



**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 i Dz 28 mm in length of up to 400 m. Sections longer than 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 anti-diffusion barrier that performs an oxygen barrier. The anti-diffusion barrier is made from AL foil. If requested by the customer, DAR-FLEX® preinsulated pipes May be provided with leak alarm impulse system wiring (reflectometric).

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 sealing of welded joints is performed using connectors radiation and chemically cross- linked NTX and TS types, „ wet flooded "on the construction site, or NT type heat shrinkable joints with double sealing, also "wet flooded", in place of their embedding.

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.

Thermal (heat) insulation

Thermal insulation is made from semi-rigid polyurethane foam evenly filling 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 present in the Table below.

Table 1

Foaming agent		Cyklopentane
Thermal conductivity coefficient	λ_{50} [W/mK]	max 0,0230
density	[kg/m ³]	min. 50
compression strenght	[MPa]	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/m³ and the Melt Flow rate not exceeding 1,5 g/10 min. (190°C, 5 kg).

The casing pipe may be lined with 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 0,7m.

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

Pipes when transported by 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 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 15cm should be addend 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 min	Dzp	g min
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-124/5/2013**, 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 class **PE100** – dark blue, to be used in water mains available in diameters between \varnothing 25 mm up to \varnothing 1200 mm, in the following SDR dimension series: SDR 7,4; SDR9; SDR11; SDR13,6; SDR17; SDR17,6; SDR21; SDR26; SDR33 and SDR41; supplied in straight sections 12 m long (for diameters between \varnothing 75 mm and \varnothing 1200 mm), and coiled in length up to 200 m (pipes of diameters between \varnothing 25 mm and \varnothing 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 \varnothing 32 mm up to \varnothing 1200 mm, in the following SDR dimension series: SDR 7,4; SDR9; SDR11; SDR13,6; SDR17; SDR17,6; SDR21; SDR26; SDR33 and SDR41; supplied in straight sections 12 m long (for diameters between \varnothing 75 mm and \varnothing 1200 mm), and coiled in length up to 200 m (pipes of diameters between \varnothing 32 mm and \varnothing 110 mm), or in other lengths as agreed with the customer;
- culvert polyethylene pipes, available in diameters between \varnothing 50 mm up to \varnothing 1000 mm, supplied in straight sections 12 m long or as agreed with the customer;
- case pipes in diameters between \varnothing 75 mm and \varnothing 1200 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 \varnothing 83 mm and \varnothing 472 mm;
- shrinkable slip-on sleeves and DX electrically welded couplings (to be used in thermally insulated joints);
- radiation and chemically cross-linked heat shrinkable sleeves in diameters between \varnothing 75 mm and \varnothing 450 mm;
- 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

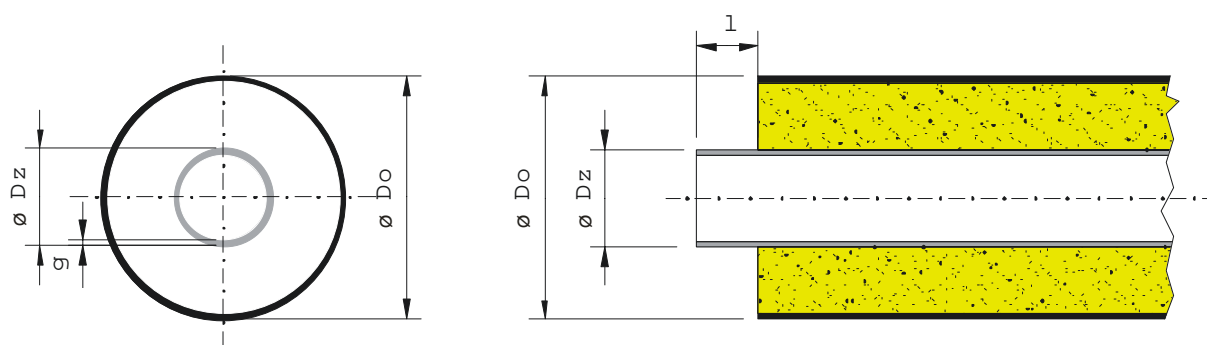


Table 3 Insulation Standard

Nominal diameter	Dimensions			Maximal length coiled	Minimal „r” bending radius	Catalogue Reference Number
	Internal pipe		External pipe			
	$\varnothing Dz$	Wall thickness [g]	$\varnothing Do$			
<i>DN</i>	<i>mm</i>	<i>mm</i>	<i>mm</i>	<i>m</i>	<i>m</i>	
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			
	$\varnothing Dz$	Wall thickness [g]	$\varnothing Do$			
<i>DN</i>	<i>mm</i>	<i>mm</i>	<i>mm</i>	<i>m</i>	<i>M</i>	
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 (radiation or chemically)



Table 5

Table 3

Nominal diameter	Carrier pipe external diameter	Jacket pipe diameter	Slip-on sleeve internal diameter	Sleeve length	Components		Heat shrinkable 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	NTX or TS-20/75
20	25	75	83	600	36,9	60,2	2	NTX or TS-25/75
25	28	75	83	600	35,6	58,0	2	NTX or TS-28/75
Single Pipes Insulation Plus								
16	20	90	107	600	58,5	95,4	2	NTX or TS-20/90
20	25	90	107	600	56,6	92,3	2	NTX or TS-25/90
25	28	90	107	600	55,3	90,1	2	NTX or TS-28/90

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

8.2. Heat shrinkable sleeve and heat shrinkable bands



Table 6

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-28/75
Single Pipes Insulation Plus									
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-28/90

DAR-FLEX flexible pipes can be joined by means of NT heat shrinkable joints, to be then filled with properly measured out and prepared A and B PUR components so that the 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 internal diameter	Components		Heat shrinkable band	Heat shrinkable plug	Catalogue Reference Number
DN	Dz	Do	Dwn	A	B			
<i>mm</i>	<i>mm</i>	<i>mm</i>	<i>mm</i>	<i>g</i>	<i>g</i>			
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-28/75
Single Pipes Insulation Plus								
16	20	90	107	41,8	68,1	1	2	NK-20/90
20	25	90	107	40,4	65,9	1	2	NK-25/90
25	28	90	107	39,5	64,4	1	2	NK-28/90

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

9.2. Insulation termination - End Cap



Table 8

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 proving good sealing to carrier and jacket pipe ends.

10. WALL TRANSITION

10.1. Rubber ring - damper



Table 9

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

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

10.2. Lateral protective tube - adaptor



Table 10

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

It is used to connect preinsulated pipelines 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 pipeline. It is supplied in 100 m rolls. It reads:

„UWAGA! RURY CIEPŁOWNICZE” and ZPU Międzyrzecz Sp. z o.o. logo
 “WARNING! HOT PIPES”



Table 11

	Colour	Width	Catalogue Reference Number
		mm	
Warning tape	żółty	150	T - 150



12. **TRADE INFORMATION**

Manufacturer and Supplier:

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