



SLOVENSKI STANDARD
oSIST prEN 12953-9:2023
01-junij-2023

Mnogovodni kotli - 9. del: Zahteve za omejlne naprave kotla in opremo

Shell boilers - Part 9: Requirements for limiting devices of the boiler and accessories

Großwasserraumkessel - Teil 9: Anforderungen an Begrenzungseinrichtungen an Kessel und Zubehör

Chaudières à tubes de fumée - Partie 9: Exigences pour les dispositifs de limitation de la chaudière et de ses accessoires

Ta slovenski standard je istoveten z: prEN 12953-9

ICS:

27.060.30 Grelniki vode in prenosniki toplote Boilers and heat exchangers

oSIST prEN 12953-9:2023

en,fr,de

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

DRAFT
prEN 12953-9

June 2023

ICS 27.060.30

Will supersede EN 12953-9:2007

English Version

Shell boilers - Part 9: Requirements for limiting devices of the boiler and accessories

Chaudières à tubes de fumée - Partie 9: Exigences pour
les dispositifs de limitation de lachaaudière et de ses
accessoires

Großwasserraumkessel - Teil 9: Anforderungen an
Begrenzungseinrichtungen an Kessel und Zubehör

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 269.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

This draft European Standard was established by CEN in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of 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 of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and United Kingdom.

Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Warning : This document is not a European Standard. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a European Standard.



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

| Contents | Page |
|---|-------------|
| European foreword..... | 4 |
| Introduction | 5 |
| 1 Scope | 6 |
| 2 Normative references..... | 6 |
| 3 Terms and definitions | 8 |
| 4 Requirements for limiter | 10 |
| 4.1 General..... | 10 |
| 4.2 Components | 11 |
| 4.3 Materials and design..... | 12 |
| 4.4 Electrical equipment..... | 13 |
| 4.5 Fault assessment | 14 |
| 4.5.1 General..... | 14 |
| 4.5.2 Fault models and exclusions | 17 |
| 4.6 Marking..... | 19 |
| 4.7 Operating instructions | 19 |
| 4.8 Type examination of functional capability | 20 |
| 4.9 Routine testing for final assessment..... | 22 |
| 5 Special requirements for water level limiters..... | 23 |
| 5.1 Design | 23 |
| 5.1.1 General..... | 23 |
| 5.1.2 Internal protection tubes | 23 |
| 5.1.3 External chambers..... | 23 |
| 5.2 Floating devices | 24 |
| 5.3 Level electrode devices | 24 |
| 5.4 Additional requirements for differential pressure sensors..... | 26 |
| 5.5 Type examination of functional capability | 26 |
| 6 Special requirements for pressure limiters | 28 |
| 6.1 Design | 28 |
| 6.2 Fault exclusion of mechanical failure of moving parts..... | 29 |
| 6.3 Type examination of functional capability | 29 |
| 7 Special requirements for temperature limiters | 31 |
| 7.1 Design | 31 |
| 7.2 Type examination of functional capability | 31 |
| 8 Special requirements for water conductivity limiters | 31 |
| 8.1 Internally mounted transducers | 31 |
| 8.2 Externally mounted transducers..... | 31 |
| 8.3 Transducers | 32 |
| 8.4 Type examination of functional capability of water conductivity limiter | 32 |
| Annex A (informative) Limiting devices | 33 |
| Annex B (informative) Example of an examination plan | 34 |
| Annex C (informative) Marking of limiters..... | 36 |

| | |
|---|-----------|
| Annex D (normative) Immunity against electrical and electromagnetic influences — Requirements and testing | 39 |
| D.1 General | 39 |
| D.2 Immunity against mains voltage variations..... | 39 |
| D.3 Immunity against short-time voltage interruptions and reductions | 40 |
| D.4 Immunity against mains frequency changes | 40 |
| D.5 Immunity against electrostatic discharge (ESD)..... | 40 |
| D.6 Immunity against fast transient disturbance variables (burst)..... | 41 |
| D.7 Immunity against surges..... | 41 |
| D.8 Immunity against high-frequency electromagnetic fields..... | 42 |
| D.9 Immunity against conducted disturbances induced by high frequency fields..... | 42 |
| D.10 Immunity against power frequency magnetic fields | 43 |
| Annex E (informative) Deterministic or probabilistic procedures for limiter safety cases..... | 44 |
| E.1 General | 44 |
| E.2 Relationships..... | 44 |
| E.2.1 Type test..... | 44 |
| E.2.2 Determination of characteristic data for use in protective circuits with SIL classification (SIL = safety integrity level)..... | 44 |
| Annex F (normative) Requirements and tests of electrical safety..... | 45 |
| Annex G (informative) Significant technical changes between this document and the previous edition | 47 |
| Annex ZA (informative) Relationship between this European Standard and the Essential Requirements of EU Directive 2014/68/EU aimed to be covered | 48 |
| Bibliography | 49 |

