

11 HANDLING POST INSULATION

11.1 General

11.1.1	Description.....	11 / 1
--------	------------------	--------

11.2 Assembling Tools

11.2.1	Survey.....	11 / 2-4
--------	-------------	----------

11.3 Assembling Connection Coupler

11.3.1	PEHD - Shrinkable Coupler.....	11 / 5
11.3.2	isojoint X - Shrinkable Coupler.....	11 / 6
11.3.3	isojoint III - Shrinkable Coupler.....	11 / 7
11.3.4	Electro - Welding Coupler.....	11 / 8
11.3.5	isocompact - Coupler.....	11 / 9
11.3.6	Spiro - Coupler.....	11 / 10
11.3.7	Reduction - Shrinkable Coupler.....	11 / 11
11.3.8	Double Reduction - Shrinkable Coupler.....	11 / 11
11.3.9	Shrinkable End Coupler.....	11 / 11
11.3.10	Assembling Connection Coupler / Assembling Parts.....	11 / 12
11.3.11	Assembling Half-Shells.....	11 / 13

11.4 PUR - Foam Table

11.4.1	Foam-Table.....	11 / 14
--------	-----------------	---------

11.5 Check List for Post Insulation

11.5.1	Building Site - Quality Assurance.....	11 / 15-16
11.5.2	isoplus-Assembling Conditions.....	11 / 17-18

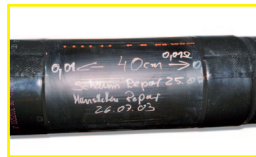
11.1 General

11.1.1 Description

All carrier pipe connections have to be insulated and sealed with connection couplers and PUR-foam after recording of the agreed pressure tests. For warranty reasons these works, except of **isocompact**-coupler, should be carried out by **isoplus**-educated assembling specialists, approved by AGFW- and BFW institute. The **isocompact**-coupler may be used by the pipe laying company for independent post-insulation at the connection spots, except of double pipes.

All coupler connections made by **isoplus** will be clearly and durable marked by the installer, this includes:

- ⇒ Date of foaming
- ⇒ Length of coupler (hollow space)
- ⇒ Assembling date of sleeves
- ⇒ Name of installer
- ⇒ Resistance values **IPS-Cu** or **IPS-NiCr**



This mark will allow a detailed identification of the executing installer and will increase the quality safety with their requirements. In case that the post-insulation should be nevertheless carried out by a third party, their ability has to be checked by presenting the AGFW-/BFW-test certificate before starting the assembling work. **isoplus** has to be informed about this in advance.

Current assembly-instructions of all **isoplus** connection-couplers are available in our download-section at www.isoplus.org.

Detailed information on wiring the leak detection and the differing wiring regulations for branching, as well as tables for the foam quantities to be used for the differing casing joint types, are also available in this section.

The preparing working steps 1. to 11. are valid concerning all coupler constructions delivered by **isoplus**. Additionally the **isoplus**-assembling conditions, see **chapter 11.5.2** have generally to be considered.

ATTENTION: Assembling works have to be carried out always with working overall and if necessary with gloves and protection glasses as well as in accordance with the general regulations for preventing accidents (UVV) requested protection clothes.

