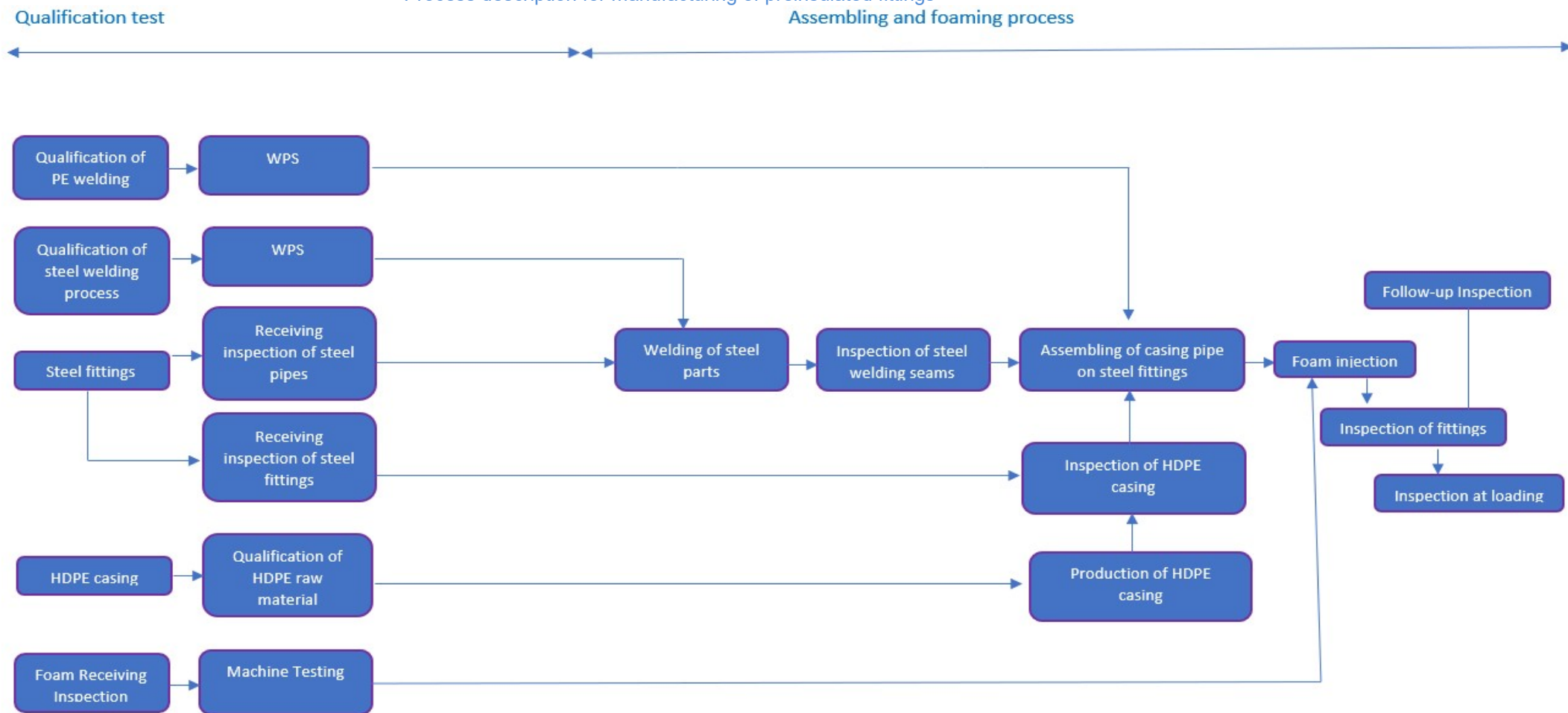


	Process and inspection plan				No.	
	Product	Preinsulated fittings			Date:	10.11.2020
	Komp no.	Preinsulated standard and special fittings			Rev. no. :	1
	Location	Ozolnieki, Latvia	Prod. Lines	-	Reviewed by:	AK
	Standard	EN 448:2020	Contract no	-	Approved by:	GL

