

BRL 5609-1
2019-08-27

Evaluation Guideline

for the KOMO® process certificate for
Pre-insulated flexible plastics piping systems for warm
water distribution outside buildings – Part 1: Installation



Validated by the Board of Experts Piping systems of plastic on 2019-07-02

Accepted by the KOMO Quality- and Certification commission on
27 August 2019

**Trust
Quality
Progress**

Preface Kiwa

This evaluation guideline has been prepared by the Board of Experts “LSK”, in which the parties interested in the field of “pre-insulated flexible plastics piping systems for warm water distribution outside buildings – Part 1 Installation”, are represented. This Board of Experts also guides the performance of certification and adjusts this Evaluation Guideline where necessary. Wherever the term ‘Board of Experts’ is used in this Evaluation Guideline, the above-mentioned Board of Experts is meant.

This Evaluation Guideline will be used by the certification institute in conjunction with the regulations for certification of the certification institute in question. These regulations detail the methods employed by the certification institute for conducting the necessary investigations prior to issuing the process certificate and the method of the external control.

Goal of this Evaluation Guideline (BRL)

The goal of this Evaluation Guideline (BRL) is to define a unified basis for the installation of manufactured pre-insulated flexible plastics piping systems for warm water distribution outside buildings, by which means the chain responsibility for the system becomes clear and abided. The starting principle is that with the installation according to this Evaluation Guideline a well-functioning warm water transportation system can be achieved, in which the predetermined parameters for energy loss and life expectancy are guaranteed.

This Evaluation Guideline contains requirements and preconditions for a good installation of pre-insulated flexible plastics piping systems for warm water distribution outside buildings. Because of this, this Evaluation Guideline is inseparably connected to the KOMO® Technical-approval-with product certificates Evaluation Guideline BRL 5609-2 Pre-insulated flexible plastics piping systems for warm water distribution outside buildings – Part-2: Products.

This is a translation of the Dutch version of evaluation guideline BRL 5609-1. In case of doubt about the translation, the Dutch version is valid.

Binding declaration

This evaluation guideline is declared binding by Kiwa on 27 August 2019.

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1 Introduction

1.1 General

The requirements embodied in this evaluation guideline (BRL), shall be employed by certification institutes that are accredited by the Dutch Accreditation Council (RvA) and which have an licence agreement with the KOMO foundation when dealing with applications for the issue or maintenance of a KOMO® (technical approval-with-)product certificate for Pre-insulated flexible plastics piping systems for warm water distribution outside buildings – Part 1: Installation.

This evaluation guideline together with Part 2 – BRL 5609-2 "Pre-insulated flexible plastics piping systems for warm water distribution outside buildings – Part 2: Products" a series of evaluation guidelines in which amongst others requirements are determent for the installation and for the products.

The quality statement to be issued is referred to as a KOMO® process certificate.

Besides the requirements embodied in this evaluation guideline, certification institutes impose additional requirements in the sense of requirements with regard to general procedures for certification as laid down in the general certification regulations of the respective certification body.

During the execution of certification activities, the certification bodies have to fulfil the requirements as laid down in the chapter 'Requirements imposed on the certification body'.

1.2 Field of application

The pre-insulated flexible plastics piping systems are intended to be used in piping systems for district heating at a design pressure of 6, 8 or 10 bar for the transport of hot water for district heating under the conditions mentioned in table 1.1. The installation work of pre-insulated flexible plastic piping systems is up to the building owner's connection The responsibility of the connection to the installation of the property owner is registered in the installation plan. The service pipe is made of either PE-X, PB, PE-RT type II or a multilayer pipe. The installation evaluation guideline is applicable for systems with both a bonded as a non-bonded piping package.

Table 1 - Classification system of the conditions of usage, this is the temperature profile of 30 years

	Temperature [°C]	Lifetime	Service coefficient
Operating temperature T_D	80	29 years	1,5
Maximum temperature T_{max}	90	1 year	1,3
Peak temperature T_{mal}	95	100 hours	1,0
Remark: the mentioned temperature profile is in accordance with class DH1			

On the basis of this evaluation guideline a process certificate can be issued for the instalment of the system on location.

Remark:

For the requirements and determination methods for combining (pre-fab parts) which are manufactured in the own company, is referred to BRL 5609-2.

1.3 Acceptance of test reports delivered by the supplier

If the supplier submits reports from research bodies or laboratories to show that the requirements of the evaluation guideline are met, then these reports have to be prepared by a body meeting the prevailing accreditation standard, i.e.:

- NEN-EN-ISO/IEC 17020 for inspection bodies;
- NEN-EN ISO/IEC 17021-1 for certification bodies certifying systems;
- NEN-EN-ISO/IEC 17024 for certification bodies certifying persons;
- NEN-EN-ISO/IEC 17025 for laboratories;
- NEN-EN-ISO/IEC 17065 for certification bodies certifying products.

The body is deemed to meet these criteria if an accreditation certificate can be submitted which has been issued by the Dutch Accreditation Council (RvA) or an accreditation body with which the Dutch Accreditation Council has concluded a mutual acceptance agreement.

This accreditation should relate to the tests required for this evaluation guideline.

If no accreditation certificate can be submitted, the certification body shall verify whether the accreditation standard has been met or repeat the tests concerned either self or by a third party.

1.4 Certificate

Based on the KOMO-systematic in appliance to this evaluation guideline KOMO process certificates are issued.

The declarations about the process in this certificate are based on chapter 4 to and including 7 of this evaluation guideline.

On the website of the KOMO foundation (www.komo.nl) the model certificates are listed, which are applicable for this evaluation guideline. The certificate which will be issued is to be in accordance to this.

Without alteration of this evaluation guideline, the validity of the certificate is indefinite.

2 Terminology

2.1 Definitions

In principle for regarding terms and definitions is referred to explanations as those are put into words in for example BRL 5609-2 and the NEN-EN 15632 series.

For definitions in coherence to certification, one is referred to the website of the KOMO foundation (www.komo.nl) and the regulations of the certifying body.

In this evaluation guideline with the following definitions are meant:

2.1.1 General

2.1.1.1 *Installer*

The party responsible for the installation processes meeting continuously the requirements on which the certification is based.

2.1.1.2 *Installation plan*

The plan in which all requirements and process steps for executing the installation are defined.

2.1.1.3 *Sub supplier*

Party who delivers product or goods.

2.1.1.4 *IQC-Scheme*

a description of the quality inspections carried out by the manufacturer as part of his quality system.

2.1.1.5 *Functional requirements*

Essential requirements which have to be set to a product so the end-user can use the product in a safe way and for the intended purpose.

2.1.1.6 *Performance requirements*

In measurements or numbers specified requirements which are related to certain (functional) properties of the part of the building (component) and which have an achievable border value which can be measured or calculated unequivocally.

2.1.1.7 *Product requirements*

In measurements or numbers defined requirements which are aimed at the (identifiable) properties of products which comprise of an achievable value which can be measured or calculated unequivocally.

