
Water-tube boilers and auxiliary installations —

Part 10: Requirements for safeguards
against excessive pressure

The European Standard EN 12952-10:2002 has the status of a
British Standard

ICS 23.060.40; 27.040

National foreword

This British Standard is the official English language version of EN 12952-10:2002. It partially supersedes BS 1113-1999 which will be withdrawn when BS EN 12952-1, BS EN 12952-2, BS EN 12952-3, BS EN 12952-5, BS EN 12952-6, BS EN 12952-7, BS EN 12952-10 and BS EN 12952-11 are all published.

When reference to this part of this European Standard has been published in the Official Journal (OJ) of the European Communities, compliance with it will confer a presumption of conformity with the essential safety requirements of the Pressure Equipment Directive covered by this part of the standard.

The UK participation in its preparation was entrusted to Technical Committee PVE/2, Water-tube boilers, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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10: Exigences pour la protection vis-à-vis des excès de
pression

Wasserrohrkessel und Anlagenkomponenten - Teil 10 :
Anforderungen an Sicherheitseinrichtungen gegen
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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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Management Centre: rue de Stassart, 36 B-1050 Brussels

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Foreword

This document (EN 12952-10:2002) 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of an identical text or by endorsement, at the latest by March 2003, and conflicting national standards shall be withdrawn at the latest by March 2003.

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

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

The European Standard EN 12952 concerning water-tube boilers and auxiliary installations 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: In-service boiler life expectancy calculations.
- Part 5: Workmanship and construction of pressure parts of the boiler.
- Part 6: Inspection during construction, documentation and marking of pressure parts of the boiler.
- Part 7: Requirements for equipment for the boiler.
- Part 8: Requirements for firing systems for liquid and gaseous fuels for the boiler.
- Part 9: Requirements for firing systems for pulverized solid fuels for the boiler.
- Part 10: Requirements for safeguards against excessive pressure.
- Part 11: Requirements for limiting devices of the boiler and accessories.
- Part 12: Requirements for boiler feedwater and boiler water quality.
- Part 13: Requirements for flue gas cleaning systems. Part 14: Requirements for flue gas DENOX-systems.
- Part 15: Acceptance tests.
- Part 16: Requirements for grate and fluidized bed firing systems for solid fuels for the boiler.

CR 12952 Part 17: Guideline for the involvement of an inspection body independent of the manufacturer.

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

NOTE Parts 4 and 15 are not applicable during the design, construction and installation stages.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This Part of this European Standard specifies the requirements for safeguards against excessive pressure in water-tube boilers as defined in EN 12952-1.

2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies (including amendments).

prEN 1268-1, Safety devices for the protection against excessive pressure — Part 1: Safety valves.

prEN 1268-5, Safety devices for the protection against excessive pressure — Part 5: Controlled safety pressure relief systems (CSPRS) — General requirements.

EN 12952-1:2002, Water-tube boilers and auxiliary installations — Part 1: General.

prEN ISO 4126-4, Safety devices for protection against excessive pressure — Part 4: Pilot-operated safety valves (ISO/DIS 4126-4:1999).

3 Terms and definitions

For the purposes of this European Standard the terms and definitions given in EN 12952-1 apply.

4 Symbols and abbreviations

For the purposes of this part of this European Standard, the symbols given in EN 12952-1:2002, Table 4-1 shall apply. Throughout this part of this European Standard, additional terminology and symbols have been included where necessary to meet the requirements of the specific text concerned (see Table 4-1 and Figure 4-1).

Table 4-1 — Symbols and units

Symbol	explanation	unit
D_E	inlet pipe internal diameter	mm
d		
d_0	smallest flow diameter (minimum free bore)	mm
L_E	developed length of inlet pipe	mm

Figure 4-1 — Safety valves

5 Requirements

5.1 Steam boiler

5.1.1 Each steam boiler and each isolatable heated compartment (e.g. reheater, superheater, economizer) shall be provided with at least one suitable safety device which shall ensure against excessive pressure. The total certified discharge capacity of all safety devices mounted on the boiler shall be at least equal to the maximum continuous rating (MCR) of the boiler. The suitability of the safety device shall be demonstrated by a hot test on the assembled boiler.

