BRITISH STANDARD

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14222:2003

Stainless steel shell boilers

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ICS 27.060.30

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National foreword

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EUROPEAN STANDARD

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EUROPÄISCHE NORM

EN 14222

April 2003

ICS 27.060.30

English version

Stainless steel shell boilers

Chaudières à tubes de fumée en acier inoxydable

Edelstahl-Großwasserraumkessel

This European Standard was approved by CEN on 21 February 2003.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This document (EN 14222:2003) 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of an identical text or by endorsement, at the latest by October 2003, and conflicting national standards shall be withdrawn at the latest by October 2003.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) {Pressure Equipment Directive (PED) 97/23/EC [1]}.

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

This European Standard refers to EN 12953: Shell boilers and EN 13445: Unfired pressure vessels.

Annex A is informative.

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, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies requirements for electrically heated shell boilers manufactured from stainless steel specifically dedicated for generating steam for sterilizers and disinfectors.

This European Standard covers only boilers that are heated by immersion heaters and which have a maximum allowable pressure (PS) of 6 bar, a maximum volume (V) of 1 000 litres and a product of PS x V not greater than 3 000 bar x l.

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).

EN 285:1996, *Sterilisation — Steam sterilizers — Large sterilizers*.

EN 12953-1, *Shell boilers — Part 1: General*.

EN 12953-5, *Shell boilers — Part 5: Inspection during construction, documentation and marking of pressure parts of the boiler.*

EN 12953-6, *Shell boilers — Part 6: Requirements for equipment for the boiler.*

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

prEN 12953-9:1999, *Shell boilers — Part 9: Requirements for limiting devices and safety circuits of the boiler and accessories.*

EN 13445-2:2002, *Unfired pressure vessels — Part 2: Materials.*

EN 13445-3, *Unfired pressure vessels — Part 3: Design.*

EN 13445-4, *Unfired pressure vessels — Part 4: Fabrication.*

EN 13445-5, *Unfired pressure vessels — Part 5: Inspection and testing.*

EN 60204-1, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements (IEC 60204-1:1997).*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 12953-1 and EN 12953-6 and the following apply:

3.1
controls
devices used for maintaining the variable to be controlled (e.g. water level, pressure, temperature) at a specific value (set point)

3.2
limiters
device that, on reaching a fixed value (e.g. pressure, temperature, flow, water level) is used to interrupt and lock-out the heating energy supply and lock-out requires manual unlocking before restart

3.3
lock-out
isolation of energy supply which requires a manual intervention to reinstate

3.4
functional check
testing of the safety device to ensure it performs its intended function

4 Materials

Each steam boiler shall be manufactured from materials in steel group 8 or 10 in accordance with EN 13445-2:2002, annex A.

5 Design

Each steam boiler shall be designed in accordance with EN 13445-3.

6 Manufacture

Each steam boiler shall be manufactured in accordance with EN 13445-4.

7 Inspection and testing

Each steam boiler shall be inspected, tested and documented in accordance with EN 13445-5.

8 Marking

The requirements for marking shall be in accordance with EN 12953-5.

9 Requirements for equipment

9.1 General

The following requirements for equipment for electrically heated stainless steel shell boilers are worked out on the basis of EN 12953-6.

9.2 Safeguards against excessive pressure

Each steam boiler shall be equipped with safeguards against excessive pressure in accordance with EN 12953-8. In a deviation from EN 12953-8 the minimum inside diameter of the safety valve seat could be reduced to 8 mm.

9.3 Materials for valves, fittings, flanges and bolting

Steel materials for valves, fittings, flanges and bolting shall be in accordance with EN 13445-2.

9.4 Limiting devices and safety circuits

9.4.1 Limiters shall be designed in addition to prEN 12953-9. In accordance with prEN 12953-9:1999, 5.4.2 level electrode inclinations between 45° and 90° from the vertical shall be allowed provided that functional capability examinations have proven successful. The electrical safety circuits shall be in accordance with EN 60204-1.

9.4.2 Functional checking of all limiters shall be possible at any time during operation e.g. by simulation where appropriate.

9.4.3 If a limiter responds, the boiler shall automatically go to a safe condition and a signal shall be given to indicate boiler malfunction.

9.4.4 After manual resetting of a limiter lock-out, the boiler shall be put back into operation by manual intervention only.

9.5 Boiler heat supply

9.5.1 The pressure of each boiler shall be controlled automatically by regulating the heating energy input.

9.5.2 Automatic start-up of the boiler and the system is permitted provided that equipment is installed to ensure that start-up is conducted safely. Automatic restarting after normal shut-down shall not be considered a start-up.

9.5.3 A high temperature alarm device for shutting off the heating energy supply shall be provided. The alarm temperature shall be determined by the manufacturer.

