a medium pipe distance of 100 mm.
- The flow speed [w]has to be determined specifically.

$$\mathbf{T_M = (T_{VL} + T_{RL}) : 2 - T_E.}$$

Example: (80° + 60°) : 2 – 10° = 60 K average temperature.

Admissible Operating Overpressure [pB] in bar for mono and twin pipes

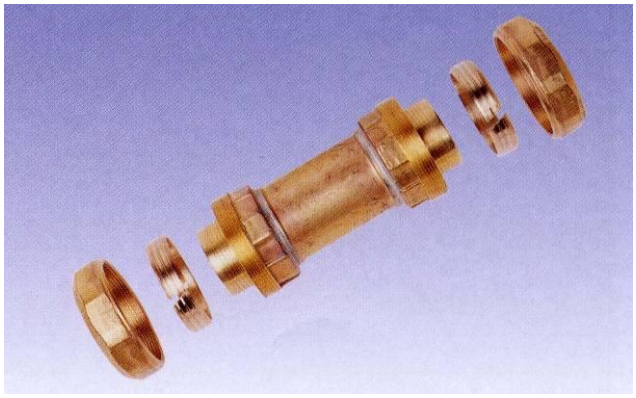
Duration	Permanent Operating Temperature TB in °C								
	10°	20°	30°	40°	50°	60°	70°	80°	90°
1 year	28,3	25,1	22,3	19,8	17,4	15,8	14,1	12,7	11,4
5 years	27,8	24,6	21,9	19,4	17,3	15,5	13,8	12,4	11,1
10 years	27,6	24,4	21,7	19,3	17,2	15,3	13,7	12,3	11,0
25 years	27,3	24,2	21,4	19,1	17,0	15,2	13,6	12,1	-
50 years	27,1	24,0	21,3	18,9	16,8	15,0	13,4	-	-

The mentioned data are corresponding to DIN 16893 for flow medium water with a safety factor of S_D =1,25.

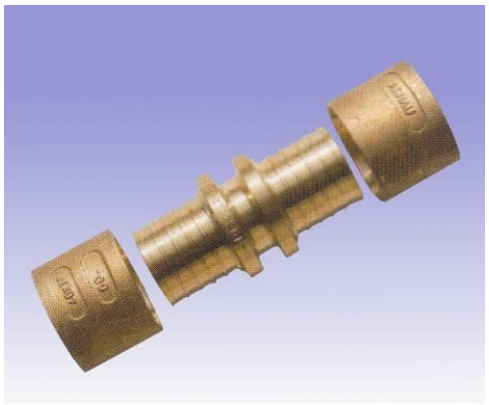
Connection accessories
ISOPAL connections PEX-PEX – 6/10 bars

TYPE ISOPAL		DESIGNATION
6 bar	10 bar	
	S-20	V – 20 x 20
H-25	S-25	V– 25 x 25
H-32	S-32	V – 32 x 32
H-40	S-40	V – 40 x 40
H-50	S-50	V – 50 x 50
H-63	S-63	V – 63 x 63
H-75	-	V – 75 x 75
H-90	-	V – 90 x 90
H-110	-	V – 110 x 110

Compression connection coupling



Threaded connection coupling



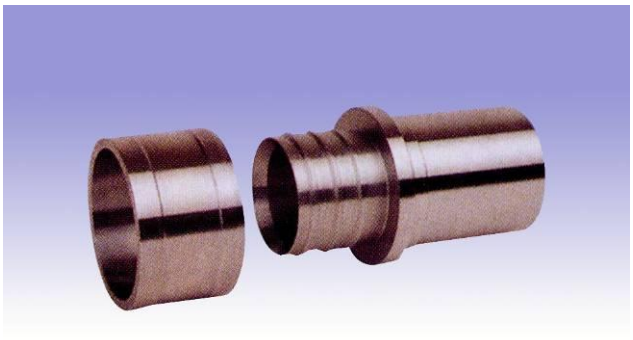
All connections (G) with threaded extremities are made according to standard DIN 2999 for assembling as follows. The threaded cap with standard DIN2986 is supplied separetely.
For all connection orders, please indicate the correct specification, the service pressure as well as the connection type on the **Isopal** pipe. These connections could be either pressed, screwed or with screw connections.
The compression connections have to be used in buried sections and preferably in heating installations (6 bars). In terms of the accessible connections in the buildings or in wells, as well as in sanitary application (10 bars), we can also offer some threaded connections.
Example: order for a connection with compressed connection
V 40 x 40, 6 bars for Isopal- Heating type H – 50

Example: order for a connection with threaded connection
R 50 x 75, 10 bars for Isopal- Sanitary type S75– 50

The compression connections are made in St 37.0 S, material following DIN 2448, or in brass CZ 132, or in red brass RG 7. The threaded connections are in brass with resistance quality according to DIN 8076.

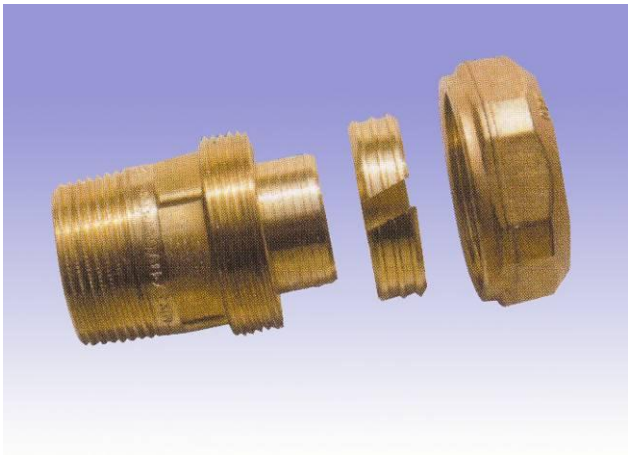
ISOPAL connections with to be welded extremity – 6/10 bar

TYPE ISOPAL		DESIGNATION
6 bar	10 bar	
	S-20	S – 20 x 1/2″
H-25	S-25	S – 25 x 3/4″
H-32	S-32	S – 32 x 1″
H-40	S-40	S – 40 x 1 ¼″
H-50	S-50	S – 50 x 1 ½″
H-63	S-63	S – 63 x 2″
H-75	-	S – 75 x 2 ½″
H-90	-	S – 90 x 3 ″
H-110	-	S – 110 x 4″



ISOPAL connections with threaded extremity - 6/10 bar

TYPE ISOPAL		DESIGNATION
6 bar	10 bar	
	S-20	G – 20 x 1/2″
H-25	S-25	G – 25 x 3/4″
H-32	S-32	G – 32 x 1″
H-40	S-40	G – 40 x 1 ¼″
H-50	S-50	G – 50 x 1 ½″
H-63	S-63	G – 63 x 2″
H-75	-	G – 75 x 2 ½″
H-90	-	G – 90 x 3 ″
H-110	-	G – 110 x 4″



All connections (G) with threaded extremities are made according to standard DIN 2999 for assembling as follows. The threaded cap with standard DIN2986 is supplied separetely.

For all connection orders, please indicate the correct specification, the service pressure as well as the connection type on the **Isopal** pipe. These connections could be either pressed, screwed or connection screws.

The compression connections have to be used in buried sections and preferably in heating installations (6 bars). In terms of the accessible connections in the buildings or in wells, as well as in sanitary application (10 bars), we can also some threaded connections.

