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Shell Boilers - Part 6: Requirements for equipment for the boiler

Großwasserraumkessel - Teil 6: Anforderungen an die Ausrüstung für den Kessel

Chaudières à tube de fumée - Partie 6: Exigences pour l'équipement de la chaudière

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents

European foreword

This document (EN 12953-6:2024) has been prepared by Technical Committee CEN/TC 269 “Shell and water-tube boilers”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2025, and conflicting national standards shall be withdrawn at the latest by June 2025.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 12953-6:2011.

This document has been prepared under a standardization request addressed to CEN by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

For the relationship with EU Legislation, see informative Annex ZA, which is an integral part of this document.

Annex H provides details of significant technical changes between this document and the previous edition.

The series concerning shell boilers consists of the following parts:

— *Part 1: General*

— *Part 2: Materials for pressure parts of boilers and accessories*

— *Part 3: Design and calculation for pressure parts*

— *Part 4: Workmanship and construction of pressure parts of the boiler*

— *Part 5: Inspection during construction, documentation and marking of pressure parts of the boiler*

— *Part 6: Requirements for equipment for the boiler*

— *Part 7: Requirements for firing systems for liquid and gaseous fuels for the boiler*

— *Part 8: Requirements for safeguards against excessive pressure*

— *Part 9: Requirements for limiting devices of the boiler and accessories*

— *Part 10: Requirements for boiler feed water and boiler water quality*

— *Part 11: Acceptance tests*

— *Part 12: Requirements for firing systems for solid fuels for the boiler*

— *Part 13: Operating instructions*

Although these parts can be obtained separately, it should be recognized that the parts are inter-dependent. As such, the design and manufacture of shell boilers requires the application of more than one part in order for the requirements of the standard to be satisfactorily fulfilled.

NOTE A “Boiler Helpdesk” has been established in CEN/TC 269 which can be contacted for any questions regarding the application of the European Standards series EN 12952 and EN 12953 see the following website: http://www.boiler-helpdesk.din.de.

Any feedback and questions on this document should be directed to the users’national standards body. A complete listing of these bodies can be found on the CENwebsite.

According to the CEN-CENELEC Internal Regulations, the national standardsorganisations of the following countries are bound to implement this EuropeanStandard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark,Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia,Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic ofNorth Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland,Türkiye and the United Kingdom.

1 Scope

This document specifies the minimum requirements for safety related equipment for shell boilers (generator and/or assemblies) as specified in EN 12953-1:2012, to ensure the boiler operates within the allowable limits (pressure, temperature, etc.) and if the limits are exceeded the energy supply is automatically interrupted and locked out, irrespective of the degree of intervention.

NOTE 1 For this document, the term “boiler” is applicable for generator and/or assemblies.

NOTE 2 The maximum time of operation without manual (human) intervention can be specified for each boiler system.

NOTE 3 Annex C gives recommendations of operation and testing of the boiler system with a maximum time of operation without manual (human) intervention of 24 h and 72 h.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN ISO 5167-1:2022, *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full - Part 1: General principles and requirements (ISO 5167-1:2022)*

EN 12953-1:2012, *Shell boilers - Part 1: General*

EN 12953-2:2012, *Shell boilers - Part 2: Materials for pressure parts of boilers and accessories*

EN 12953-3:2016, *Shell boilers - Part 3: Design and calculation for pressure parts*

EN 12953-7:2002, *Shell boilers - Part 7 : Requirements for firing systems for liquid and gaseous fuels for the boilers*

EN 12953-8:2001, *Shell boilers - Part 8: Requirements for safeguards against excessive pressure*

EN 12953-9:2024, *Shell boilers - Part 9: Requirements for limiting devices of the boiler and accessories*

EN 12953-10:2003, *Shell boilers - Part 10 : Requirements for feedwater and boiler water quality*

EN 12953-12:2003, *Shell boilers - Part 12: Requirements for grate firing systems for solid fuels for the boiler*

EN 12953-13:2012, *Shell boilers - Part 13: Operating instructions*

EN 14597:2012, *Temperature control devices and temperature limiters for heat generating systems*

EN 50156-1:2015, *Electrical equipment for furnaces and ancillary equipment - Part 1: Requirements for application design and installation*

EN 60529:1991,[1] *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)*

EN 60730-1:2016, *Automatic electrical controls - Part 1: General requirements (IEC 60730-1:2013)*

[1] Document impacted by A1:2000, A2:2013 and AC:2016.