Process description for manufacturing of preinsulated fittings



N. pk	General description	Responsible department	Inspection	Ref. to standard	Test frequency	Recording of results	Ref. to documen	Inspection			
			Accept-Criteria					L	-	-	
Qualifiaction of material or process											
1	Qualification test of new PUR material (new polyol, new isocyanatetype, new blowing agent)	Group Technology	For qualification of PUR, test fittings per machine type (high or low pressure) are manufactured on production plant. The fittings are tested according to EN 448:2020					-	H	-	-
			<u>Density</u> : The foam density is measured according to ISO 845		EN 253:2020, 4.4.4						
			<u>Water absorption</u> : The water absorption determined in accordance with EN 253:2020, 5.3.5 shall be max. 10 %. The value is an average of min. 3 test specimens		EN 253:2020, 4.4.5						

N. pk	General description	Responsible department	Inspection	Ref. to standard	Test frequency	Recording of results	Ref. to document	Inspection		
			Accept-Criteria					L	-	-
			<u>Compressive strength:</u> The compressive strength at 10% relative deformation determined according to ISO 844 shall be min. 0,3 MPa in radial direction. <u>Linear water tightness:</u> Linear water tightness determined in accordance with 5.4.6 shall be no water leaking at the bottom pipe and after 168 h. <u>Closed cell content:</u> The closed cell content determined in accordance with EN 253, 5.3.2.2 shall be min. 88%. <u>Size of cells:</u> The average size of the cells in a radial direction shall be max. 0,5 mm, determined in accordance to EN 253, 5.3.2.1. <u>Voids and bubbles:</u> Voids and Bubbles shall not constitute more than 5% of the cross sectional area when determind in accordance to EN 253, 5.3.2.3. No single voids shall leave less than 1/3 of the nominal insulation thickness between steel and casing pipe. <u>Min. insulation thickness:</u> The insulation thickness shall be min. 50 % of the nominal insulation thickness and nowhere less than 15 mm. <u>Expected thermal life and long term temperature resistance</u> <u>Thermal conductivity in unaged condition</u>	EN 253:2020, 4.4.3 EN 253:2020, 4.4.12 EN 253:2020, 4.4.2.3 EN 253.2020, 4.4.2 EN 253:2020, 4.4.2.4 EN 448:2020, 4.4.6 EN 253:2020, 4.5.6 EN 253:2020, 4.5.7	Type test	External inspection				
2	Qualification test of PE (butt fusion and extrusion) welding process	Group Technology	Butt fusion weldings shall be verified with Welding Procedure Specifications (WPS)	EN 448:2020	Type test (per Dm group)	WPS	-	H	-	-
3	Qualification test of steel welding process	Group Technology	Extrusion weldings shall be verified with Welding Procedure Specifications (WPS)	EN 448:2020	Type test (per dimension)	WPS	-	H	-	-
Competence for personell performing special processes										
4	Competence of the butt fusion welder	Plant Manager	Butt fusion weldings shall be performed by qualified welders. Welder are approved by welder-test, where test samples are inspected according to EN 448: - Visual examination of weldings - Bending test	EN 448:2020, 4.1.10.5 EN 448:2020, 4.4.3.3 EN 448, 4.4.3.4	Annual test per welder per WPS	Certificate	-	H	-	-
5	Competence of the extrusion welder	Plant Manager	Extrusion weldings shall be performed by qualified welders. Welder are approved by welder-test, where test samples are inspected according to EN 448: - Visual examination of weldings - Bending test	EN 448:2020, 4.1.10.5 EN 448:2020, 4.4.3.3 EN 448:2020, 4.4.3.4	Annual test per welder per WPS	Certificate	-	H	-	-
Inspection of equipment and machines for fabrication										
6	Inspection of foam machine	Operator (foam)	Inspection of machines mixture between ISO/POL/CP according machine sheet. A quantity of Polyol and a quantity of Isocyanate are injected in a determind period of time. Injected Polyol and Isocyanate are weighed and ration are calculated.	EN 253:2020, 4.4.1	Weekly per foam machine	Internal report	-	C	-	-