Example: order for a connection with threaded extremity
G50 x 1½", 10 bars, with threaded connection for Isopal- Sanitary type S – 50

Example: order for a connection with compression connection extremity
S - 75 x 2½", 6 bars, for Isopal - Heating type H – 75

The compression connections are made in St 37.0 S, material following DIN 2448, or in brass CZ 132, or in red brass RG 7. The threaded connections are in brass with resistance quality according to DIN 8076.

Other accessories

For heating district networks, the steel accessories POLYURETUB can be used. For sanitary networks we use brass Isopal connections.

Bends

The minimal bending radius r obtained by the pipe elasticity is relatively weak, so it is possible in general to refuse using pre-fabricated bends on the network. For heating connections, we recommend pre-insulated POLYURETUB 130 bends.

Bends 90° ISOPAL – 6/10 bar

TYPE ISOPAL		**DESIGNATION BENDS 90°**
6 bars	**10 bars**	
	S-20	**B – 20 x 20**
H-25	S-25	B – 25 x 25
H-32	S-32	B – 32 x 32
H-40	S-40	B – 40 x 40
H-50	S-50	B – 50 x 50
H-63	S-63	B – 63 x 63

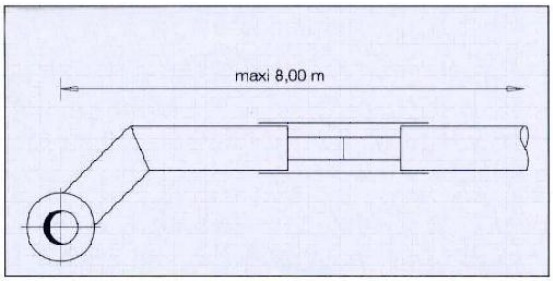
For all bends orders, please indicate the correct specification, the service pressure as well as the connection specification for the extremities of the **Isopal** pipes. These connections coud be either pressed, screwed or connection screws.

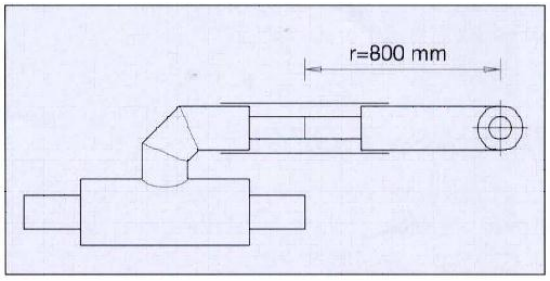
Example od bend order : B - 63 x 63, 6 bars, with compression connections for Isopal - Heating type H - 63

The compression connections are made in St 37.0 S, material following DIN 2448, or in brass CZ 132, or in red brass RG 7. The threaded connections are in brass with resistance quality according to DIN 8076.

Derivation

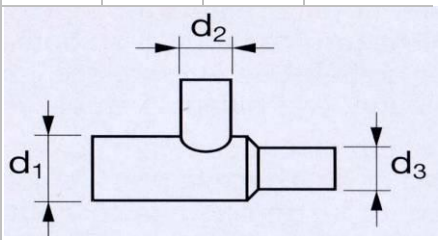
It is possible to realise derivations from different pipe systems (jump tee, right tee, parallel tee). With the **POLYURETUB** connections. For heating derivations, using pre-insulated **POLYURETUB** is recommended.
In terms of steel **Isopal** connections, it is important to consider the pre-insulated steel static.





Isopal T connection in 6/10 bars

TYPE ISOPAL		DIAMETRE	DERIVATION d_2								
6 bars	**10 bars**	**d_1 - d_3**	20	25	32	40	50	63	75	90	110
	S-20	20-20	**x**								
	S-25	25-20	x	x							
H-25	S-25	25-25	x	x							
H-32	S-32	32-25	x	x	x						
H-32	S-32	32-32	x	x	x						
H-40	S-40	40-25	x	x	x	x					
H-40	S-40	40-32	x	x	x	x					
H-40	S-40	40-20	x	x	x	x					
H-50	S-50	50-32	x	x	x	x	x				
H-50	S-50	50-40	x	x	x	x	x				
H-50	S-50	50-50	x	x	x	x	x				
H-63	S-63	63-40	x	x	x	x	x	x			
H-63	S-63	63-50	x	x	x	x	x	x			
H-63	S-63	63-63	x	x	x	x	x	x			



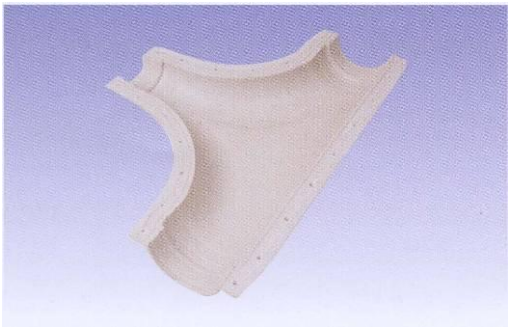
For all orders please indicate the three nominal diametres (d_{1-3}), service pressure as well as the connection specification for the extremities of the **Isopal** pipes. These connections could be either pressed, screwed or connection screws.

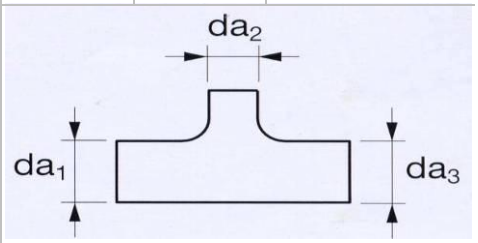
Example of T connection order : T - 63 x 32 x 50, 6 bars, with compression connections for **Isopal** - Heating type S - 63/32/50.

The compression connections are made in St 37.0 S, material following DIN 2448, or in brass CZ 132, or in red brass RG 7. The threaded connections are in brass with resistance quality according to DIN 8076.

JACKET PIPE CONNECTIONS

Assembling branch 90°



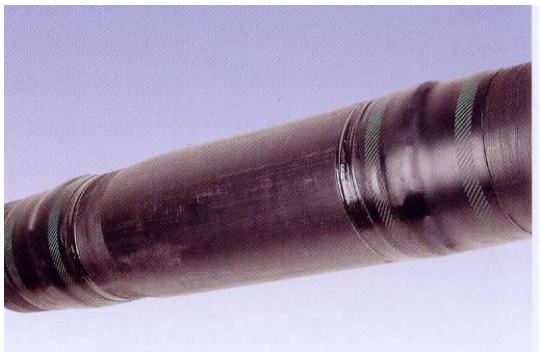
Passage in mm	Branch resp. Exit Da2 in mm							
		75	90	110	125	140	160	180
75 -75		x						
90 - 65		x	x					
90 - 75		x	x					
90 - 90		x	x					
110 - 75		x	x	x				
110 - 90		x	x	x				
110 - 110		x	x	x				
125 - 90		x	x	x	x			
125 - 110		x	x	x	x			
125 - 125		x	x	x	x			
140 - 110		x	x	x	x	x		
140 - 125		x	x	x	x	x		
140 - 140		x	x	x	x	x		
160 - 125		x	x	x	x	x	x	
160 - 140		x	x	x	x	x	x	
160 - 160		x	x	x	x	x	x	
180 - 140		x	x	x	x	x	x	x
180 - 160		x	x	x	x	x	x	x
180 - 180		x	x	x	x	x	x	x

For all orders it should be clearly indicated the corresponding jacket pipe dimensions [Da1-3]
or/and the flexible **Isopal** pipe types. All half shells consist of a break proof fibre glass polyester. The delivery includes the two shells and the required quantity of stainless-hexagon-screws M6 x 35, sealing stripes made of butyl-rubber, eventually required reducing rings, brass threaded-valve including closing cap for the PUR-foam filling-hole, as well as the corresponding quantity of ready-made foam portion.