11.2.1 Survey

#	Coupler construction / -type	PEHD Shrinkable	isojoint X	isojoint III	Electro-Welding	isocompact	Spiro
1	Pressure set with pump and manometer	✓	✓		✓		
2	Workman's overall	✓	✓	✓		✓	✓
3	Working gloves	✓	✓	✓		✓	✓
4	Binding wire	✓	✓		✓		✓
5	Drilling set, $\phi = 4, 6$ and 10 mm	✓	✓		✓		✓
6	Drilling machine (Akku or 230 V)	✓	✓		✓		✓
7	Triangular scraper	✓	✓		✓		✓
8	High-grade-steel strap retainer	✓			✓		
9	Gas-burner set	✓	✓	✓	✓	✓	
10	Hammer, ca. 150 gramme	✓	✓	✓		✓	eventual
11	Hand-broom	✓	✓	✓	✓	✓	✓
12	Wood-driller with stopper	✓	✓		✓		✓
13	Insulation adhesive tape, 40 mm, if required	✓	✓	✓		✓	✓
14	Cable drum, if required	✓	✓				✓
15	Cartouche-press, if required				✓		✓
16	Marker, white + black (water resistant)	✓	✓	✓	✓	✓	✓
17	Measuring tape and meter stick	✓	✓	✓		✓	✓
18	Tongs for rivets						✓
19	PE-burr-remover resp. -scraper	✓	✓		✓		✓
20	PE-cleaner resp. fat solvent	✓	✓	✓		✓	✓
21	Propane-liquid gas bottle	✓	✓	✓	✓	✓	eventual
22	Cleaning rag, fluffy free	✓	✓	✓	✓	✓	✓
23	Umbrella if required	✓	✓	✓		✓	✓
24	Stiring set for drilling machine	✓	✓		✓		✓
25	Hand-saw	eventual		✓		✓	eventual
26	Peel-driller, conical, size M 3		✓		✓		
27	Foaming machine, starting from $D_a \geq 315$ mm	✓	✓		✓		✓
28	Scissors	✓	✓	✓		✓	✓
29	Emery linen, 50 mm, grain 60	✓	✓	✓	✓		✓
30	Set of screwdrivers, kirve and cross	✓	✓		✓		✓
31	Protecting glasses	✓	✓	✓	✓		✓
32	Welding transformer / -machine (400 V)	✓	✓		✓		✓
33	Welding pincers				✓		
34	Stretch band, at least 2 pieces	eventual					✓
35	Sprayer with soap-water	✓	✓		✓		✓
36	Steel brush	✓	✓	✓	✓	✓	✓
37	Mortise chisel	✓	✓		✓		✓
38	Compass saw	eventual					
39	Plug-welding machine(230 V)	✓	✓		✓		
40	Current aggregate, if required	✓					✓
41	Tapestry roller	✓	✓		✓		
42	Temperature probe	✓	✓	✓		✓	eventual
43	Carpet knife	✓	✓	✓	✓	✓	

#	Type of leak detecting	IPS-Cu	IPS-NiCr
45	Wire distance holder, per coupler 2 pieces	✓	✓
46	Electro pincer set (strip the insulation, press, cutter, kombi)	✓	✓
47	isoplus-hand-system tester, type IPS-HST	✓	✓
48	Soldering burner	✓	✓
49	Soldering tin	✓	
50	Pinch husks	✓	✓
51	Shrinking tube		✓

#	Assembling fitting	Coupler	Elbow	Branch
52	Extruder welding unit (220 V), starting from $D_s = 225$ mm	✓	✓	✓
53	Hot-air welding unit (220 V), up to $D_s = 200$ mm	✓	✓	✓
54	PE-welding wire	✓	✓	✓
34	Stretch bands	✓	✓	✓

11 HANDLING POST INSULATION

11.2 Assembling Tools

 # 1	 # 2	 # 3	 # 4	
 # 5	 # 6	 # 7	 # 8	
 # 9	 # 10	 # 11	 # 12	
 # 13	 # 14	 # 15	 # 16	 # 17
 # 18	 # 19	 # 20	 # 21	 # 22
 # 23	 # 25	 # 27		
 # 24	 # 26			

 # 28	 # 29	 # 32	 # 34
 # 30	 # 31	 # 33	 # 35
 # 36	 # 37	 # 38	 # 39
 # 40	 # 41	 # 42	 # 43
 # 45	 # 47	 # 50	
 # 46	 # 48	 # 49	 # 51
 # 52	 # 53	 # 54	

11 HANDLING POST INSULATION

11.3 Assembling Connection Coupler

11.3.1 PEHD - Shrinkable Coupler



Working Procedure

Technical description see **chapter 6.2.2**

Current assembly-instructions of the PEHD-Shrinkable Coupler are available in our download-section at www.isoplus.org .

11.3.2 isojoint X - Shrinkable Coupler



Heat-shrinkable
cross linked
PEHD-pipe



Butyl-rubber-
sealing tape



two PE-venting- and
weldable plugs each

Working Procedure

Technical description see **chapter 6.3.2**

Current assembly-instructions of the **isojoint X-Shrinkable coupler** are available in our download-section at www.isoplus.org .

