

Product Evaluation Guideline (PEG)

W 001

for certification of multilayer piping systems
PE-X /AI, PE-RT/AI, PP-R/AI and PP-RCT/AI
intended for transport of hot and cold drinking water
inside buildings

in accordance with EN ISO 21003 “Multilayer piping systems for hot
and cold water installations inside buildings”

PREFACE

This Product Evaluation Guideline (PEG) has been approved by the Board of Stakeholders (BoS), wherein all the relevant parties in the field of Plastics piping systems of PE-X/Al, PE-RT/Al, PP-R/Al and PP-RCT/Al intended for the transport of hot and cold drinking water are represented.

The BoS was established with the purpose of implementing certification in a co-operation between certification bodies.

The co-operation is based on the “General Rules for Product Certification by the co-operation of certification bodies” (GRPC) wherein the mutual recognition of surveillance reports from accredited inspection bodies as well as the acceptance of test reports of accredited test laboratories is specified.

The BoS also supervises the certification activities and where necessary require the evaluation guideline to be revised. The BoS also guides the performance of certification and updates this evaluation guideline in case necessary. Wherever the term “Board of Stakeholders” is used in this PEG, the above mentioned Board of Stakeholders is meant.

This PEG for piping system certification is based on the corresponding EN ISO piping system standard(s) in combination with the hygienic requirements.

It sets requirements for type testing as well as ongoing quality surveillance by third party inspection.

The certification bodies will use this evaluation guideline in conjunction with the “General Rules for Product Certification by the co-operation of certification bodies” (GRPC).

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REFERENCES

GRPC General Rules for Product Certification by the co-operation of certification bodies

EN 681-1, *Elastomeric seals – Materials requirements for pipe joint seals used in water and drainage Applications – Part 1: Vulcanized rubber*

EN ISO 9001, *Quality management systems – Requirements*

ISO 17456:2006, *Plastics piping systems – Multilayer pipes - Determination of long-term strength*

EN ISO 21003-1:2008 + Amd 1: 2011, *Multilayer piping systems for hot and cold water installations inside buildings – Part 1: General*

EN ISO 21003-2:2008 + Amd 1: 2011, *Multilayer piping systems for hot and cold water installations inside buildings – Part 2: Pipes*

EN ISO 21003-3:2008, *Multilayer piping systems for hot and cold water installations inside buildings – Part 3: Fittings*

EN ISO 21003-5:2008, *Multilayer piping systems for hot and cold water installations inside buildings – Part 5: Fitness for purpose of the system*

CEN ISO/TS 21003-7:2019, *Multilayer piping systems for hot and cold water installation inside buildings – Part 7: Guidance for the assessment of conformity*

1. SCOPE

This PEG is applicable to a multilayer piping systems of PE-X /Al, PE-RT/Al, PP-R/Al and PP-RCT/Al which is intended to be applied for hot and cold drinking water installation inside building at a design pressure (= maximum operating pressure) of 4, 6, 8 or 10 bar.

Note: Observe national pressure requirements in drinking water installations, see GRPC table 1.

The application class covered by this document is listed in Table 1.

Table 1: Temperature profile during 50 years

	Temperature [°C]	Lifetime	Design coefficient
T _{operation}	70	49 years	1,5
T _{max}	80	1 year	1,3
T _{malfunction}	95	100 hours	1,0

Note: This temperature profile is in accordance with application class 2 of EN ISO 21003-1.

All systems, which satisfy the conditions specified in Table 1, shall also be suitable for the conveyance of cold water for a period of 50 years at a temperature of 20 °C and a design pressure of 10 bar.

Further, the multilayer pipe of the piping system is composed of 5 layers as follows:

Inner layer made of PE-X, PP-R, PP-RCT or PE-RT with a thickness of at least 0,5 mm.

- Adhesive layer
- Aluminum layer
- Adhesive layer
- Outer layer made of thermoplastic material (including PE-X)

The total wall thickness of the pipe consists at least of 60% plastic material.

2. TERMS AND SYMBOLS

2.1. Terms

For the purposes of this PEG, the terms given in EN ISO 21003-1, CEN/ISO/TS 21003-7, the GRPC and the following apply:

Applicant: the party that applies for a certificate

Piping system: the set of pipes and fittings including transition fitting (thread adaptors) as well as optionally sealing, expansion pieces and other piping components.

Remark: Installation tools are not part of the system.