prEN 12953-9:2023 (E)**European foreword**

This document (prEN 12953-9:2023) has been prepared by Technical Committee CEN/TC 269 “Shell and water-tube boilers”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 12953-9:2007.

Annex G provides details of significant technical changes between this European Standard and the previous edition.

The European Standard series EN 12953 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 feedwater and boiler water quality*
- *Part 11: Acceptance tests*
- *Part 12: Requirements for grate firing systems for solid fuels for the boiler*
- *Part 13: Operating instructions*

Although these Parts may be obtained separately, it should be recognized that the Parts are interdependent. As such, the design and manufacture of shell boilers requires the application of more than one part in order for the requirements of the European 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>.

This document has been prepared under a Standardization Request given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s) / Regulation(s).

For relationship with EU Directive(s) / Regulation(s), see informative Annex ZA, which is an integral part of this document.

Introduction

The types of limiters which are to be fitted to boilers are specified in prEN 12953-6:2023 and the design of the safety systems are specified in EN 50156-1:2015.

In order to provide the necessary safety function, for example, to cut off the energy supply to the boiler in the event of a low water fault, the limiter is connected to other elements in the safety system.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[oSIST prEN 12953-9:2023](https://standards.iteh.ai/catalog/standards/sist/efeb4c94-b3ba-4099-aaf5-b84569acdb1b/osist-pren-12953-9-2023)

<https://standards.iteh.ai/catalog/standards/sist/efeb4c94-b3ba-4099-aaf5-b84569acdb1b/osist-pren-12953-9-2023>

prEN 12953-9:2023 (E)

1 Scope

This document specifies requirements for limiters which are incorporated into safety systems for shell boilers as specified in EN 12953-1:2012.

The design requirements and examination of the limiters are covered in this document.

NOTE See Annex E for determination of the characteristic data for use in protective circuits with a safety integrity level (SIL) rating. The requirements for limiters with regard to the safety integrity level (SIL), for example, in accordance with EN 61508 are not regulated in this document.

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 228-1:2003, *Pipe threads where pressure-tight joints are not made on the threads — Part 1: Dimensions, tolerances and designation (ISO 228-1:2000)*

EN 10226-1:2004, *Pipe threads where pressure tight joints are made on the threads — Part 1: Taper external threads and parallel internal threads - Dimensions, tolerances and designation*

prEN 12953-6:2023,¹ *Shell boilers — Part 6: Requirements for equipment for the boiler*

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

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 50156-2:2015, *Electrical equipment for furnaces and ancillary equipment — Part 2: Requirements for design, development and type approval of safety devices and subsystems*

EN 60529:1991,² *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989/Amd1:2000, Amd2:2013)*

EN IEC 60664-1:2020, *Insulation coordination for equipment within low-voltage systems — Part 1: Principles, requirements and tests (IEC 60664-1:2020)*

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

EN 60730-2-6:2016,³ *Automatic electrical controls - Part 2-6: Particular requirements for automatic electrical pressure sensing controls including mechanical requirements (IEC 60730-2-6:2015)*

¹ At draft stage.

² Document impacted by A1:2000 and A2:2013.

³ Document impacted by A1:2020.

EN IEC 60730-2-9:2019,⁴ *Automatic electrical controls — Part 2-9: Particular requirements for temperature sensing controls (IEC 60730-2-9:2015)*

EN IEC 60730-2-15:2019, *Automatic electrical controls - Part 2-15: Particular requirements for automatic electrical air flow, water flow and water level sensing controls (IEC 60730-2-15:2017)*

EN 60747-5-2:2001, *Discrete semiconductor devices and integrated circuits — Part 5-2: Optoelectronic devices — Essential ratings and characteristics (IEC EN 60747-5-2:1997)*

EN 60747-5-5:2011, *Semiconductor devices — Discrete devices — Part 5-5: Optoelectronic devices — Photocouplers (IEC 60747-5-5:2007)*

