Zakład Produkcyjno Usługowy Międzyrzecz
POLSKIE RURY PREIZOLOWANE Sp. z o.o.

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PREINSULATED FLEXIBLE PIPE

with steel carrier pipe

DAR-FLEX

ZPU MIĘDZYRZECZ SP. Z O.O.
PREINSULATED PIPE SYSTEM
TO BE USED IN HIGH PARAMETER UTILITIES
FLEXIBLE PIPE SYSTEM
WITH STEEL CARRIER PIPE

DAR-FLEX

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1. GENERAL INFORMATION ON DAR-FLEX PREINSULATED FLEXIBLE STEEL PIPE SYSTEM

DAR-FLEX preinsulated flexible pipes are used to convey heating media from the point of their generation up to their reception point. Their prime use are single family house laterals and as distribution networks in residential areas. DAR-FLEX® preinsulated pipes can convey media at the maximal continuous operating temperature of 120°C which can be exceeded singularly up to 140°C at the maximal operating pressure up to 2.5 MPa. DAR-FLEX steel flexible pipes are manufactured in the following range of carrier pipe diameters Dz 20, Dz 25 and Dz 28 mm in lengths of up to 400 m. Sections longer that 12 m are coiled.

DAR-FLEX preinsulated flexible steel pipes are bonded steel structures combining a steel carrier pipe placed axially inside a casing pipe. The thermal insulation filling in the space between the carrier and casing pipes is composed from semi-rigid polyurethane foam which permanently bonds the carrier pipe with the casing pipe. Semi-rigid polyurethane foam used in DAR-FLEX pipes is foamed with cyclopentane. The casing pipe is made from deformable polyethylene and can be provided with an anti-diffusion barrier that performs an oxygen barrier. The anti-diffusion barrier is made from an AL foil. If requested by the customer, DAR-FLEX preinsulated pipes may be provided with leak alarm impulse system wiring (reflectrometric).

During the assembly and installation works the DAR-FLEX carrier pipe is welded to another DAR-FLEX pipe or a standard preinsulated pipe (a rigid preinsulated pipe). Insulation and leak tightness of the welded joints is achieved by means of PEX-b type TS silane crosslinking “wet cured” on site, or by means of NT heat shrinkable joints with double insulation “wet cured” in situ.

The basic advantages of the use of DAR-FLEX preinsulated steel pipes are:

- almost no elbows used;
- minimal number of welded joints;
- increased reliability of the system by minimized number of joints;
- reduced labour costs achieved through a shortened assembly time;
- utilities easily diverted;
- quickly assembled.

2. MATERIALS USED IN THE MANUFACTURING OF DAR-FLEX SYSTEM

Carrier Pipe

The DAR-FLEX flexible system incorporates at least an E-195 steel seamed pipe compliant with the standard PN-EN 10305-2, PN-EN 10305-3, or seamless compliant with the standard PN-EN 10305-1 as the carrier pipe.

Thermal (heat) insulation

Thermal insulation is made from semi-rigid polyurethane foam evenly filing in the space between the carrier and casing pipes. The foaming agent used in the generation of polyurethane foam is cyclopentane. The requirements that the DAR-FLEX thermal insulation has to meet are presented in the Table below:

Table 1

Foaming agent		Cyclopentane
thermal conductivity coefficient λ_{50} density compression strength	$[^{W}/_{mK}]$ $[^{kg}/_{m^3}]$ [MPa]	max 0.0230 min. 50 min. 0.12
thermal resistance	[°C]	from 120°C to 140°C
water absorbing power at elevated temperature	[%]	< 10
closed cell content	[%]	> 88

Casing (jacket) pipe

The casing pipe is made from polyethylene of the density no less than 915 kg/m^3 and the Melt Flow rate not exceeding 2.0g/min (190°C, 5 kg).

The casing pipe may be lined with an anti-diffusion barrier that eliminates the unfavourable phenomenon of gas exchange inside the insulation foam.

DAR-FLEX pipes meet the requirements imposed by PN-EN 15632-4.