2.2. Symbols

For the purposes of this PEG, the terms given in EN ISO 21003-1, CEN/ISO/TS 21003-7, the GRPC and the following apply:

CB	Certification body
CCB	Co-operation of certification bodies
BoS	Board of Stakeholders
PEG	Product Evaluation Guideline
GRPC	General Rules of Product Certification by the co-operation of certification bodies
FPC	Factory production control
BRT	Batch release test
PVT	Product verification test
PE-X	Cross-linked polyethylene
PE-RT	Polyethylene of raised temperature resistance
PP-R	Polypropylene random copolymer
PP-RCT	Polypropylene random copolymer with modified crystallinity

3. CONDITIONS FOR CERTIFICATION

The issuing of a certificate requires that the applicant commits himself to follow the GRPC and this PEG.

4. APPLICATION FOR A CERTIFICATE

The applicant shall use the application form from the CB to choose the requested certification. This application form shall be sent to the chosen certification bodies.

The application shall include:

- Reports covering type tests and initial inspection according to clause 7.2 and description of each component intended to be covered in the certificate. Technical specifications and when appropriate, drawings can be used. Type test reports or any other reports should preferably be presented in English language.
- Specification of the type of raw material used in pipes and fittings including the name of its manufacturer.
- If applicable information concerning manufacturer and type of the sealing rings, together with documentation that the sealing ring material meets the requirements of the relevant standard, EN 681-1, either by a valid certificate or with test reports from an accredited body.
- Description of the manufacturer's internal quality control system (quality plan) and a list of instructions for factory production control of the relevant product according to clause 7.3.
- Installation manual

Certificates can only be issued to the supplier of the piping system.

Note: The applicant may purchase externally parts of the complete piping system (e. g pipes, fittings or other components) which are in the scope of the certification. In such case, the supplied parts shall either be certified by the supplier under his own brand, or they shall be considered as subcontracted products and shall be certified as such under the applicant's brand.

5. CERTIFICATE

The certificate can be granted when all requirements of this document are met, including the requirements of the GRPC. The production site shall be listed in an annex of the certificate and shall only be available for certificate holder and the certification body and their partners.

6. PERFORMANCE REQUIREMENTS

The pipes, fittings and joints of the piping system as specified in clause 1 shall be tested with regard to their proper functioning. All requirements of the tests in EN ISO 21003 part 1, 2, 3 and 5 have to be fulfilled, see Annex A.

All components of the installation system in contact with drinking water have to fulfill the hygienic requirements of the countries where the cooperating certification bodies acc. GRPC are registered.

7. TESTING AND INSPECTION

7.1 General

Testing and inspection include:

- type testing and initial inspection, clause 7.2
- factory production control (BRT, PVT), clause 7.3
- periodical inspection and audit testing (AT), clause 7.4
- Change in design, compound, production method, production site and extension of product range, clause 7.5

For testing and inspection the grouping to pressure groups (table 2) and to size groups (table 3), according to CEN ISO/TS 21003 part 7:2019 applies.

Table 2

Pressure group	Operating pressure, p_{op} [bar]
1	4; 6
2	8; 10

Table 3

Size group	1	2	3
Nominal outside diameter, d_n [mm]	$10 \leq d_n \leq 26$	$26 < d_n \leq 63$	$d_n > 63$

The grouping of fittings additionally is according to Table 4, which is according to CEN ISO/TS 21003 part 7:2019.

Table 4

Fitting group	Fitting type
1	Elbows, tees, reducers, couplers, end caps
2	Unions, flange adaptors, transition fitting, adaptor pieces and/or their plastics parts, and others

7.2 Type testing and initial inspection

7.2.1 Type testing

Type testing shall be carried out on material/compound, pipes and fittings, which are to be included in the certificate and to the extent stated in annex A. Type testing for two material changes at the same time is stated in table A.3.

Samples for the type test may be taken by the manufacturer or an auditor. At least one fitting with female thread and one fitting with male thread should be tested in the type test.

The samples shall be documented in such a way that suitable measures can be taken to ensure that the samples for the subsequent surveillance tests correspond to those for the type approval test. Such measures may include checking functionally relevant dimensions and composition.

For characteristics, which require third party involvement, the testing shall be carried out by a testing laboratory according to the GRPC.

The type test report shall confirm that all requirements are fulfilled with regard to the relevant material/compound and pipes/fittings and verify that the manufacturers test results are available and fulfils the requirements in this PEG. The type test report shall state the designation of material from which the pipes and fittings are made.