2.1.1.8 *Proces requirements*

Specified requirements where the process has to comply to, if needed including the conditions and parameters the process is permitted or needs to be taking place.

2.1.1.9 *Proces owner*

The assigned person responsible for (a part of) the execution.

2.1.1.10 *Work instruction*

The work instruction is an instruction in order to do certain activities without supervision. A work instruction is to meet the following requirements:

- Is formulated in such a way that a qualified person can do the work, even if it is the first time this person does the specific task.
- The level of detail is not to supersede the level of expertise of the employee, such that the employee with the level of knowledge that is required for his/ her function/ part can understand the work instruction.

2.1.1.11 *Test Request Form*

Form with a description of the samples to be taken.

2.1.1.12 *Checklist*

A list with points that need to be checked, and which is to be filled in by the person tasked with the review, on the bases of his or her findings. By using a checklist, one achieves complete and consistent control.

2.2 **Service conditions**

2.2.1.1 *Operating temperature (T_D)*

The temperature of the water in the piping system during operation, that occurs at least during a certain part of the lifetime of the piping system. See table 1.

2.2.1.2 *Maximum temperature (T_{max})*

The highest water temperature in the piping system during operation, that occurs during a certain part of the lifetime of the piping system (the highest occurring temperature during a short time). See table 1.

2.2.1.3 *Design Pressure (P_D)*

The allowable pressure in the piping system that during continuous use during 30 years may occur. In this guideline 'design pressure' is defined as the prevailing overpressure.

Remark: prevailing overpressure is the pressure measured from the absolute zero minus the prevailing pressure of the air. Calculations are made with an prevailing air pressure of 1 bar.

2.2.1.4 *Malfunction temperature (T_{mal})*

The highest water temperature in the piping system under abnormal circumstances. For example due to malfunctioning during a short period (maximum 100 hours per 30 years). See table 1.

2.2.1.5 *Service coefficient (C)*

A coefficient with a value larger or equal to 1, which takes the service conditions and the properties of the components of the piping system into account for as far as they are not covered in the LPL value.

2.2.1.6 *Temperature profile ($DH1$)*

On the basis of the employed design pressure in relation with the maximum and peak temperature, the temperature profile according to table 1 may be used for a lifetime of 30 years.

2.3 Construction

2.3.1 *Bonded piping package*

The medium pipes and the outer casing of the piping package are joined by the insulation material in such a way that under influence of expansion forces, no displacements at the interface of the mutual piping layers occur.

2.3.2 *Non-bonded piping package*

The medium pipes, the insulation material and the outer casing of the piping package can be mutually displaced under influence of expansion forces.

2.4 Symbols / abbreviations

Abbreviations	Term
BRL	Beoordelingsrichtlijn (evaluation guideline)
IQS	Internal Quality Schedule
PB	Polybutene
PE-X	crosslinked Polyethene
PE-RT	Polyethene – Raised Temperature resistant
PE	Polyethene

3 Procedure for obtaining a certificate

3.1 Initial investigation

In order to obtain a KOMO® process certificate, the certification institute will conduct an investigation. The investigation to be carried out is done by means of the process and product requirements including methods of determination of this evaluation guideline and consists of, depending on the nature of the process to be certified:

- An investigation, to determine if the process and the installed product meet the product and/ or process requirements;
- Evaluation of the installation process;
- Evaluation of the internal quality system and the IQC-scheme of the installer;
- Review of the presence and performance of the other required procedures at the installer.

3.2 Evaluation of the quality system

In order to obtain a KOMO process certificate, the certification institute will conduct an investigation. In the initial investigation are included:

- Evaluation of the installation process;
- Evaluation of the internal quality system and the IQC-scheme of the installer;
- Review of the presence and performance of the other required procedures at the installer.

The certification institute is to determine that the requester is capable to perform the process in such a way this complies to the requirements consistently as stated in the evaluation guideline.

3.3 Issue of the certificate

After completion of the initial investigation, the results are presented to the decision-maker. The decision-maker evaluates the results and determines whether the certificate can be issued or whether additional information and/or investigations are required in order to be able to issue the certificate.

4 Installation requirements and test methods

The installation of factory-insulated flexible plastic pipe systems up to the building owner's connection point must comply with the requirements set out in this chapter.

4.1 Reporting of activities

All projects which are installed as subject to this Evaluation Guideline are to be reported by the installer before execution of the projects to the CI in writing.

Unless agreed upon otherwise, this should be at least 7 workdays before the initial start of the work. A (temporary) cease or continue of the work, has to be reported to the CI as soon as possible.

4.2 Process build-up

The general process is shaped in process steps (see fig. 1). This process certification regulation leaves the process steps "design" and "detail design" out of scope.