DAR-FLEX pipes are manufactured in two types of insulation: Insulation Standard and Insulation Plus.

3. GENERAL PRINCIPLES OF LYING DAR-FLEX FLEXIBLE PIPES

DAR-FLEX pipes are to be laid directly in ground on sand bed and sand haunched. The height of the sand bed, haunching, and sand grain grade should be compliant with the current "Manual of Assembly and Acceptance of ZPU Międzyrzecz Sp. z o.o. System Buried Preinsulated Utilities."

The minimal bending radius for transport and assembly purposes for the whole range of diameters is 0.7 m.

DAR-FLEX pipes are shipped to the site in lengths requested by the customer.

Pipes when transported by a lorry should be laid flat, on a clean surface without any protruding parts. They should be placed vertically or horizontally depending on the coil dimension. Pipes should be unloaded by means of 10 cm wide textile strings; they may also be unloaded by forklifts with rounded fork prongs (guarded arms). It is inadmissible that the DAR-FLEX pipes be dropped down from the lorry or rolled on the ground; neither steel ropes not chains can be used.

Pipes should be store on flat, dry surfaces without stones, sand beds may be used as supports, likewise pallets or square-sawn timbers. If improperly unloaded, the pipes may quite likely get damaged.

When pipes are to be cut to a measure on each side an extra 15 cm should be added to make room for fittings. The casing pipe should be cut off over a 15 cm distance, the foam removed and the carrier pipe cleaned.

4. DIAMETERS OF CARRIER AND CASING PIPES

The following carrier and case pipes are used in the manufacturing of DAR-FLEX ZPU Międzyrzecz Sp. z o.o. system pipes and fittings:

Table 2

Carrier pipe			Casing pipe Insulation Standard		Casing pipe Insulation Plus	
DN	Dz	g	Dzp	g	Dzp	g
mm	mm	mm	mm	mm	mm	mm
16	20	2.0	75	2.2	90	2.2
20	25	2.0	75	2.2	90	2.2
25	28	2.0	75	2.2	90	2.2

DN - nominal diameter of a carrier pipe
Dz , Dzp ; - external diameter
g ; - wall thickness

5. QUALITY ASSURANCE SYSTEM

ZPU Międzyrzecz Sp. z o.o. system materials and preinsulated products are manufactured in accordance with the implemented Certificate of Integrated Management of Quality *Environment, and compliant with the standard **PN-EN ISO 9001:2009** and **PN-EN ISO 14001:2005**.

The quality management system entails: designing, developmental works, manufacturing processes, supplies and assembly of ZPU Międzyrzecz Sp. z o.o. system pipes and fittings.

ZPU Międzyrzecz Sp. z o.o. was awarded **Certificate of Quality System No JS–124/3/2008**, acknowledging the compatibility of the Quality Management System as used in our Company and the requirements of **PN-EN ISO 9001:2009** and **PN-EN ISO 14001:2005**.

6. INFORMATION ON OTHER PRODUCTS

The manufacturing offer ZPU Międzyrzecz Sp. z o.o. also comprises:

- polyethylene pipes **PE100** – dark blue to be used in water mains available in diameters between Ø 25 up to Ø 1200 mm, in the following SDR dimension series: SDR 9; SDR 11; SDR 13.6; SDR 17; SDR 17.6; SDR 21; SDR 26; SDR 33 and SDR 41, supplied in straight sections 12 m long (for diameters between Ø 75 mm and Ø 1200 mm), and coiled in lengths up to 200 m (pipes of diameters between Ø 25 mm and Ø 110 mm), or in other lengths as agreed with the customer;
- polyethylene pipes class **PE100** – black to be used in delivery sewer systems available in diameters between Ø 32 up to Ø 1200 mm, in the following SDR dimension series: SDR 9; SDR 11; SDR 13,6; SDR 17; SDR 17,6; SDR 21; SDR 26; SDR 33 and SDR 41, supplied in straight sections 12 m long (for diameters between Ø 75 mm and Ø 1200 mm), and coiled in lengths up to 200 m (pipes of diameters between Ø 32 mm and Ø 110 mm) or in other lengths as agreed with the customer;
- culvert polyethylene pipes, available in diameters between Ø 50 mm up to Ø 1000 mm, supplied in straight sections 12 m long or as agreed with the customer;
- case pipes in diameters between Ø 83 mm and Ø 472 mm;
- pipes, fittings and preinsulated fixtures to be used in buried thermal utilities as specified in the Preinsulated Product Catalogue;
- standard slip-on sleeves in diameters between Ø 83 and Ø 472 mm;
- shrinkable slip-on sleeves and DX electrically welded couplings (to be used in thermally insulated joints);
- preinsulated pipes with polyethylene carrier pipes (diameters agreed with the customer);
- SPIRO voral-type preinsulated pipes and fittings (as specified in the SPIRO Pipe Catalogue);
- preinsulated pipes to be used in water steam delivery lines.

