Deutsches Institut für Bautechnik

Approval body for construction products and types of construction

Bautechnisches Prüfamt

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European Technical Assessment ETA-15/0878 of 19 August 2016

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General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	RAXINOX PIPING SYSTEM
Product family to which the construction product belongs	Kit for the transport of cold and hot water inside buildings
Manufacturer	Viega GmbH & Co. KG Viega Platz 1 57439 Attendorn DEUTSCHLAND
Manufacturing plant	gemäß Anhang see Annex
This European Technical Assessment contains	13 pages including 1 annex which form an integral part of this assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	European Assessment Document (EAD) 290001-00-0701
This version replaces	ETA-15/0878 issued on 1 June 2016

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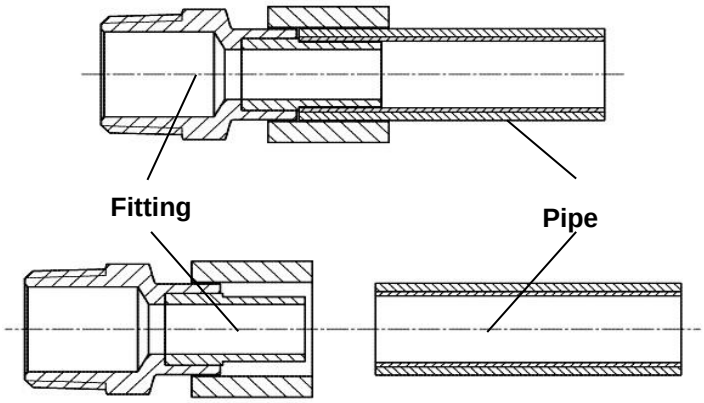
Specific Part

1 Technical description of the product

The piping system consists of a:

- medium conveying inner pipe made of stainless steel provided with a solid fixed smooth outer covering layer of polyethylene and
- stainless steel/plastic composite press fittings.

Figure 1: Piping System



2 Specification of the intended use in accordance with the applicable EAD

The kit is used for the transport of cold and hot water inside buildings.[1] Operating temperature is 70 °C with a maximum temperature of 80 °C and a malfunction temperature of 95 °C according to table 2 of EN 806-2:2005. The maximum operating pressure is 10 bar with a safety factor of 1.5 (see Table 1).

Table 1: Temperature profiles during 50 years according to EN 806-2 table *2*

Application class	Operating temperature	Maximum temperature	Malfunction temperature	Typical field of application
1	60 °C for 49 years	80 °C for 1 year	95 °C for 100 h	Hot water supply (60 °C)
2	70 °C for 49 years	80 °C for 1 year	95 °C for 100 h	Hot water supply (70 °C)

[1] **Remark:** The feature "impact on the quality of water intended for human consumption" is not addressed in this European Technical Assessment. The conformity of the water distribution system with this European Technical Assessment cannot be interpreted as a presumption of the serviceability of the product for the transport of water intended for human consumption within the meaning of Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonized conditions for the marketing of construction products (CPR). Therefore only water distribution systems are used for the transport of water intended for human consumption in accordance with this European technical Assessment if they meet the relevant applicable requirements at the place of use national, regional or local legal. Therefore, water distribution systems in accordance with the European Technical Assessment can only be used for the transport of water intended for human consumption, if they fulfill the applicable national, regional or local legal requirements at the point of use.

The kit which fulfills the conditions specified in Table 1, it can be assumed, that these are also suitable for transporting of cold water for a period of 50 years at a temperature of 20 °C and an operating pressure of 10 bar.

3 Performance of the product and references to the methods used for its assessment

3.1 Mechanical resistance and stability (BWR 1)

Not applicable

3.2 Safety in case of fire (BWR 2)

The pipe - excluding the stainless steel/plastic composite press fitting parts - were tested on reaction to fire according to EN ISO 11925-2 and classified according to EN 13501-1 as fire class E.

The plastic composite parts of the press fitting are very thin. Therefore it has be constituted that these parts in connection with the pipe do not make any contribution to fire growth or to the fully developed fire and they have no influence to smoke hazard. In the context of this end use application of the stainless steel/ plastic composite press fittings can be considered to satisfy any reaction to fire requirements.