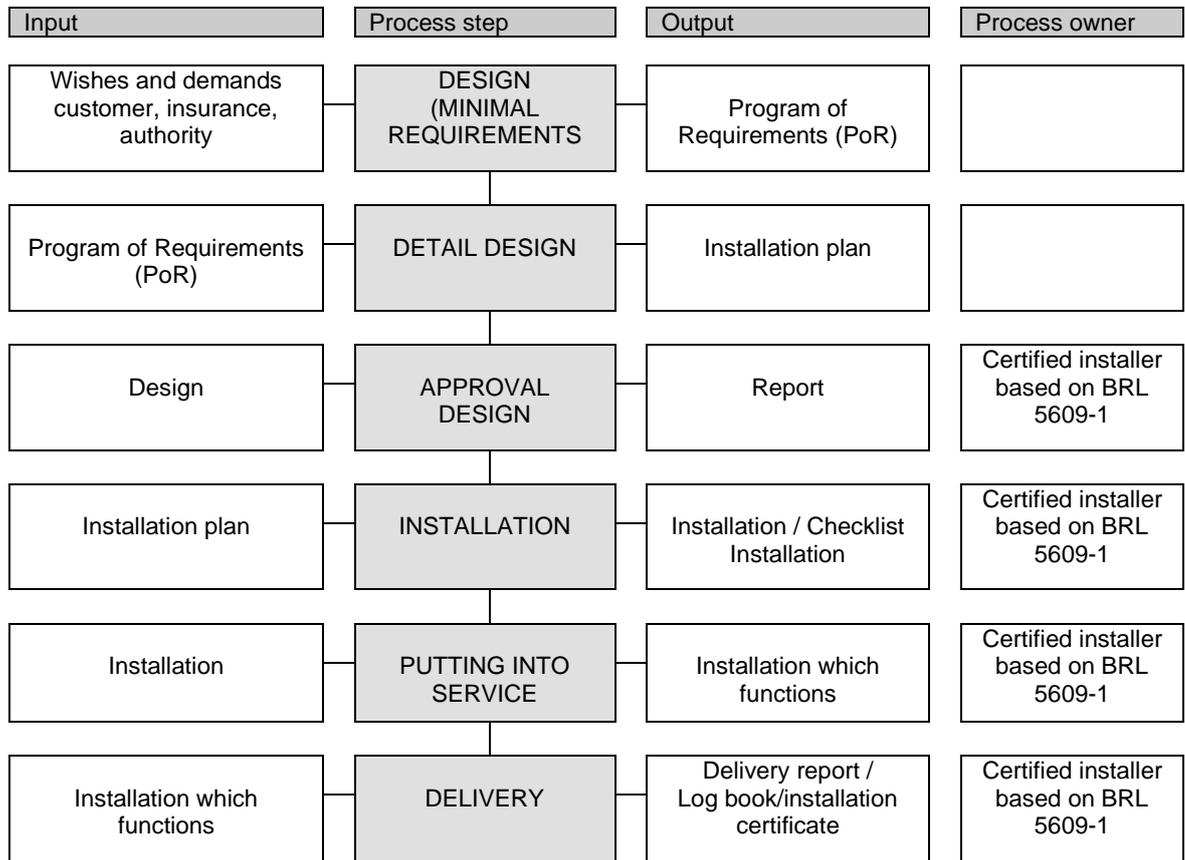


Figure 1 – General process build-up

In figure 2 is zoomed in further on the process steps that are part of the evaluation guideline (BRL). Because systems can differ and to prevent that overly detailed process steps could come in the way of innovation, there are for this guideline for each process step a working instruction (see 2.1.1.10 for the definition), a checklist (see 2.1.1.12 for the definition) and a process owner required.

Input	Proces step	Output	Process owner
Installation plan & relevant work instructions	PREPARATION OF THE BUILDING LOCATION	Checklist	Certified installer based on BRL 5609-1
Piece list of the system to be installed	CONTROL OF THE MATERIAL	Checked piece list	Certified installer based on BRL 5609-1
Work instructions of material that is needed for the installation	CONTROL OF THE MATERIAL	Checklist	Certified installer based on BRL 5609-1
Concerning work instructions and according installation plan	MAKING CONNECTIONS OF THE SERVICE PIPE	Checklist	Certified installer based on BRL 5609-1
Concerning work instructions and according installation plan	POST-INSULATION	Checklist	Certified installer based on BRL 5609-1
Concerning work instructions and according installation plan	PROVIDING LEAK TIGHTNESS	Checklist	Certified installer based on BRL 5609-1
Sample form	SAMPLING	Report	Certified installer based on BRL 5609-1
Concerning work instructions and according installation plan	PUTTING INTO COMMISSION (TESTING/ MAKING CONNECTION)	Checklist	Certified installer based on BRL 5609-1
Delivery checklist	DELIVERY	Delivery report	Certified installer based on BRL 5609-1

Figure 2 – Process build up – process step installing

4.3 Requirements and testing methods

4.3.1 General

4.3.1.1 *Implementation in quality system*

The holder of the certificate/ installer is to have implemented the process steps in figure 2 at minimum.

4.3.1.2 *Design document*

Remark: design and detail design are not taken into consideration in this evaluation guideline.

Each installation is to be made on the basis of a design document. The design document is to be sufficiently detailed, so after performing the installation the intended quality can be guaranteed.

The design document can be based on the following parts:

- Wishes of the customer, authority;
- Program of requirements (specification requirements);
- Design instructions of suppliers and manufacturers;
- Measures to be taken in relation to legislation, safe working environment and pre-existing constructions (in the subsoil).

The document is to be written in the Dutch language.

The design document is to be approved by a qualified person commissioned by the installer.

Remark:

Recommended is that the design document is in accordance with NEN-EN 13941:2009+A1:2010 article 4.5.

The design document is to be documented in the quality system of the installer and is the basis for the installation plan.

4.3.1.3 *Installation plan*

The installation of the piping system is to be conducted according to:

- The installation plan of the installer and the installation instructions of the sub-supplier of the system and/ or products;
- Instructions to insure the safety of the staff and others.

The installation plan is to be sufficiently detailed, so after performing the installation the intended quality can be guaranteed. A list of all components needs to be included in the installation plan, for example by means of a piece list (see Annex II). On this list each product is specified on the basis of:

- Product name and if applicable type designation;
- Possibly: nominal size, pressure class, material etc.;
- Name of the sub-supplier of the components.

The installation plan also indicates which documents are to be present at the building site, for example: operating instruction(s) of the piping system of the piping manager, user manual of supplier and material.

In the installation plan needs to be included how to deal with:

- Approved and rejected connections;
- Installed work about which is uncertain if the desired quality level is achieved;
- In-correct execution of the post-insulation
- How to solve rejections and how to re-asses and report.

The installation plan and the other documents are to be present at the building site during the installation process and to be drafted in the Dutch language. Procedures are to be recorded in the IQC scheme of the installer after approval of the certification institute.

4.3.1.4 *Pre-existing constructions in the subsoil*

The design of the installation is to be such, that pre-existing constructions cannot cause damage to the piping system to be installed.

The installation and execution are not to cause damage to existing constructions as for example: roads, cables and other piping systems.

4.3.2 *Preperations of the construction site*

The construction site is to be prepared according to the installation plan and according to the relevant working instructions under the responsibility of the (welding)supervisor of the installer.

After preparation of the construction site the checklist is filled in and signed-off on by the (welding)supervisor of the installation team.

4.3.2.1 *Trenches*

The field pipes are preferably put into small trenches. The free space on both sides is 10 cm at the minimum, unless specified differently in the specification. The free space is filled in with clean sand, free of debris, so heat-loss is limited and good compaction of the soil is possible. If more than 1 pipe is put into the trench, then a minimum distance of 10 cm between the pipes is to be maintained.

How deep the pipes are put into the ground is determined by the local circumstances. In general a cover of 60 cm is maintained, in which the top-layer of at least 10 cm of "clean sand" complemented with soil from the digging of the trench. For area's with a traffic load (SLW 60) a minimum cover of at least 80 cm is to be maintained. In an area without traffic load a minimal size 50 cm is to be maintained.

4.3.2.2 *Minimal bending radius of the piping package*

The bending radii of the pre-insulated flexible plastics piping systems are constrained to prevent unwanted strains in the system (in particular in the insulation package).

The value of the minimum bending radii can differ per system and are therefore is to be supplied by the manufacturer of the pre-insulated flexible plastics piping systems as well as noted in the installation plan.

Remark: The minimal bending radius can be dependent on the nominal size of the piping package and is to be determined according to BRL 5609-2:2019 article 12.1.

4.3.3 Making trial connections

As part of the project between the customer and the installer it can be agreed that trial connections are made.

Requirements:

- The agreements made about trial connections are to be documented in the installation plan;
- The results of the trial connections are discussed between the customer and the installer before the actual work has started;
- The procedures related to making a connection are to be reviewed and if necessary are to be revised accordingly;
- A revision has to be in consultation with the customer.

Also possible is an agreement to make a test connection on site to check if the conditions under which, for example, the welding is to take place are sufficient. If the test weld (trial connection) is meeting the requirements according to article 5.4 it is assumed the conditions are sufficient.