Example of order:
HS 140 x 110 x 125 for **Isopal**, Sanitary type **S - 75/50/63**

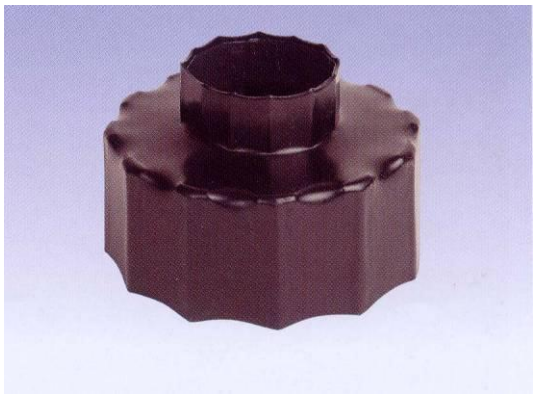
Connection accessories

Junction sleeve



The ISOPAL pipes have to be insulated in the soil at the junction with the outer casing where a junction sleeve can be used.
Due to the long lengths, this is only required for exceptional circumstances.

Protection Cap



In order to protect the PUR foam against moisture by means of condense, inside of buildings (dryingrooms) protection caps should be used. These are consisting of age-resistant neoprene-rubber and will be used as simplex- or doublex-cap, depending from kind of flexible pipe-type.
The pipe laying company will be responsible to put on the protection cap before connecting with the building line. These caps have to be protected from fire, may not be cutted and may not be used for post installation. The installation of the pipe ends without protection cap (AK) is not permitted.

Wall Duct

Wall sealing rings will avoid water penetration at wall entries in manholes or buildings. The pipe laying company will be responsible to put in the wall sealing ring and to centralise it at the wall entry before the connection to the building line will be made. The installation of flexible pipes without wall sealing rings (DR) is not permitted.
If pressure-water-tight systems will be used, a suitable security measure has to be provided in order to avoid a damage of the PELD outer casing pipe.

Other accessories

Miscellanous accessories can also be delivered such as expansion pads and PUR foam.

ISOPAL

NETWORK CONCEPTION

OVERVIEW

As well as for flexible pipe systems, it is necessary to acquire a specific know-how for the flexible pipe systems. The following examples will show how to properly install the **Isopal** flexible pipes. In any case, our Design Department will be at your disposal to direct and support you for the best solution.

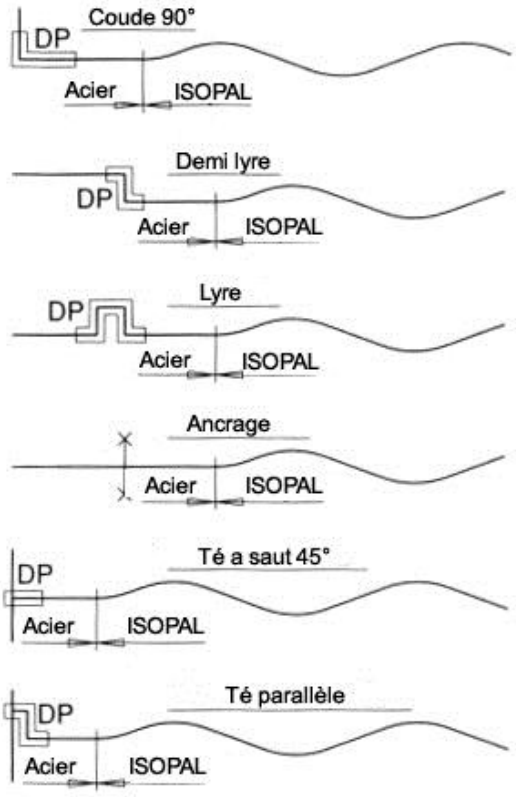
Isopal pipes are self compensating and may therefore be laid without limitation of laying lengths and without expansion pads. Due to the remaining tension and -bending after uncoiling,
Isopal pipes may and will be laid similar to wave-technology,

STEEL PRE-UNSULATED CONNECTION : ISOPAL

Before assembling an Isopal pipe and a pipe which strenches in its axial and/or lateral direction for a pre insulated steel pipe, it is essential to offset the expansion. You need to predesign a bend in L, Z or in U shape, or an ancre.

In case of changes in the pipe from a transition, a rigid steel connection with a minimal length of 2,50m has to be installed between the transition and the liaison for offsetting the lateral expansion.

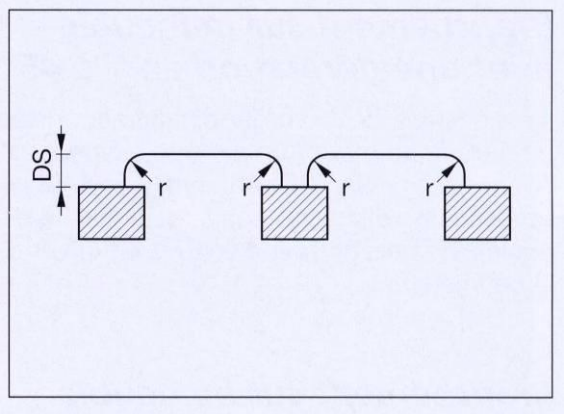
Expansion side legs of the steel systems have to be provided with expansion pads, according to the Isopal drawings.



Installation

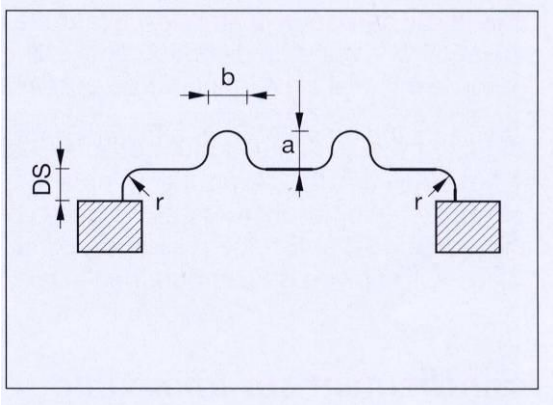
Loop Technology

Flexible pipes will be laid from building to building resp. from house connection area to house connection area, Lmax has to be considered. In front of the building additionally an expansion side leg [DS], of at least 1,00 m, or a minimum bending radius [r] has generally to be considered.



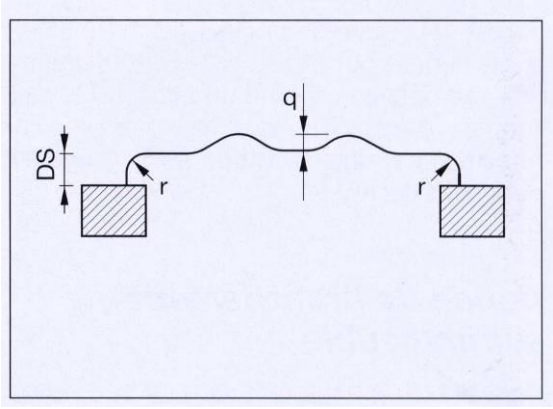
U compensation

In case of pipe laying lengths longer than Lmax U compensation may be used. The length [a] and the width [b] of the U-elbows should be at least the double of the minimum bending radius [r].



