

**AR 58**

July 2024

validated Dutch version

# Approval requirement 58

Saddles with clamp connection of high impact polyvinyl chloride (PVC-HI)



**Trust  
Quality  
Progress**

# Foreword

This, translated from Dutch, approval requirement (AR), is approved by the Board of Experts (BoE) GASTEC QA. in which relevant parties in the field of gas related products are represented. This Board of Experts supervises the certification activities and where necessary require the GASTEC QA approval requirement to be revised. All references to Board of Experts in this GASTEC QA approval requirement pertain to the above-mentioned Board of Experts.

This, translated from Dutch, AR will be used by Kiwa Nederland BV in conjunction with the GASTEC QA general requirements and the KIWA regulations for certification.

In this AR is established which requirements a product and the requestor/ certificate holder of the GASTEC QA product certificate should meet and the matter to which Kiwa evaluates this.

Kiwa has a method which is established in the certification procedure for the execution of:

- The investigation for provisioning and maintaining a GASTEC QA product certificate based on this AR.
- The periodic evaluations of the certified products for the purpose of maintaining a provided GASTEC QA product certificate based on this AR.

This AR, translated from Dutch, is used as supporting document. In case of doubt of interpretation of this AR, the Dutch version is leading.

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# 1 Introduction

## 1.1 General

This GASTEC QA approval requirement (AR) in combination with the GASTEC QA general requirements, is applied by Kiwa as the basis for the issuing and maintaining the GASTEC QA product certificate for saddles with clamp connection of high impact polyvinyl chloride (PVC-HI).

With this product certificate, the certificate holder can demonstrate to his or her customers that an expert independent organization monitors the production process of the certificate holder, the quality of the product and the related quality assurance.

Next to the requirements established in this AR and the general requirements, Kiwa has additional requirements in the sense of general procedural requirements for certification, as laid down in the internal certification procedures.

This GASTEC QA approval requirement replaces the version of February 2018.

List of changes:

- This approval requirement has been adapted to the new layout of GASTEC QA approval requirements
- The approval requirement is fully textually reviewed
- Paragraph 3.2 has been removed, NEN 7232: 2020 specifies the full the materials
- Chapter 4 is fully reviewed
- Extension field of application with PE pipes
- Extension with a test focused on the relaxation, see paragraph 4.2
- Extension with a test focused on the clamps, see paragraph 4.3
- The list of reference standards has been adjusted

The product requirements are extended with test requirements focused on the relaxation and the clamps.

## 1.2 Scope

This approval requirement describes the requirements for saddles with clamp connection of high impact polyvinyl chloride (PVC-HI) applicable for pipe systems made of high-impact polyvinyl chloride (PVC-HI) and/or polyethylene pipes (PE) suitable for underground distribution of natural gas (see the 2<sup>nd</sup> and 3<sup>rd</sup> family gas according to EN 437) with a maximum operating pressure of 200 mbar.

The used high-impact PVC pipes shall comply to NEN 7232.  
PE pipes shall comply with EN 1555-2.

*NOTE:*

*First generation PE pipes and PVC-U pipes are not covered by the current -EN 1555-2 or NEN 7230 standards respectively.*

*Nevertheless, it has been determined that the high-impact PVC saddles with clamp connections with a GASTEC QA quality mark can also be used safely with PE pipes from the 1<sup>st</sup> generation and PVC-U pipes. See research report GT – 220199: 2022, Netbeheer Nederland – ‘Een veilige verbinding voor lagedruk toepassingen (A safe connection for low-pressure applications)’.*

## 2 Definitions

In this approval requirement, the following terms and definitions are applicable:

**Board of Experts:** The Board of Experts Gastec QA.

**Clamps:** closure sliders needed to compose the saddle and a pipe

**High-Impact PVC:** Impact-resistant polyvinyl chloride or PVC-HI, a mixture of unplasticized PVC and an impact improver.

**Maximum Operating Pressure (MOP):** maximum pressure that a component is capable of withstanding continuously in service under normal operating conditions.

**SDR (Standard Dimension Ratio):** Numerical designation of a pipe that is equal to the ratio between the nominal outside diameter and the nominal wall thickness of a pipe.

See also the definitions mentioned in the GASTEC QA general requirements.

# 3 Material and product requirements

This chapter contains the material and product requirements that the raw materials, materials and products used shall meet.

## 3.1 General

The product shall comply with the requirements in NEN 7232: Plastics piping systems for gas supply – Saddles with clamp connection of high-impact polyvinyl chloride (high-impact PVC) - Requirements and test methods.