4.3.4 Material check

4.3.4.1 Products approved for installation

This process certification regulation is only valid for installations in which the pre-insulated flexible plastics piping systems comply to the requirements of BRL 5609-2.

4.3.4.2 Storage, treatment and transport

Storage, treatment, transport and handover of products to be installed, are to be done in such a way that the functional properties are maintained.

Points of concern during storage, treatment and transport are for example:

- Prevent contact with materials and chemicals which have a negative influence on the welding capability and performance of the products;
- Prevent possible damage by squeezing, dropping etc.;
- Make use of a decent packaging of the product;
- Prevent the products of influence of sun light (ultra-violet radiation).

The requirements and procedures for storage, treatment and transport are dependent on the system and are therefore by responsibility of the installer agreed upon between the end user and the sub suppliers. The procedure is to be recorded in the quality system of the installer. Work instructions are to be present on the construction site and is to be written in the Dutch language.

4.3.5 Equipment check

4.3.5.1 User manual equipment

From all equipment used for installing a user manual from the supplier is to be present or available. According to the manual must be operated.

4.3.5.2 Approval of equipment

The status of periodic approval of the equipment must be recognizable and traceable.

Remark: Recognizability can be achieved by means of amongst others:

- Sticker;
- Label;
- Engraving.

4.3.5.3 *Butt fusion welding en electro fusion welding equipment*

Butt fusion welding equipment is to comply to NEN-ISO 12176-1. Electro fusion welding equipment is to comply to ISO 12176-2 and NEN 3140.

According to NEN-ISO 12176-1 and ISO 12176-2 the equipment can be used for welding of PE with a normal temperature range of $-10\text{ }^{\circ}\text{C}$ to $40\text{ }^{\circ}\text{C}$. For the welding of PB and PE-RT the temperature range is to be agreed upon with the end-user, the installer and the supplier of the products to be welded. If needed it is to be agreed upon at what relative humidity it is still allowed to weld or what extra measures are to be taken at a too high a relative humidity.

Electro fusion welding equipment is to be provided with the minimal required power for the entire welding process. Here it is needed to keep in mind possible power-loss due to use of extension cables.

All in the IQC-scheme mentioned data must be registered.

4.3.5.4 *Socket welding equipment*

Socket welding equipment is to be compliant to DVS 2208-1.

All in the IQC-scheme mentioned data must be registered.

4.3.6 *Making of a connection with the service pipe*

The service pipe can be made of PE-X, PB, PE-RT or can be a multilayer pipe.

Pipes of PB and PE-RT are allowed to be welded.

Pipes of PE-X and multilayer pipes are not possible to be welded and are therefore required to be connected with a mechanical fitting.

4.3.6.1 *Welded connections*

The welded connections are made by a qualified plastic welder according to the work instruction noted in the installation plan under the responsibility of the qualified (weld)supervisor.

In case of doubt about the quality of the connection, the procedure in the IQC scheme is to be followed.

4.3.6.2 *Mechanical connections*

The mechanical connections are made by qualified personnel, according welder according to the work instruction noted in the installation plan under the responsibility of the qualified (weld)supervisor of the installation team.

In case of doubt about the quality of the connection, the procedure in the IQC scheme is to be followed.

4.3.7 *Post-insulation*

The post-insulation is executed according to the work instruction noted in the installation plan under the responsibility of the qualified (weld)supervisor of the installation team.

Remark: Post-insulation can be performed with pre-shaped shells with insulation tape (PE foam) or by spray foam insulation.

In case of doubt about the quality of the connection, the procedure in the IQC scheme is to be followed.

4.3.8 Sealing

The installed part and if applicable also the connections on the old piping system are made watertight according to the work instruction noted in the installation plan under the responsibility of the qualified (weld)supervisor of the installation team.

The work instruction is to be such that it complies to BRL 5609-2:2019 article 12.3 “sealing in linear directions”.

After sealing the result should be recorded by making a photograph.

Remark: Work instructions for sealing of non-bonded or bonded piping packages can be different.

4.3.9 Sampling

The sampling is to be executed as recorded in the specification or as decided by the piping manager/ installer.

The sampling is part of the installation plan and consists of by example the following information:

- Sampling procedure;
- Who is responsible for the sampling;
- Who executes the sampling;
- Which test samples must be sampled;
- How many test samples must be sampled.

4.3.10 Putting into commission

4.3.10.1 Leak tightness

After installation of (a part of) the piping system it needs to be checked if the connections of the service pipe are watertight according to the method of testing mentioned in article 5.3.

4.3.10.2 Ability to disconnect

Ability to disconnect in district systems is at least possible at the following points:

- In the substation in which each substring is to be provided with a steel closing valve. The transition to plastic needs to take place in the station after the closing valve.
- In a junction box, on which on each set a steel closing valve needs to be connected on the connecting brace. The transition to plastic needs to be in the junction box before the locking valve.
- For integrated piping networks in which piping networks of high-rise buildings are connected: plastic piping may only be used in the lower rise buildings. After entering the first residence, the plastic piping must change to steel, starting with a steel valve.

4.3.11 Delivery- report of delivery

For each project there should be a document made by the installer from which could be deduced that the installation is according to BRL 5609-1.

Remark: The report may consist of a collection of checklists that are filled in before the installation.

4.4 Marking

In the contract pieces in which the realisation of the under process certificate to be executed processes are recorded, is to be mentioned:
Executed under KOMO®-process certificate.

The documents related to execution and the result of the process are allowed to be marked with the KOMO®-wordmark followed with the certificate number. The wordmark is as follows:



Besides this, a QR-code is allowed to be placed, which links to the details of the process certificate on the website of the KOMO foundation.

5 Requirements and test methods

5.1 Product requirements

The installer needs to proof the suitability of the applied products. The installed products are to meet the requirements as stated in BRL 5609-2.

Remark: A valid technical-approval-with certificate according to BRL 5609-2 is sufficient proof.

5.2 Requirements of the installed product

The installed product is to be in accordance to the requirements from the program of specifications and the design document.

5.3 Leak-tightness installed piping system

Unless not mentioned in the specification, the following is true:

The determination of the water tightness based on NEN-EN 805:2000 paragraph 11.3. The procedure that needs to be followed is the so called pressure-loss method in which (a part of) the piping system is put under a test pressure of 1,5 the design pressure. The duration of the test is at least 1 hour or longer if so agreed upon with the end-user. For the duration of the test the maximum pressure difference is 20 kPa. During the test differences in temperature are to be reduced to a level that they do not pose a significant effect on the leak-tightness measurement.

Remark: Beside leakage of water there can also be a difference of pressure by temperature changes during the test.

5.4 Check of connections – short duration

5.4.1 Weld connections

5.4.1.1 Socket weld

Visual evaluation

Imperfections in the welds are to be visual evaluated according to DVS 2202-1 – Acceptance level II.

What constitutes as imperfections in the weld and who is responsible is to be recorded in the installation plan.