7.2.2 Initial inspection

The initial inspection shall be carried out by auditors qualified according to the GRPC before the certificate is issued. Existing inspection reports may be used.

The initial inspection shall verify that the manufacturers system for quality assurance for relevant products at the production site(s) is according to EN ISO 9001 or equivalent.

Note: The use of a common CCB checklist for the initial inspection list is preferred.

7.3 Factory production control (FPC), batch release test (BRT) and process verification test (PVT)

The manufacturer is responsible for demonstrating through described procedures and written instructions that pipes and fittings fulfill the requirements of this PEG.

The manufacturer is responsible for ensuring that the instructions concerning the internal quality control (FPC, BRT, PVT) are available for the personnel in the language of the manufacturing country concerned.

Records of the internal quality control shall be dated, traceable and available to the external inspector according to clause 7.4.

The records shall include information of - or traceability to

- Type of raw material
- Certificate of raw material
- Compound / recipe identification / designation
- Batch number
- Date of production

7.3.1 Batch release test (BRT)

The manufacturer shall specify a batch or lot in his quality plan. Batch release testing is carried out by the producer and includes determination of the characteristics listed in A.2 with the specified minimum sampling frequencies.

Documentation from the control should be kept at least for 5 years.

A batch or lot shall only be released for supply when all the relevant tests and inspections have been carried out at least once at the specified frequencies and the requirements have been met.

If a product fails in respect of any characteristic given in A.2, as applicable, the batch or lot shall be rejected or the retest procedure shall be performed for the characteristic on which the product failed.

The retest procedure shall be given in the manufacturer's quality plan.

7.3.2 Process Verification test (PVT)

Process verification testing is carried out by the producer and includes determination of the characteristics listed in A.3 with the specified minimum sampling frequencies.

Documentation from the control should be kept at least for 5 years.

If a product does not conform to the requirements in respect of any characteristic given in A.3, as applicable, the retest procedure detailed in the manufacturer's quality plan shall be performed.

If the retest procedure does not confirm conformity of the product to the requirements, then the process shall be investigated and corrected in accordance with the procedures given in the manufacturer's quality plan, as well as to verify the characteristics given in A.3, as applicable.

A test performed as an AT does not need to be repeated as a PVT.

7.3.3 Indirect testing

Generally, testing shall be performed using the test methods referred to ISO 21003. Indirect testing may be used for BRT characteristics as given in A.2. Indirect testing shall not be used for TTs, PVTs or ATs.

The indirect test method used and the correlation or safe relationship of the indirect testing to the specified testing shall be documented in the manufacturer's quality plan. The continuing validity of the indirect testing shall be checked at regular intervals. In cases of dispute, the BRT as specified in A.2 shall be used.

The indirect testing shall be accepted by certification body.

7.4 Periodical inspection and audit testing

Periodical inspection and the audit testing of all system components (materials/compounds, multilayer pipes as well as fittings made of plastic and metallic materials), as part of the current certificate shall be carried out by auditors qualified according to the GRPC and testing laboratory according to the

specifications defined in the GRPC. The required extent of audit testing is given in A.4.

The periodical inspection shall verify that the manufacturers FPC system for the relevant products at the production site(s) is according to this PEG. If the requirements are not fulfilled the certification body decides, if necessary in consent with the inspection body/testing laboratory concerned, which actions shall be taken.

Deficiencies in the internal control and/or in the test results may result in a cancelling of the approval marking temporarily or definitely until actions are taken to state correct quality. The certification body may even extend the amount of testing to be carried out within a fixed period.

Note: See the GRPC.

7.5 Change in design, compound, production site, production method and extension of product range

Relevant type testing shall not only be carried out on new systems, but whenever there is a change in design, compound, production site or production method, other than routine in-process adjustments, and/or whenever there is an extension of the product range.

In all these cases the characteristics according to A.1 and CEN ISO/TS 21003-7:2019 shall be tested.

The applicant shall in advance inform the certification body of any relevant change. Only products with changes approved by the CB can be certified.

8. MARKING

Pipes and fittings included in the certificate shall be marked with:

- Information according to EN ISO 21003-2 clause 16 or EN ISO 21003-3 clause 11 respectively.
- The conformity mark according to the specific rules of the CB, see annex A, table 2 of the GRPC.
- If relevant, the certificate number.

9. REGISTER

Register of approved systems according to this product evaluation guideline can be found on the homepage of each certification bodies of this co-operation, see GRPC, annex A, table 1.