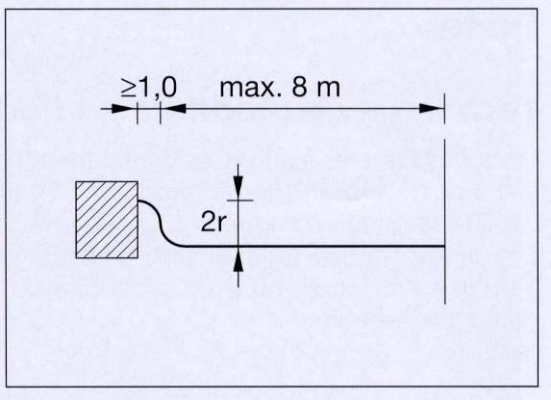
Wave-Technology

Pipe laying in wavy lines may be also used in case that Lmax will be exceeded. The flexible pipes will be laid in wavy lines with a cross-measure [q] of at least 2,00 m.
At the beginning and at the end of such a section a
90° angle with a corresponding minimum bending radius [r] has to be provided. Branches can be not installed in this kind of technology.



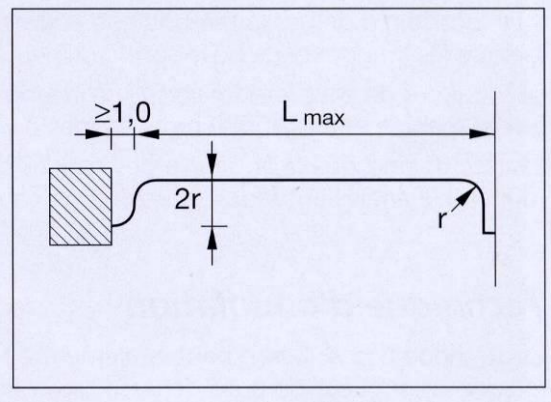
Branch-Technology

The connection of **Isopal** pipes will be made by use of pre-fabricated 45°- or parallelbranches.
It will be generally possible, to produce all kinds of branches.
The connecting branch-pipe to the main pipe will be made by use of **Isopal**, depending from requirement, that means no additional medium pipe and jacket-pipe reduction will be necessary.



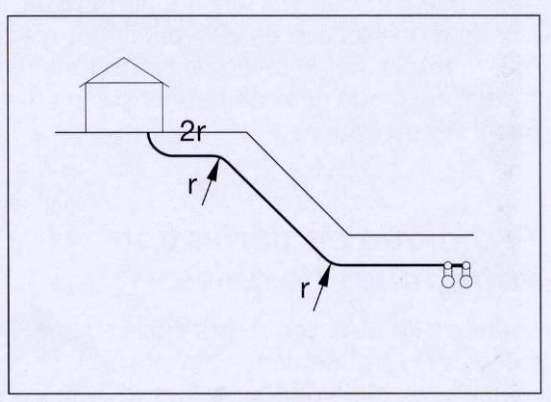
House Connection with 45° T-Branch

Buildings can be connected directly up to a distance of 9,00 m with **Isopal** , by using a 45°-branch.
Before the house-entry an expansion side-leg of a length corresponding to the double of the minimum bending radius [r] has to be provided. This will guarantee that inside of the building no expansion and no other strength have to be compensated.



House Connection with Sloping Terrain

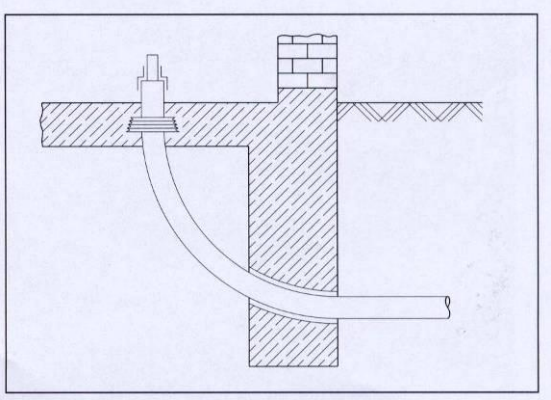
In case of terrain denivelation, **Isopal** pipes will be particularly suitable.
The connection to the main pipeline will be made as already described with 45°- or parallel branch.



Connection bend to building

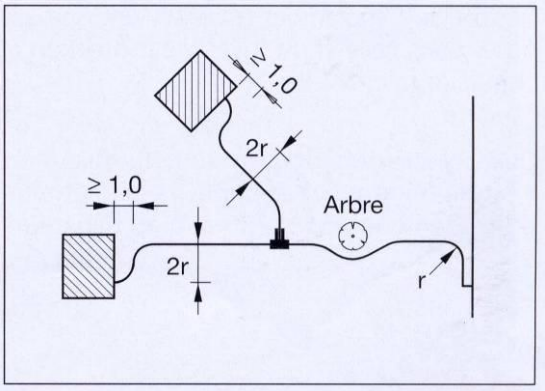
Special constructions for house connections of houses without cellar may be installed only after agreement and approval by **Isopal** design engineers.
The diameter of the protecting pipe should be at least 10 mm bigger than the PELD outer casing pipe dimension of the flexible pipe.

For example, if you have a 65mm pipe, you will need a 85mm protection pipe.



Derivation techniques between Isopal flexible pipes

Isopal pipes are linked between them with T connections and half shells.



ISOPAL

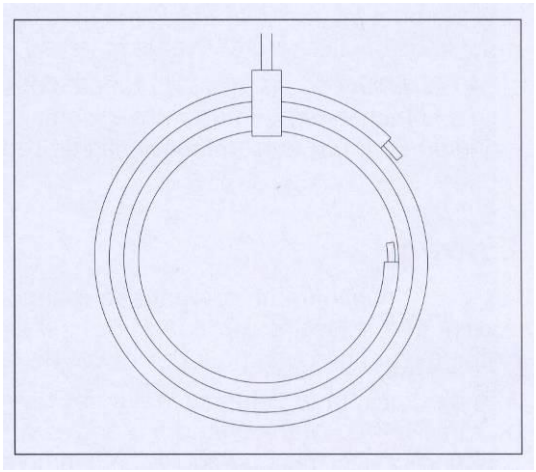
INSTRUCTION MANUAL

Delivery

All flexible Isopal pipes are delivered in rolls (diametre ≥ 2,00 m) by truck straight away on site or on stockage areas. In order to protect the pipes, the extremities are protected by yellow end cups. These cups have to taken during junction installation. Before deliveries, make sure that no rigid items are laid on the trailer platform so that no damage occur on the pipes during transport. The pipes have to be laid flat.

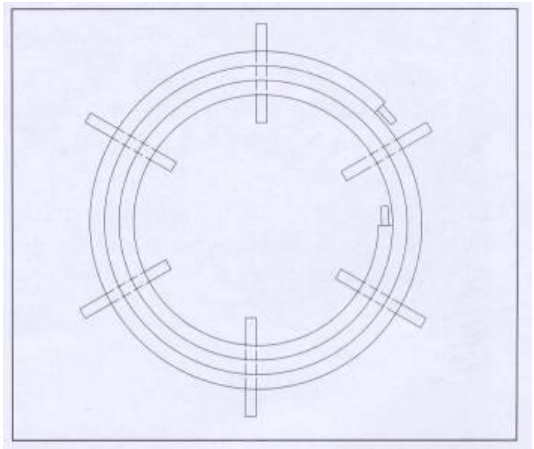
Downloading

Downloading has to be carried out correctly by the installer, During downloading with a crane, you will require some textile security straps with a minimum width of 10cm. It is prohibited to use steel cables or chains to pull the material outside the trailer. Make certain the soil is even so tat we avoid scratches as well as crashing the casing. It is also completely forbidden to use of fork without protection for this kind of products.