## 4 Performance requirements and test methods

This chapter contains the performance requirements and associated test methods that the products shall meet in addition to NEN 7232. This chapter also specifies the limit values where applicable.

### 4.1 General

The requirements in this chapter focus on relaxation (see paragraph 4.2) and clamps (see paragraph 4.3). These requirements (described in 4.2 and 4.3) are based on research reports from Netbeheer Nederland, respectively GT – 220199: 2022 (A safe connection for low-pressure applications) and GT – 220070: 2023 (Failed PVC saddle systems).

### 4.2 Aging - relaxation

In addition to NEN 7232, the impact-resistant PVC saddles shall, before being assessed on some functional requirements, first be relaxed. Depending to the field of application the relaxation takes place on the mounted saddle on a PE and/or high-impact PVC pipe.

The relaxation will be simulated by exposing the mounted high-impact PVC saddle to 60 °C with a duration of 500 hours. After relaxation the saddles shall be leak tight. With respect to the test parameters there is no distinguish made in SDR class of the pipe.

#### 4.2.1 Test method

The high-impact PVC saddle will be mounted on a PE and/or high-impact PVC pipe (depending on the intended field of application) according to the instruction manual of the producer.

The composed saddle will be conditioned in fluid without any additional resistances, at  $60 \pm 1$  °C with a duration of 500 hour (+72 hour / - 0 hour) after which cooled in air at  $23 \pm 2$  °C for 16 hours.

Hereafter the connections will be assessed on leak tightness according to paragraphs 5.1 and 5.2 of NEN 7232.

#### 4.2.2 Number of samples

The relaxation will be performed on a number of samples needed to perform the first upcoming test (see paragraphs 5.1 and 5.2 of NEN 7232).

### 4.3 Resistance to impact of het clamps

In addition to NEN 7232, the clamps of a saddle will be assessed on the impact resistance. The tests are carried out on samples with diameters in which the following size groups are distinguished:

size group	connection diameter (mm)
1	$d < 110$
2	$110 \leq d \leq 200$
3	$d > 200$

The test\*, described in paragraph 4.3.1\*\*, is carried out in triplicate per size group and focuses on the clamps (2 per saddle) of 3 different saddles. The 6 cleats must all pass the impact test to meet the test criterion.

If a failure (a rupture of a clamp) occurs in this series of impact tests 4.3 will be repeated. Again 6 clamps are being assessed.

A rupture in the saddle does not count as a disqualification in this test. If the saddle is damaged, the saddle will be replaced.

Notes:

\*On the saddles and clamps involved in 4.3 relaxation according to 4.3 does not take place.

\*\*The test method, see 4.3.1, differs possible from the installation manual of the producer.

#### 4.3.1 Test method

- 3 Sets are assembled for the test. At each set an high-impact PVC saddle is placed on a corresponding high-impact PVC pipe.
- At each set, the clamp is fully installed on one side until the top of the clamp is flush with the saddle (see left image, below).

*For more clarity: a distinguish is made in this description between the left and right clamp. With clamp L and clamp R meant are respectively the left clamp and right clamp, according to the first two images below.*

*The clamp is unlike the installation manual of the producer, fully mounted on one side until the clamp is equal to the saddle.*



Example set 160-250mm



Example set 63-110 mm



Example impact test



- When clamp L is mounted, clamp R is secured to the other side of the saddle with a small tap (see the image on the left below) and protrudes well above the saddle. This installation ensures that the saddle is maximally open on this side and maximum tension is created on the clamp during the stroke.
- The sets are conditioned according to appendix C.3 of NEN 7232.
- The tube section with saddle is then placed on a steel core under the fall device. The pipe section is placed in such a way that clamp R is positioned directly under the falling weight.
- Now clamp R is hit on the saddle with one strike using the falling weight, see the right image below.  
In contradiction to NEN 7232, a fall weight of 4 kg and a fall height of 2.5 m are taken into account. Just as in NEN 7232, the bottom of the falling mass must be flat.
- After this first strike, clamp R is tapped back until the upper side is equal with the saddle.
- Clamp L is then tapped back to the test position so that it is still on the saddle and protrudes well above the saddle.  
The set is conditioned again according to appendix C.3 of NEN 7232. After at least 15 minutes conditioning (in the refrigerator for example) the other clamp is struck with the falling device.

The impact test is performed on 3 left and 3 right clamps.

#### **Criterion**

- After the series of impact tests has been completed, the 6 hammered clamps are visually assessed. The test criterion is met when no ruptures are constated.
- When a rupture is constated in 1 of the 6 clamps, the impact test is again applied on 6 clamps of 3 different saddles with the same dimensions of the products of the first series of tests.
- When no rupture is concluded from the second series of impact tests the test results meet the requirements. A rupture which does occur in this second series does lead to rejection of the clamp.