The number and type of safety devices to be installed shall be specified by the manufacturer and shall meet the requirements of this clause.

At least one of the following safety device shall be considered suitable:

- a) direct-loaded safety valves in accordance with prEN 1268-1 or;
- b) assisted safety valves in accordance with prEN 1268-1 or;
- c) supplementary-loaded safety valves in accordance with prEN 1268-1 or;
- d) pilot-operated safety valve (POSV) in accordance with prEN 1268-1 or prEN ISO 4126-4, consisting of a main valve, controlled by signals from 3 pilot valves;
- e) controlled safety pressure relief system (CSPRS) in accordance with prEN 1268-5, consisting of a main valve, controlled by signals from 3 sensing lines.

In the case of safety devices in accordance with d) and e) the following shall apply:

The safety device shall be capable of operating when the signal from only one pressure sensing line is available.

The size and position of the pressure sensing lines shall ensure that the risk of loss of function is reduced to a minimum.

The mechanical and electrical parts of the pilot and control unit which are used to actuate the main valves shall still be functionally fit even in the case of an assumed individual defect.

It shall be possible to prove the reliability of the safety pressure relief device by functional testing on the plant.

In case of assisted, supplementary loaded safety valves, POSV and CSPRS shall be allowed to control one or more main valves by the same control unit.

5.1.2 The minimum flow diameter of safety valves or main valves of POSV or CSPRS for boilers with a volume ≤ 10 litres shall be at least 6 mm and for volumes > 10 litres shall be at least 15 mm.

5.1.3 In the case of boilers without superheater(s) the safety valves or main valves of POSV or CSPRS shall be connected to the steam space.

NOTE If the total required discharge capacity is q_m and the drumspace is simultaneously protected by n safety devices ($n > 1$) the discharge capacity of each of them should be at least $q_m/(n + 1)$.

5.1.4 In the case of once-through steam generators the safety valves or main valves of POSV or CSPRS shall be located at the steam outlet of the boiler.

5.1.5 In the case of superheaters that cannot be isolated the following shall apply:

- 1) Safety devices in accordance with 5.1.1 located at the superheater outlet shall be of sufficient capacity to prevent the allowable wall temperature of the superheater from being exceeded.
- 2) Safety devices in accordance with 5.1.1 a), b) and c) rated for at least 75 % or in accordance with 5.1.1. d) or e) rated for at least 25 % of the required discharge capacity shall be located at the saturated steam space of the boiler. No safety devices need be installed at the saturated steam space if the capacity of the safety device in accordance with 5.1.1 d) or e) located at the superheater outlet corresponds to the total steam quantity to be discharged and at least one pressure signal is transmitted to the control unit from the saturated steam space.
- 3) The superheater safety device shall be so set as to respond, in the case of natural and forced circulation boilers, before the safety device on the saturated steam space.

5.1.6 A superheater that can be isolated shall be equipped with at least one safety valve or main valve of POSV or CSPRS at the superheater outlet. The safety valve or main valve of POSV or CSPRS shall be rated for at least 20 % of the required discharge capacity of the boiler. The safety valve or main valve of POSV or CSPRS located on the saturated steam space of the steam generator shall in this case be rated for the maximum continuous rating. If the superheater can be isolated precautions shall be taken to prevent overheating.

5.1.7 Every reheater shall have at least one safety valve or main valve of POSV or CSPRS with a total discharge capacity of not less than the maximum steam flow for which the reheater is designed.

5.1.8 There shall be no shut off devices between the boiler and its protective safety devices or between the safety devices and their points of discharge.

5.1.9 Direct-loaded safety valves shall be installed in the vertical position. The line leading to the safety valve (inlet pipe) shall be as short and straight as possible and should not be located opposite to other nozzles.