EN 60947-5-1:2017, *Low-voltage switchgear and controlgear — Part 5-1: Control circuit devices and switching elements — Electromechanical control circuit devices (IEC 60947-5-1:2016 + COR1:2016)*

EN 61000-4-2:2009, *Electromagnetic compatibility (EMC) — Part 4-2: Testing and measurement techniques — Electrostatic discharge immunity test (IEC 61000-4-2:2009)*

EN IEC 61000-4-3:2020, *Electromagnetic compatibility (EMC) — Part 4-3: Testing and measurement techniques — Radiated, radio-frequency, electromagnetic field immunity test (IEC 61000-4-3:2020)*

EN 61000-4-4:2012, *Electromagnetic compatibility (EMC) — Part 4-4: Testing and measurement techniques — Electrical fast transient/burst immunity test (IEC 61000-4-4:2012)*

EN 61000-4-5:2014,⁵ *Electromagnetic compatibility (EMC) — Part 4-5: Testing and measurement techniques — Surge immunity test (IEC 61000-4-5:2014/Amd1:2017)*

EN 61000-4-6:2014, *Electromagnetic compatibility (EMC) — Part 4-6: Testing and measurement techniques — Immunity to conducted disturbances, induced by radio-frequency fields (IEC 61000-4-6:2013)*

EN 61000-4-8:2010, *Electromagnetic compatibility (EMC) — Part 4-8: Testing and measurement techniques — Power frequency magnetic field immunity test (IEC 61000-4-8:2009)*

EN IEC 61000-4-11:2020,⁶ *Electromagnetic compatibility (EMC) — Part 4-11: Testing and measurement techniques — Voltage dips, short interruptions and voltage variations immunity tests (IEC 61000-4-11:2020)*

EN IEC 61000-6-2:2019, *Electromagnetic compatibility (EMC) — Part 6-2: Generic standards – Immunity standard for industrial environments (IEC 61000-6-2:2016)*

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

EN IEC 61558-1:2019, *Safety of power transformers, power supplies, reactors and similar products — Part 1: General requirements and tests (IEC 61558-1:2019)*

⁴ Document impacted by A1:2019 and A2:2020.

⁵ Document impacted by A1:2017.

⁶ Document impacted by AC:2020-06 and AC:2022-10.

prEN 12953-9:2023 (E)

EN 61558-2-6:2009, *Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1100 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 61558-2-16:2009,⁷ *Safety of power transformers, power supply units and similar — Part 2-17: Particular requirements for safety isolating transformers for switch mode power supplies (IEC 61558-2-16:2009/Amd1:2013)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in prEN 12953-6:2023, EN 12953-10:2003 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**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.

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, on its 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.

3.2**self-monitoring**

regular and automatic determination that all chosen components of a safety system are capable of functioning as required

3.3**redundancy**

provision of more than one device or system which, in the event of a fault, will still be provided by the necessary facilities

⁷ Document impacted by A1:2013.

3.4**diversity**

provision of different means of performing the required function, e.g. other physical principles or other ways of solving the same problem

3.5**safety shut-down**

process which is effected immediately following the detection of a fault within the limiter or caused by exceeding the threshold of the process value limit resulting in a defined state with deactivated terminals of the safety output(s)

3.6**fault shut-down**

safety shut-down with lock-out

3.7**lock-out**

safety shut-down condition of the limiter, such that a restart can only be accomplished by manual unlocking of the limiter or by manual unlocking of the safety logic on site and by no other means

3.8**sensor**

measuring element for mechanical, physical or electrical properties optionally with transmitting and/or transducing functions (provides an output quantity having a specified relation to the input quantity)

Note 1 to entry In this document, the wording "sensor" can be understood as "transducer" if the requirements are combined with transmitting and/or transducing functions.