# 5 Marking and instructions

## 5.1 Marking

In addition to the marking as described in NEN 7232 the impact resistance PVC saddles shall be marked with GASTEC QA or the GASTEC QA logo.

## 5.2 Instructions

The supplier shall provide user instructions in the Dutch language and in the language of the country in which the product will be used. These instructions shall have the following information included:

- The use and installation of the product and if the saddle is suitable for PE and / or PVC.
- The way to check if the product is installed correctly.
- The way the product should be stored.
- The maximum storage period.

## 6 Quality system requirements

The supplier shall make a risk assessment of the product and production process according to chapter 3.1.1.1 and 3.1.2.1 of the GASTEC QA general requirements as part of the initial certification. The risk assessments shall be available to Kiwa for review and will be discussed yearly.

In addition to paragraphs 3.1.2 and 4.1 of the general requirements GASTEC QA the manufacturer shall for certification include the internal product control in on the clamps in the quality plan.

The manufacturer is, in consulting with and after confirmation by Kiwa, free to deviate from the test method described in paragraph 4.3 of this approval requirement, as long as the high product quality (of the clamp) is guaranteed.

In any case, the test shall be carried out with a falling mass and height as described in NEN 7232, appendix C.2.

# 7 Summary of tests

This chapter contains a summary of tests to be carried out during:

- The initial product assessment;
- The periodic product verification;

## 7.1 Test matrix

Description of requirement	Clause NEN 7232 or AR 58	Test within the scope of		
		Initial product assessment	Product verification	
			Verification	Frequency
Product requirements	4			
Implementation of the saddles	4.1	X		
Appearance and finish of the saddles	4.2	X		
Connection of the saddles	4.3	X		
Material of the saddles	4.4			
General	4.4.1	X		
Colour	4.4.2	X		
Vicat softening temperature	4.4.3	X	x	1 x per year
K-value	4.4.4	X		
Rubber seals	4.4.5	X		
Resistance to gas	4.4.6	X		
Dimensions and admissible dimensional deviation of the saddles	4.5			
General	4.5.1	X		
Wall thickness and surface of the saddles	4.5.2	X	X	1 x per year
Sealing of the saddles	4.6	X		
Connections in the saddles	4.7	X		
Connection pieces	4.8	X		
Functional requirements	5			
Leak tightness at internal pressure with and without mechanical load	5.1.1*	X	X	1 x per year
Leak tightness at external pressure with and without mechanical load	5.1.2*	X		
Resistance to impact at 0°C on the saddle	5.2*	X	X	1 x per year
Influence of heating on the saddles and parts of the saddles	5.3	X	X	1 x per year
Tensile strength and strength of full-end load coupling	5.4.1	X	X	1 x per year
Leak tightness of the rubber seal of non-end-load connection piece	5.4.2	X		
Marking and documentation	7	X	X	1 x per year
Additional GASTEC QA requirements				
Aging – simulating the relaxation	AR 58: Ch 2*	X	X	1 x per year
Resistance to impact at 0°C on the clamp	AR 58: Ch 4.3	X	X	1 x per year
Marking and user instructions	AR 58: Ch 5	X	X	1 x per year

\*for certification first AR58: H4.2 takes place after which the test mentioned in 5.1 and 5.2 of NEN 7232 will be performed

## 8 List of referenced documents and source

### 8.1 Standards / normative documents

All normative references in this approval requirement refer to the editions of the standards as mentioned in the list below.

NEN 7232: 2020	Plastics piping systems for gas supply - Saddles with clamp connections of high-impact polyvinyl chloride (PVC-HI) - Requirements and test methods
EN 1555-2:2021	Plastics piping systems for the supply of gaseous fuels - Polyethylene (PE) - Part 2: Pipes
NEN 7230:2020	Plastics piping systems for gas supply - Pipes of high-impact poly(vinyl chloride) (PVC-HI) - Requirements and test methods
General requirements GASTEC QA	

### 8.2 Source of informative documents

EN 437: 2021	Test gases- test pressure – appliance categories
Netbeheer Nederland – onderzoeksrapport (research report) Kiwa Technology GT – 220199: 2022	Een veilige verbinding voor lagedruk toepassingen ('A safe connection for low-pressure applications')
Netbeheer Nederland – onderzoeksrapport (research report) Kiwa Technology GT – 220070: 2023	Falende PVC zadelsystemen ('Failing PVC saddle systems')