Safety devices shall be safeguarded against damaging external influences, e.g. the weather, which may impair the functional capability of the safety device. The transfer of vibrations onto the safety device shall be avoided.

Safety device outlet pipes shall discharge the effluent safely. No liquid shall be allowed to accumulate in the outlet system. Where the pipe is endangered by freezing, it shall be protected accordingly. Taking into account the local operating conditions, the pipes shall be so dimensioned and laid out so as to safely withstand the static, dynamic (reaction forces) and thermal loadings.

Safety devices where leaking fluid, e.g. due to open bonnet, may directly or indirectly endanger persons or the environment, shall be provided with suitable protective devices.

5.1.10 The cross-section of the line leading to the safety valve or main valve of POSV or CSPRS (inlet pipe) shall not be less than the safety valve or main valve of POSV or CSPRS inlet cross-section.

The outlet pipe cross-section shall not be less than the safety valve or main valve of POSV or CSPRS outlet cross-section.

The diameter and length of outlet pipes, bends, silencers etc. will determine the build-up of back pressure. These parts shall be so dimensioned and laid out so that the allowable back pressure indicated by the valve manufacturer shall not be exceeded.

The pressure loss in the inlet pipe shall not exceed 3 % of the pressure difference between the set pressure and the superimposed back pressure at the greatest mass flow to be discharged. A blow down of the installed safety valve (difference between set and reseating pressure) of least 5 % is a prerequisite to undisturbed functioning at this pressure loss.

At a blowdown of less than 5 % the difference between the blowdown and the pressure loss in the inlet pipe shall be at least 2 % of the pressure difference between set pressure and the superimposed back pressure.

For controlled safety pressure relief systems the requirements for pressure loss in the inlet pipe shall only apply if these valves operate as direct-loaded valves in the event of releasing the operating force.

5.1.11 Back pressures on the outlet side affecting the set pressure (gauge) and the opening forces or the mass flow shall be taken into consideration.

NOTE If the back pressure exceeds 12 % of the inlet pressure, or the back pressure is variable, the valve manufacturer should be informed so that a suitable device can be supplied.

The pressure relief system shall be properly designed and installed to ensure that the required discharge capacity of the safety device is not impaired.

Where the outlet pipe of a safety valve or main valve for POSV or CSPRS leads into a downstream system, the safety valve or main valve for POSV or CSPRS shall be so set and dimensioned so that it is capable of discharging the required mass flow at the highest possible back pressure p_{ao} , which is the sum of built up and superimposed back pressure.

5.1.12 Safety devices shall be accessible for functional testing and maintenance.

5.1.13 The installation instructions of the safety device manufacturer shall be taken into consideration.

5.1.14 Where CSPRS are installed to protect the downstream system by preventing further fluid input, the closing function of the main valves of the safety shut-off devices shall be safeguarded instead of the opening function. For the closing function the requirements for CSPRS as defined in prEN 1268-5 shall apply accordingly. Upstream of the main valves a strainer shall be installed. The system to be safeguarded downstream of the safety shut-off device shall be additionally provided with a safety valve with a capacity based on the leakage rate of the main valve of the safety shut-off device.

5.2 Hot water generator

5.2.1 Each hot water generator shall be provided with at least one suitable safety device against excessive pressure.

The discharge capacity corresponding to the required relief capacity at maximum continuous rating of the applicable boiler parts shall be achieved without causing the pressure to be increased by more than 10 % of the maximum allowable pressure.

After reclosing of all safety devices, the pressure shall be less than or equal to *PS*.

In the case of staggered set pressure, at least one safety device shall respond if the maximum allowable pressure is reached, but all valves shall have reached their required capacity within a pressure surge of 10 % above *PS*.

The suitability of the safety devices shall be demonstrated by a type test.