11.3 Assembling Connection Coupler

11.3.3 isojoint III - Shrinkable Coupler

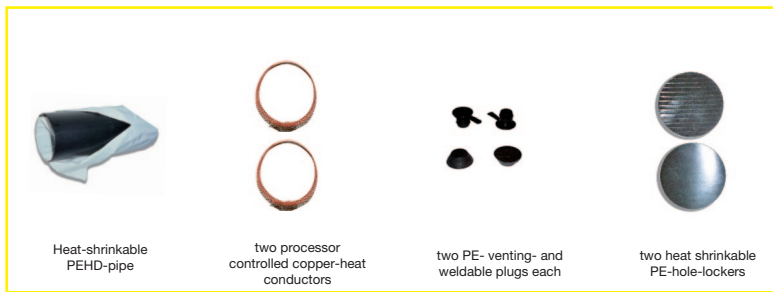


Working Procedure

Technical description see **chapter 6.4.2**

Current assembly-instructions of the **isojoint III** - Shrinkable coupler are available in our download-section at www.isoplus.org .

11.3.4 Electro - Welding Coupler

**Working procedure**

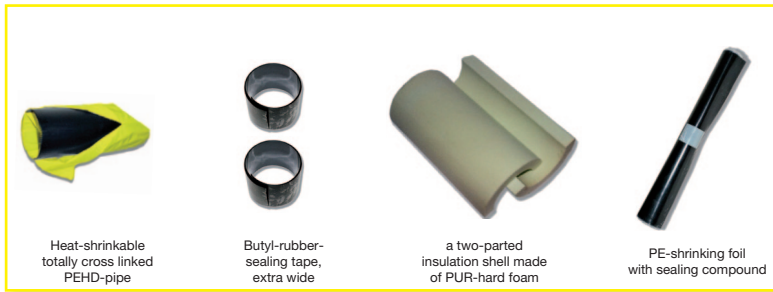
Technical description see **chapter 6.5.2**

Current assembly-instructions of the **Electro - Welding coupler** are available in our download-section at www.isoplus.org .

11 HANDLING POST INSULATION

11.3 Assembling Connection Coupler

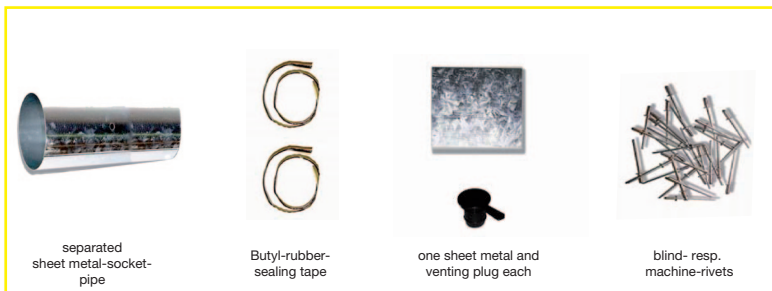
11.3.5 isocompact - Coupler



Working Procedure

Technical description see **chapter 6.6.2**

Current assembly-instructions of the **isocompact** - coupler are available in our download-section at www.isoplus.org .

11.3.6 Spiro-Coupler

separated
sheet metal-socket-
pipe

Butyl-rubber-
sealing tape

one sheet metal and
venting plug each

blind- resp.
machine-rivets

Working procedure

Technical description see **chapter 6.7.2**

Current assembly-instructions of the Spiro - coupler are available in our download-section at www.isoplus.org .

11 HANDLING POST INSULATION

11.3 Assembling Connection Coupler

11.3.7 Reduction - Shrinkable Coupler

Delivery range and technical description see **chapter 6.8.1** and **6.8.2**

11.3.8 Double Reduction - Shrinkable Coupler

Delivery range and technical description see **chapter 6.9.1** and **6.9.2**

11.3.9 Shrinkable End Coupler

Delivery range and technical description see **chapter 6.10.1** and **6.10.2**

Assembly instruction for reduction coupler, double reduction coupler and shrinkable end coupler are the same like PEHD shrinkable coupler.

They are available in our download-section at www.isoplus.org.

11.3.10 Assembling Connection Coupler / Assembling Parts

Assembly shrinking joints, bends, branch fittings, and short circuits must be separated in an axial direction during assembly, folded over the carrier pipe connection, and subsequently welded in accordance with the HDPE hot air or extrusion process.

Assembly parts should GENERALLY BE AVOIDED FOR QUALITY and WARRANTY REASONS !

Usage of these components is therefore restricted to absolute EXCEPTIONS (!!!); manufacturing may only take place at the EXPRESS WRITTEN request of the client and at the client's own risk.

Assembly joints/assembly fittings do NOT meet the requirements and regulations of EN 253 !

11.3.11 Assembling Half-Shells



Working procedure

Technical description see **chapter 3.6**

Current assembly-instructions of the Assembling Half-Shells are available in our download-section at www.isoplus.org .

