

10 Quality

10.1 Production quality

The Management System of Akatherm International BV has been approved:

- ISO 9001:2000 for the Quality Management System
 - ISO 14001:2004 for the Environmental Management System
- This concerns the development, manufacturing, marketing and supply of plastic pipe systems.

PE100 pressure fittings are manufactured generally in accordance with the following standards:

Standard	Title
EN 12201:2003	Plastics piping systems for water supply - Polyethylene (PE)Part 3: Fittings
EN 1555:2002	Plastics piping systems for the supply of gaseous fuels - Polyethylene (PE)Part 3: Fittings
EN 13244:2003	Plastics piping systems for buried and aboveground pressure systems for water for general purposes, drainage and sewerage - Polyethylene (PE)Part 3: Fittings
DIN 16963	Pipe joints and components of Polyethylene (PE) for pipes under pressure
ISO 15494:2003	Plastics piping systems for Industrial applications- Polybutene (PB) Polyethylene (PE) Polypropylene (PP)

Table 10.1

PE100 pressure fittings are subjected to the following mechanical product tests:

- Hydraulic test 20°C/100h EN921
- Hydraulic test 80°C/165h EN921
- Hydraulic test 80°C/1000h EN921
- Decohesive resistance test A ISO13954/ISO13955, for electrofusion fittings
- Decohesive resistance test B ISO13956, for electrofusion saddles
- Tensile strength ISO13953, for butt fusion
- Impact resistance test EN11716, for electrofusion saddles
- Pressure drop test EN12117, for electrofusion saddles

10.2 Quality inspection during work-site assembly

Quality inspections during assembly are key to the manufacture of a reliable pipe system. Assembly has to be performed according the applicable standards and guidelines and the user needs to exercise constant care regarding quality assurance issues.

Instructions for quality-assurance measures during assembly work:

- Prior to assembly, check pipes and pipe components for flawless appearance and workmanship.
- Make sure that fittings and especially flange connections are incorporated in a stress-free manner.
- Check the brackets to ensure that linear or point loads cannot occur.
- Examine the construction of the brackets and fixed points. Are they stable or somewhat undersized?
- Have inappropriate compulsory guides for the pipe replaced.
- Can the pipe system expand without hindrance? If so, are the fixed points, sliding brackets and guide brackets (sliding and guide saddles) placed in the right locations?
- Is the movement of the pipe so large that it can easily begin to swing? In such case, additional guide brackets (guide saddles) are to be incorporated.
- Has care been taken to ensure that connections to pumps and tanks are elastic enough to enable longitudinal and transverse movement without large reaction forces?

- Place high value on strict adherence to welding regulations and have a record made of each seam.

The preceding abstract should encourage critical monitoring and correction of assembly work.

10.3 Leak test prior to initial use

Prior to initial use, pipe systems must be tested for strength and leak-tightness in order to demonstrate that they are leak-proof and sufficiently robust to withstand the mechanical load.

The goal of the pressure test is to subject the completely installed pipe system to loading above the operation load and therefore to perform an empirical demonstration of its reliability. Any existing leakage in flange connections can be promptly remedied and the effects of expansion processes under internal pressure and temperature changes observed. However, small defects in the pipe system may remain undetected. Only in the rarest cases do these result in failure of the pipe system in the operating state. As a result, the pressure test is a means of verifying the overall quality-control concept.

Leak test according to DIN 4279-1

DIN 4279-1 part 1 "Leak test of pressure pipe systems for water" contains guidelines for accomplishing the leak test. In DVS 2210-1 complementary guidelines for aboveground pressure systems are described.

After running the pressure test, the characteristics of plastic pipes result in an increase in the pipe's internal volume. At the same time, filling the pipe system with cold water causes, in most cases, a temperature change in the pipe wall. For instance, a temperature change in the pipe wall of 10°C during the pressure test will lead to a pressure decrease of 0.5 to 1 bar, even though the pipe network is absolutely sealed. This behaviour is taken into account by dividing the pressure test into two parts.

1. Pre-test stage

The pre-test is intended to eliminate volume change in order to enable a clear conclusion about the leak-tightness of the system to be drawn in the main test.

2. Main test stage

Even during the main test, consideration needs to be given to the fact that expansion processes are continuing, if only to a limited degree. To be certain, it is recommended not to begin the main test for 2 hours after terminating the pre-test.

Short term test

Pipes up to DN 50 and a total length of 100 m can be subjected to a short-term test. The short-term test represents a special case, as it is not very efficient in exposing deficiencies in the pipe system.

Quality

PE pipe systems	Pre test	Main test	Short term test
Test pressure (*)	1,5 * PN max (PN + 5) bar	1,3 * PN max (PN + 3) bar	1,5 * PN
Length of the test	min. 3 hours for pipe systems without branches with a total length \leq 100 m	min. 3 hours for pipe systems without branches with a total length \leq 100 m	min. 1 hours for pipe systems without branches with a total length \leq 100 m
	min. 6 hours for pipe systems with branches with a total length > 100 m	min. 6 hours for pipe systems with branches with a total length > 100 m	min. 3 hours for pipe systems with branches with a total length > 100 m
Check during test	Every hour with recovery of test pressure	Every 1.5 hour with recovery of test pressure	Every hour with recovery of test pressure
Material specific pressure drop (direction)	\leq 0,8 bar / h	\leq 0,3 bar / h	\leq 0,8 bar / h
Direction for test	Normal	Normal	Exceptional case (approval of client required)

Table 10.2 Recommended test for installed pressure pipe systems

(*) The test pressure depends on the maximum operating pressure for the pipe series (SDR). The test pressure has to be selected in a way no damage will be caused to the pipe system. Also the reduced pressure load of fittings has to be taken into account. During the test connections have to be accessible. Complementary details can be found in DIN 4279 Part 1.

10.4 Chapter summary

General quality controls	In connection with general quality controls, relevant tests should be run to ensure the quality and functionality of the employed fittings as well as the factory-made or on-site manufactured pipe systems. Such tests are best served by non-destructive test procedures.
Pressure test	The pressure test is only used for pressure pipe systems. It verifies both internal pressure stability and the leak-tightness of the system. Pressure tests consist of two test stages: the pre-test and the main test. In exceptional cases, a short-term test can be run on pipe systems in which $d_e \leq 50$ mm and pipe length is a max. 100 m.