3.9**make-up water**

water which compensates for losses of water and steam from the system

[SOURCE: EN 12953-10:2003, 3.3/prEN 12953-6:2023, 3.20]

3.10**feedwater**

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

[SOURCE: EN12953-10:2003, 3.4/prEN 12953-6:2023, 3.21]

3.11**boiler water**

water within a natural or assisted circulation boiler

[SOURCE: EN 12953-10:2003, 3.6]

3.12**water hardness**

sum of alkaline earths in water (essentially calcium and magnesium ions) in millimoles per liter (mmol/l)

3.13**set point, limiting value**

specific value of a measurand (e.g. conductivity or water hardness) which when reached interrupts the feedwater supply (e.g. permissible limits for boiler or feedwater in accordance with EN 12953-10)

prEN 12953-9:2023 (E)**3.14****limit value range**

range of a measurand (e.g. conductivity or water hardness) within which the limit can be set

3.15**sample line**

supply of the water which is to be monitored to the monitoring system

3.16**dead time**

time period between exceeding the permissible limit and output of the switching command

3.17**allowable temperature range**

maximum/minimum allowable temperature *TS* of the medium indicated by the manufacturer

Note 1 to entry maximum allowable temperature (*TS*) is a maximum temperature for which the pressure equipment is designed.

For examples:

- for hot water boiler, *TS* means the flow temperature measured at the outlet branch;
- for steam generator, *TS* means the saturated steam temperature at PS;
- for superheater, *TS* means the temperature of the hot steam measured at the outlet branch;
- for economizer, *TS* means the flow temperature measured at the outlet branch.

3.18**ambient temperature**

ambient air temperature range in which the device may be operated as specified by the manufacturer

3.19**maximum allowable pressure**

maximum allowable pressure *PS* of the medium indicated by the manufacturer and for which the pressure equipment is designed

3.20**fail-safe**

limiter is fail-safe if it possesses the capability of remaining in a safe condition or transferring immediately to another safe condition in the event of certain faults occurring

4 Requirements for limiter**4.1 General**

4.1.1 The limiters described in this document are elements of a safety device and safety accessories fixed for shell boilers and on reaching a limiting value (water level, pressure, temperature and conductivity) interrupt and lock out the energy supply. 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 document.

NOTE 1 For safety logic and actuating elements, see also Figure A.1.

A limiter shall be such that, as a minimum, single faults in any related part shall not lead to a loss of the safety function. For additional fault considerations, the requirements specified in 4.5 shall be fulfilled.

NOTE 2 EN 50156-1:2015 is mentioned several times in this document. EN 50156-2:2015, 4.2.2 mentions type testing to fulfil EN 50156-1:2015. If the type testing according to EN 50156-2:2015 is not following the required conformity assessment procedure for a safety accessory according to PED, a conformity assessment procedure of the limiting device or protective system according to PED, individually or during assembly, can be performed.

NOTE 3 Figure A.1 shows the scope of a limiter and of a protective system. Conformity assessment procedure according to PED could refer to either the scope of a limiter or of the protective system. The boiler manufacturer selects the conformity assessment procedure for protective system, if the limiter is not covered by a separate conformity assessment procedure, the boiler manufacturer is responsible for all requirements of the protective system including the limiters.

4.1.2 The requirements of Clause 4 have been established to ensure uniform assessment of different devices.

- a) The installation requirements associated with the selected measurement principle shall be taken into consideration.
- b) Simple removal and reinstallation for inspection and cleaning purposes shall be ensured.
- c) Limiters shall function independently of each other and of controls. Other functions of the limiter are accepted if the safety functions of the limiter are not affected.
- d) Automatic locking or manual resetting shall be realized as a part of the limiter or as a part of the safety logic.
- e) Instructions shall be available with the limiter including necessary precautions for its safe installation.
- f) The function of fail-safe limiters, if applicable including their interlocking device, shall not be impaired by other electrical circuits or controls. This applies in particular to devices with indicating and warning devices and/or contacts for such equipment.

4.2 Components

This limiter shall consist of one or more units needed to provide the necessary safety function.

The limiter shall be comprised of the following elements where applicable: connection lines, spacer, chamber, connecting flange and/or connecting thread, sensor, differential pressure transducer, differential pressure tubes, protection tube or external chamber (see NOTE), timing element, sensor control units, testing devices and other associated equipment up to the terminals of the switching output contacts as shown in Annex A.

NOTE Protection tubes from the boiler manufacturer and external chambers can be considered to be part of the boiler and in these cases it will be necessary for the limiter manufacturer and the boiler manufacturer to agree on the design and manufacturing requirements to ensure that the limiter system performs as intended.

Limiters with own pressure housing, chambers, connecting pipes and protection tubes shall be designed so that they:

- a) can be cleaned and inspected;
- b) prevent the build-up of sludge in the tubes/chambers;
- c) can be drained and vented.

prEN 12953-9:2023 (E)**4.3 Materials and design**

4.3.1 The use of materials or combination of materials, which may be affected by corrosive phenomena (e.g. with significant differences in their electrochemical potential) shall be avoided in order to prevent corrosion which could affect the function of the limiter.