11.4.1 Foam-Table

Tables for the quantity of components A (polyol) and B (isocyanate) to be used for the different joint constructions are available in our download section at www.isoplus.org

The liter quantities [ltr] given in the tables are valid for a standard weight of the joint foam of 80 kg/m³ as well as for a length [L] of 440 mm of the non-insulated pipe section (carrier pipe). For other lengths [L] in mm, the required foam quantity [V] is calculated on the basis of the given quantities [v'] (= A, B or Σ) using the following simple rule of three:

$$V = v' \cdot L / 440 \quad [\text{ltr}]$$

The stated liters apply to a processing or air temperature of $\geq +20$ °C. At lower temperatures, these quantities must be multiplied by the correction factor of 1,3.

11.5 Check list for Post Insulation

11.5.1 for Building Site - Quality Assurance

For building site it will be necessary to provide a guideline for a quality performance of the single working steps, in order to reach an optimization of the installing situation for preinsulated jacket pipes. This guideline will be valid in the same manner for civil underground engineering, pipe layer and pipe manufacturer. The most important test parameters are listed chronologically in the following table in accordance with the construction progress.

Working step	Execution and result
Considering of the working information from the corresponding system manufacturer	- The correct function of the total system is depending essentially from the consideration of all execution guidelines.
Consideration of the wiring	- Wiring regulations and building site execution have to be congruent for a later fault location
Measuring of the pipeline in sections	- Recording of the measuring values in sections Receipt of an individual standard value for the pipeline in order to evaluate modifications later on Correct electrical transmission on the complete system
Pricking out of the frontal PUR-foam of the factory produced pipes and fittings	- Avoiding of construction moisture in the couplers
Checking of reaction and validity of the PUR-foam components	- Testing of required reaction and quality of foam by providing of test-foam before the real local foaming procedure
Keeping of the temperature conditions for foaming	- Outside temperature at least 15° C, steel pipe not warmer than 45° C, in case of variation; providing of special measurements; foaming works may be not carried out at air temperatures below + 5° C and at a relative humidity above 90 %; works in the open should be avoided during rain - In case that these requirements cannot be kept, additional special measurements, i. e. weather protection, pre-heating of the pipelines, have been provided by the buyer

See **isoplus-Assembling Conditions chapter 11.5.2**

Working Steps	Execution and result
Destroying test of single couplers by taking drill-cones of 30 mm diameter or testing of the total coupler-foam	- Consideration of the quality guidelines of EN 253 and EN 489 for apparent density, cell size, water absorption, pressure resistance of the PUR-foam produced at building site
Preparing of a rough surface at the area of the shrinkable sleeves at the jacket-and socket-pipe, free from lubrication	- Creating of optimal compound conditions of the sleeves on the PEHD-surface
Heating of the coupler- and jacket-pipe for improving of the compound and heating of the sleeve	- Correct flow of the melt adhesive and lateral penetration as sign for a complete heating of the area
Thumb test	- Wrinkling should immediately disappear when moving the sleeve with the thumb, due to swimming on the melt-adhesive
Circular strength	- Tight position and correct sealing at the sleeve edges
Proportional support on coupler- and jacket-pipe	- Sleeve should be positioned constant on coupler-and jacket-pipe
Destroying test	- Check of compound strength on the underground. Removing of the sleeve in cold condition The sleeve should be removable only in small pieces and not totally in one piece
Pressure test with 0,2 bar with foam producing agent	- Demonstration of the tightness of all functional sealing areas and seams
Obvious check and inner pressure test of the seams (PEHD)	- Keeping of a constant heated and correct filled welding seam
Installing of side-pads in stripes	- Strong sticking of the expansion pad stripes on the PEHD-jacket-pipe, later filling may not loosen the pad
Installing of stripe pads with laminate covering or expansion pad complete covering	- Expansion pads should cover the pipe completely and should also tighten frontal, in order that no sand may penetrate; good push-type overlapping will be required
Leak detecting: Check of the total system after filling of the trench	- A final measurement of the pipelines in operation will result in final data which may be used for later comparisons

See **isoplus-Assembling Conditions chapter 11.5.2**

11.5 Check list for Post Insulation

11.5.2 isoplus - Assembling Conditions

for executing of insulation- and sealing works at district heating compound systems by AGFW-/BFW-approved and isoplus- factory educated assembling engineers