ANNEX A

Extent of testing

A.1.1 Type testing (TT)

For characteristics of plastic fittings that require type testing (TT) see CEN ISO/TS 21003-7: 2019, table 8 and for characteristics of metal fittings that require type testing (TT) see CEN ISO/TS 21003-7: 2019, table 9.

Table A.1 – Tests of PE-X/Al, PE-RT/Al, PP-R/Al and PP-RCT/Al pipes that require type testing (TT) (see also ISO/TS 21003-7:2019, table 6).

M-pipes	ISO 21003-2	I	Change of								P	E	T	Sampling	
			M1a	M1b	M2	M3	M4	M5	M6	M7					M8
Appearance	6.1	X	X	X				X	X	X	X	X	X	3 pipes of 1 m per dimension	
Dimensions	8.2	X	X	X	X	X	X	X				X	X	3 pipes of 1 m per dimension	
Long term strength complete testing	9.1 ISO 17456 6.2.3	X		X		X						X	X ¹⁾	X ¹⁾	weakest dimension / dimension group / similar construction type
Long term strength conformation testing	9.1 ISO 17456 6.2.4	X	X	X		X				X		X	X ²⁾	X ²⁾	other dimensions / similar construction type additive package: one dimension / dimension group
Strength of weldline / Control point tests 95°C/22/165/1000h ⁵⁾	9.1/11 ISO17456 6.2.5	X			X	X				X		X	X	one dimension / dimension group	
Thermal stability inner layer 110°C/ >1 year	10.2.1	X	X	X					X	X		X	X ³⁾	X ³⁾	one pipe of one dimension / material
Thermal durability outer layer	10.2.2 Annex C	X						X		X		X	X ⁴⁾	X ⁴⁾	one dimension / material
Delamination before and after TCT	12.2	X	X	X	X	X						X	X		one dimension / similar construction type
Long term strength inner layer material	14	X	X	X					X						one dimension / material
Degree of crosslinking (PE-X inner layer)	14	X	X	X					X			X			one dimension / similar construction type
MFR (PE-RT, PP-R and PP-RCT inner layer)	14	X	X	X					X			X			one dimension / similar construction type
Aluminium	14	X				X									documentation check
Hygiene		X	X	X	X				X	X		X			acc. national requirements
System	ISO 21003-5	I	Change of								P	E	T	Sampling	
			M1a	M1b	M2	M3	M4	M5	M6	M7					M8
Resistance to internal pressure ⁷⁾	5.2	X	X	X		X ⁶⁾		X					X ⁹⁾	X ⁶⁾	all dimensions / jointing technique
Bending ⁸⁾	5.3	X		X		X ⁶⁾							X ⁹⁾	X ⁶⁾	smallest and largest dimension / size group / jointing technique
Pull out ⁷⁾⁸⁾	5.4	X		X		X ⁶⁾		X					X ⁹⁾	X ⁶⁾	smallest and largest dimension / size group / jointing technique
Thermal cycle ⁷⁾	5.5	X	X	X	X ⁶⁾	X ⁶⁾	X ⁶⁾	X ⁶⁾					X ⁹⁾	X ⁶⁾	all dimensions Change with same type material inner- and/or outer layer: smallest and largest dimension / size group / jointing technique
Pressure cycle ⁷⁾⁸⁾	5.6	X		X		X ⁶⁾							X ⁹⁾	X ⁶⁾	smallest and largest dimension / size group / jointing technique
Vacuum ⁷⁾⁸⁾	5.7	X		X									X ⁹⁾	X ⁶⁾	smallest and largest dimension / size group / jointing technique

¹⁾ If dimension is weaker

²⁾ Stronger dimension

³⁾ If inner layer is thinner than the one tested in initial type test

⁴⁾ If outer layer is thinner

⁵⁾ Results of "Complete testing" or "Confirmation testing" can also be used instead of "Control point tests", if these points can also be taken from the other tests, where applicable.

⁶⁾ Test shall be made on one product diameter per size group and jointing system.

⁷⁾ Combination with 2 pressprofiles or 2 different fittings with one pipe type or combination of 2 different pipe types with one fitting and one press profile allowed.

⁸⁾ Not for welded and cemented joints.

9) Outside the current dimension group

- Note:**
- Additives: Stabilizers, anti-oxidants, peroxide (PE-Xa), silan catalyst (PE-Xb).
 - Additives / pigments with the same CAS number are considered as identical substances.
 - Change of amount of any stabilizer, peroxide or other additives or pigments equal or less than $\pm 30\%$ requires no testing.
 - For a decrease of amount of peroxide no thermal stability test 110°C/1 year is required.