The stainless steel parts of the press fitting are considered to satisfy the requirements for performance class A1 of the characteristic reaction to fire in accordance with the EC Decision 96/603/EC (as amended) without the need for testing on the basis of it fulfilling the conditions set out in that Decision and its intended use being covered by that Decision.

3.3 Safety and accessibility in use (BWR 4)

Essential characteristics and methods of verification and performance of the kit is given in Table 2.

Table 2: Essential characteristics and methods of verification and performance of the kit

Essential characteristic of the pipe	**Method of Verification**	**Performance**
Pipe	**3.3.1**	
Pipe Materials	**3.3.1.1**	
Stainless Steel	3.3.1.1.1	level
Plastics	3.3.1.1.2	level
Pipe characteristics	3.3.1.2	
Surface condition	3.3.1.2.1	level
Dimensions	3.3.1.2.2	level
Internal pressure resistance	3.3.1.2.3	level
Homogeneity of the weld seam	3.3.1.2.4	level
Bond of layers	3.3.1.2.5	level
Bending behavior at low temperatures	3.3.1.2.6	level
Behaviour under bending stress	3.3.1.2.7	level
Thermal durability of the outer layer	3.3.1.2.8	level

Fitting	**3.3.2**	
Fitting Materials	**3.3.2.1**	
Stainless steel	3.3.2.1.1	level
Plastics	3.3.2.1.2	level
Fitting characteristics	3.3.2.2	
Surface condition	3.3.2.2.1	level
Dimensions	3.3.2.2.2	level
Internal pressure resistance	3.3.2.2.3	level
Piping system	**3.3.3**	
Vacuum resistance	3.3.3.1	level
Pressure cycling resistance	3.3.3.2	level
Thermal cycling resistance	3.3.3.3	level
Internal pressure resistance	3.3.3.4	level
Pull-out resistance	3.3.3.5	level
Bending resistance	3.3.3.6	level
Leak path protection functionality	3.3.3.7	level

3.3.1 Pipe

3.3.1.1 Pipe materials

3.3.1.1.1 Stainless steel

The identity of the stainless steel alloy has been evidenced according to EN 10088-2, clause 7.2.

The stainless steel alloy of the pipe complies with type 1.4435 according to EN 10088-2.

3.3.1.1.2 Plastics

The conformity of the supplied plastic materials has been evidenced by means of an inspection certificate 3.1 according to EN 10204. Clean own re-processable material which is the same as the virgin material may be added to that virgin material. External re-processable material shall not be used.

The plastic material used is a PE-RT type II complying with EN ISO 22391. The PE-RT II is solidly fixed to to the stainless steel by means of a melt adhesive.

3.3.1.2 Pipe characteristics

3.3.1.2.1 Surface condition

A test report on the visual inspection of the inner and outer surface of the pipe and the weld seam, describes the surface roughness, the occurrence of scratches, voids and other surface irregularities.

The uniformity of the pipe surfaces, the inner and outer pipe surface and of the weld seam has been determined by visual inspection of the manufacturer. The surface finish of the tested pipe exhibited in comparison with the reference sample no influencing properties to the fitness for use.

3.3.1.2.2 Dimensions

The dimensions of the pipe have been measured in accordance to EN ISO 3126. The accordance of the measured dimensions and the technical drawings as provided by the manufacturer has been confirmed.

3.3.1.2.3 Internal pressure resistance

The internal pressure resistance of the pipe has been determined in accordance with EN ISO 1167-1, EN ISO 1167-2 and the conditions given in Table 3.

The test report states, that the time to failure of the pipe exceeds more than 5 minutes.

Table 3: Test conditions for internal pressure resistance

temperature [°C]	pressure [bar]	length [mm]	specimens [ ]
23	40	> 500	3

3.3.1.2.4 Homogeneity of the weld seam

The homogeneity of the weld seam is characterized by shape, absence of holes and other irregularities limiting the performance of the system. The used means for the continuous monitoring of the weld seam comply with EN ISO 15549.

3.3.1.2.5 Bond of layers

The sufficient bond of the layers between the stainless steel and plastic parts of the pipe was detected by determining the peel force F_{pull} to separate the layers.

The assessment has been performed at 23 °C with pipes of two different conditions (a) and (b):

(a) without any further conditioning

(b) thermal cycling conditioning in accordance with EN 12293 using the test parameters given in EN ISO 21003-5, clause 5.5, table 5

The peel force has been assessed by means of a test report according to ISO 17454[2], clause 9 stating, that F_{pull} exceeds 50 N/cm for both conditions (a) and (b).