4.3.2 Care shall be taken that if magnetic materials are chosen, they do not adversely affect the working of the limiter.

4.3.3 Selection of materials for pressurized components shall be in accordance with:

- a) harmonized European standards;
- b) European approvals of materials;
- c) individual approvals of materials.

4.3.4 Limiters shall be capable of withstanding the thermal, mechanical, chemical and electrical loads that can occur during operation.

The device shall function safely without qualification for all possible combinations of the following conditions:

- a) within the range for foreseen operation conditions for working pressure and for all foreseen adjustable values for maximum allowable pressure PS;
- b) within the range for foreseen operation conditions for working temperature and for all foreseen adjustable values for maximum allowable temperature TS;
- c) within the ambient temperature range of 20 °C to 70 °C (or 55 °C for device components installed exclusively in switch cabinets) or beyond in accordance with the operating instructions;
- d) in all of the operating positions also designated as permissible by the operating instructions of the device (e.g. horizontal or vertical installation)

If auxiliary equipment and remedial measures are required for compliance with the allowable operating conditions, then they shall be defined in the installation and operating instructions.

4.3.5 Limiters shall be designed such that changes in critical circuit in the whole range of tolerances shall not affect the safety function of the limiter. Critical circuit components for example affecting timing or long term stability, shall be checked by worst case analysis.

4.3.6 The set and/or limiting value shall not be capable of changing itself under operating conditions. Adjustment of the limiting value shall only be possible by means of auxiliary equipment (e.g. tools, software, etc.) and shall be secured against accidental alteration (e.g. vibration), e.g. varnish or sealing. The set value shall be visible (e.g. on the device, in a display, marking on the system).

4.3.7 Soft soldering is not permitted for connecting pressure components unless verification of sufficient safety is provided.

4.3.8 Suitable sealing shall be used for thread connections (for examples: flat metal sealing rings or filling sealing rings).

4.3.9 The limiter shall not have any sharp edges and corners which can cause damage and injuries or impair its function.

4.3.10 The limiter operating equipment shall be constituted such that their operation does not cause any foreseeable hazard.

4.4 Electrical equipment

4.4.1 Subclause 4.4 describes the basic requirements to be met by electrical equipment. If called for by the fault assessment (4.5), then additional requirements can also be found there as well.

4.4.2 All wiring and electrical equipment in connection with the limiter shall be adequately protected against the ingress of moisture and the effect of temperature (see also [2]).

4.4.3 The function of the limiter and the associated electrical circuit responsible for shutting down and locking out the energy supply system shall not be affected by other electrical circuits in their proximity. In such case, screened cables shall be used (see also [2]).

4.4.4 Electrical components within units directly attached to the boiler shall be capable of withstanding a temperature environment resulting from surrounding temperatures of up to 70 °C. Components within units not directly attached to the boiler shall be capable of withstanding an ambient temperature of up to 55 °C. Any equipment that is in contact with parts carrying steam or hot water shall be capable of withstanding the temperature of those parts.

4.4.5 The device and its components shall as a minimum correspond to the degree of protection specified in Table 1 in accordance with EN 60529:1991.

Table 1 — Degrees of protection

| Location | Degree of protection |
|--|--|
| Components located directly on the boiler | IP 54 |
| Components located in the boiler room | IP 44 |
| Device components installed in switch cabinets | The degree of protection required for the switchgear shall suffice |

For location of the boiler outside of the boiler room or the boiler house, the degree of protection shall be suitable for the environmental conditions.

4.4.6 If mechanical output contacts are used they shall be of the quick acting type. Mercury switching tubes, reed relays and reed contacts are not permitted.

The relays shall meet the following requirements that:

a) they are successfully tested at maximum contact load defined for the limiter for a minimum of 250 000 operating cycles;

NOTE Other standards (e.g. EN 13611:2019) applicable to the limiter may require additional operating cycles.

b) the maximum contact load shall be defined as part of the life test;

The maximum contact load shall be under consideration of the maximum load dependent on the safety protective system in normal operation.

c) they have a mechanical endurance (without load) of at least 3 000 000 operating cycles in accordance with EN 60947-5-1:2017, C.2.

Switches/micro-switches: The number of operating cycles amounts to 100 000 at maximum load.