- I = Initial type test due to a new product (pipe or fitting), i.e. full type testing
- M1a = Change of inner layer material grade (e.g. from PE-Xa to PE-Xa)
- M1b = Change of inner layer material (e.g. from PE-Xa to PE-RT Type II)
- M2 = Change of inner adhesive material
- M3 = Change of Al layer material
- M4 = Change of outer adhesive material
- M5 = Change of outer layer / additive material outer layer
- M6 = Change of additive package inner layer
- M7 = Change of color masterbatch inner layer
- M8 = Change of color masterbatch outer layer
- P = Change of production location
- E = Extension product range
- T = Change of the thickness of an inner or outer or aluminum layer

A.1.2 Two material changes at the same time

Table A.2 – Description of tests for table A.3

Abbreviation	Description		Sampling
A Appearance	Appearance	ISO 21003-2: 6.1	all dimensions
B Dimensions	Dimensions	ISO 21003-2: 8.2	all dimensions
C Strength	Long term strength complete testing	ISO 21003-2: 9.1 ISO 17456 6.2.3	weakest dimension / similar construction group
D Confirmation	Long term strength conformation testing	ISO 17456 6.2.4	other dimensions / similar construction group additive package: one dimension / dimension group
E 110°C test	Thermal stability inner layer 110°C/ >1 year	ISO 21003-2: 10.2.1	one dimension / material
F Thermal durability	Thermal durability outer layer	ISO 21003-2: 10.2.2 Annex C	one dimension / material
G Delamination	Delamination before and after TCT	ISO 21003-2: 12.2	one dimension / similar construction group
H Long term	Long term strength inner layer material	ISO 21003-2: 14	one dimension /material
I Crosslinking	Degree of crosslinking (PE-X inner layer)	ISO 21003-2: 14	one dimension / similar construction group
J MFR	MFR (PE-RT inner layer)	ISO 21003-2: 14	one dimension / similar construction group
K Control points	Strength of weldline / Control point tests 95°C/22/165/1000h	ISO 21003-2: 11 ISO 17456 6.2.5	one dimension / dimension group
L Hygiene	National hygienic requirements		smallest dimension
M Waterpressure ¹⁾	Resistance to internal pressure	ISO 21003-5: 5.2	all dimensions / jointing technique

Abbreviation	Description		Sampling
N Bending ²⁾	Bending test	ISO 21003-5: 5.3	smallest and largest dimension / size group / jointing technique
O Pull out ¹⁾²⁾	Pull out test	ISO 21003-5: 5.4	smallest and largest dimension / size group / jointing technique
P Thermal cycle ¹⁾	Thermal cycle test	ISO 21003-5: 5.5	all dimensions Change with same type material inner- and/or outer layer: smallest and largest dimension / size group / jointing technique
Q Pressure cycle ¹⁾²⁾	Pressure cycle test	ISO 21003-5: 5.6	smallest and largest dimension / size group / jointing technique
R Vacuum ¹⁾²⁾	Leaktightness under vacuum	ISO 21003-5: 5.7	smallest and largest dimension / size group / jointing technique

¹⁾ Combination with 2 pressprofiles or 2 different fittings with one pipe type or combination of 2 different pipe types with one fitting and one press profile allowed.

²⁾ Not for welded and cemented joints.

