

## Evaluation Guideline

for the KOMO-(technical-approval-with) product certificate for

**Plastics piping systems for drainage and sewerage with or without pressure – Glass-reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP).**

Determined by CvD Plastics Piping Systems on ...-...-20...

Accepted by KOMO Quality and Assessment Committee on ...-...-20...

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## EVALUATION GUIDELINE

FOR THE KOMO-(TECHNICAL-APPROVAL-WITH) PRODUCT CERTIFICATE FOR

**Plastics piping systems for drainage and sewerage with or without pressure – Glass-reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP).**

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Determined by the CvD Plastics Piping Systems on. ...-...-20...

Accepted by the KOMO Testing and Quality Commission on. ...-...-20...



## Preface

This KOMO Evaluation Guideline (BRL) has been drawn up by the Board of Experts Plastics Piping Systems (LSK), which counts with representatives from the interested parties on the subject matter of this BRL. This Board also supervises the certification activities based on this BRL and will make any necessary adjustments. All references to the Board of Experts in this BRL pertain to the above mentioned Board of Experts.

This BRL will be used by certification bodies who have a license agreement with the KOMO Foundation in connection with the established certification procedures. This BRL details the requirements an applicant or an existing holder of a KOMO certificate must comply with, and the method employed by the evaluating certification body. The certification procedure established by the certification body includes a description of the working method as employed by the certification body in the implementation of:

- (pre)certification tests required for granting and renewing a KOMO product certificate based on the present BRL;
- periodic assessments for the maintenance of a previously issued product certificate based on the present BRL.

The product requirements and test methods comply with the requirements listed in NEN-EN-ISO 23856. The aspects of the assessment of conformity comply with NPR-CEN/TS 14632. This evaluation guideline includes additional requirements and determination methods set by the Board of Experts.

In the BRL the following parts have been changed:

- In accordance with the new (Dutch) KOMO template, the arrangement of the chapters has been altered;
- NEN-EN 14364 has been replaced by NEN-EN-ISO 23856 and therefor reference to the new standard NEN-EN-ISO 23856 is made, which includes the following major updates:
  - Reducing factors for dry creep (alpha) and ageing (beta) according to NEN 7037 are not applicable anymore and deleted from the BRL;
  - Resistance to shock or impact is not applicable anymore and deleted from the BRL;
- In accordance with the latest updates of NPR-CEN/TS 14632, the following has been changed:
  - Resistance to abrasion is not applicable anymore and deleted from the BRL;
  - Resistance to chemical attack as audit test covers resistance to ring deflection under wet conditions and the latter is not applicable as an audit test anymore.

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## Table of contents

Preface.....	2
1 Introduction, general provisions, and general requirements .....	5
1.1 Introduction.....	5
1.2 Subject matter and area of application.....	5
1.2.1 Subject.....	5
1.2.2 Field of application.....	5
1.3 Validity .....	6
1.4 Relation with Legislation and Rules and Regulations .....	6
1.4.1 European Construction Products Regulation (No. CPR, EU 305/2011) .....	6
1.5 Requirements to be imposed on conformity assessing institutions .....	6
1.6 KOMO (technical-approval-with-) product certificate .....	6
1.7 Markings and specifications .....	7
Marking of pipes .....	7
Marking of fittings (including couplings) .....	7
2 Terminology .....	8
2.1 Terms and definitions .....	8
2.2 Abbreviations and symbols .....	8
3 Requirements imposed on the materials and the design of the GRP piping system .....	11
3.1 General.....	11
3.2 Materials.....	11
3.2.1 Reinforcement .....	11
3.2.2 Resin .....	11
3.2.3 Particle size aggregates .....	11
3.2.4 Constancy of the material composition .....	11
3.2.5 Elastomers.....	11
3.2.6 Locking key.....	12
3.2.7 Metals .....	12
3.3 Design of the GRP piping system .....	12
3.3.1 General.....	12
3.3.2 Demonstration of soundness of the GRP piping system design.....	12
3.3.3 Classification of the GRP piping system design.....	12
3.3.4 Wall construction design .....	13
3.3.5 Structural design of fitting .....	13
3.4 Processing instructions .....	13
4 Requirements imposed on the performances in the application .....	14
4.1 General.....	14
4.2 Requirements and determination methods for the joints .....	14
4.2.1 General.....	14
4.2.2 Joint requirements.....	14
4.3 Fixation of the elastomeric sealing element.....	15
4.4 Installation instructions .....	15
4.5 Initial investigation and periodic assessment.....	16
5 Requirements imposed on the product.....	17
5.1 General.....	17
5.2 Elapsed or extrapolated time for determination of the long-term properties, (x) .....	17
5.3 Temperature effects .....	17
5.4 Requirements and determination methods for pipes .....	17
5.4.1 General.....	17
5.4.2 Appearance of pipes .....	17
5.4.3 Geometrical characteristics .....	17
5.4.4 Material composition of the pipe.....	19
5.4.5 Mechanical characteristics .....	19
5.5 Requirements and determination methods for fittings and couplings .....	20
5.5.1 General.....	20
5.5.2 Dimensions and tolerances .....	20
5.6 Initial investigation and periodic assessment.....	20



6	Requirements for certificate holders and internal quality control.....	21
6.1	General.....	21
6.2	Internal quality control .....	21
6.3	Competence of personnel .....	21
7	External conformity assessments .....	22
7.1	General.....	22
7.2	Type test groups.....	22
7.3	Reference conditions for TT and AT .....	22
7.4	Initial investigation for the KOMO® technical-approval-with-product certificate .....	22
7.5	Initial investigation for the KOMO® product certificate.....	23
7.6	Type and frequency of periodic inspections.....	23
7.7	Product changes / production technique changes .....	23
7.7.1	General.....	23
7.7.2	Determination methods .....	25
7.8	Shortcomings .....	26
7.8.1	Weight of shortcomings .....	26
7.8.2	Follow-up of shortcomings .....	26
7.8.3	Sanction procedures.....	26
7.9	Suspension of product certificate .....	26
7.10	Summary of tests and inspections (test matrix) .....	26
7.11	Inspection of the quality system .....	27
8	Requirements for the certification body .....	28
8.1	General.....	28
8.2	Certification staff.....	28
8.2.1	Competency criteria for certification staff .....	28
8.2.2	Qualification certification personnel.....	29
8.3	Communications about the pre-certification test and periodic inspections .....	29
8.4	Decisions with regard to the KOMO® (technical-approval-with-) product certificate .....	29
8.5	Reporting to the Board of Experts.....	29
8.6	Interpretation of requirements .....	29
9	List of documents.....	30
9.1	Public law and Rules and Regulations .....	30
9.2	Normative documents .....	30
9.3	Informative documents .....	30
	Model IQC-scheme (informative) .....	32



## 1 Introduction, general provisions, and general requirements

### 1.1 Introduction

Based on the regulations laid down in this KOMO Evaluation Guideline (BRL) a KOMO product certificate is issued for plastics piping systems for drainage and sewerage with or without pressure – glass-reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP). This product certificate enables the certificate holder to prove their clients that an expert, independent organization supervises the certificate holder's production process, the quality of the product and its respective quality control. Thus it may be assumed that the product has the characteristics as established in the present BRL.

The requirements determined in this BRL are used by the certification bodies, which have been accredited as such by the Board of Accreditation, or have presented an application, and who have a license agreement with the KOMO Foundation, employed when processing an application for the issuance and maintenance of a KOMO product certificate for plastics piping systems for drainage and sewerage with or without pressure – glass-reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP).

In addition to the requirements laid down in this BRL, certification bodies impose additional requirements in the sense of general procedure requirements for certification, as established in their internal certification procedures.

### 1.2 Subject matter and area of application

#### 1.2.1 Subject

The subject of certification in relation to this guideline are underground piping systems made from reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP). The piping systems are intended to be used for the discharge of drainage water and sewerage with or without internal pressure. The piping systems to be certified consist of pipes, fittings and/or couplings.

Pipes can be made according to different processes, e.g.: centrifugal casting, continuous filament winding or cross filament winding.

Fittings can be made using any of the following techniques:

- 1) Fabricated from straight pipe;
- 2) Moulded by:
  - i) filament winding;
  - ii) tape winding;
  - iii) contact moulding (hand lay-up);
  - iv) hot or cold press moulding.