Mechanical research

Socket welds of a pipe or a support are also to be tested according to table 5 (NEN 7200 of ISO 13953) under condition that the sample can be loaded uni-axial during the pull test.

5.4.1.2 Butt fusion welds

Visual evaluation

Imperfections in the welds are to be visual evaluated according to DVS 2202-1 – Acceptance level II.

Mechanical research

The mechanical properties of a butt fusion weld are, dependent on the nominal outside diameter (see table 5) to be determined according to NEN 7200:2017 paragraph 6.3.2 (uni-axial pull test) of ISO 13953.

Test samples are only to be tested after 24 hours after making the weld. The welds are subjected to a pull test at a temperature of (23 ± 2) °C after a conditioning period of the samples of at least 6 hours at (23 ± 2) °C.

It is allowed to remove the welding bead but if so, this has to be clearly noted in the test report.

During the pull test a but weld of adequate quality will show a plastic deformation in or directly next to the welding zone. Brittle breaks in the welding zone and insufficient flow of the material next to the welding zone, point out to a bad quality weld and is unacceptable.

Figure 11 of NEN 7200:2017 can be used to determine if there has been a plastic deformation in the welding zone or directly besides the welding zone. With a good (acceptable) bottom fusion weld the material in the weld zone or directly next to the weld zone the material is constricted so the length of the sample increases. With an acceptable weld the material there is to be a point in the tension strain curve (see figure 11 of NEN 7200:2017) where the tension is at maximum. This point is the so called yield stress of the material (in and around the weld) and typical for an acceptable quality of the weld. If this maximum in the first zone in the figure is missing, then there is a so called brittle break or so called failure of the test sample without plastic deformation of the test sample.

With an evaluation of the weld according to ISO 13953 the pull strength of the weld is determined by a maximum measured pull force until sample failure, divided by initial cross section of the test sample.

The pull force of the bottom fusion weld connection is at least 80% of the average pull strength of the material measured by the same testing speed and an identical cross section of the sample. Besides this for each sample is to be noted if the failure type is "brittle" or "ductile". This is valid for samples that are tested according to NEN 7200 and ISO 13953.

Table 3 – Testing method for the determination of the quality of a bottom fusion weld dependent on the nominal diameter

Nominal outside diameter (mm)	Testing method	Testing speed (mm/minute)
DN < 90	NEN 7200 / DVS 2203-1 – pull test	100
DN ≥ 90	ISO 13953 / DVS 2203-1 – pull test	5

The amount of samples that is to be tested is dependent of the nominal outside diameter and is noted in table 4.

Table 4 – amount of test rods

Nominal outside diameter (mm)	Sample amount
DN < 90	1
90 ≤ DN < 110	2
110 ≤ DN < 180	4
If one test rod is to be prepared from the sample it is needed to take this from the position with the biggest difference in alignment. If multiple samples need to be prepared from the sample they need to be taken equally divided from the circumference.	

5.4.1.3 *Electro fusion welding*

Visual evaluation

Imperfections in the welds are to be visual evaluated according to DVS 2202-1 – Acceptance level II.

Mechanical research

Electro fusion welding between a PB and a PE-RT and a support of PB and PE-RT are classified and tested according to ISO 13954 or ISO 13955, dependent on the nominal diameter (see table 5).

Table 5 – Testing method for the determination of the quality of a electro fusion weld dependent on the nominal diameter

Nominal outside diameter (mm)	Testing method	Testing speed (mm/minute)	Amount of samples
DN < 90 mm	ISO 13955	100 mm/minute \pm 10% (compression)	One sample with two sections to be tested
DN \geq 90 mm	ISO 13954	100 mm/minute \pm 10% (pull)	3

Test samples are only to be tested after 24 hours after making the weld. The welds are subjected to a pull test at a temperature of (23 ± 2) °C after a conditioning period of the samples of at least 6 hours at (23 ± 2) °C.

Determine from each sample the percentage of the de-cohesion (C_c) and the type of failure.

The percentage of the de-cohesion (C_c) is to be 33% at the minimum. Is valid for all tested pieces.

The following failure behaviours are distinguished and have to be reported:

- Brittle break on the weld line;
- Ductile failure of the pipe material or of the fitting material;
- Tearing between the metal winds with plastic deformation of the polymer material.

5.4.2 **Mechanical connections**

The resistance to elongation under constant load in the longitudinal direction between the support and the pipe is to be determined according to NEN-EN-ISO 3501 (see table 6).

Table 6 – Test parameters for the determination of the quality of the mechanical connection

Test parameters	Value	Unit
Pull force	according 3501:2015 appendix A	N
Test duration	60	minutes
Test temperature	23 ± 2	°C
Free length of the pipe	250	mm

During and after the testing the connections are not to show any signs of detaching from the connection or local or complete separation of the pipe components and the fitting.

5.5 Check of connections - long term

The resistance against hydrostatic pressure of the connection is to be determined according to NEN-EN-ISO 1167-1, NEN-EN-ISO 1167-4.

Tabel 7 – Test parameters for the verification of the long term properties of the connection

Aspect	Requirement	Test parameters				Testing method
		Aspect	Value			
Resistance against hydrostatic pressure	No failure of the test piece during the test periode	Duration	At least 1000 hour			NEN-EN-ISO 1167-1 NEN-EN-ISO 1167-4
		Temperature	(95 ± 2) °C			
		Amount of samples ¹⁾	3			
		Material service tube	Test pressure (bar)			
		Pressure class	PN6	PN8	PN10	
		PEX	8,3	11,0	13,8	
		PB	8,7	11,6	14,5	
		PE-RT type II	7,5	10,0	12,5	
Multi-layer	²⁾	²⁾	²⁾			
¹⁾ Three samples for Initial investigations according to BRL 5609-2 and one sample for regular quality control (Audit Test). ²⁾ On the basis of the regression curve and at least equal to the value of the material of the material of the innertube according to NEN-EN-ISO 21003-5.						

6 Requirements quality system installer

6.1 General

In this chapter the requirements are stated to which the quality system of the installer is to comply.

6.2 Manager of the quality system

Within the organizational structure an employee must be appointed who is in charge of managing the quality system.

6.3 Internal quality control/quality plan

The supplier must have an implemented and operational internal quality control scheme in place (IQC-scheme).

In this IQC-scheme the following must be demonstrably recorded:

- which aspects are checked by the installer;
- according to which methods these inspections are carried out;
- how often these inspections are carried out;
- how the inspection results are registered and stored.

This IQC-scheme shall be derived from the example format as shown in the annex. The scheme must be detailed in such a way that it provides CI sufficient confidence that the requirements of this evaluation guideline are continuously fulfilled.

Before issuing the certificate this schedule must be functioning for a minimum of 3 months.

6.4 Management of laboratory- and measure apparatus

The supplier must determine which laboratory- and measure apparatus are needed based on this guideline in order to demonstrate the product fulfils the requirements.

When applicable laboratory- and measure apparatus need to be calibrated at specified intervals.