7. DAR-FLEX PREINSULATED FLEXIBLE PIPES

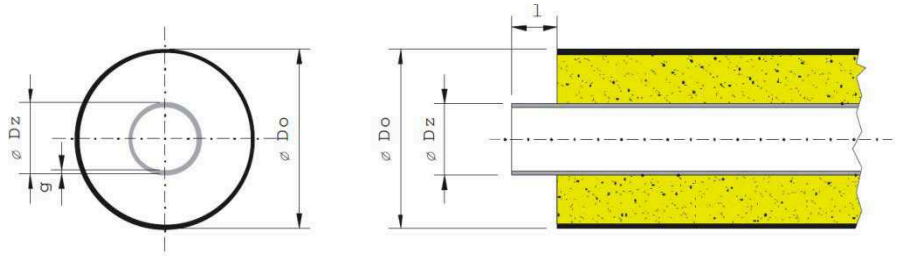

Table 3 Insulation Standard

Nominal Diameter	Dimensions			Maximal length coiled	Minimal "r" bending radius	**Catalogue Reference Number**
	Internal Pipe		External Pipe			
	Ø Dz	Wall Thick-ness [g]	Ø Do			
DN	*mm*	*mm*	*mm*	*m*	*m*	
16	20	2.0	75	400	0.8	**RF – 20/75**
20	25	2.0	75	400	0.8	**RF – 25/75**
25	28	2.0	75	400	0.8	**RF – 28/75**

Table 4 Insulation Plus

Nominal Diameter	Dimensions			Maximal length coiled	Minimal "r" bending radius	**Catalogue Reference Number**
	Internal Pipe		External Pipe			
	Ø Dz	Wall Thick-ness [g]	Ø Do			
DN	*mm*	*mm*	*mm*	*m*	*m*	
16	20	2.0	90	400	0.9	**RF – 20/90**
20	25	2.0	90	400	0.9	**RF – 25/90**
25	28	2.0	90	400	0.9	**RF – 28/90**

8. JOINT UNIT

8.1 Heat shrinkable sleeve

Table 5

Nominal Diameter	Carrier Pipe Exter-nal Diame-ter	Jacket Pipe Diameter	Slip-on Sleeve Internal Diameter	Sleeve Length	Components		Heat Shrink-able Plug	Catalogue Reference Number
DN	Dz	Do	Dwn	L	A	B		
mm	*mm*	*mm*	*mm*	*mm*	*g*	*g*	*set*	
Single Pipes Insulation Standard								
16	20	75	83	600	38.8	63.3	2	**TS-20/75**
20	25	75	83	600	36.9	60.2	2	**TS-25/75**
25	28	75	83	600	35.6	58.0	2	**TS-25/75**
Single Pipes Insulation Plus								
16	20	90	107	600	58.5	95.4	2	**TS-20/90**
20	25	90	107	600	56.6	92.3	2	**TS-25/90**
25	28	90	107	600	55.3	90.1	2	**TS-25/90**

DAR-FLEX flexible pipes can be joined by means of special TS crosslinked heat shrinkable joints, to be then filled with properly measured out and prepared A and B PUR components so that he joint could be insulated.