This BRL is applicable to joints which are or are not intended to be resistant to axial loading:

- 1) Socket-and-spigot (either integral with pipe or sleeve coupling) or mechanical joint.
- 2) Locked socket-and spigot joint;
- 3) Cemented or wrapped joint;
- 4) Bolted flange joint.

Rubber sealing elements may be used as part of the joints.

#### 1.2.2 Field of application

The field of application is underground piping systems and its components made from glass-reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP) intended to be used for drainage, sewerage, with or without pressure and is in agreement with the scope of NEN-EN-ISO 23856.

This means that this BRL is applicable to pipes, fittings and their joints of nominal diameters from DN 100 to DN 4000, which are intended to be used for the conveyance of surface or sewage water at temperatures up to 50 °C.



In this application, the products are not intended for use under continuously varying load. With a continuously varying load is meant here cycling loads with a frequency of at least 1 cycle per minute varying between two load levels.

### 1.3 Validity

This revision of the BRL replaces the version dated 2016-12-19.

All KOMO product certificates that have been issued based on that version of the BRL will expire after twelve months after publication of this evaluation guideline.

Based on the aforementioned previous version of this BRL, existing certificates may be issued at the very latest three months before the current product certificate must be replaced.

The validity of the KOMO® (technical-approval-with-) product certificate is in principle unlimited. Validity may be limited (terminated), among other reasons, because of:

- A modification of this evaluation guideline,
- Incompliance the certificate holder's obligations.

### 1.4 Relation with Legislation and Rules and Regulations

#### 1.4.1 European Construction Products Regulation (No. CPR, EU 305/2011)

There is no harmonized European norm applicable to the products referred to in this BRL.

#### 1.5 Requirements to be imposed on conformity assessing institutions

With regard to the requirements laid down in this evaluation guideline, the applicant may submit, in the scope of external inspections, reports issued by conformity assessing institutions to prove that the requirements of this BRL are being satisfied. It must be demonstrated that the respective analysis/inspection/test and/or evaluation reports have been drawn up by a body that complies with the respective applicable accreditation norm with regard to the subject matter,

- NEN-EN-ISO/IEC 17020 inspection institutions;
- NEN-EN-ISO/IEC 17021-1 institutions that certify management systems;
- NEN-EN-ISO/IEC 17025 for laboratories;
- NEN-EN-ISO/IEC 17065 for institutions certifying products, processes, and service.

An organization will be considered as compliant with these criteria if an accreditation certificate for the respective subject matter can be submitted, issued by the Board of Accreditation (RvA) or another accreditation organization which has been accepted as a member of a multilateral agreement on the subject of mutual recognition and acceptance of accreditation, which have been drawn up within the EA, IAF and ILAC. If no accreditation certificate can be submitted, the certification organization itself will assess if compliance is given to the accreditation criteria.

#### 1.6 KOMO (technical-approval-with-) product certificate

Based on this evaluation guideline are issued:

- KOMO® technical-approval-with-product certificates and
- KOMO® product certificates.

For the following systems a technical-approval-with-product certificate can be issued:

- GRP piping systems according to chapter 3 and 4 in which the GRP pipes and fittings and/or couplings are reviewed as a unique system in there combination.

For the following type of products a product certificate can be issued:

- GRP pipes and fittings and/or couplings according to chapter 3 and 5.

The (technical-approval-with-) product certificate to be issued must be in accordance with the model (technical-approval-with-) product certificate as published for this version of the BRL on the KOMO website ([www.komo.nl](http://www.komo.nl)).



## 1.7 Markings and specifications

Marking details shall be printed or formed directly on the products in such a way that the marking does not initiate cracks or other types of failure. If printing is used, the colouring of the printed information shall differ from the basic colouring of the product and such that the markings shall be readable without magnification.

### Marking of pipes

The marking details shall be on the outside of each pipe, and in the case of DN 600 or greater shall be either on the inside or on the outside surface of the pipes and shall comply with clause 5.5 of NEN-EN-ISO 23856 as well as the following shall be applied to the products:

- KOMO logotype or KOMO word mark followed by the certificate number without specifying the version;
- Number of this BRL i.e. BRL 52204 or NEN-EN-ISO 23856.

### Marking of fittings (including couplings)

Marking details shall be printed or formed directly on the fitting and/or coupling in such a way that the marking does not initiate cracks or other types of failure. If printing is used, the colouring of the printed information shall differ from the basic colouring of the product and such that the markings shall be readable without magnification.

The marking details shall be on the outside of each product and comply with clause 6.7 of NEN-EN-ISO 23856 as well as the following shall be applied to the products:

- KOMO logotype or KOMO word mark followed by the certificate number without specifying the version;
- Number of this BRL i.e. BRL 52204 or NEN-EN-ISO 23856.

The KOMO logo type must be applied as follows:



The KOMO word mark must be applied as follows:

KOMO®

After issuance of the KOMO® (technical-approval-with-) certificate this KOMO logo/KOMO word mark may be also used by the certificate holder in public communications with regard to their certified activities, as specified in the "Rules and Regulations for the use of the KOMO marks" as published on the KOMO website.





## 2 Terminology

For an explanation of the terminology used in this BRL for certification, please go the glossary on the website of the KOMO Foundation ([www.komo.nl](http://www.komo.nl)).

### 2.1 Terms and definitions

The terms and definitions according chapter 3 of NEN-EN-ISO 23856 are applicable.

Further, in this BRL the meanings of the following terms are:

- **IQC scheme:** A description of the quality inspections carried out by the supplier as part of his quality system.
- **Supplier:** The party responsible for ensuring that the design of products continuously fulfils the requirements of this evaluation guideline.

### 2.2 Abbreviations and symbols

In this BRL, the abbreviations and symbols given in NEN-EN-ISO 23856 and NPR-CEN/TS 14632 and listed in table 1 apply. The following English terms shall be translated to Dutch as follows:

**Table 1 – Abbreviations and symbols in English and Dutch.**

Abbreviation	Term	
	English	Dutch
BRL	Evaluation Guideline	Beoordelingsrichtlijn
BoE	Board of Experts	College van Deskundigen
CvD-LSK	Board of Experts - Plastic Piping Systems	College van Deskundigen - Leidingssystemen Kunststof
CB	Certification body	Certificatie instelling
RvA	Dutch accreditation council	Raad voor de accreditatie
	Supplier	Leverancier
IQC scheme	Internal quality control scheme	Intern kwaliteitsbewakingsschema
UP	Unsaturated polyester	Onverzadigde polyester
GRP	Glass reinforced thermosetting plastics	Met glas versterkte thermohardende kunststof
	Filament winding	Kruislings wikkelen
	Tape winding	Tape wikkelen
	Centrifugally cast	Centrifugaal gegoten
	Contact moulding hand lay-up	Handlamineren
	Hot or cold press moulding	Warm of koud persen
	Cemented joint	Gelijmde verbinding
	Wrapped joint	Gelamineerde verbinding
	Fitting	Fitting, hulpstuk
	Joint	Verbinding
	Locking key	Borgsnoer
DN	Nominal size	Nominale afmeting



DN-ID	Nominal size, internal diameter	Nominale afmeting, binnendiameter
DN-OD	Nominal size, external diameter	Nominale afmeting, buitendiameter
PN	Nominal pressure	Nominale druk
SN	Nominal stiffness	Nominale stijfheid
CE	CE-marking	CE-markering
	Product investigation	Toelatingsonderzoek
	Certification	Certificatie
S	Ring stiffness	Ringstijfheid
S <sub>0</sub>	Initial ring stiffness	Initiële ringstijfheid
TT	Type testing	Type testing
AT	Audit test	Audit test
BRT	Batch release test	Batch release test
PVT	Process verification test	Proces verificatie test
RLTT	Reduced long-term test	Verkorte lange duur test
d <sub>m</sub>	Mean diameter	Gemiddelde diameter
d <sub>i</sub>	Mean internal diameter	Gemiddelde binnendiameter
d <sub>u</sub>	Mean outer diameter	Gemiddelde buitendiameter
e	Wall thickness	Wanddikte
e <sub>0,tot</sub>	Mean total wall thickness	Gemiddelde totale wanddikte
e <sub>eff</sub>	Mean structural layer thickness	Gemiddelde effectieve wanddikte
ω	Winding angle	Wikkelhoek
α <sub>x,creep,wet</sub>	Wet creep factor	Natte kruipfactor
S <sub>x,wet</sub>	Calculated long-term ring stiffness	Berekende lange duur ring stijfheid
R <sub>RF</sub>	Re-rating factor	Herwaarderingsfactor
σ <sub>LA</sub> <sup>*</sup> , σ <sub>LB</sub> <sup>*</sup> , σ <sub>LC</sub> <sup>*</sup> . subscript A, B, C denote the method of test used	Initial longitudinal tensile strength	Initiële longitudinale treksterkte.
σ <sub>cA</sub> <sup>*</sup> , σ <sub>cB</sub> <sup>*</sup> , σ <sub>cC</sub> <sup>*</sup> . subscript A, B, C denote the method of test used	Initial circumferential tensile wall strength	Initiële tangentiële treksterkte
	Nominal length	Werkende lengte
	Rubber seal (lock) joint	Mof en spie verbinding met rubber dichtingselement.
	Double bell coupler	Dubbele mof en spie verbinding met rubber dichtingselement
	Adhesive bonded joints	Lijmverbindingen
	Flange joints	Flensverbindingen
	Laminated joints	Laminaatverbindingen
	Flexible joint	Flexibele verbinding