Table A.3 – Type testing for two material changes at the same time

First layer change	+ second layer change	combination with		M-pipe											piping system						
				Appearance	Dimensions	Strength	Confirmation	110°C test	Thermal durability	Delamination	Long term	Crosslinking	MFR	Control points	Hygiene	Waterpressure	Bending	Pull out	Thermal cycle	Pressure cycle	Vacuum
Inner layer - same type material (Annex A ISO 21003-7)	Inner adhesive material	Current	1	X	X					X			X	X							
		new	2	X	X		X	X		X	X	X	X	X				X			
	Al layer material	Current	3	X	X	X ¹⁾	X ²⁾			X											
		new	4	X	X		X	X		X	X	X	X	X				X			
	additive package inner layer	Current	5	X	X		X	X			X	X	X	X							
		new	6	X	X		X	X			X	X	X	X				X			
	color masterbatch inner layer	Current	7	X	X			X						X	X						
		new	8	X	X		X	X			X	X	X	X	X			X			
	outer layer / additive material outer layer	Current	9	X	X				X							X		X	X		
		new	10	X	X		X	X	X		X	X	X	X		X		X	X		
	color masterbatch outer layer	Current	11	X	X				X												
		new	12	X	X		X	X	X		X	X	X	X		X			X		
		adhesive material		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
Inner adhesive layer	Al layer material	Current	13	X	X	X ¹⁾	X ²⁾			X											
		new	14	X	X	X ¹⁾	X ²⁾			X				X							
	additive package inner layer	Current	15	X	X		X	X			X	X	X	X							
		new	16	X	X		X	X			X	X	X	X							
	color masterbatch inner layer	Current	17	X	X			X						X	X						
		new	18	X	X			X						X	X						
	outer layer / additive material	Current	19	X	X				X						X	X		X	X		
		new	20	X	X				X						X	X		X	X		
color masterbatch outer layer	Current	21	X	X				X						X							
	new	22	X	X				X						X							
		additives		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
Additive package inner layer	color masterbatch inner layer	Current	23	X			X	X						X							
		new	24	X			X	X						X							
	outer layer / additive material outer layer	Current	25	X	X				X					X	X		X	X			
		new	26	X	X		X	X	X					X	X		X	X			
	color masterbatch outer layer	Current	27	X					X					X							
		new	28	X			X	X	X					X							
		color batch		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
color masterbatch inner layer	outer layer / additive material outer layer	Current	29	X	X				X					X	X		X	X			
		new	30	X	X			X	X					X	X		X	X			
	color masterbatch outer layer	Current	31	X					X					X							
		new	32	X				X	X					X							

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- Note:** - Additives: Stabilizers, anti-oxidants, peroxide (PE-Xa), silan catalyst (PE-Xb).
- Additives / pigments with the same CAS number are considered as identical substances.
- Change of amount of any stabilizer, peroxide or other additives or pigments equal or less than $\pm 30\%$ requires no testing.
- For a decrease of amount of peroxide no thermal stability test 110°C/1 year is required

¹⁾ different alloy

²⁾ same Al alloy from another supplier

The test results of testings according to table A.3 only apply to exactly the unique material combination taken from column 1 "First layer change" and column 2 "Second layer change", e.g. a new inner layer material in combination with a new inner adhesive layer material.

A.1.3 Interchangeability of different material grades

In case of exchanging a material grade by a different material grade, for one or several layers, the method described in ISO/TS 21003-7:2019, Annex A, applies.

A.2 Batch release testing (BRT)

Characteristics of pipes and minimum sampling frequencies for BRT

See CEN ISO/TS 21003-7:2019, table 11

Characteristics of plastic fittings and minimum sampling frequencies for BRTs

See CEN ISO/TS 21003-7:2019, table 12

A.3 Process Verification Test (PVT)

Characteristics of pipes and minimum sampling frequencies for PVT

See CEN ISO/TS 21003-7:2019, table 13

Characteristics of plastic fittings and minimum sampling frequencies for PVT for fittings

See CEN ISO/TS 21003-7:2019, table 14

A.4 Audit test (AT)

M-pipes	ISO 21003-2	frequency	sampling
appearance	6.1	1x year	one dimension / per dimension groupe
dimensions	8.2	1x year	one dimension / per dimension groupe
degree of crosslinking (PE-X inner layer)	14	1x year	one dimension / per dimension groupe
MFR (PE-RT inner layer delta of 20%)	14	1x year	one dimension / per dimension groupe
resistance to inner water-pressure 95°C / 1000h	ISO 17456 6.2.5	1x year	one dimension / per dimension groupe
Marking	16	1x year	one dimension / per dimension groupe
Hygiene		1x year	acc. national requirements
Fittings	ISO 21003-3	frequency	sampling
appearance	6.1	1x year	3 fittings / per dimension groupe / per fitting group
metal material	5.3	1x year	one fitting per material
dimensions	7	1x year	3 fittings / per dimension groupe / per fitting group
Fitting body internal pressure test 95° / 1000h	8.3 (table 2)	1x year	3 fittings / per dimension groupe / per fitting group
Sealing elements	9.3	1x year	available testreport according EN 681-1
Marking	11	1x year	3 fittings / per dimension groupe / per fitting group
Hygiene		1x year	acc. national requirements
System	ISO 21003-5	frequency	sampling
Resistance to inner water-pressure 95° / 1000h	5.2	1x year	one dimension/ jointing technique