EN 61140:2016, *Protection against electric shock - Common aspects for installation and equipment (IEC 61140:2016)*

EN 61558-2-6:2009, *Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1 100 V - Part 2-6: Particular requirements and tests for safety isolating transformers and power supply units incorporating safety isolating transformers (IEC 61558-2-6:2009)*

EN 61558-2-16:2009, *Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1 100 V - Part 2-16: Particular requirements and tests for switch mode power supply units and transformers for switch mode power supply units (IEC 61558-2-16:2009)*

ISO 2186:2007, *Fluid flow in closed conduits — Connections for pressure signal transmissions between primary and secondary elements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 12953-1:2012 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
control
device used for maintaining the variable to be controlled (pressure, temperature, etc.) at a specific value (set point)

3.2
monitoring system
monitoring device
system which checks given parameters and draws attention to those which are outside normal operating limits but which are below the limiting values determined by the hazard and risk analysis and specified e.g. in the operation manual

Note 1 to entry: Normal operating conditions of the process can be restored either directly by the system or by a boiler attendant depending on the individual requirements.

3.3
safety accessory
device designed to protect pressure equipment against the allowable limits being exceeded, including devices for direct pressure limitation, such as safety valves, bursting disc safety devices, buckling rods, controlled safety pressure relief systems (CSPRS), and limiting devices, which either activate the means for correction or provide for shutdown or shutdown and lockout, such as pressure switches or temperature switches or fluid level switches and safety related measurement control and regulation (SRMCR) devices

[SOURCE: PED 2014/68/EU]

3.4
pressure accessory
device with an operational function and having pressure-bearing housings

[SOURCE: PED 2014/68/EU]

3.5
limiter
limiting device
safety accessory which, on reaching a limiting value (water level, pressure, temperature, flow, water quality), is used to interrupt and lock out the energy supply

Note 1 to entry: A limiter is an element of a safety device and a safety accessory for shell boilers as specified in the Pressure Equipment Directive 2014/68/EU, Article 2, Clause 4. A limiter contains a sensor, possibly a sensor control unit and ends at the output contact. The following safety logic and actuating element are not components of this part of the standard, see EN 12953-9:2024, Figure A.1.

Note 2 to entry: A limiting device comprises

— a measuring function and

— optional with a display and

— an activation function for correction, or shut-down, or safety shut-down and fault shut-down, and which is used to carry out safety related functions as specified in the PED 2014/68/EU. These functions may be on their own or as part of a safety (protective) system (e.g. sensors, limiters). If this is achieved by multichannel systems, then all items or limiters for safety purposes are included within the safety (protective) system.

3.6
lock-out
safety shut-down condition of the protective device, such that a restart can only be accomplished by a manual reset of the limiter or by a manual reset of the safety logic on site and by no other means

3.7
functional check
testing of the safety device to ensure it performs its intended function

3.8
electrically heated boiler
boiler in which water is heated by an electric current flowing between electrodes or by immersion heaters

3.9
expansion vessel
vessel to compensate for temperature dependent changes in water volume of a hot water boiler, where

— a closed expansion vessel is pressurised and

— an open expansion vessel is vented to atmospheric pressure and is not pressurised

3.10
allowable heat output
maximum heat output (water mass flow times the difference between outlet and inlet enthalpy) that can be generated during continuous operation and at which hot water boilers can be operated

3.11
maximum allowable temperature
TS
maximum temperature for which the pressure equipment is designed, as specified by the manufacturer

Note 1 to entry For hot water boiler, TS means the maximum allowable flow temperature measured at the outlet branch.

Note 2 to entry For steam generator, TS means the maximum allowable saturated steam temperature at PS.

Note 3 to entry For superheater, TS means the maximum allowable temperature of the hot steam measured at the outlet branch.

Note 4 to entry For economizer, TS means the maximum allowable flow temperature measured at the outlet branch.

Note 5 to entry TS corresponds to Pressure Equipment Directive 2014/68/EU, Article 2, indent (9).

3.12
maximum allowable pressure
PS
maximum pressure for which the pressure equipment is designed, as specified by the manufacturer, and defined at a location specified by him, being either the connection of protective and/or limiting devices, or the top of equipment or, if not appropriate, any point specified

Note 1 to entry PS corresponds to Pressure Equipment Directive 2014/68/EU, Article 2, indent (8).