	Rigid joint	Starre verbinding
	End-load-bearing	Trekvast
	Non-load-bearing	Niet-trekvast
	Fixation of the elastomeric sealing element. The fixation of the elastomeric sealing element means the preservation of the elastomeric sealing element in the groove while pushing the spigot end into the socket.	Fixering van het rubberdichtingselement. De fixering van het rubberdichtingselement is het in de groef houden van het rubberdichtingselement bij het inschuiven van het spieëind in de mof.
D	Draw	Longitudinale verplaatsing
T	Total draw	Totale longitudinale verplaatsing
M	Misalignment	Verkeerde uitlijning
$\delta$	Angular deflection	Vrije hoekverdraaiing
	Socket-and-spigot (either integral with pipe or sleeve coupling) or mechanical joint	Mof en spie-eind (hetzij integraal met buis of klemkoppeling) of mechanische verbinding.
	Locked socket-and spigot joint	Trekvaste mof en spie-eind verbinding



### **3 Requirements imposed on the materials and the design of the GRP piping system**

This chapter includes the requirements for the characteristics of the employed raw materials, materials used for the production of the products to be certified according to this BRL as well as the requirements for the design of the piping system.

#### **3.1 General**

To the raw materials and additives used in the production, the requirements as stated in clause 3.2 are to be upheld.

The raw materials and additives applied shall be recorded by the supplier in the design (see clause 3.3) of the piping system, by means of a technical specification. The conformity of the applied raw materials and additives to the requirements is to be done by the CB.

Each intended change in thus named parameters, is to be reported to the CB. It is up to the CB to evaluate if the change possibly has influence on the attested performance(s), in which re-evaluation of said performance(s) can be required.

When the applicant / supplier has more production locations, the applicant / supplier shall specify which production locations are concerned.

#### **3.2 Materials**

The pipe or fitting shall be constructed using chopped and/or continuous glass filaments, strands, or rovings, mats, or fabric, glass or synthetic veils, and polyester resin with or without fillers and if applicable additives necessary to impart specific properties of the resin. The pipe and fitting may also incorporate aggregates.

##### **3.2.1 Reinforcement**

The glass used for the manufacture of the reinforcement shall be one of the types listed in NEN-EN-ISO 23856.

##### **3.2.2 Resin**

###### **3.2.2.1 Resin type**

Application of this evaluation guideline shall be limited to the manufacture of rigid components made from thermosetting resins (GRP components). Typical resins are polyester and vinyl ester.

###### **3.2.2.2 Temperature of deflection**

The resin used in the structural layer shall have a temperature of deflection of at least 70 °C when the test specimen is tested in accordance with method A of NEN-EN-ISO 75-2.

###### **3.2.3 Particle size aggregates**

The particle size of aggregates and fillers shall not exceed 1/5 of the total wall thickness of the pipe or fitting or 2,5 mm, whichever is the lesser.

###### **3.2.4 Constancy of the material composition**

The constancy of the material composition of the wall construction of the product shall be determined according to ISO 7510. The following constituents can be distinguished: resin, aggregate and filler and type and arrangement of the glass layers. The difference in mass of each constituent of two samples, taken in two diametrically opposite places in one cross-section shall not exceed 5%, when based on the lowest value determined.

The masses of the glass, aggregates and resin of a component shall be determined according to ISO 7510 and shall be declared by the supplier.

###### **3.2.5 Elastomers**

Each elastomeric material of the sealing component shall conform to the applicable requirements of BRL 2013 (class 1).

The supplier shall demonstrate to the CB possibilities of good mounting of the sealing component and GRP component(s) by means of drawings of all dimensions and tolerances of the components.



### 3.2.6 Locking key

The locking key of the rigid locked joint with elastomeric sealing ring shall be made of a pressure resistant and shear resistant material e.g. polyvinylchloride, polyamide or a material equivalent to it. In the latter case the equivalency shall be proved, either by documentation or by testing.

### 3.2.7 Metals

Where metal components are used, there shall be no evidence of corrosion of the components after the fitting has been immersed in an aqueous sodium chloride solution, 30 g/l for seven days at  $(23 \pm 2)$  °C.

## 3.3 Design of the GRP piping system

### 3.3.1 General

The GRP piping system is to be designed for a life time expectancy of at least 50 years and at specified nominal pressure and temperature profile within the application. The piping system shall remain (water)tight and therefore the requirements according to clause 4.2 apply.

Aside from recording the raw materials to be used (see clause 3.1), the design contains a specification of the involved diameters with respective wall thicknesses of the products and records of other relevant geometrical characteristics. In case rubber sealants are used, then the applied type of rubber(s) is(are) to be specified as well as the hardness and dimensions of the rubber seals. The rubber sealing elements shall be certified according KOMO evaluation guideline BRL 2013.

The conformity of the design to the requirements shall be done by the CB.

### 3.3.2 Demonstration of soundness of the GRP piping system design

The supplier shall demonstrate to the certification body that the design and manufacturing of pipes, fittings and arrangements for the joints are in accordance with relevant design practices that results in a mechanical performance of the fitting or joint equal to or greater than that of a straight GRP-UP pipe of the same pressure and stiffness rating when installed in a piping system and, if appropriate, supported by anchor blocks or encasements.

The quality management system of the supplier shall document the procedures for designing and manufacturing the pipes, fittings and joints.

It also include the results of testing programs to verify performance and establish over what range the test results are applicable and how the design procedures are proven and how they apply across the product range.

It is likely that multiple tests will be required to qualify the full range of PN and DN for any given combination of fitting or joint configuration and loading condition and these results shall be documented as part of the quality management system.

The quality management system shall document the fabricated fitting and joint design procedures including materials, material properties, sequence of attaching and reinforcing layups, the process for applying layups and quality control procedures during and after fabrication for the entire range of fittings produced.

Remark: The soundness of the design procedure can be demonstrated by means of a (validated) calculation program.

In order to keep the total test burden within acceptable limits but at the same time to control the use of test data beyond their limits of application, the concept of Type Test Groups is used in this evaluation guideline. The supplier shall declare its Type Test Groups in his quality plan, see also clause 7.2.

### 3.3.3 Classification of the GRP piping system design

The designed GRP piping system shall be classified according to nominal size (DN) and nominal pressure (PN) and joint type (e.g. flexible joint, rigid joint) according to NEN-EN-ISO 23856. In addition pipes shall include nominal stiffness (SN) in their classification (see table 2).



**Table 2 - Nominal stiffness class (SN)**

630	5000
1250	10000
2500	-

Remarks:

- Nominal stiffness classes higher than 10000 N/m<sup>2</sup> can required in special piping systems like casings for wells subject to external load and/or offshore piping subject to possible large water heads, piping systems under runways of airports.
- Europe it is common practice to classify stiffness on the basis of the initial stiffness.

The nominal pressure (PN) shall conform to one of those given in table 3.

**Table 3 - Nominal pressure class (PN)**

1	12,5
2,5	16
4	20
6	25
8	32
10	-

Remark: Components marked PN 1 are non-pressure (gravity) components.

### 3.3.4 Wall construction design

The wall construction of the products consists of:

- inner layer (liner);
  - structural layer;
  - outer layer;
- and shall consist the following constituents in the individual layers, when appropriate:
- glass fibre reinforcement,
  - thermosetting polyester resin;
  - fillers;
  - Aggregates.

The wall construction (the sequence and composition of the individual layers comprising the pipe or fitting) shall be documented by the supplier. The supplier shall translate the product design into detailed process specifications to control the amount and placement of material components.