3.3.1.2.6 Bending behaviour at low temperatures

The correlation between bending radius and the occurrence of irregularities like folds, cracks or buckles has been determined.

The correlation between bending radius and the occurrence of irregularities is assessed by bending tests using a form/template as shown in EN ISO 3503, figure 1. Comparison testing has been performed with the smallest bending radius and a reference showing the most critical pattern of irregularities on the inner surface of the pipe, both as specified by the manufacturer.

The sequence of bending tests has been defined as follows:

Step 1 3 straight test specimens per nominal dimension shall be conditioned for > 2 hours at 0 (zero) °C ± 1 °C

Step 2 Each specimen has been bent to an angle of > 90° at the specified smallest radius using the form/template shown in EN ISO 3503, figure 1

Step 3 The bent specimen relaxed for > 30 seconds

Step 4 The specimens following step 3 has been bent in the reverse direction for > 20°.

All of the above steps 2 – 4 are been performed within one minute. Following bending step 4, the bent pipe has been compared immediately visually with the specified reference.

The minimum bending radius specified by the manufacturer is 4 times the outer pipe diameter.

The test report states

- that the manufacturer provided a reference sample showing the most critical allowed pattern of irregularities.
- 3/3 bent test specimen show less critical pattern of irregularities compared to the reference.

[2] Note: In deviating from ISO 17454 the number of test pieces has been reduced from 10 to 5 pieces for each condition.

3.3.1.2.7 Behaviour under bending stress

The correlation between bending radius and internal pressure resistance has been determined.

The correlation between bending radius and resistance to internal pressure has been assessed by using a form/template as shown in EN ISO 3503, figure 1. The test has been performed with the smallest bending radius as specified by the manufacturer. The bent pipe has been exposed to internal pressure resistance according to EN ISO 1167-1.

The sequence of bending tests has been defined as follows:

Step 1 3 straight test specimens per nominal dimension shall be conditioned for > 2 hours at 23 °C ± 2 °C

Step 2 Each specimen shall be bent to an angle of > 90° at the specified smallest bending radius using the form/template shown in EN ISO 3503, figure 1

Step 3 Relax the bent specimen for > 30 seconds

Step 4 The specimens following step 3 shall be bent in the reverse direction for > 20°.

All of the above steps 2 – 4 have been performed within one minute. Following step 4, the bent pipe was exposed to internal pressure resistance according to EN ISO 1167-1 and the test conditions given in Table 4.

Table 4: Test conditions for behaviour under bending stress

temperature [°C]	pressure [bar]	specimens [ ]
23	40	3

The test report states that

- the bent samples exposed to internal pressure exceed 5 minutes time to failure
- the smallest bending radius as specified by the manufacturer:

  Outer diameter: 16 mm – bending radius: 64 mm

  Outer diameter: 20 mm – bending radius: 80 mm

3.3.1.2.8 Thermal durability of the outer layer

The thermal durability of the pipe outer layer has been determined by oven ageing.

The thermal durability of the pipe outer layer has been assessed by exposing the complete pipe to a test procedure according to EN ISO 21003-2, Annex C (see Table 5). No sample showed signs of cracks by visual inspection after 8760h.

Table 5: Test conditions for thermal durability

temperature [°C]	time [h]	specimens [ ]
110	8760	3

3.3.2 Fitting

3.3.2.1 Fitting Materials

3.3.2.1.1 Stainless steel

The identity of the stainless steel alloy has been evidenced according to EN 10088-2, clause 7.2, EN 10088-3, clause 7.2 or EN 10283, clause 8. The stainless steel alloy of the fitting complies with type 1.4401 and 1.4404 according to EN 10088-2 and EN 10088-3 and type 1.4408 according to EN 10283.

3.3.2.1.2 Plastics

The conformity of the supplied plastic materials has been evidenced by means of an inspection certificate 3.1 according to EN 10204.

The plastic material intended for the transport of cold and hot water is PPSU complying with DIN 16838.

3.3.2.2 Fitting characteristics

3.3.2.2.1 Surface condition

The inner and outer surface of the fitting has been determined by visual inspection.

The inner and outer surfaces of the fittings are free of scratches, voids and other surface irregularities when being compared to a reference product.