The installer needs to validate and register the previous measure results, when at the time of calibration is determined that the laboratory and measure devices are not operating correctly.

The apparatus in question need to be marked in such a way that can be determined what the calibration status is.

The supplier is required to register the calibration results.

6.5 Procedures and instructions

The supplier must be able to submit procedures for:

- the handling of installations with non-conforming products;
- corrective actions in case non-conformities are found;
- the handling of complaints regarding the services supplied;
- managing work instructions and inspection sheets in use.

Procedures are to be recorded in the IKB schedule (quality system) of the installer after approval of the certification institute.

6.6 SHECC (Safety, Health and Environment Checklist Contractors) certificate

The installer needs to show the company complies to the demands that are put forward to the SHECC**-company certificate or equal.

Remark:

A valid management system certificate with a fitting scope statement and issued by a for this topic accredited CI, should suffice as sufficient proof.

6.7 Composition of the installation team

The installer is to register the names and the responsibilities of the persons in the installation team and to record any change of personnel in the logbook.

The (weld)supervisor of the installation team is to be present during the execution of the work.

6.8 Qualification of the staff

The installer is responsible for qualifying the staff that executes, safeguards and checks the installation. Demonstrated must be that the staff is sufficiently competent to perform the tasks as stated in the certificate. There must be a procedure available in writing in which this working method is incorporated.

In this at least is included:

- The required level of competence and the level of knowledge of the employees who execute the installation, which must be recorded, preferably by means of a personal "passport";
- The level of education of the employees who execute the installation;
- The mentoring by qualified employees of employees in training who are performing installation activities;
- The (re-)qualification methods
- Required skills;
- The responsibilities when nominating for qualification, the qualifying, authorizing and registration;
- Registration;
- Archiving.

The certificate holder is to draft clear competence profiles and to uphold during the qualification. Key is what specifically the person to be qualified must demonstrate flawless and independently. The majority will be technical skills, but can also be skills concerning organizing, supervising, validating and evaluating.

For the qualification the following is registered:

- The required level of education and/ or the learning objectives;
- The maximum term of validity of the qualification of the person responsible for the quality of the installation team, as well as the requirements for re-qualification;
- By which means there is a possibility to withdraw the qualification of the (weld)supervisor, if demonstrated that the executing of the quality assurance of the installation team is insufficient for a prolonged period of time.

Remark:

It is advised for the employees to successfully follow a installation course from the supplier of the products.

For plastic welders and (weld-) supervisors the next supplementary/ specific requirements are valid.

6.8.1 Plastic welders

6.8.1.1 Qualification

Plastic welders are to be qualified according to BRL 5609-2, chapter 11. In this chapter is referred to NEN-EN 13067 and summarizes the process steps in which way the plastic welder is to be certified.

Qualification is to be according to NEN-EN 13067 or equivalent.

Remark:

The welding of PE-RT is covered by NEN-EN 13067, but not the welding of PB. If applicable all the information specifically for welding of PB and which serves as a standard for the quality of the welds and the qualification of the welder is to be recorded in the quality system of the installer.

During the installation all work done for the welding procedure needs to be done by a welder in possession of a valid welding certificate and a personal welding pas.

6.8.1.2 Re-qualification

The requalification is set for 2 years. If demonstrably the qualified welder has welded regularly, then a full requalification does not have to take place. With rare welding connections a full requalification has to be done.

6.8.2 (Weld)supervisor

The (weld)supervisor is authorized to visually check made (electrofusion) connections and to designate for sampling.

The qualification of the (weld)supervisor is determined in consensus between the end user (piping manager) and the installer.

For the qualification is recorded:

- The required level of education and/ or the learning objectives;
- The maximum term of validity of the qualification of the (weld)supervisor, as well as the requirements for re-qualification;
- By which means there is a possibility to withdraw the qualification of the (weld)supervisor, if demonstrated that the executing of the quality assurance of the (electrofusion) connections is insufficient for a prolonged period of time.

6.8.3 Evaluator of the instalation plan

The evaluator of the installation plan is authorized to review the made installation plan and to approve. The qualification of the evaluator is determined in consensus between the end user (piping manager) and the installer.

For the qualification is recorded:

- The required level of education and/ or the learning objectives;
- The maximum term of validity of the qualification of evaluator, as well as the requirements for re-qualification;
- By which means there is a possibility to withdraw the qualification of the evaluator, if demonstrated that the executing of the quality assurance of the evaluating of the installation plan is insufficient for a prolonged period of time.

6.8.4 Registration

The installer is in possession of an up-to date qualification overview, in which at the minimum is listed:

- Personal data, if applicable personnel number;
- Last qualification date, method of qualification;
- Content of the qualification;
- End date of the qualification;
- Re- qualifications;
- Persons in training, end date of the training program, mentor, registration number.

The qualifications must be clearly re-traceable per qualified person. For this purpose the installer has a system which enables each qualified welder to be in possession of a personal written proof of the qualifications. On this is stated a date of issue, date of the last qualification, qualification overview, name and surname and if applicable personnel number.

6.8.5 Control by third parties

In mutual agreement it has to be arranged at what time the certification institute at random can verify the practical execution of the qualification process.

6.8.6 Putting welders to work

Welders can only be put to certificate related work when the installer can demonstrate that the welders and if applicable the (test-)welds conform to the qualification requirements.

Welders in training can be put to work under strict supervision of a mentor or the (weld)supervisor. There the making of test welds it is put under extra attention. A mentor is part of the welding personnel and can be used as a mentor due to his experience and commitment.

6.9 Requirements regarding subcontractors

In case the entire installation process is subcontracted to subcontractors, the subcontractor himself is to hold a certificate according to this evaluation guideline.

In case parts of the installation process is subcontracted, the IQC scheme needs to hold interlocking procedures in which the certified installer stipulates how the quality which the subcontractor delivers, is guaranteed. The following aspects are relevant:

- Materials/ equipment to be used;
- Work instructions for the subcontractor;
- Checks to be performed by the subcontractor;
- Post-checks by the certified installer;
- Quality registration of the subcontractor and the certified installer;
- The required level of knowledge and skills of the subcontractor.

The certified installer is to keep close track of the quality of the labour executed by third parties and is to declare his IQC scheme to be applicable here too.

The certified installer is the person final responsible for the installation process and every executed detail thereof.

A subcontractor has to show that the company conforms to the demands stated to the SHECC*-company certificate or equal.

Remark:

A valid management system certificate with a fitting scope declaration and issued by a for this subject accredited CI, counts as sufficient proof.

6.10 Document management

The installer has to possess (and apply) a system for the management of at least the following documents:

- a. IQC-scheme, quality plans, work instructions, procedures, checklists, organisation schemes, registration forms;
- b. Qualifications and qualification overviews;
- c. Norms and guidelines, including relevant safety sheets;
- d. Documents belonging to the installation process step (see figure 2);
- e. Log book with all installation projects that are and will be executed, which fall under this process certificate.