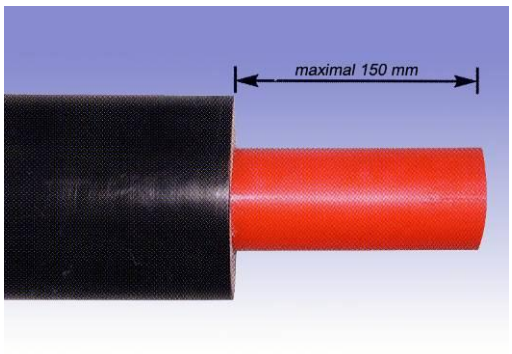


Stocking areas

Isopal pipes have to be laid on an even soil area, with no stones. It is also advised to avoid areas where water can be accumulated between the pipes. We could use some sand bags or some wooden beams to support the rolls. In case of long term stocking, it is necessary to plan any measures against the weater conditions especially in case of frost, hence also protecting the pipes against chocks. The accessories have to be stocked in close door, in containers for example. The installer or the person receiving the goods are responsible for the goods until they are installed in the ground.



Cutting off pipes



Flexible pipe-coils have to be **opened from inside**, due to the remaining tension.

Attention: Danger of injury

For assembling the **Isopal** flexible pipes will be uncoiled and cutted to the corresponding lengths.
The coils should be also turned accordingly.
Additionally it should be considered, that the coil will be not pulled on an uneven respectively stone containing ground.
After the right-angled cutting of the flexible pipe, the jacket-pipe and the PUR-foam should be cutted in a distance of max. 150 mm from the cut. Then the jacket will be peeled by use of a suitable tool and the foam, as well as the remaining foam will be removed.

Attention: The red E/VAL-diffusion barrier of the **Isopal** pipe, 6 bar - heating, may be not destroyed!

COUPLING

The minimum bending radius for each pipe has to be respected. It is imperative not to use a coupling system which is not designed to this pipe model.
In order to avoid any damage to the flexible pipes, do not couple around difficult angles (example: other conduits, walls or building angles). For coupling the Isopal Pipes, it is required to use a tool prescribed by Inpal Industries in order to deal with the elasticity of the product.

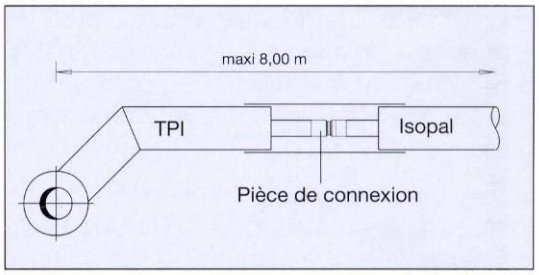
PROCESSING

Pipe laying and processing of **Isopal** flexible pipes will be generally possible up to an outside temperature of + 10° C. At temperatures below 10°C eventually suitable precautions should be provided, depending from dimensions. Up to PELD jacket-pipe dimension of 90 mm the assembling of flexible pipes will be also possible at ≥ 0° C. In case of lower temperatures PUR-foam and jacket pipes can break. The risk will generally exist in case of jacket pipes > 90 mm and in case of **Isopal** double pipes at temperatures below 10° C.

If the pipe is installed in cold weather, it is required to heat the PELD casing in a building where a maximum room temperature can be heated up to 40C, or the pipes can be filled up with hot water. The pipes must not be exposed to frost on a long term basis.
If we use a propane torch for pre-heating, its head must have a maximum of 50mm diametre. Pre-heating has to be carried out with a yellow flame, maintained in movement on the whole part of the pipe. Sporadic pre-heating can cause a damage to the flexible pipes.

Pre insulated steel connection- Isopal

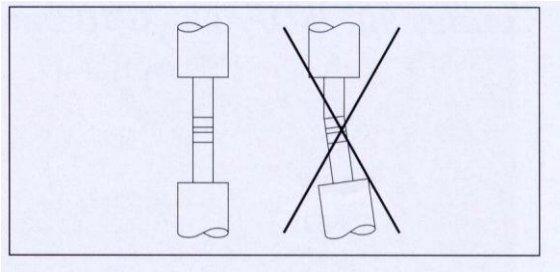
An **Isopal** connection in steel type St 37.0 will be necessary for the connection. The insulation of the main pipe will be removed for a length of maximum 400 mm. The branch diameter of the medium pipe will be tapped or burned out.
Thereafter the connection coupling will be welded electrically or autogenously to the rigid **Isopal** pipe.



The part of this connection has to be insulated with connection jacket or a reduction coupling.
A reduction coupling is only necessary when the external stee diametre is different from the **Isopal** pipe.

Assembling with threaded extremities

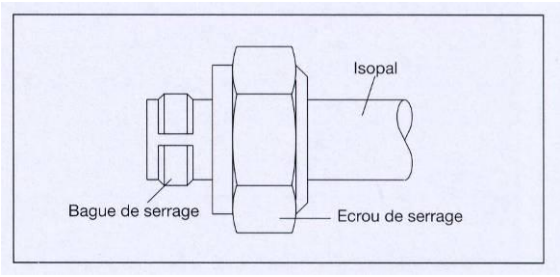
In this case, the Isopal pipe as to be cut in a right angle (90degree) and its insulation has to be removed on a maximum of 150mm. The extremities of the two pipes have to be straight because this system can't tolerate devious bend or angle.



After cut off and removing the insulation, the pipes have to be denuded with a special tool.

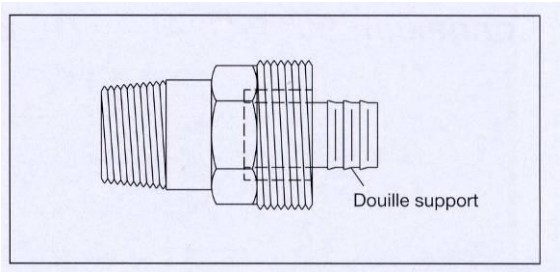
Attention: do not damage the red anti-diffusion barrier during the operation. You then need to slide the ring/rings with a key on the Isopal pipe.

For the diametres between 90 and 100mm, press on then the support washer in the tube, by making certain not to damage the washer and the extremity of the pipe during the operation.

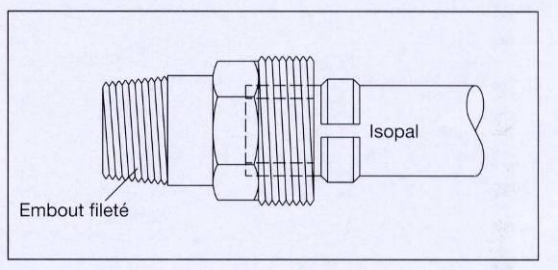


Insert the extremity of the Isopal pipe in the cylindrical thread to the “fond d'alesage”.

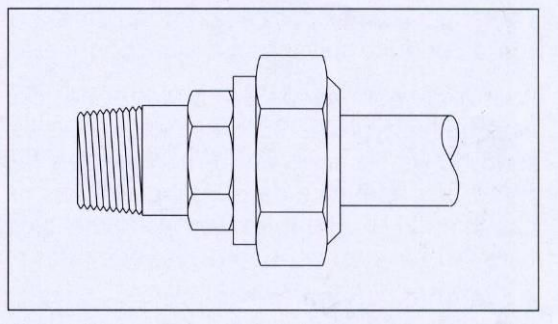
In case the connection at the extremity has to be welded, it is recommended to start with the weld (because of over heating the connection and **Isopal** pipe).