The specifications of the constituents and semi-finished products shall be part of the IQC scheme of the supplier.

The minimal total wall thickness, including the inner layer, shall be declared by the supplier and shall not be less than 3 mm.

The inner, structural and outer layer shall comply with the requirements of NEN-EN-ISO 23856.

### 3.3.5 Structural design of fitting

The structural design of a fitting shall be demonstrated according to NEN-ISO 18851.

The required test parameters are set by the standard making reference to this international standard, i.e. NEN-EN-ISO 23856.

### 3.4 Processing instructions

The raw materials, materials, and semi-products employed must be applied/processed in accordance with the corresponding processing instructions and/or application conditions.



## **4 Requirements imposed on the performances in the application**

In this chapter the requirements are recorded in relation to the performance of the GRP piping system in its application as well as the determination methods to evaluate if these requirements are met.

In case that a specific property or specification is applicable to the technical-approval-with-product certificate, it will be stated as such in the clause.

### **4.1 General**

A specification of the applicable nominal sizes, the classification (nominal pressure(s) and nominal stiffness(es)), the temperature profile and the parts to be used, are recorded in the KOMO® technical-approval-with-product certificate.

### **4.2 Requirements and determination methods for the joints**

#### **4.2.1 General**

For the connections of the GRP piping system, the following types of joints can be used, with or without end load:

- 1) Socket-and-spigot (either integral with pipe or sleeve coupling) or mechanical joint.
- 2) Locked socket-and spigot joint;
- 3) Cemented or wrapped joint;
- 4) Bolted flange joint.

Rubber sealing elements may be used as part of the joints, see also clause 4.3.

A specification of the jointing types shall be recorded in the KOMO® technical-approval-with-product certificate.

#### **4.2.2 Joint requirements**

Joint performance shall conform to the requirements of chapter 7 of NEN-EN-ISO 23856.

A summary of tests required for the various types of joints is given in table 4.



**Table 4 - Summary of tests required for various types of joints.**

<b>Joint type / standard</b>	<b>Properties to be tested</b>	
Flexible non-end-load-bearing joints with elastomeric sealing rings. (ISO 8639)	Initial leakage – initial pressure	
	External pressure differential - negative pressure	
	Misalignment and draw	Positive static pressure
		Positive cyclic pressure
	Angular deflection and draw	Initial pressure
Positive static pressure		
Flexible end-load-bearing joints with elastomeric sealing rings. (ISO 7432)	Initial leakage – initial pressure	
	External pressure differential	Maintained pressure
		Positive cyclic pressure
	Short duration resistance - Maintained pressure	
	Resistance to bending	Preliminary hydrostatic pressure
Maintained hydrostatic pressure		
Wrapped or cemented joints. (ISO 8533)	Internal leakage – initial pressure	
	External pressure differential – negative pressure	
	Resistance to bending and pressure	Preliminary pressure
		Maintained pressure
		Positive cycling pressure
Short duration resistance – maintained pressure		
Bolted flange joints. (ISO 8483)	Initial leakage – initial pressure	
	External pressure differential – negative pressure	
	Resistance to bending and pressure	Preliminary pressure
		Maintained pressure
	Resistance to internal pressure	Maintained pressure
		Positive cyclic pressure
Short duration resistance – maintained pressure		

#### 4.3 Fixation of the elastomeric sealing element

The following applies in case elastomeric sealing elements are used.

For judgement of the fixation of the elastomeric sealing element, the end of a pipe shall be pushed into the socket after the elastomeric sealing element is mounted into the socket. The pipe shall have a length of at least 3 meters. The elastomeric sealing element shall be mounted into the inner side of the socket according to the instructions of the manufacturer. When pushing the pipe into the socket no measures concerning centring shall be taken, the test shall be carried out at a way similar to practice.

To meet the requirements concerning the fixation of the elastomeric sealing element, the pipe shall be able of being pushed into the socket without the elastomeric sealing element being pushed out of the groove.

#### 4.4 Installation instructions

The supplier shall provide installation instructions in the Dutch and/or English language. The instructions must contain specific information with regard to storage, safety, transport, processing temperature, construction of the joints and specific installation guidelines. These aspects are checked by the CB. A reference to the installation instructions is made in the KOMO® technical-approval-with-product certificate.





#### **4.5 Initial investigation and periodic assessment**

Of the GRP piping system to be certified, it must initially be determined if the performance requirements of this chapter are met. In the test matrix of clause 7.10 (table 8) this is detailed per clause. In the test matrix it is also stated which tests and checks are applicable when the periodic assessments take place, which are performed after the technical-approval-with-product certificate is issued.



## 5 Requirements imposed on the product

In this chapter the requirements are recorded in relation to the product, translated to the product properties of the individual parts of the GRP piping system, as well as the determination methods and the critical limits to evaluate if these requirements are met.

In case that a specific property or specification is applicable to the product certificate, it will be stated as such in the clause.

### 5.1 General

The pipes, fittings and couplings are produced from unsaturated polyester resin (UP). The piping system can consist of pipes and fittings (without couplings) or pipes and couplings (without fittings) as well.

A specification of the applicable nominal sizes, the classification (nominal pressure(s) and nominal stiffness(es)) shall be included in the KOMO® product certificate.

The conformity of the previously mentioned to the requirements is to be determined by the CB.

### 5.2 Elapsed or extrapolated time for determination of the long-term properties, (x)

The subscript x, in for example  $S_{x,wet}$ , denotes the elapsed or extrapolated time for which the long-term property is to be determined. Unless otherwise specified, the long-term properties shall be determined at 50 years (438 000 h).

### 5.3 Temperature effects

When properties are determined at  $(23 \pm 5)$  °C their values are applicable to products used at temperatures up to and including 35 °C. For service temperatures over 35 °C type tests have to be carried out, at least at the design service temperature  $^{+5/0}$  °C, to establish re-rating factors for all properties used in design.

### 5.4 Requirements and determination methods for pipes

#### 5.4.1 General

The pipes shall conform to the requirements of chapter 5 of NEN-EN-ISO 23856.

#### 5.4.2 Appearance of pipes

Both internal and external surfaces shall be free from irregularities, which can impair the ability of the component to conform to the requirements of this evaluation guideline.

The supplier shall demonstrate to the CB which irregularities are allowable defects, repairable defects, and defects which shall impair the ability of the component to conform to the requirements of this evaluation guideline.

Remark: Classifying visual defects in glass-reinforced plastics laminate parts could be carried out according to ASTM D 2563.

#### 5.4.3 Geometrical characteristics

##### 5.4.3.1 Determination of dimensions

Measurements shall be made in accordance with clause 5.2 of NEN-EN-ISO 23856.

##### 5.4.3.2 Diameter

The diameter of the GRP-UP pipes shall be designated by nominal size (DN) in accordance with one of the following two series listed in NEN-EN-ISO 23856:

- **Series A** - which specifies the internal diameters in millimetres (mm), DN-ID;
- **Series B** - which specifies external diameters in millimetres (mm), DN -OD.

Note: In standardising the diameters of (GRP-UP) pipes, difficulties are encountered because of the varying methods of manufacture (e.g. filament winding, centrifugal casting or contact moulding). GRP-UP pipes are typically produced by controlling either the internal diameter, or the external diameter to a fixed value.

Tolerances on the internal diameter or external diameter shall conform to NEN-EN-ISO 23856.



#### 5.4.3.3 Total wall thickness

The minimum total wall thickness, including the inner layer, shall be declared by the supplier and shall not be less than 3 mm.

The wall construction comprise an:

- inner layer;
- structural layer;
- outer layer.

The inner layer shall comprise one of the following:

- a thermosetting resin layer with or without aggregates or fillers and with or without reinforcement of glass or synthetic filaments;
- a thermoplastic liner.

The wall construction shall be declared by the supplier.

#### 5.4.3.4 Thickness of structural layer ( $e_{\text{eff}}$ ) and inner and outer layers

The thickness of the structural layer (and when applicable its individual layers), inner and outer layer shall be determined as follows. Cut a piece of cross section from the pipe (or fitting) and measure the thicknesses of the separate layers using a magnifying glass with a minimum magnification of seven and an accuracy of 0,1 mm.

Alternatively, the supplier may use its own test procedure. The test procedure shall be approved by the certification body and shall be implemented in the supplier's quality system (IQC-schedule).

#### 5.4.3.5 Winding angle

When applicable, the winding angle of the pipes for each type is recorded – in the quality system of the supplier.