With the certified installer has to have the following documents available in the office:

- All under “a. to and including e.” named documents;
- NEN-EN-ISO 9001 if certified;
- SHECC**-company certificate.

At the installation team of the certified installer the following documents have to be available:

- Procedures, work instructions;
- Checklists, registration forms;
- Installation plan;
- Validated copy of the KOMO certificate.

7 Summary of tests and inspections

This chapter contains a summary of the tests and inspections to be carried out in the event of certification:

- Initial tests;
- the evaluation tests on process and product requirements;
- Evaluation of the quality system.

Also is indicated with what frequency inspection visits are performed by the certification institute

7.1 Testmatrix

Table 8 – Test matrix – Description of the visit ¹⁾

Description of the requirement	Article BRL	Tests within the scope of:		
		Initial tests	Supervision by CI after granting the certificate	
			Inspection	Frequency
Reporting of activities	4.1	x	x	2)
Implementation in quality system	4.3.1.1	x	x	2)
Design document	4.3.1.2	x	x	2)
Installation plan	4.3.1.3	x	x	2), 3)
Pre-existing structures in the subsoil	4.3.1.4	x	x	2), 3)
Preparations of the construction site	4.3.2	x	x	3)
Making trial connections	4.3.3	x	x	2), 3)
Material check	4.3.4	x	x	2), 3)
Equipment check	4.3.5	x	x	2), 3)
Marking of the connections with the service pipe	4.3.6	x	x	2), 3)
Post insulation	4.3.7	x	x	2), 3)
Sealing	4.3.8	x	x	2), 3)
Sampling	4.3.9	x	x	3)
Putting into commission	4.3.10	x	x	3)
Hand-over, report of delivery	4.3.11	x	x	2), 3)
Marking	4.4	x	x	2), 3)
Product requirements	5.1	x		2), 3)
Requirements of the installed product	5.2	x		2)
Leak tightness of the installed piping system	5.3	x		3)
Check of connections – short duration	5.4	x		3)
Check of connections – long term	5.5	x		3)
Manager of the quality system	6.2	x		2)
Internal quality control/ quality plan	6.3	x		2)
Management of laboratory- and measure apparatus	6.4	x	x	2), 3)
Procedures and work instructions	6.5	x	x	2), 3)
SHECC-certificate	6.6	x	x	2), 3)
Composition of the installation team	6.7	x	x	2), 3)
Qualification of the staff	6.8	x	x	2), 3)
Requirements regarding subcontractors	6.9	x	x	2), 3)
Document management	6.10	x	x	2), 3)

1. Installation of multiple projects/ systems can be evaluated during the same visit
 2. Office visit (1 time per year)
 3. Visit of a project (frequency yearly determined by the CvD-LSK)

7.2 Evaluation of the quality system

The quality system of the installer will be evaluated by the certification institute. This evaluation contains at least the aspects mentioned in the Rules for Product certification of the certification institute.

8 Requirements imposed on the certification body

8.1 General

The certification body has to be accredited for the subject of this guideline on the basis of NEN-EN-ISO/IEC 17065 by the Dutch Accreditation Council (RvA) and who have an licence agreement with the “Stichting KOMO” foundation.

The certification body must have the disposal of a regulation, or an equivalent document, in which the general rules for certification are laid down.

In particular these are:

- The general rules for carrying out the initial tests, to be distinguished in:
 - The way suppliers are informed about the handling of the application;
 - Execution of the initial tests;
 - The decision with regard to the initial tests executed.
- The general rules with regard to the execution of inspections and the inspection aspects to be employed;
- The measures to be taken by the certification body in the event of non-conformities;
- The measures to be taken by the certification body in the event of illegitimate use of certificates, certification marks, icons and trademarks;
- The rules for termination of the certificate;
- The possibility of lodging appeal against decisions or measures made by the certification body.

8.2 Certification staff

The staff involved in the certification is to be sub-divided into:

- Certification assessor/ Reviewer: in charge of review of the by the supplier supplied or to be supplied construction drawings and documents, admissions, reviewing of applications and the review of conformity assessments;
- Site assessor: in charge of carrying out external inspections at the supplier's works;
- Decision-maker: in charge of taking decisions in connection with the initial tests performed, continuing the certification in connection with the inspections performed and making decisions on the need of corrective actions.

8.2.1 Competence requirements

Distinguished are:

- Competence requirements for executive certification staff of a CI that fulfil the requirements of NEN-EN-ISO/IEC 17065;
- Competence requirements for executive certification staff of a CI that are in addition set up by the Board of Experts for the subject of this evaluation guideline.

The competencies of the relevant certification personnel must be visibly documented.

Table 9 – Competence of personnel certification institute

	Certification assessor/ Reviewer	Site assessor	Decision-maker
General competence			
Knowledge of company processes Competence for professional evaluation	<ul style="list-style-type: none"> Higher vocational education 1 year work experience 	<ul style="list-style-type: none"> Intermediate technical vocational education 2 years work experience 	<ul style="list-style-type: none"> Higher vocational education 5 years work experience of which 1 year in certification
Audit skills	<ul style="list-style-type: none"> n/a 	<ul style="list-style-type: none"> Audit training Participation of at least 4 inspection visits of which at least 1 was conducted independently under supervision 	<ul style="list-style-type: none"> n/a
Technical competence			
Relevant knowledge of: <ul style="list-style-type: none"> The technology involved with producing the products to be inspected, the execution of processes and the provisioning of services. The way products are used, processes are applied and services are rendered; Any deficiency that can occur during use of the product, any mistake that can be made during the use of a product and any imperfection in the rendering of services. 	<ul style="list-style-type: none"> Relevant technical higher vocational education work and intellectual level. 	<ul style="list-style-type: none"> Intermediate technical vocational education work and intellectual level. At least x year of experience in .. industry. 	<ul style="list-style-type: none"> n/a

8.2.2 Qualification

Certification staff must be demonstrably qualified by evaluation of education and experience of the above-mentioned requirements.
The authority for qualification rests with the management of the certification body.

8.3 Report initial tests

The certification body records the results of the initial tests in a report. The report must fulfil the following requirements:

- Completeness:** the report judges about all requirements of the evaluation guideline;

- **Traceability:** the findings whereupon the judgements are based must be recorded in a traceable way.

With regard to granting the certificate, the decision-maker must be able to base his decision upon the findings recorded in the report.

8.4 Decision with regard to the issue of the certificate

The decision with regard to the issue of the certificate must be made by a qualified decision-maker, who was not involved at the initial tests. The decision must be traceable recorded.

8.5 Nature and frequency of external inspections

The certification body must enforce inspections at the supplier's site to investigate whether the obligations are met. The Board of Experts advises about the number of inspection visits required.

At the time of validation of this evaluation guideline the frequency for evaluating the quality system has been fixed at 4 inspection visits per year. In case the quality system of the supplier is certified on the basis of ISO 9001, the frequency for evaluating the quality system is set at 2 inspection visits per year.