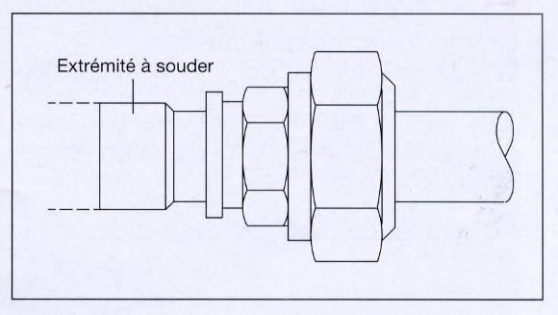
Finally tight up firmly the screw. For assembling threaded connections of Isopal pipes, which are submitted to 60-80C, it is important to tight up again when the service temperature is running. For insulating the new connection points with some PUR foam on site, it is recommended to leave the temperature going down a maximum of 45C.



Assembling the following pipe is then made on the connection either with the treaded or to be welded extremity.

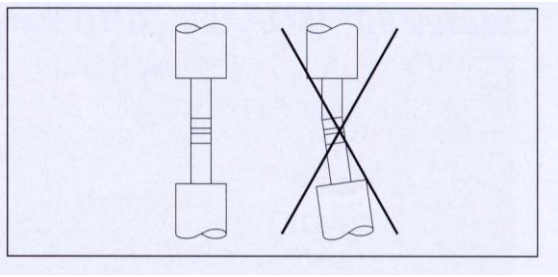


In case the connection at the extremity has to be welded, it is recommended to start with the weld (because of over heating the connection and **Isopal** pipe).

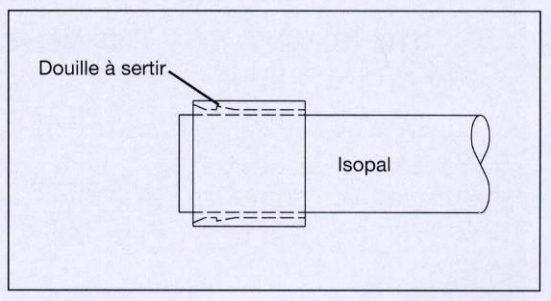


Assembling with compression couplers at extremities

In this case, the Isopal pipe as to be cut in a right angle (90degree) and its insulation has to be removed on a maximum of 150mm. The extremities of the two pipes have to be straight because this system can't tolerate devious bend or angle.

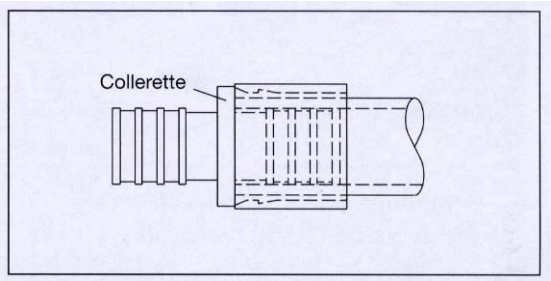


Attention: do not damage the red anti-diffusion barrier during the operation. You then need to slide the ring/rings with a key on the Isopal pipe. Then with a press tool, crimp on the extremities of the PEX pipe twice, with a 30 degree angle, during 5 seconds approximately.

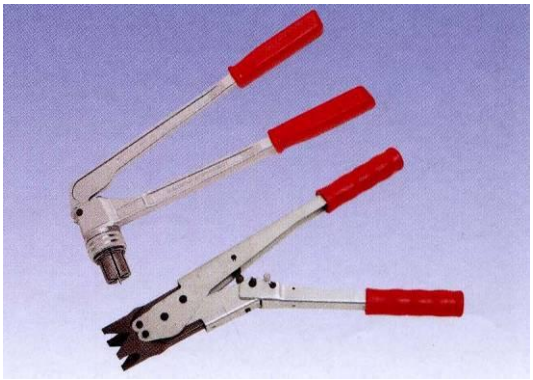


Then insert the liaison element in the extremity of the Isopal pipe until the "butee de colerette"The ring has then to be crimped against the "colerette" of the liaison element, by using eventually a wooden hammer.

We now use a press tool (can be hired on a weekly basis) and we crimp until the ring and the "colerette" touch each other. Do clean all elements before doing any compression joints. This last will be easier to do if the pipe is greased. When the assembling temperatures are near 0C, it is better to heat the pipe in a meaningful way (Ex: drier with hot ait at around 20C) without damaging it.

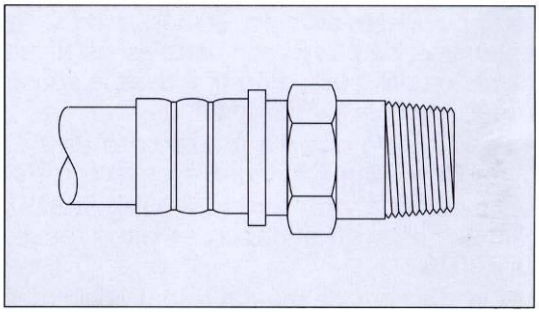


The connection of the following pipe is therefore realised with the threaded extremity. If one liaison part with a compression connection and an extremity to be welded at the end of the line, it is advised to follow up as such:



Before pressing the connection, you need to close up a steel pipe part on a length of 200mm with a rounded back. Then this pipe part is welded on the extremity to weld on. The part is then ready to be crimped on the **Isopal** Pipe. The insulation is then made wit an end cap at the end of the line.

While assembling the following section, the end cap and the rounded back are cut off and the following connection is welded. It is therefore necessary to cool down the first crimping to avoid this last not to get unglued. Ten we proceed the assembling of the connection on the **Isopal** pipe. The insulation is made with a cap with a long connection.
In case the connection at the extremity has to be welded, it is recommended to start with the weld (because of over heating the connection and the **Isopal** pipe).