3.13
maximum continuous rating
maximum continuous steam output that can be generated during continuous operation taking the specified steam condition into consideration

3.14
internal steam cushion
steam filled space located within the steam boiler to accommodate changes in volume

3.15
external steam cushion
steam filled space located outside the steam boiler to accommodate changes in volume

3.16
gas cushion
gas-filled space to accommodate changes in volume

3.17
effective heat transfer
energy supply is on and

— for a hot water boiler, flow of water is greater than or equal to a specified minimum value or

— for a steam boiler, the start-up or steam valve is open and the temperature is greater than the saturation temperature at ambient pressure

3.18
normal operation
automatic operation, with all regulating circuits and controls (open loops/closed loops) in automatic mode and with the set points and parameters valid for normal operation

Note 1 to entry: Normal operation also includes the automatic switching on and off of the assigned actuators (e.g. burner).

3.19
normal shut down
controlled switch off of the boiler either operated manually or automatically

3.20
make-up water
water which compensates for losses of water and steam from the system

Note 1 to entry: Definition from EN 12953-10:2003.

3.21
feed water
mixture of returned condensate and/or make up water supplied to the boiler inlet

Note 1 to entry: Definition from EN 12953-10:2003.

3.22
pressurization equipment
external system for keeping the hot water system pressure within the required pressure limits

Note 1 to entry: In order to prevent corrosion caused by oxygen infiltration, systems that prevent the system water being in direct contact with air should be preferred.

3.23
boiler attendant
boiler operator skilled person appointed for operating the boiler plant

3.24
temperature monitoring of the furnace shell
measurement system for monitoring the temperature of the furnace shell in the area of the highest heat flux

3.25
minimum flow rate
minimum flow of water in the piping required for hot water boilers and economisers to avoid overheating of the boiler or economiser

3.26
cold start
starting the boiler from ambient pressure at room temperature to normal operating condition

4 General requirements for steam boilers and hot water boilers

4.1 Safeguards (safety valves) against excessive pressure

Each steam boiler and hot water boiler, except open vented hot water boiler, shall be equipped with safeguards (safety valves) against excessive pressure in accordance with EN 12953-8:2001.

Superheaters and economizers shall be protected in accordance with EN 12953-8:2001. Where a superheater or an economizer can be isolated a pressure gauge connection shall be provided.

NOTE For example, see Annex A (Figures A.5 and A.6).

4.2 Materials for valves, fittings, flanges and bolting

The conditions and requirements to select the material shall be in accordance with EN 12953-2:2012.

4.3 Protective systems

4.3.1 All limiters and their installation shall be designed in accordance with EN 12953-9:2024. Limiters shall function independently of each other and of controls unless their safety function cannot be affected by other such functions.

The protective systems shall be in accordance with EN 50156-1:2015.

4.3.2 The application design and installation of the electrical safety circuit as well as the electrical and control equipment for the energy supply and its auxiliary equipment shall be in accordance with EN 50156-1:2015.

A hazard analysis SIL classification shall be carried out for each limiting device function and appropriate levels of functional safety implemented.

Typical Safety Integrity Level (SIL) requirements cannot be less than 2.

It shall be possible to stop the boiler by additional devices outside the boiler such as shut-off valve, emergency stop device, fire detectors, etc.

4.3.3 Functional check of all limiters shall be possible at any time during operation e.g. by simulation in accordance with operating instructions as specified in Clause 7.

4.3.4 When a limiter mentioned in this document activates, information shall be given to indicate which limiter has activated.

4.3.5 After lock out, the steam boiler/hot water boiler shall be physically checked by the boiler attendant (operator), before start-up (see 4.4.2).

4.3.6 Any valves that may isolate a limiter or monitoring device from the boiler system during normal operation shall be prevented from unintended closure (e.g. by wire and seal, locked in open position or position switches integrated in a safety circuit, etc.).

4.3.7 For purpose of function testing a bypassing of limiters at the boiler shall be allowed for a time not exceeding:

— for both channels of a two channels water level limiter, 30 s;

— for one channel of a two channels water level limiter, 5 min;

— for a maximum pressure limiter if there is a second channel in operation (e.g. safety valve or second pressure limiter), 5 min;