3.3.2.2.2 Dimensions

The dimensions of the fitting parts have been determined by means of technical drawings as provided by the manufacturer. The dimensions of the fitting parts have been measured in accordance to EN ISO 3126.

The accordance of the measured dimensions and the technical drawings as provided by the manufacturer has been confirmed.

3.3.2.2.3 Internal pressure resistance

The fitting parts made of plastic and intended for the transport of cold and hot water have been determined for their internal pressure resistance.

The internal pressure resistance of the plastic fitting parts intended for the transport of cold and hot water has been assessed by means of a test report in accordance to EN ISO 21003-3, clause 8, which stated that the test parameters given in EN ISO 21003-3, clause 8.3, table 2, are met (see Table 6).

Table 6: Test conditions internal pressure resistance

temperature [°C]	pressure [bar]	time [h]	specimens [ ]
20	44,8	1	3
95	25,3	1000	3

3.3.3 Piping system

3.3.3.1 Vacuum resistance

The vacuum resistance of the piping system has been determined in accordance to EN 12294.

The vacuum resistance of the piping system has been assessed by means of a test report in accordance to EN 12294, clause 7, which stated that the test parameters given in EN ISO 21003-5, clause 5.7, table 7, are met (see Table 7).

Table 7: Test conditions vacuum resistance

temperature [°C]	pressure [bar]	time [h]	specimens [ ]
23	-0,8	1	3

3.3.3.2 Pressure cycling resistance

The pressure cycling resistance of the piping system has been determined in accordance to EN 12295.

The pressure cycling resistance of the piping system has been assessed by means of a test report in accordance to EN 12295, clause 7, stated that the test parameters given in EN ISO 21003-5, clause 5.6, table 6, are met (see Table 8).

Table 8: Test conditions for pressure cycling resistance

temperature [°C]	pressure [bar]	cycles [ ]	specimens [ ]
95	0,5 – 25	10.000	3

3.3.3.3 Thermal cycling resistance

The thermal cycling resistance of the piping system has been determined in accordance to EN 12293.

The thermal cycling resistance of the piping system has been assessed by means of a test report in accordance to EN 12293, clause 7, which stated that the test parameters given in EN ISO 21003-5, clause 5.5, table 5, are met (see Table 9).

Table 9: Test conditions for thermal cycling resistance

outer diameter [mm]	temperature [°C]		pressure [bar]	cyless [ ]	force [N]
	T_1	T_2			
16	20	95	10	5.000	280
20					445

3.3.3.4 Internal pressure resistance

The internal pressure resistance of the piping system has been determined.

The internal pressure resistance of the piping system has been assessed after preparation in accordance to EN ISO 1167-1 and EN ISO 1167-2 and the test conditions given in Table 10.

The test report stated that the time to failure of the piping system exceeds 1.000 hours.

Table 10: Test conditions for internal pressure resistance

temperature [°C]	pressure [bar]	specimens [ ]
95	25	3

3.3.3.5 Pull-out resistance

The pull-out resistance of the piping system has been determined in accordance to EN ISO 3501.

The pull-out resistance of the piping system has been assessed by means of a test report in accordance to EN ISO 3501, clause 8, using the test parameters given in EN ISO 21003-5, clause 5.4, table 4 (see Table 11 which states, that no pipe is pulled out of the fitting at the given conditions.

Table 11: Test conditions for pull-out resistance

outer diameter [mm]	temperature [°C]		force [N]	time [h]	specimens [ ]
16	T_1	23	994	1	3
	T_2	95	505	1	3
20	T_1	23	800	1	3
	T_2	95	803	1	3

3.3.3.6 Bending resistance

The bending resistance of the piping system has been determined in accordance to EN ISO 3503.

The bending resistance of the piping system has been assessed by means of a test report in accordance to EN ISO 3503, clause 8, using the test parameters given in EN ISO 21003-5, clause 5.3, table 3. The test reports states that the piping system exceeds a test pressure of 25 bars (see Table 12).

Table 12: Test conditions for bending resistance

temperature [°C]	pressure [bar]	time [h]	specimens [ ]
20	25	1	3

The minimum bending radius specified by the manufacturer is 4 times the outer pipe diameter (R=4xOD).

3.3.3.7 Leak path protection functionality

It has been determined that the piping system with leak path protection functionality and press fittings, not yet pressed, are leaking. It was determined that the same setup but with subsequently pressed fittings has shown no leaking.