N. pk	General description	Responsible department	Inspection	Ref. to standard	Test frequency	Recording of results	Ref. to documen	Inspection		
			Accept-Criteria					L	-	-
			Record temperature and the set up of foam machine (mixture ratio). Injection sample is taken (free foaming) at correct ratio. The injection sample and foam is tested according to datasheet: - cream time - fibre time - density - tack free time Test of foammachines foaming performance according to specified performance.	EN 253:2020, 4.4.1	Once a month per foam machine	Internal report	-	C	-	-
7	Inspection of gasdetector	Plant Manager	Inspection and calibration of gas-detector (pentan)	-	Once every six months	Internal report	-	C	-	-
8	Inspection of extruder	Plant Manager	Approval of extruder by welding test.	EN 448:2020	1 welding test per machine per year	Internal report	-	H	-	-
9	Inspection of butt fusion welding machines	Plant Manager	Preparing of pressure characteristic to butt fusion machine, where the pressure of approx. 0,15 N/mm is specified.	EN 448:2020	Every second year	Pressure characteristic	-	H	-	-
			Maintenance and inspection of equipment concerning stability during welding process.	EN 448:2020		Internal report	-	H	-	-
			Approval of butt fusion equipment by welding test of 1 dimension per diameter group.	EN 448:2020	Every year per machine	Internal report	-	H	-	-
Preparation of service pipes										
10	Inspection of service pipe	Operator	Shotblasting of outside surface of steel pipes for fittings is not required. The outer surface of the pipe shall comply with rust grade A, B or C according to EN ISO 8501-1, without pitting	EN 448:2020, 4.1.11	Continuous random inspection	Internal report	-	C	-	-
Preparation and assembling of casing pipes										
11	Inspection of casing pipes	Operator	Visual inspection for scratches on casing pipe. Scratches in the casing from the handling and the storage shall not exceed 10% of the original wall thickness of the casing. On casings with a wall thickness exceeding 10 mm scratches shall not be deeper than 1 mm. Otherwise, scratches are repaired by extrusion welding.	EN 253:220, 4.5.10	Continuous random inspection	Internal report	-	C	-	-
			The inside surface of the casing pipe shall be dry and free of moisture(water). The moisture is removed by using airblasting.	-						
			The inside surface of the casing pipe shall be free of loose material and dust etc. The loose material/dust is removed by using airblasting.	-						
12	Sawing of casing pipes	Operator	The length of casing pipes are checked according to specification.	-	Continuous inspection		-	C	-	-
13	Assembling of casing pipe on raw fitting	Operator	Assembling of spacers on fittings according specification.	-	Continuous random inspection		-	C	-	-
			Assembling of alarm wires in spacers according to specification.	-			-	C	-	-
14	Extrusion welding process and inspection	Operator	All weldings shall be performed according to welding procedure specification.	-	Continuous		-	C	-	-