The winding angle is determined using a representative glass filament and the following equation:

$$\tan \omega = a/b$$

where:

a is the outside circumference of the pipe

b is the pitch of the winding

#### 5.4.3.6 Length

The pipe shall conform to the requirements of clause 5.2.3 of NEN-EN-ISO 23856.

#### 5.4.3.7 Sockets and spigots formed at the pipe or formed on the pipe end provided with a elastomeric sealing

The socket-spigot joint may be end load bearing or not end load bearing, depending on the practical situation. The dimensions and tolerances of the socket, the spigot, sealing element and locking key shall be recorded on drawings.

##### 5.4.3.7.1 Out-of-roundness of the socket

End load bearing joint with elastomeric sealing element.

Measure at one cross-section, at the place where the elastomeric sealing is located, the largest and the smallest internal diameter.

In any cross-section of the socket, the difference between the largest and smallest internal diameter may not exceed 0,007 times the average inner diameter  $d_i$

Not load bearing joint. Measure at one cross-section, at the place where the elastomeric sealing is located, the largest and the smallest internal diameter at maximum draw.

In any cross-section of the socket, the difference between the largest and smallest internal diameter may not exceed 0,007 times the average inner diameter  $d_i$

Remark: Maximum draw (i.e. total draw) of flexible joints means: the maximum permissible displacement of the spigot in the socket, when the leaktightness is maintained.



#### **5.4.3.7.2 Out-of-roundness of the spigot for elastomeric sealing elements**

Measure at the groove for the elastomeric sealing the largest and the smallest outer diameter and determine from this the out-of-roundness.

In any cross-section of the spigot, the difference between the largest and smallest external diameter may not exceed 0,007 times the average outer diameter  $d_u$

#### **5.4.3.8 Sockets and spigots formed on the pipe for the purpose of bonded joints**

The dimensions and tolerances of the inner diameter of the socket, outer diameter of the spigot, insertion depth and conical shape, as well as the dimensions of the socket and spigot shall be recorded on drawings.

##### **5.4.3.8.1 Out-of-roundness of the spigot**

At midway of the spigot the difference between the largest and the smallest measured outer diameter shall not exceed 0,007 times the average outer diameter  $d_u$

##### **5.4.3.8.2 Out-of-roundness of the socket**

The socket is always manufactured at the factory and the tolerances of the dimensions, among which the out-of-roundness, shall be recorded on drawings, taking into account the volume that could be taken by the adhesive making the bond

In any cross-section of the socket, the difference between the largest and smallest external diameter may not exceed 0,007 times the average inner diameter  $d_u$ .

#### **5.4.4 Material composition of the pipe**

See clause 3.2.4 of this evaluation guideline.

#### **5.4.5 Mechanical characteristics**

In table 5 the required mechanical characteristics are listed.



**Table 5 - Mechanical characteristics: test method and requirement.**

Characteristic	Test method	Requirement
Initial ring stiffness	ISO 7685	Declaration of nominal stiffness (SN)
Long-term ring stiffness under wet conditions and calculation of the wet creep factor	ISO 10468	As mentioned in clause 5.3.2 of NEN-EN-ISO 23856:
Resistance to initial ring deflection	ISO 10466	As mentioned in clause 5.3.3 of NEN-EN-ISO 23856.
Long-term resistance to ring deflection under wet conditions	ISO 10471	As mentioned in clause 5.3.4 of NEN-EN-ISO 23856.
Initial longitudinal tensile strength	ISO 8513, method A or B	The requirements mentioned in clause 5.3.5 of NEN-EN-ISO 23856.
Initial failure pressure	ISO 8521, method A, B, C, D, E or F	As mentioned in clause 5.3.6 of NEN-EN-ISO 23856.
Long-term resistance to failure pressure. Extrapolation procedure.	ISO 7509 ISO 10928	As mentioned in clause 5.3.7 of NEN-EN-ISO 23856.
Resistance to chemical attack for the inside of a section in a deflected condition (only for septic sewers)	NEN-ISO 10952	As mentioned in clause 5.4 of NEN-EN-ISO 23856

The tests listed in table 5 shall be performed and evaluated according to clause 5.3 of NEN-EN-ISO 23856.

## **5.5 Requirements and determination methods for fittings and couplings**

### **5.5.1 General**

Fittings and couplings shall comply with the requirements of chapter 6 of NEN-EN-ISO 23856.

### **5.5.2 Dimensions and tolerances**

The relevant dimensions (i.e. diameter, angle, radius, length, laying length, body length, concentric/eccentric, wall thickness, etc.) and tolerances of fittings shall conform to the appropriate requirements according to chapter 6 of NEN-EN-ISO 23856.

Dimensions and tolerances shall be specified in drawings.

### **5.6 Initial investigation and periodic assessment**

Of the GRP products to be certified, it must initially be determined if the requirements of this chapter can be met. In the test matrix of clause 7.10 (table 8) this is detailed per clause. In the test matrix it is also stated which tests and checks are applicable when the periodic assessments take place, which are performed after the product certificate is issued.



## 6 Requirements for certificate holders and internal quality control

### 6.1 General

The management of the certificate holder is responsible at all times for the quality of the production process, internal quality control, and the quality of the product. The internal quality control must meet the requirements laid down in this chapter.

### 6.2 Internal quality control

The certificate holder must have an internal quality control scheme used by them (IQC-scheme).

This scheme must clearly establish:

- Which aspects are subject to inspections carried out by the organization of the certificate holder or an external organization contracted by them,
- Which methods are employed to carry out these inspections,
- The frequency of these inspections,
- If and if affirmative, the inspection results are recorded.

The IQC-scheme must at least include the following main groups:

- Inspection of measuring equipment,
- Entrance inspection,
- Process inspection,
- Product inspection,
- Internal transportation and storage,
- Delivery,
- Procedures for:
  - Processing of claims,
  - Processing of deviations and follow-up of corrective measures.

This IQC-scheme must be based on the IQC-scheme model included in Annex I, and detailed in such a way that the CB generates sufficient confidence that the requirements laid down in this this evaluation guideline are being continuously satisfied.

Internal quality control must enable the certificate holder to demonstrate that the requirements laid down in this evaluation guideline are being continuously satisfied.

The manufacturer shall describe in his quality plan the limits used to define a batch for testing purposes. Typically, a quality control batch consists of products of a particular diameter, stiffness class and pressure class.

A batch may be released for supply when all the relevant tests and inspections have been carried out and the requirements have been met. If one or more items fail one or more tests or inspections, then the retest procedures detailed in NPR-CEN/TS 14632 shall be performed.

The manufacturer shall detail in his quality plan a verification procedures (PVT) and the frequency they are carried out. The frequency of these tests shall complement the frequency of audit tests (AT). The manufacturer shall describe in his IQC-scheme the limits of the conditions for temperature and relative humidity at which BRT's and PVT's shall be carried out in his laboratory.

Note: The purpose of PVT tests is to assess the conformity of the long-term properties of the product.

### 6.3 Competence of personnel

The supplier shall demonstrate in his quality plan education, training and/or work experience of the personnel.

It is recommended to demonstrated competence of the laminators by means of:

- certification of personnel according to NEN-EN-ISO/IEC 17024 or;
- DVS 2220 or;
- NEN-EN-ISO 9001:2015, clause 7.2.



## 7 External conformity assessments

### 7.1 General

The certification body will carry out a pre-certification for the purpose of granting a KOMO product certificate. After issuance of the KOMO product certificate, the certification body will carry out periodic inspections.

For the assessment of conformity the required test pieces shall be manufactured by the supplier (certificate holder) under the conditions:

- the manufacture process;
- raw material receipt;
- design;

during the manufacture of the test pieces is the same as the manufacture of the test pieces used for the product investigation.

It is not allowed to manufacture the test pieces for the assessment of conformity at different production locations.

### 7.2 Type test groups

A type test group consists of a range or family of products made such that the results of the long-term type tests are applicable to all products in the group. A pipe type test group for example shall contain products:

- manufactured by the same process;
- with the same material specifications;
- with the same pipe wall construction (i.e. the sequence of layers, layer compositions, material properties);
- design method;
- tested with the same loading condition (end load bearing or not end load bearing).

The quality management system shall document all process details that could influence type test performance. The quality management system shall document the complete product design method and demonstrate how the results of the type tests are used to establish product designs and pipe type test groups.