The leak path protection functionality of fittings has been assessed with a test setup consisting of different fitting components (e.g. elbows, tees, couplings). In total 20 fitting components has been connected with pipe and pressure tested. The assembly does not slip apart due to unpressed fitting components.

This assembly was tested first under water with pressurized air using the test pressures given in Table 13. Each test pressure has been held for > 10 seconds.

The test report stated that the average air bubble number per second at each test pressure. Second, the fitting components in the already tested assembly will be pressed. This assembly is then filled with water.

The test report stated, stated that the pressed, water-filled assembly shows leaking when being pressurized according to the test conditions given in Table 14.

Table 13: Test conditions for leak path protection, unpressed

medium	pressure	criteria
air	110 mbar	one or more rising air bubbles per second
air	1,0 bar	one or more rising air bubbles per second
air	6,0 bar	one or more rising air bubbles per second
water	1,0 bar	one or more falling drops per second
water	6,0 bar	one or more falling drops per second

Table 14: Test conditions for leak path protection, pressed

temperature [°C]	pressure [bar]	time [h]
23	25	1

3.4 Protection against noise (BWR 5)

Not applicable

3.5 Energy economy and heat retention (BWR 6)

Not applicable

3.6 Sustainable use of natural resources (BWR 7)

For the sustainable use of natural resources no performance was investigated for this product.

3.7 General aspects

The verification of durability and serviceability is part of testing the essential characteristics. Durability and serviceability is only ensured if the specifications of intended use according to specifications of the technical file of the manufacturer are kept.

3.8 Identification

All components are clearly specified. Changes of materials, of composition or characteristics, should be immediately notified to the DIBt, which will decide whether a new assessment will be necessary.

4 Assessment and verification of constancy of performance (AVCP) system applied with reference to its legal base

For the products covered by this EAD the applicable European legal act is: Decision 1999/472/EC. The system is: 4

In addition with regard to reaction to fire the systems are 3 or 4. System 1 as foreseen in the above mentioned Decision 1999/472/EC for certain cases is not relevant because

- the pipes are to be classified according to the standard EN 13501-1 based on tests according to EN ISO 11925-2 (see 3.2) which lead at the best to class E, and
- the fittings are covered by the Decision 96/603/EC, as amended (see 3.2).

5 Technical details necessary for the implementation of the AVCP system, as provided for the applicable EAD

5.1 Tasks of the manufacturer

The corner stones of the actions to be undertaken by the manufacturer of the piping system in the procedure of assessment and verification of constancy of performance are laid down in Table 15.

Table 15: Control plan for the manufacturer; corner stones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of pieces	Minimum frequency of control
(1)	(2)	(3)	(4)	(5)	(6)
Factory production control (FPC) [including testing of samples taken at the factory in accordance with a prescribed test plan]*					
1	Conformity of the supplied materials with the specification agreements between manufacturer and supplier	3.3.1.1.1 3.3.1.1.2 3.3.2.1.1 3.3.2.1.2	yes / no	continuous	Each delivery
2	Conformity of the surface conditions between manufacturer's references and samples and observations	3.3.1.2.1 3.3.2.2.1	yes / no	continuous	documentation once per batch
3	Conformity of the dimensions between manufacturer's specifications and measurements	3.3.1.2.2 3.3.2.2.2	yes / no	1	once per week or batch

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of pieces	Minimum frequency of control
(1)	(2)	(3)	(4)	(5)	(6)
4	Conformity of the weld seam homogeneity between manufacturer's reference and measurements	3.3.1.2.4	yes / no	continuous	documentation once per batch
5	Performance of the pipe in respect to internal pressure resistance and Bond of layers	3.3.1.2.3 3.3.1.2.5a	performance value	1	once per week or batch
6	Conformity of the pipe's bending behaviour between manufacturer's reference and measurements	3.3.1.2.6	yes / no	1	once per week or batch
7	Performance of the plastic fitting parts in respect to internal pressure resistance at 20°C/1h	3.3.2.2.3	performance value	1	once per week or batch
8	Checking the marking	Visual examination			once per day

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Manufacturing Plant 3:	Viega, Zum langen Acker 7, 57439 Attendorn-Ennest
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RAXINOX PIPING SYSTEM	Annex 1
Manufacturing Plants	