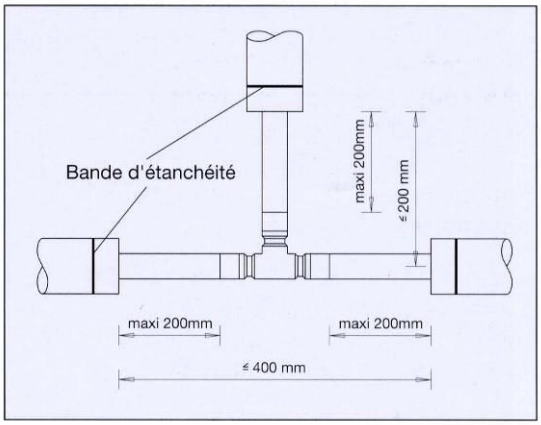


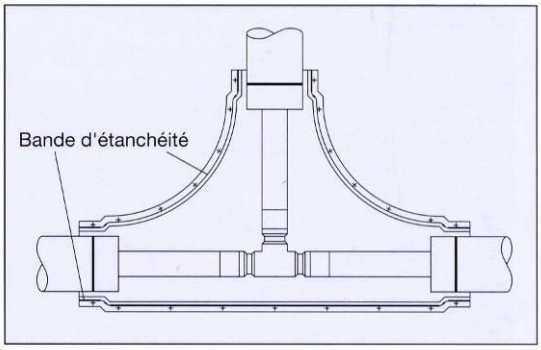
Assembling half shells on T Isopal

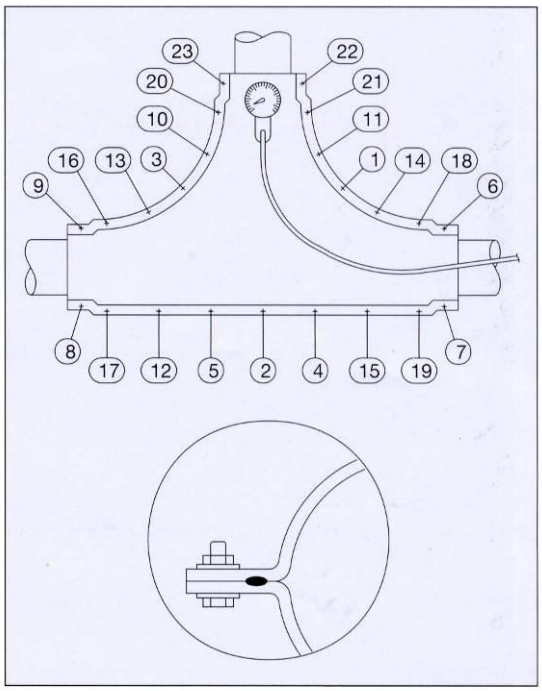
Isopal pipes will be connected right-angled with Tpieces.
The dismantled pipes lengths of the three pipe ends have to be limited to maximum 150 mm each. In case that one of the jacket-pipes should be reduced, the reducing ring has to be prepared.
Before assembling the PE-reducing ring should be marked and cut off by two wedge cuts. The sealing tape should be put into the grooves of the both inside rings and has to be pressed to the cut- and surface.
All jacket-pipe ends should be cleaned with a PE cleaner before the sealing tape will be put in.

Thereafter the sealing tape has to put into all of the provided grooves of the half-shells. In case that a reducer has to be used it should be pressed by 90° against the sealing surface of the half-shell twisted cutting surface at the corresponding jacket-pipe end.

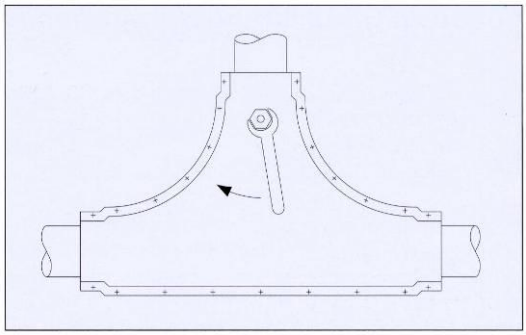
Thereafter the half-shell without foaming hole will be put under the pipes and pressed upwards. Then the other half-shell with the filling hole will be put above the lower one and connected by using the enclosed M6 x 35 screws and two supplement disks in the described sequence.
After at least 10 minutes the screws should be fastened again in the same sequence. By using the test-drilling the connection of the half-shells can be proved by air-pressure test of max. 0,2 bar. The transition areas will be soaped.

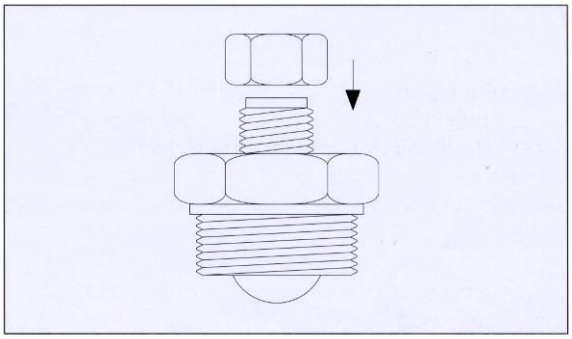




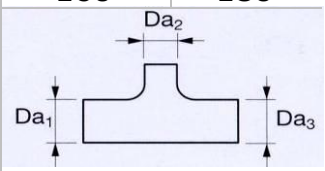


The component-separating splint of the PUR-foam packing in correspondence with the half-shell diameter has to be removed and by kneading the two components will be mixed. Now the edge of the bag has to cut off immediately and the foam will be filled above the test drilling into the half-shell. The screwed-valve for the drilling has to be assembled immediately thereafter.
If the reacting PUR-foam has pushed the ball of the screwed-valve upwards, the foam has to harden for a period of at least 120 minutes. Thereafter the closing cap will finally be fixed to the valve and sealed.





Assignment Packet-foam numbers / Half-shells - ∅

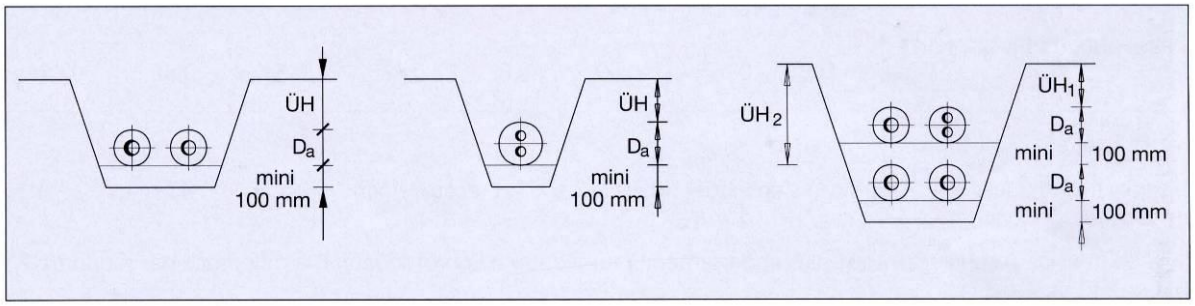
Diametre Da_1 - Da_3 en mm	**BRANCH Da_2 en mm**						
	75	**90**	**110**	**125**	**140**	**160**	**180**
75 – 75	2						
90 – 90	2	2					
110 – 110	5	5	15				
125 – 125	5	5	15	15			
140 – 140	6	6	6	8	8		
160 – 160	6	6	8	8	8	8	
180 – 180	-	-	-	-	-	2 • 6	2 • 6

For branches the diameter of passage Da3 is not relevant for determination.

Installation of Isopal fexible pipes

Assembling of flexible pipes will be normally on a 10 cm sand bed. Eventually required manholes should be provided as working area. Due to the long delivery lengths this requirement will occur only exceptionally. Supports have to be provided in a distance of 2,00 m.

Flexible pipes may be laid side by side or on top of each other into the trenches. Pipe-laying by use of a special horizontal flush-drilling procedure will be also possible. The instruction of the executing company has to be strictly considered.

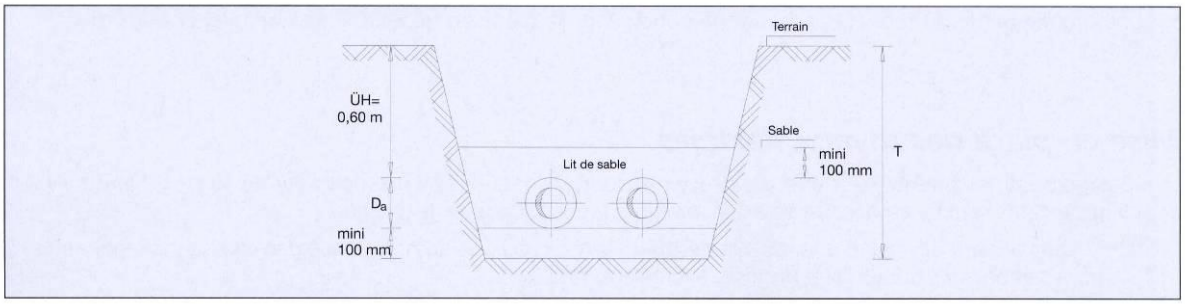


Civils works

Soil-works have to be carried out in accordance with the general valid guidelines and standard for civil engineering. Also the additional and different local government regulations have to be considered.