### 7.3 Reference conditions for TT and AT

The reference conditions for type testing and audit testing, such as:

- 1) temperature;
- 2) properties of the water for testing;
- 3) loading conditions;
- 4) pre-conditioning;
- 5) measurements of dimensions;

shall conform to the requirements listed in NEN-EN-ISO 23856, clause 4.5.

### 7.4 Initial investigation for the KOMO® technical-approval-with-product certificate

The applicant of the KOMO® technical-approval-with-product certificate states which products are to be listed on the technical-approval-with-product certificate to be issued. The applicant provides all relevant information of these products for the purpose of drafting the product specification and the proclamation of the product characteristics as is to be incorporated in the technical-approval-with-product certificate to be issued.

For the purpose of issuing the technical-approval-with-product certificate the CB will perform an initial investigation in the framework of which:

- The certification institute shall initially determine the performance of the system in the application according to chapter 4,
- The certification institute shall determine if the applicant, by means of his internal quality control, is able to continuously guarantee that the products have the properties and show the performance as are stated in chapters 3 and 5 of this evaluation guideline.

Assessment of the production process and the final product are part of this;



- The certification institute evaluates if the operational methods of the internal quality assurance comply to the requirements of chapter 6 of this evaluation guideline.

When applicable, the assessment of the by the applicant provided documents in relation to the product and/ or the internal quality assurance with the listed results meet the requirements as laid down in this guideline.

Based on the initial investigation a report is drafted on the basis of which a technical-approval-with-product certificate either can or cannot be issued.

In the test matrix of clause 7.10 is listed which aspects are under review for the initial investigation.

### **7.5 Initial investigation for the KOMO® product certificate**

The applicant of the product certificate states which products are to be listed on the product certificate to be issued. The applicant provides all relevant information of these products for the purpose of drafting the product specification and the proclamation of the product characteristics as is to be incorporated in the product certificate to be issued.

For the purpose of issuing the KOMO® product certificate the CB will perform an initial investigation in the framework of which:

- The certification institute shall determine if the applicant is able to continuously manufacture products that have the properties and show the performance requirements as are stated in chapters 3 and 5 of this evaluation guideline. Assessment of the production process and the finished product are part of this;
- The certification institute evaluates if the operational methods of the internal quality assurance complies to the requirements of chapter 6 of this evaluation guideline.

Where applicable, the assessment of the by the applicant provided documents in relation to the product and/ or the internal quality assurance with the listed results meet the requirements as laid down in this guideline.

Based on the initial investigation a report is drafted on the basis of which a product certificate either can or cannot be issued.

In the test matrix of clause 7.10 is listed which aspects are under review for the initial investigation.

### **7.6 Type and frequency of periodic inspections**

After issuing the product certificate, the certification body must carry out periodic inspections at the certificate holders' to verify compliance with their obligations. The College of Experts will decide the type, scope, and frequency of the periodic inspections.

At the time this evaluation guidelines is entering into effect, the frequency has been determined on 2 annual periodic inspections per production location.

The audit program includes the type and frequency of the period inspections. These are related to:

- The production specification laid down in the certificate;
- The production process of the certificate holder;
- The certificate holder's IQC-scheme,
- The results of the inspections performed by the certificate holder,
- The correct method of marking of the certified products,
- Compliance with the required procedures,

and compliance of the requirements laid down in this evaluation guideline is verified.

The audit program with the aspects to be checked during the periodic inspections are specified in the test matrix of clause 7.10.

The results of each assessment carried out, will be recorded in a traceable manner in a report by the certification body.

### **7.7 Product changes / production technique changes**

#### **7.7.1 General**

To determine the effect of e.g. a product change or change in production technique (process), the required test pieces may be manufactured on various production locations under the condition that:





BRL 52204 Plastics piping systems for drainage and sewerage with or without pressure – Glass-reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP) «date BRL»

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- the manufacture process;
- the raw material receipt;
- design of the test piece;

on the various production locations is the same.

In table 6, the tests to be performed are mentioned which have to be carried out in case of a product / production technique change.

The supplier shall not make any changes that may be related to the quality of the products before the CB has agreed to such changes. After the supplier's proposed changes have been reported to the CB, the CB assesses whether further investigation is required and informs the supplier thereof.

Note: definitions of changes in material, design and process are listed in NPR-CEN/TS 14632 annex B.

The effects of changes shall be determined according to NPR-CEN/TS 14632, annex C.



**Table 6 - Test to be performed for material changes.**

Property to be tested	Standard	Clause of BRL
Amount of constituents	ISO 7510	7.5.2.1
Initial ring stiffness	ISO 7685	7.5.2.2
Initial resistance to ring deflection	ISO 10466	7.5.2.3
Initial failure pressure	ISO 8521	7.5.2.4
RLTT failure pressure	ISO 7509	7.5.2.5
RLTT resistance to chemical attack	NEN-ISO 10952	7.5.2.6
RLTT creep under wet conditions	ISO 10468	NPR-CEN/TS 14632, annex D

Tests to be performed to changes in design, process or joint materials are listed in table 7.

**Table 7 - Test to be performed for changes in design, process and joint materials.**

Property to be tested	Standard	Clause of BRL
Amount of constituents	ISO 7510	7.5.2.1
Initial ring stiffness	ISO 7685	7.5.2.2
Initial resistance to ring deflection	ISO 10466	7.5.2.3
Initial failure pressure	ISO 8521	7.5.2.4
RLTT failure pressure	ISO 7509	7.5.2.5
Joint performance tests	NPR-CEN/TS 14632	7.5.2.6

The proposed change shall be implemented only when the applicable requirements detailed in the evaluation guideline are fulfilled.

## 7.7.2 Determination methods

### 7.7.2.1 Amount of constituents (material composition)

The resin, glass, aggregate and filler contents and the type and arrangement of the constituent glass layers shall be determined according to ISO 7510.

A difference of more than 10% between the results before and after the proposed change, does require a new product investigation of the product or type test, whichever is applicable. The results before the change refer to the declared values.

### 7.7.2.2 Initial ring stiffness

The initial ring stiffness shall be determined according to ISO 7685 and shall not be less than the declared SN classification.

### 7.7.2.3 Initial resistance to ring deflection

The initial resistance to ring deflection shall be determined according to ISO 10466 and shall fulfil the requirements of NEN-EN-ISO 23856 clause "Initial resistance to failure in a deflected condition". This means that the test pieces shall be free from bore cracks and are without structural failure: i.e. interlaminar separation, tensile failure of the glass fibre reinforcement, buckling of the pipe wall, if applicable separation of the thermoplastic liner from the structural wall. The results shall be evaluated in accordance with NPR-CEN/TS 14632.

### 7.7.2.4 Initial failure pressure

The initial failure pressure shall be determined according to ISO 8521. The results shall be evaluated in accordance with NPR-CEN/TS 14632.

### 7.7.2.5 RLTT resistance to failure pressure

The RLTT shall be carried out on six test pieces according to ISO 7509.



The internal pressure levels shall be selected from the relevant pressure design curve derived in accordance with the relevant procedures described in ISO 10928 for the following expected times to failure: 100 h, 600 h and 2 000 h.

Two test pieces should be tested at each of the three determined pressures.

The results shall be evaluated in accordance with NPR-CEN/TS 14632, annex D.3.

#### **7.7.2.6 RLTT resistance to chemical attack (strain corrosion)**

The RLTT shall be carried out on six test pieces in conformity with the test procedures described in NPR-CEN/TS 14632, annex D.2.2 and NEN-ISO 10952. The RLTT shall use the same basis as that used for TT i.e. failure times at specified strain levels. The test solution shall comprise sulphuric acid solution at a concentration of 0,5 mol/l. This shall be introduced into the test pieces within 2 h of deflecting in accordance with NEN-ISO 10952. This is the zero time from which the long-term properties are determined. The results shall be evaluated in accordance with NPR-CEN/TS 14632, annex D3.

#### **7.7.2.7 Joint performance tests**

Joint performance shall comply with NPR-CEN/TS 14632, clause 6.2.3.

### **7.8 Shortcomings**

#### **7.8.1 Weight of shortcomings**

When weighing shortcomings in the frame of the supervision after granting the product certificate by the certification body, a distinction will be made between:

- Shortcomings that might directly have a negative impact on the quality of the product (critical shortcomings),
- "Other" shortcomings (non-critical shortcomings).