N. pk	General description	Responsible department	Inspection	Ref. to standard	Test frequency	Recording of results	Ref. to documen	Inspection		
			Accept-Criteria					L	-	-
			PE welding shall be visual inspected and shall fulfill requierements according to EN 448. A root overflow of 20% of the wall thickness is permitted	EN 448:2020	random inspection					
15	Butt fusion welding process and inspection	Operator	All weldings shall be performed according to welding procedure specification. Welding temperatur, warm up time, welding pressure and cooling time are specified.	EN 448:2020	Continuous random inspection		-	C	-	-
			PE welding shall be visual inspected and shall fulfill requierements according to EN 448.	EN 448:2020						
PUR foaming process										
16	Preparing of fittings for foam injection	Operator	Ensuring correct length of free pipe ends.	-	Continuous random inspection	Internal report	-	C	-	-
			Assembling of endstops on fittings-ends.	-						
			The alarm wires shall be restringed with weights or springs.	-						
17	Foam injection	Operator (foam)	Prior to foaming the surface temperatur of steel and casing pipes shall be min. 20° C.	-	-	-	-	C	-	-
			Injection of foam in pipe according to foaming sheet.	-						
			The foam is hardening. Endstops are removed.	-						
18	Inspection of preinsulated fittings	Operator	Measurement of PUR density per end. Density can be determind by measuring of foam samples. The accept criteria is specified on Machine data sheet.	-	Min. 2 fittings per shift	Internal report	-	C	-	-
			Inspection of the outside diameter at casing pipe ends.	EN 253:2020, 4.5.4	100%					
			Inspection of length of free pipe end	EN 253:2020, 4.5.3	100%					
			Inspection center line deviation at pipe ends	EN 253:2020, 4.5.5	Continuous random inspection					
			Check for visibel foam on the outside of the PE welds	EN 448, 4.4.4						
			Angular deviation between service pipe and casing	EN 448:2020, 4.4.1.3						
			Visual inspection of surfaces	-	100%	Marking with sticker at pipe ends	-	C	-	-
			Check of steel pipe ends magnetism <20G	-	100%					
			Inspection of function of alarm wire according to POLIURS specification.							
19	Follow up inspection	3rd party companies	PUR inspection:		According to requirement s of EN 253:2020	External report	-	R	-	-
			Cell structure:							
			Cell size	EN 253:2020, 4.4.2.2						
			Closed cell content	EN 253:2020, 4.4.2.3						
			Voids and bubbles	EN 253:2020, 4.4.2.4						
			Compressive strength	EN 253:2020, 4.4.3						
			Density	EN 253:2003, 4.4.4						
			Water absorption	EN 253:2020, 4.4.5						
			Fitting assembly inspection:							
			Fitting end and outside diameter	EN 448:2020, 4.4.1-4.4.5						
		Bending test	EN 448:2020, 4.4.3.4							
		Leak-tightness of welded casing	EN 448:2020, 4.4.4							
		Min. thickness of thermal insulation	EN 448:2020, 4.4.6							
		Tolerances on main fitting dimension	EN 448:2020, 4.4.7							
		Geometrical measurements:								
		Diameter	EN 253:2020, 4.5.4							
		Wall thickness	EN 253:2020, 4.5.4							
		Free pipe end	EN 253:2020, 4.5.3							
		Quality Manager								

N. pk	General description	Responsible department	Inspection	Ref. to standard	Test frequency	Recording of results	Ref. to document	Inspection		
			Accept-Criteria					L	-	-
			Angle between casing segment of bend and min length. Inspection of other geometrical measurement according to drawing.	EN 448, 4.4.2	According to requirements EN 448:2020	Internal & External reports				
			Angular deviation between service pipe and casing	EN 448, 4.4.1.3						
			Center line deviation	EN 253:2020, 4.5.5						
			Ovality of cold formed bends	EN 448, 4.1.4.2						
			Min. insulation thickness: The insulation thickness shall be min. 50 % of the nominal insulation thickness and nowhere less than 15 mm.	EN 448, 4.4.6						
		3rd party companies	Steel parts inspection:			EN 448:2020, 4.1.10.4				
			Inspection of steel welds:							
			A.Visual surface examination 100% welds							
			B.Leak-tightness test and Liquid Penetration test							
			C.Radiographic examination of welds							
Storage and Loading										
20	Inspection at loading	Operator	Check of rust on pipe ends and inside the pipe according to Poliurs standard.	-	Continuousl y inspection	-	-	C	-	-
			Visual inspection for scratches on casing pipe. Scratches in the casing from the handling and the storage shall not exceed 10% of the original wall thickness of the casing. On casings with a wall thickness exceeding 10 mm scratches shall not be deeper than 1 mm. Otherwise, scratches are repaired by extrusion welding.	-						
			Visual inspection of damages on steel pipe.	-						
			Check of type and quantity according to order-note.	-						

Inspection code:

H:	Hold point	The inspections results shall be approved by POLIURS before continuing the operation.
W:	Witness point	Stage in production where operations may be witnessed
M:	Monitor point	Stage in production where the activity is monitored.
R:	Review point	Point where inspection results is reviewed
C:	Inspection point	Point where inspection will be carried out by POLIURS