At least one of the following safety devices shall be considered suitable, taking into account that safety devices in the water space of hot water generators shall have proportional lift characteristics:

- a) direct-loaded safety valves in accordance with prEN 1268-1 or;
- b) assisted safety valves in accordance with prEN 1268-1 or;
- c) supplementary-loaded safety valves in accordance with prEN 1268-1;
- d) pilot-operated safety valve (POSV) according to prEN 1268-1 or prEN ISO 4126-4, consisting of a main valve, controlled by signals from three pilot valves;
- e) controlled safety pressure relief system (CSPRS) according to prEN 1268-5, consisting of a main valve, controlled by signals from three sensing lines.

The total certified discharge capacity of all safety devices mounted on the generator shall be at least equal to the maximum continuous rating (MCR) of the boiler.

In the case of safety pressure relief devices according to d) and e), the mechanical and electrical parts of the pilot and control unit (actuation of main valves) shall still be functionally fit even in the case of an assumed individual defect.

It shall be possible to prove the reliability of the safety pressure relief device by functional testing on the plant.

5.2.2 The minimum flow diameter of safety valves or main valves of POSV or CSPRS for hot water generators shall be at least 15 mm.

5.2.3 The safety device shall be installed at the highest point or in vicinity thereof, or on the flow line in direct vicinity of the hot water generator.

5.2.4 In the case of once-through hot water generators the safety devices shall be installed on the hot water outlet nozzle.

5.2.5 When rating safety devices, steam discharge shall be assumed to occur at the saturated steam condition corresponding to the safety device setting also for valves set under hydraulic pressure during operation. The safety devices shall be so designed that the steam flow corresponding to the allowable heat output can be discharged, without the maximum allowable pressure of the hot water generator being exceeded by more than 10 %.

NOTE The discharge capacity of safety valves or main valves of POSV or CSPRS fitted to hot water generators may need to consider the effects of two phase flow.

5.2.6 Each overhead expansion vessel operated with a steam space shall be additionally equipped with a safety device being so set as to discharge earlier than the pressure relief device of the hot water generators.

NOTE When rating this device, it will be sufficient to take the output of the largest of all hot water generators connected provided the expansion vessel is designed for that pressure which may be generated in this hot water generator at the allowable flow temperature.

Auxiliary heating systems and auxiliary steam supply shall be taken into consideration for rating.

5.2.7 Each closed expansion vessel shall be equipped with at least one safety device, which shall be so rated that the maximum allowable pressure will not be exceeded under any operating condition. All quantities flowing into the tanks as well as auxiliary heating systems and auxiliary steam supply, if any, shall be taken into account for rating.

Annex ZA (informative)

Clauses of this European Standard addressing essential safety requirements or other provisions of Pressure Equipment Directive

This European standard has been prepared under a mandate given by the European Commission and the European Free Trade Association and supports essential safety requirements of the Pressure Equipment Directive 97/23/EC.

Warning: Other requirements and other EU Directives **may** be applicable to the product(s) falling within the scope of this standard.

Compliance with the clauses of this standard given in Table ZA.1 provide one means of conforming with the specific essential requirements of the Directive concerned and associated EFTA regulations.

**Table ZA.1 — Comparison between EN 12952-10 and the essential safety requirements of the
Pressure Equipment Directive 97/23/EC with respect to requirements for safeguards against excessive
pressure for water-tube boilers**

EN 12952-10 harmonized clauses	Content	Pressure Equipment Directive 97/23/EC Annex I
5	Protection against exceeding limits	2.10
5	Safety accessories	2.11
5.2	Minimizing risks from overheating by: Provisions of sample points	5.2nd para b)
5	Elimination of damage risk from depo- sist Pressure limiting devices	5-2nd para c)
5	Restrictions on pressure surge to 10 % of MAP	7.3-1st para

Bibliography

- [1] Directive 97/23/EC of the European Parliament and of the Council of 29 May 1997 on the approximation of the laws of the Member States concerning pressure equipment OJEC, L181.

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London
W4 4AL