#### **7.8.2 Follow-up of shortcomings**

A certification body will do follow-ups of shortcomings as follows:

- The certification body must be able to finalize processing critical shortcomings within the time frame established by the certification body; this period shall not exceed 3 months,
- The certification body must be able to finalize processing non-critical shortcomings within the time frame established by the certification body; this period shall not exceed 6 months.

#### **7.8.3 Sanction procedures**

The weighing and follow-ups of shortcomings and the sanction policy have been established in an interpretation document pertaining to this evaluation guideline, which is published on the website of the plan administrator.

### **7.9 Suspension of product certificate**

If (temporarily) there is no production or products cannot be delivered, in case of a stop of longer than 6 months, at the request of the certificate holder, the validity of their KOMO product certificate may be (temporarily) suspended. Such a suspension may be granted by the certification body for a maximum of 5 years.

After suspension has been granted, a certificate holder may request the suspension be lifted earlier than anticipated.

In case the period of suspension exceeds 1 year prior to restarting production and delivery as per the product certificate, an additional inspection must be carried out to ensure that all requirements laid down in this evaluation guideline are still being met, after which the status of suspension may be converted into a valid status.

#### **7.10 Summary of tests and inspections (test matrix)**

Table 8 contains a summary of the tests and inspections to be carried out in the event of certification.



**Table 8 – Test matrix**

Description of requirement	Clause BRL	Tests within the scope of:		
		Product investigation	Surveillance by CB after issue of the certificate	
			inspection	Frequency
Marking and specifications	1.7	x	x	1 / year
<b>Requirements imposed on the materials and the design of the GRP piping system</b>				
General	3.1	x	x	1 / year
Materials	3.2	x	x <sup>a)</sup>	1 / year
Design of the GRP piping system	3.3	x	x <sup>a)</sup>	1 / year
Type test groups	3.4	x	x <sup>a)</sup>	1 / year
Reference conditions for TT and AT	3.5	x	x <sup>a)</sup>	1 / year
Reference conditions for BRL and PVT	3.6	x	x <sup>a)</sup>	1 / year
Processing guidelines	3.7	x	x	1 / year
<b>Requirements imposed on the performances in the application</b>				
General	4.1	x		
Requirements and determination methods for the joints	4.2	x	x <sup>b)</sup>	1 / 5 years
Fixation of the elastomeric sealing element	4.3	x		
Installation instructions	4.4	x	x	1 / year
<b>Requirements imposed on the product</b>				
General	5.1	x		
Elapsed or extrapolated time for determination of the long-term properties, (x)	5.2	x		
Temperature effects	5.3	x		
Requirements and determination methods for the pipes	5.4	x	x <sup>c)</sup>	1 / 5 years
Requirements and determination methods for the fittings and couplings	5.5	x		
<b>Requirements for certificate holders and internal quality control</b>				
General	6.1	x		
Internal quality control	6.2	x	x	1 / year
Competence of personnel	6.3	x	x	1 / year

- a) Requirement is compared with the for this aspect ascertained values that are listed in the supplier's IQC scheme.
- b) Requirement that is part of audit testing according clause 4.2.2.
- c) Requirement that is part of audit testing for the following aspects:
- i) Amount of constituents, clause 7.5.2.1;
  - ii) Creep under wet condition (RLTT), NPR-CEN/TS 14632, annex D;
  - iii) Long term failure pressure (RLTT), clause 7.5.2.5;
  - iv) Resistance to strain corrosion (RLTT), clause 7.5.2.6.

**Remark:**

Reduced long-term type tests (RLTT) as detailed in NPR-CEN/TS 14632 may be used for satisfying the relevant audit test requirements, as well as proving that products still conform to the original specifications. Reduced long-term tests can thus be used as a comparison with existing long-term data, but not as a basis for a new design.

### 7.11 Inspection of the quality system

The quality system will be checked by Kiwa on the basis of the IQC scheme.

The inspection contains at least those aspects mentioned in the Kiwa Regulations for Product certification. See also chapter 6.



## 8 Requirements for the certification body

### 8.1 General

The certification body must have a procedure that establishes the general rules employed for certification processes.

### 8.2 Certification staff

Certification staff involved can be divided as follows:

- Certification assessor/Reviewer: in charge of preparing the design and documentation assessments, assessment of applications, and review of the conformity assessments,
- Location assessor: in charge of external conformity assessments at the certificate holders' location,
- Decision maker: in charge of making decisions with regard to pre-certification tests carried out and about continuity of certification based on performed inspections.

#### 8.2.1 Competency criteria for certification staff

Qualification requirements for the certification staff consist of qualification requirements for the staff executing the certification activities as laid down in the following table. The competency of the involved certification staff must be demonstrably established.

Competencies	Certification assessor Reviewer	Location assessor	Decision maker
<b>Basis competencies</b>			
<ul style="list-style-type: none"> <li>• Knowledge of business processes</li> <li>• Be able to assess professionally</li> </ul>	<ul style="list-style-type: none"> <li>• HBO thinking and working level</li> <li>• 1 year of relevant experience</li> </ul>	<ul style="list-style-type: none"> <li>• MBO thinking and working level</li> <li>• 1 year of relevant experience</li> </ul>	<ul style="list-style-type: none"> <li>• HBO thinking and working level</li> <li>• 5 years of relevant experience of which at least 1 year in certification activities</li> </ul>
Auditing competencies	N/A.	<ul style="list-style-type: none"> <li>• Training in auditing competencies</li> <li>• Participation in at least 4 periodic visits, with a minimum of 1 periodic visits carried out independently under supervision</li> </ul>	N/A
<b>Technical competencies</b>			
Relevant knowledge of: <ul style="list-style-type: none"> <li>• The technology for the manufacture of the products to be inspected, the execution of the processes and the providing of services</li> <li>• The way products are applied, processes carried out and services provided.</li> <li>• Existing defects that appear when using the product, during the execution of the processes as well as shortcomings in provision of services.</li> </ul>	Knowledge of one of the following disciplines: <ul style="list-style-type: none"> <li>• Minimum of 1 year experience in manufacturing, testing, inspection and / or installation,</li> <li>• including: - two initial applications under supervision</li> </ul> Or Internal training, including: two initial applications under supervision.	Knowledge of one of the following disciplines: <ul style="list-style-type: none"> <li>• Minimum of 1 year experience in manufacturing, testing, inspection and / or installation,</li> <li>• including: - two inspections under supervision</li> </ul> Or Internal training, including: three inspections under supervision.	N/A
Specific technical competencies	<ul style="list-style-type: none"> <li>• Detailed knowledge of the BRL</li> </ul>	<ul style="list-style-type: none"> <li>• Detailed knowledge of the BRL</li> </ul>	N/A



### 8.2.2 Qualification certification personnel

Qualification personnel must be demonstrably qualified by testing their knowledge and skills against the abovementioned requirements. If qualification takes place based on other criteria, this must be put down in writing.

The authority with regard to qualification must be established in the quality system of the certification body.

### 8.3 Communications about the pre-certification test and periodic inspections

The certification body will record the results of the pre-certification tests and periodic inspections in an unequivocal report. Such report must satisfy the following requirements:

- **Completeness:** the report will include a substantiated report of the determined grade of conformity with regard to the requirements laid down in this evaluation guideline,
- **Traceability:** the results on which statements are based must be recorded in a traceable way.

### 8.4 Decisions with regard to the KOMO® (technical-approval-with-) product certificate

The decision with regard to the issue of a (technical-approval-with-) product certificate or the invoking of measures in regard of a (technical-approval-with-) product certificate must be based on the findings recorded in the dossier.

The results of an initial investigation and, in case of a major non-conformity, periodic assessments must be evaluated by a reviewer.

Based on the performed review the decision-maker determines if:

- The (technical-approval-with-) product certificate can be issued;
- Sanctions are laid down;
- The (technical-approval-with-) product certificate has to be suspended or revoked.

The reviewer and the decision-maker are not allowed to have been involved at the preparations of the findings on which the decision is being made.

The decision must be traceable recorded.

### 8.5 Reporting to the Board of Experts

The certification body will annually present a report to the Board of Experts about the activities carried out and the respective results with regard to the product certificates based on this evaluation guideline. This report must include at least the following matters::

- The number of inspections performed versus the determined frequency,
- The number of performed pre-certification tests,
- Results of assessments,
- Measures imposed in case of detected shortcomings,
- Complaints received from third parties about certified products.

### 8.6 Interpretation of requirements

The Board of Experts may establish the interpretation of the requirements of this evaluation guideline in one or more separate interpretation document(s). Interpretation documents are available for/from members of the CvD, certification bodies and the certificate holders who carry out activities based on this evaluation guideline.