The frequency for evaluating installed piping systems is set to 1 inspection visit. Due to the fact that this concerns a new regulation, the frequency for evaluating installed piping systems will be evaluated by the Board of Experts (CvD-LSK) on a yearly basis.

Inspections shall invariably include:

- The in the certificate recorded specification of the process;
- The in the process used products and materials;
- The IQC-scheme of the installer and the results of tests carried out by the installer;
- The compliance with the required procedures.

The findings of the inspection visits performed shall be traceably recorded, by the certification body, in a report.

8.6 Report to the Board of Experts

The certification body reports at least once a year about the certification activities performed. In this reporting, the following subjects must be addressed:

- Mutations in number of certificates (new/cancelled);
- Number of inspections carried out in relation to the fixed frequency;
- Results of the inspections;
- Measures imposed in case of non-conformities;
- Complaints received from third parties concerning certified products.

8.7 Interpretation of requirements

The Board of Experts may lay down the interpretation of this evaluation guideline in one or more separate interpretation documents. This (these) document(s) are available on the service page of the website of the Certification Institute which has issued this Evaluation Guideline.

The certification body is obliged to inform whether an interpretation document is available. If this is the case, then the interpretations as laid down in the interpretation document must be employed.

8.8 Sanction policy

The sanction policy and the weighing of shortcomings is available on the service page on the website of the certification body, which has issued this Evaluation Guideline.

9 Titles of standards

9.1 Normen / normatieve documenten:

Number ¹⁾	Titel
BRL 5609-2:2019	Evaluation guideline for the KOMO® Pre-insulated flexible plastics piping systems for warm water distribution outside buildings - Part 2: Products
DVS 2201-1:2011 (third issue)	Testing of semi-finished products of thermoplastics – bases - indications
DVS 2202-1:2011 (third issue)	imperfections in thermoplastic welded joints Features, description, evaluation
DVS 2203-1:2011 (third issue)	Testing of welded joints of thermoplastic sheet and pipes Test methods – requirements
DVS 2208-1:2011 (third issue)	Welding of thermoplastics. Machines and devices for the heated roll welding of pipes, piping parts and panels.
ISO 13953:2001	Buizen en hulpstukken van polyetheen (PE) - Bepaling van de treksterkte en faalwijze van proefstukken genomen uit een stuiklasverbinding
ISO 13954:1997	Plastics pipes and fittings - Peel decohesion test for polyethylene (PE) electrofusion assemblies of nominal outside diameter greater than or equal to 90 mm.
ISO 13955:1997	Plastics pipes and fittings - Crushing decohesion test for polyethylene (PE) electrofusion assemblies
NEN 3140+A2:2018	Operation of electrical installations - Low voltage
NEN 7200:2017	Plastics pipelines for the transport of gas, drinking water and waste water - Buttwelding of PE pipes and fittings of PE 63, PE 80 and PE 100
NEN-EN 805:2000	Water supply - Requirements for systems and components outside buildings
NEN-EN 13067:2012	Plastics welding personnel - Qualification testing of welders - Thermoplastics welded assemblies
NEN-EN 13941:2009+A1:2010	Plastics welding personnel - Qualification testing of welders - Thermoplastics welded assemblies
NEN-EN 15632-1:2009+A1:2014	District heating pipes - Pre-insulated flexible pipe systems - Part 1: Classification, general requirements and test methods
NEN-EN 15632-2:2010+A1:2014	District heating pipes - Pre-insulated flexible pipe systems - Part 2: Bonded plastic service pipes - Requirements and test methods
NEN-EN 15632-3:2010+A1:2014	District heating pipes - Pre-insulated flexible pipe systems - Part 3: Non bonded system with plastic service pipes; requirements and test methods
NEN-EN-ISO 1167-1:2006	Thermoplastics pipes, fittings and assemblies for the conveyance of fluids - Determination of the resistance to internal pressure - Part 1: General method
NEN-EN-ISO 1167-4:2007	Thermoplastics pipes, fittings and assemblies for the conveyance of fluids - Determination of the resistance to internal pressure - Part 4: Preparation of assemblies
NEN-EN-ISO 3501:2015	Plastics piping systems - Mechanical joints between fittings and pressure pipes - Test method for resistance to pull-out under constant longitudinal force
NEN-EN-ISO 9001:2015	Quality management systems - Requirements
NEN-ISO 12176-1:2017	Plastics pipes and fittings - Equipment for fusion jointing polyethylene systems - Part 1: Butt fusion
ISO 12176-2:2008	Plastics pipes and fittings - Equipment for fusion jointing polyethylene systems - Part 2: Electrofusion

NEN-EN-ISO 21003-5:2008	Multilayer piping systems for hot and cold water installations inside buildings - Part 5: Fitness for purpose of the system
NEN-EN 13067:2012	Plastics welding personnel - Qualification testing of welders - Thermoplastics welded assemblies
<p>It is checked annually whether the normative documents are still up-to-date. Amendments to the normative documents to apply are published on the service page on the website of the certification body that has issued this assessment.</p>	

I Example IQC-scheme for product manufacturer (informative)

IQC-schedule INTERNAL QUALITY PLAN	Manufacturer / supplier : Production location address :	Number of appendices:
Field(s) of application According Evaluation Guideline(s)		
Number of installation teams:	Quality manual, procedures and working instructions Is the Quality Management System (QMS) certified according to ISO 9001 ¹⁾ ?	
Quality Control 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:	If yes, by which certification body: If yes, is the certification body accredited for the particular scope of certification? In case the QMS is not certified according to ISO 9001: <ul style="list-style-type: none"> • Working instructions, test instructions and procedures are documented as follows: • The following procedure for dealing with <u>complaints</u> applies: • The following procedure for <u>nonconformity review</u> applies: 	
Inspection and test records All records shall be maintained for a minimum of years.		
Specific agreements/comments/explanations	Signature of the manufacturer/supplier: Date :	

¹⁾ 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 **CI** in tables B, C and D.

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

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

C. Batch release tests per machine (including in-process and finished product testing) 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:

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

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

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

Specific agreements/comments/explanations:

Raw materials list (not required to fill-out this appendix in case reference can be made to the CI ATA part of the certification agreement)		Appendix I Date:
I.1 The product is made-up of the following raw materials: a) In case of products made from ready-made raw materials: listing of name and/or unique code of the raw material(s); 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 CI (e.g. by the CI inspector); 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). - - - - - - -		

List of technical drawings			Appendix II Date:.....
Drawing title and number	Drawing date	Drawing title and number	Drawing date

List of procedures			Appendix II Date:.....
Title and number	Issue date	Title and number	Issue date

II Example of a list of a piping system (informative)

Piece list of a piping system

Supplier of the piping system	
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Product		
Service pipes		
Protection pipes		
Post-insulation sets		
Electrofusion fittings		
Screw fittings		
Sleeve welding fittings		
Plastic to metal transition		
Fixing anchors		
Wall ducts		
Sleeves		
Prefab branches		
1.		