1. In order to assure a qualitative optimal and exact terminated post insulation, an announcement in advance of at least five working days and during the months July, August, September and October even eight working days have to be considered. The execution of the insulation and sealing works will last approximately as long as the time for the pipe laying- and welding works.
2. The exact terminated completion of the works will depend from the detailed information about the extent of the works. **isoplus** will be not responsible for exceeding of the agreed date of completion, due to not sufficient information.
3. The pipe layer will be exclusively responsible for providing of all required system accessories for post insulation works (PUR-foam, shrinkable sleeves, expansion pads etc.) as well as for a dry, frost-free and protected against direct sun irradiation storing in a lockable room or container. PUR-foam has to be stored at temperatures between + 15° C and + 25° C. The maximum storing period is 3 month.
4. In case of building ducts the delivered end- respectively shrinkable caps have to put on without any damage before the later welding works. During the welding works these parts have to be protected against heat and combustion. In case that this cannot be guaranteed, so called zip-end caps should be ordered and assembled. Standard end caps may not be cut off.
5. The completeness of all delivered accessories has to be checked and confirmed by the pipe layer at receipt of the material. Complaints will be accepted only within three days. Only the pipe layer will be responsible for any material which will disappear during the construction period.
6. The pipe layer will be generally responsible to drain the pipe trenches and to keep them free until the post insulation works will be completed, according to DIN 4033, section 5.3. The trenches have to be constructed according to the regulations of the Employer's Liability Insurance Association. The **isoplus**-laying guidelines have to be considered additionally.

The assembling progress as well as the quality of all required works, and therefore the expected lifetime of a district heating pipeline will essentially depend from a trench construction which will fulfill all regulations and guidelines.

7. PEHD-assembling fittings should be used only exceptionally, due to assembling technology reasons. These parts have to be checked and approved before using, by our technical departments concerning pipe-static. A production will be made only on written request. Sufficient construction space as well as a both side support should be available in order to produce assembling fittings at site.
8. For open line constructions the pipe layer has to install and to hold the required assembling scaffolds acc. to DIN 4420 free of charge, until completion of all laying- and post insulation works. The Employer's Liability Insurance Association regulations for prevention of accidents have to be considered.

9. Post insulation in manholes, buildings or channels will be only carried out if a sufficient ventilation and aeration can be granted at site. If this will be not the case, the shrinking works cannot be carried out.

10. Foaming works may not be carried out at air temperatures below + 5° C and at a relative humidity of more than 90 % as well as during rain. In case that this will be not possible, additional measurements, i. e. weather protection or pre-heating, has to be provided by the purchaser. The temperature of the system components, the PEHD-jacket-pipe and the carrier pipe should be at least + 15° C, however may not exceed + 45° C. As executing party of the insulation and sealing works, **isoplus** will have the right to stop or to postpone the post insulation works in case of unfavourable weather conditions.

11. The disposal of all waste resulting from the insulation and sealing works will be on charge of the pipe-layer. The **isoplus**-assemblers will pack the waste in waste-sacks and will deposit it at the agreed collection place. The disposal of PUR-waste will be made via a house-waste-garbage, according to the kind of waste catalogue of the German Environment Department, according to waste-key-number 57110 for hardened PUR-foam. The liquified Polyol- and Isocyanat-components have to be deposit at a special-waste-garbage according to the waste-key-number 57202.

12. During installation of the final components of the leak detection the pipe-layer has to assure that all buildings, manholes etc. will be accessible and not closed.

13. Additional works which will be not to **isoplus** charge, will be generally invoiced separately. This will include:

- ⇒ Additional approach and additional departure as well as overnight stay due to not sufficient information respectively not sufficient preparations.
- ⇒ Not considering of the **isoplus**-laying guidelines, especially concerning sufficient assembling space at the areas of the couplers, assembling fittings and expansion pads.
- ⇒ Cleaning works at the accessories and the welding spots, which are caused by not correct storage and not according to DIN prepared trenches.
- ⇒ Repairing of complaints at system components, caused by a third party.
- ⇒ Fees for waste disposal which has been charged to us.
- ⇒ Additional approaches to building site in case of less than eight couplers for post insulation.

14. The purchaser will be obliged to confirm the assembling reports after completion of the insulation and sealing works.

15. For all kind of documentation which will be required during assembling but which has been not agreed, respectively which was not included in the offer, **isoplus** will invoice according to the occurred additional extra works and the actual **isoplus**-rate per hour. This will be also valid for eventual required technical documents, like master drawings, static calculations, wiring drawings etc.