Interpretation documents are published on the website of the plan administrator.

Every certification body that makes use of this evaluation guideline is under the obligation to employ the interpretations laid down in it.



## 9 List of documents

### 9.1 Public law and Rules and Regulations

There are no applicable public laws and rules and regulations.

### 9.2 Normative documents

This evaluation guideline remits to the following normative documents:

Remarks:

Verification if normative documents are still up-to-date is carried out annually. Modifications of the applicable normative documents will be published on the services page on the website of the certification body which draw up the evaluation guideline.

### 9.3 Informative documents

This evaluation guidelines remits to the following documents for information purposes:

**Table 9 – List of in evaluation guideline mentioned documents**

Standard <sup>1)</sup>	Title
ASTM D2563-08(2015)	Standard Practice for Classifying Visual Defects in Glass-Reinforced Plastic Laminate Parts.
BRL 2013:2012 + AMD:2014	Evaluation guideline for the KOMO® product certificate for vulcanized rubber products for cold and hot non-drinking water applications
DVS 2220:2011	Qualification testing of plastics laminators and adhesive bonders. Laminates as well as laminate and adhesive-bonded joints between GFRPs (UP-GF and EP-GF).
ISO/DIS 7432:2021	Glass-reinforced thermosetting plastics (GRP) pipes and fittings - Test methods to prove the design of locked socket-and-spigot joints, including double-socket joints, with elastomeric seals.
ISO 7510:2017	Plastics piping systems - Glass-reinforced plastics (GRP) components - Determination of the amounts of constituents using the gravimetric method.
ISO 7685:2019	Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes - Determination of initial specific ring stiffness.
ISO 8483:2019	Glass-reinforced thermosetting plastics (GRP) pipes and fittings - Test methods to prove the design of bolted flange joints.
ISO 8513:2000	Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes - Determination of longitudinal tensile properties.
ISO 8521:2020	Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes - Test methods for the determination of the apparent initial circumferential tensile strength.
ISO 8533:2019	Glass-reinforced thermosetting plastics (GRP) pipes and fittings - Test methods to prove the design of cemented or wrapped joints.
ISO 10466:2021	Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes - Test method to prove the resistance to initial ring deflection.
ISO 10468:2018	Glass-reinforced thermosetting plastics (GRP) pipes - Determination of the long-term specific ring creep





BRL 52204 Plastics piping systems for drainage and sewerage with or without pressure – Glass-reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP) «date BRL»

	stiffness under wet conditions and calculation of the wet creep factor.
ISO 10471:2018	Glass-reinforced thermosetting plastics (GRP) pipes - Determination of the long-term ultimate bending strain and the long-term ultimate relative ring deflection under wet conditions.
ISO 10928:2016	Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes and fittings - Methods for regression analysis and their use.
NEN-EN-ISO 75-2:2013	Plastics - Determination of temperature of deflection under load - Part 2: Plastics and ebonite.
NEN-EN 14364:2013	Plastics piping systems for drainage and sewerage with or without pressure - Glass-reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP) - Specifications for pipes, fittings and joints
NEN 7037:1981	Buizen van met glasvezel versterkte thermoharde kunststoffen voor buitenriolering - Eisen en beproevingsmethoden.
NEN-EN-ISO 9001:2015	Quality management systems - Requirements
NEN-EN-ISO/IEC 17020:2012	Conformity assessment -General criteria for the operation of various types of bodies performing inspection.
NEN-EN-ISO/IEC 17021-1:2015	Conformity assessment - Requirements for bodies providing audit and certification of management systems
NEN-EN-ISO/IEC 17024:2012	Conformity assessment - General requirements for bodies operating certification of persons.
NEN-EN-ISO/IEC 17025:2018	General requirements for the competence of testing and calibration laboratories.
NEN-EN-ISO/IEC 17065:2018	Conformity assessment - Requirements for bodies certifying products, processes and services
NPR-CEN/TS 14632:2012	Plastics piping systems for drainage, sewerage and water supply, pressure and non-pressure - Glass-reinforced thermosetting plastics (GRP) based on unsaturated polyester resin (UP) - Guidance for the assessment of conformity
NEN-ISO 10952:2021	Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes and fittings - Determination of the resistance to chemical attack for the inside of a section in a deflected condition
NEN-ISO 18851:2015	Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes and fittings - Test method to prove the structural design of fittings
1. for dated references the edition cited applies	



## Model IQC-scheme (informative)

<p><b><u>IQC-schedule</u></b> <b><u>INTERNAL QUALITY PLAN</u></b></p>	<p>Manufacturer / supplier : Production location address :</p>	<p>Number of appendices:</p>
<p><u>Field(s) of application</u></p> <p><u>According evaluation guideline(s)</u></p>		
<p><u>Number of production shifts:</u></p>	<p><u>Quality manual, procedures and working instructions</u> Is the Quality Management System (QMS) certified according to ISO 9001<sup>1)</sup>?</p> <p>If yes, by which certification body: If yes, is the certification body accredited for the particular scope of certification? The following procedure for dealing with <u>complaints</u> applies: In case the QMS is <b>not</b> certified according to ISO 9001:</p> <ul style="list-style-type: none"> <li>• Working instructions, test instructions and procedures are documented as follows:</li> <li>• The following procedure for <u>nonconformity review</u> applies:</li> </ul>	
<p><u>Quality Control</u> Total number of employees in QC department : Number of QC-operators per shift : If no QC-inspections are carried out during night shifts, state the QC procedure(s)/instruction(s) to be followed: , documented in:</p>		
<p><u>Inspection and test records</u> All records shall be maintained for a minimum of        years.</p>		
<p><u>Specific agreements/comments/explanations</u></p>	<p>Signature of the manufacturer/supplier:</p> <p>Date :</p>	

<sup>1)</sup> In case the QMS is ISO 9001 certified and covers the scope of the product certificate(s), reference to the applicable procedure(s) on the next pages is sufficient and the tables A till F do in principle not have to be further filled-out except for the frequency of tests/inspections (to be approved by CB) in tables B, C and D.



<b>A. Calibration of measuring and test equipment</b>				
Applicable procedure(s) nr(s):				
Equipment to be calibrated	Calibration aspect	Calibration method	Calibration frequency	Calibration file (name and location)

<b>B.Raw material and additives</b>				
Applicable procedure(s) nr(s):				
<b>B.1Receipt</b>				
For each delivery of raw material or additives data with respect to dates, producers, types and quantities are recorded as follows:				
<b>B.2Entry control</b>				
Type of raw material	Inspection aspect	Inspection method	Inspection frequency	Registration file (name and location)



<b>C. Batch release tests per machine (including in-process and finished product testing)</b>				
Applicable procedure(s) nr(s):				
Production process(es):				
Type of product	Type of test	Test method	Test frequency	Registration file (name and location)

Specific agreements/comments/explanations:

<b>D.Process verification tests</b>				
Applicable procedure(s) nr(s):				
Type of product	Type of test	Test method	Test frequency	Registration file (name and location)



<p><b>E. Control of nonconforming and/or rejected products</b> Applicable procedure(s) nr(s):</p>
<p><b>E.1</b> <b>Method of registration</b></p>
<p><b>E.2 Method of identification</b></p>
<p><b>E.3 Method of nonconformity review and disposition</b></p>

<p><b>F. Inspection with regard to packaging, storage and transportation of the finished product</b> Applicable procedure(s) nr(s):</p>			
Inspection aspects	Inspection method	Inspection frequency	Registration file (name and location)
<p><b>F.1</b> <b>Packaging, storage and transport</b></p>			



<b>Raw materials list</b>	<b>Appendix I</b> Date: .....
<p>I.1 <b>The product is built-up of the following raw materials:</b></p> <p>a) In case of products made from ready-made raw materials: listing of name and/or unique code of the raw material(s);</p> <p>b) In case of products made from own compounded raw materials: reference to raw material/compound sheets which are (only) available at the production location and which have to be authenticated by Kiwa (e.g. by the Kiwa inspector);</p> <p>c) In case of composed products (e.g. plastics fitting body, with separate nut, clamp ring and rubber sealing ring): of each part a specification according to a) or b) (whatever applicable).</p> <p>-</p> <p>-</p> <p>-</p> <p>-</p>	

<b>List of technical drawings</b>		<b>Appendix II</b> Date:.....	
Drawing title and number	Drawing date	Drawing title and number	Drawing date