Trench depth

The depth of soil [T] in the pipe-trench will be calculated from covering height [ÜH], PELDjacket pipe diameter [Da] and height of the pipe support respectively sand-bed. Minimum covering height of **Isopal** pipes is 0,40 m.



Outer casing Ø **D_a** [mm]	75	90	110	125	140	160	180
Trench depth T [m]	0,575	0,59	0,61	0,625	0,64	0,66	0,68

The values mentioned in the table are valid for the given covering heights and a sand-bed respectively assembling support of 0,10 m.

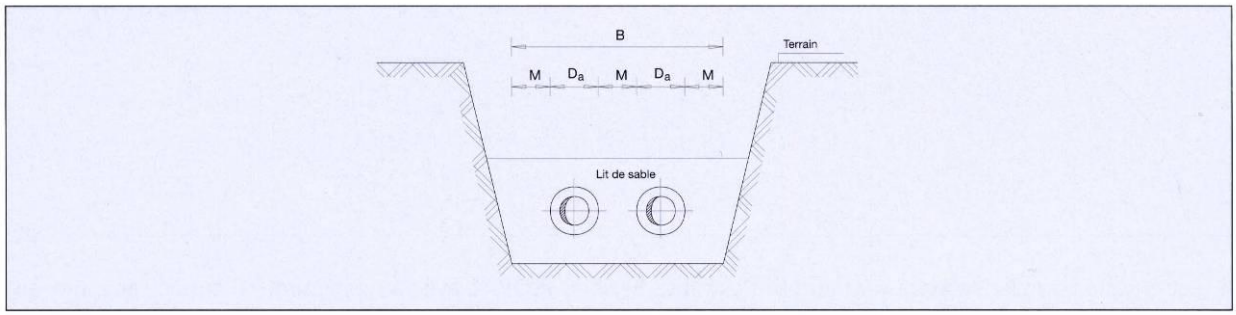
In case of other covering heights the difference value from the mentioned covering height has to be added or reduced to the depth [T].

Trench Width

The soil-width [B] will be calculated in trench-sections without any foreign elements from PELD outer casing diametre [Da] and the minimum assembling distance [M].

In case that expansion pads are required for **Isopal** at alterations of direction or at branches, the distance [M] has to be enlarged about 80 mm.

Outer casing Ø **D_a** [mm]	75	90	110	125	140	160	180
Minimum **M** [mm]	100	100	100	100	100	100	100
Width in trench bottom B [mm]	450	480	520	550	580	620	660



The width [B] mentioned in the above will be valid for two pipes of the same PELD outer casing diametre.

For the pipe laying of double **Isopal** pipes this value will be calculated as follows:

$$B_{Doublepipe} = Da + 2 \bullet M \text{ [m]}$$

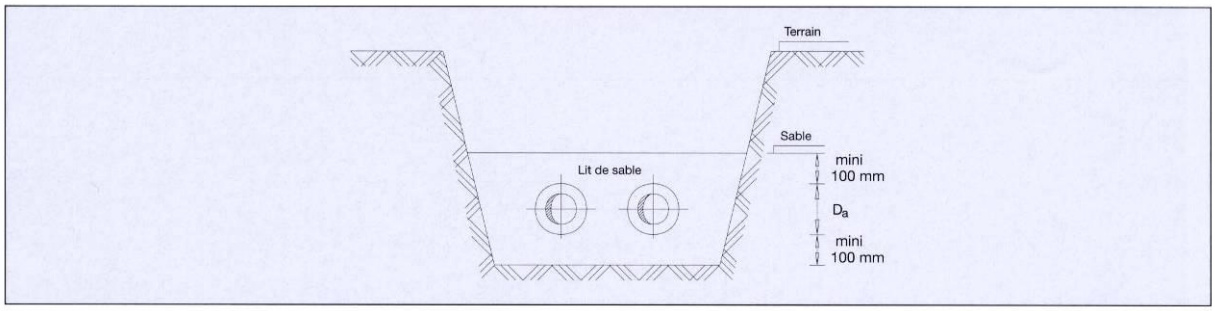
For all other applications, i.e. in case of several pipes [x] the soil-width [B] will be calculated as follows : $B = x \bullet Da + (x+1) \bullet M$ [m]

Sand-Bed

After assembling of flexible pipes and eventually required sealing and insulation works, all kind of tests which are part of the performance have to be carried out. The following details have to be considered:

→ The statically calculated covering height has to be kept
→ Expansion pads have been assembled in the given lengths and sizes and are secured against soil-pressure
→ All couplers have been foamed and recorded, the breakthrough to the buildings and constructions have to be closed
→ In case of thermal pre-stressing the given expansions and the corresponding expansions should have been reached and recorded
→ The pipeline guidance has to be in correspondence with the valid trench-design

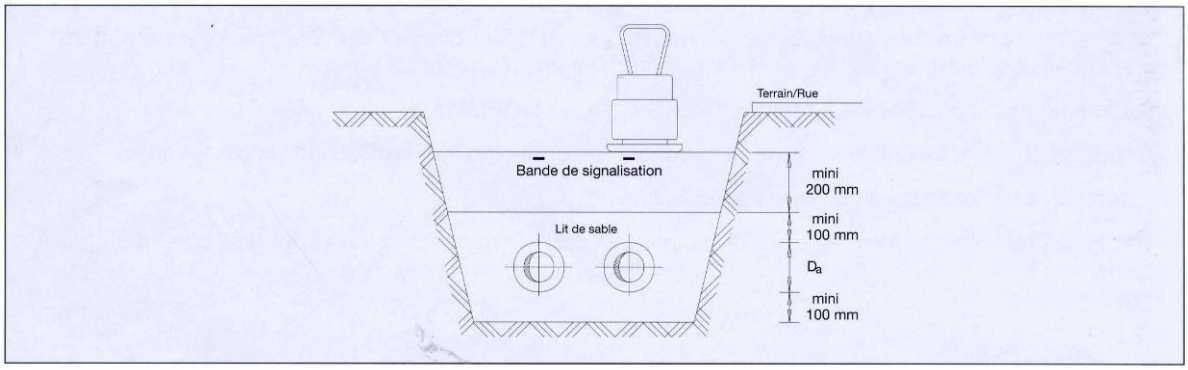
Before the sand-bed will be refilled again, the trench has to be approved from the responsible site-supervisor.



Thereafter the **Isopal** pipes have to be refilled carefully with sand with a grain structure of 0 - 4 mm (class NS 0/2) in layers up to at least 10 cm. Then the sand should be compressed manually. Especially attention should be given to gaps or gores in order to avoid hollow spaces.
Such areas have to be compressed separately, in order to avoid settings or movings later on.
During these works pipe supports should be removed.

Re-Filling

After completion of the sand-bed the trench will be re-filled by using the digging material.
Compressing of several layers will be necessary. The filling and compressing of the trench has to be carried out simultaneously on both sides of the pipes, in order to avoid movements or lifting of the pipeline.
After filling of a 20cm layer, compressing machines like a compressor or compressing-ram may be used.
It is important to respect the permissible surface load on the Isopal pipes during this operation.



The "additional technical contract conditions and guidelines for digging and soil-works for road construction", have to be considered additionally.

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