8.2 Heat Shrinkable sleeve and heat shrinkable bands

Table 6

Nominal Diameter	Carrier Pipe External Diameter	Jacket Pipe Diameter	Slip-on Sleeve Internal Diameter	Sleeve Length	Components		Heat Shrinkable Band	Heat Shrinkable Plug	Catalogue Reference Number
DN	Dz	Do	Dwn	L	A	B			
mm	*mm*	*mm*	*mm*	*mm*	*g*	*g*	*pc*	*set*	
Single Pipes Insulation Standard									
16	20	75	83	600	38.8	63.3	2	2	**NT-20/75**
20	25	75	83	600	36.9	60.2	2	2	**NT-25/75**
25	28	75	83	600	35.6	58.0	2	2	**NT-25/75**
Single Pipes Insulation Standard									
16	20	90	107	600	58.5	95.4	2	2	**NT-20/90**
20	25	90	107	600	56.6	92.3	2	2	**NT-25/90**
25	28	90	107	600	55.3	90.1	2	2	**NT-25/90**

DAR-FLEX flexible pipes can be joined by means of special TS crosslinked heat shrinkable joints, to be then filled with properly measured out and prepared A and B PUR components so that he joint could be insulated.

The internal surfaces of the heat shrinkable sleeve are lined with heat melting glue. While being shrunk the glue melts making the casing pipe and the sleeve bond tightly. Additional tightness is achieved by applying heat shrinkable bands.

9. INSULATION AND PIPELINE TERMINATION

9.1 Pipeline termination – end sleeve

Table 7

Nominal Diameter	Carrier Pipe External Diameter	Jacket Pipe Diameter	Slip-on Sleeve Internal Diameter	Components		Heat Shrink-able Band	Heat Shrink-able Plug	Catalogue Reference Number
DN	Dz	Do	Dwn	A	B			
mm	*mm*	*mm*	*mm*	*g*	*g*	*pc*	*set*	
Single Pipes Insulation Standard								
16	20	75	83	27.7	45.2	1	2	**NK-20/75**
20	25	75	83	26.4	43.0	1	2	**NK-25/75**
25	28	75	83	25.4	41.4	1	2	**NK-25/75**
Single Pipes Insulation Standard								
16	20	90	107	68.1	68.1	1	2	**NK-20/90**
20	25	90	107	65.9	65.9	1	2	**NK-25/90**
25	28	90	107	64.4	64.4	1	2	**NK-25/90**

It is used to terminate (linestopping) of the pipeline placed directly in the ground and intended for future extension.

9.2 Insulation termination – End cap

Nominal Diameter of casing pipe Do [mm]	Catalogue Reference Number
75 mm	**E – 75**
90 mm	**E – 90**

End Cap terminals are heat shrinkable moulded products. End Caps are set on pipe ends, preventing the insulation between both pipes from getting damp with water. Depending on a flexible pipe, available in single and double makes.

The product is lined with elastomer adhesive specially formulated for high temperature applications, thus providing good sealing to carrier and jacket pipe ends.

10. WALL TRANSITION

10.1 Rubber ring – damper

Nominal Diameter of casing pipe Do [mm]	Catalogue Reference Number
75 mm	**P – 75**
90 mm	**P – 90**

Sealing rings protect against possible water leaks through inspection chamber or building transitions.

10.2 Lateral protective tube – adaptor

Nominal Diameter of casing pipe Do [mm]	Catalogue Reference Number
75 mm	**A – 75**
90 mm	**A – 90**

It is used to connect preinsulated pipeline with the drainage network to secure free extension of pipes placed in a network or a pipeline without a threat of damage to the preinsulated pipe.

11. WARNING TAPE

Warning tape is laid above the line. It is supplied in 100 m rolls. It reads:
„UWAGA! RURY CIEPŁOWNICZE” and the *ZPU Międzyrzecz Sp. z o.o.* **logo**.
„WARNING! HOT PIPES”

	Colour	Width *[mm]*	Catalogue Reference Number
Warning tape	yellow	150	**T - 150**

12. TRADE INFORMATION

Manufacturer and Supplier:

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