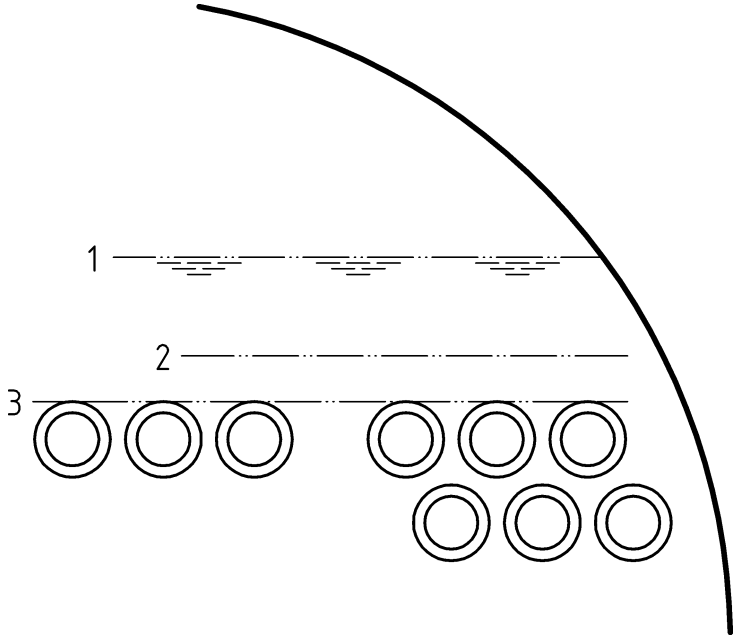
9.5.4 The electrical supply circuits and the safety of the control equipment shall conform to EN 60204-1.

9.6 Water level indication

9.6.1 Each steam boiler shall have at least one independent means (independent from other equipment) of indicating the water level, which shall be a gauge of transparent material directly connected to the boiler shell.

9.6.2 The gauge(s) shall be mounted so that the water level is visible through the transparent material at the lowest alarm level, i.e. at the lowest permissible water level (LWL), which shall be marked. The maximum permissible water level, which shall be specified by the boiler manufacturer, shall be visible. The gauge shall be capable of showing a measurement of "15 mm below LWL".

9.6.3 The lowest permissible water level (LWL) of the boiler (see Figure 1), which shall be permanently and legibly marked on the boiler shell and identified by the letters "LWL", shall be at least 30 mm above the uppermost surface of the immersion heaters "HHS".



Key
1 Controlled water level
2 LWL
3 HHS

Figure 1 — Water level indication

9.6.4 Pipes and fittings connecting a water level gauge to a boiler shall be as short as possible and constructed so that no undrained pocket is formed between the boiler and the gauge. There shall be no outlet therefrom except for regulators, steam pressure gauges and drains or other similar apparatus, which does not permit the escape of a significant amount of steam.

Pipes connecting a water level gauge to the boiler shall not be less than 8 mm bore. Where a chamber of a safety control or alarm device is fitted to the water gauge or its piping, the connecting pipes between the boiler and the water level gauge shall have a bore not less than 15 mm.

9.6.5 Where the water level gauge is a part of the boiler shell, the requirements of 9.6.4 shall not apply.

9.7 Steam pressure indication

9.7.1 Each boiler shall have a steam pressure gauge in accordance with EN 285:1996, 6.1.1.2, connected to the steam space either directly or through the water level gauge column or its steam connection.

9.7.2 The steam pressure gauge shall be connected to a siphon or similar device of sufficient capacity to keep the gauge tube filled with water. The pipe shall be of sufficient size and shall have provision for blowing through if possible. Alternatively the pressure line shall be fitted with an isolating membrane close to the boiler. The pressure line between the membrane and the gauge shall contain a non-compressible fluid.

9.7.3 Steam pressure gauge connections shall be made suitable for the design working pressure of the boiler.

9.7.4 Pressure gauges shall be graduated to indicate the pressure in bars. The maximum allowable pressure shall be indicated by a fixed and readily visible red mark on the pressure gauge.

NOTE In addition, the operating pressure and the safety valve set pressure may also be indicated.

9.7.5 Each boiler shall be provided with a valve connection for the special purpose of connecting a test gauge when the boiler is in service so that the accuracy of the boiler steam gauge can be ascertained.

9.8 Drain and blowdown devices

9.8.1 Each boiler shall be fitted with drain valves placed at, or as near as practicable to, the lowest point of the apparatus.

NOTE On some boilers, drain valves may be used for blowdown purposes.

9.8.2 Where drain valves from two or more boilers are connected to a common discharge, two valves shall be fitted to each drain line, one being of a non-return type to prevent the contents of one boiler passing to another. As an alternative to the non-return valves an interlock system, enabling only one valve to be open at a time shall be allowed.

9.8.3 Taper-plug valves where fitted, shall be of the bolted cover type with separately packed glands.

9.8.4 Where drain valves are not self-closing or capable of being locked in the closed position, a further shut-off device shall be installed in the line.

NOTE Having the drain valve enclosed by a cabinet or an inspection door is included in the term "being locked in a closed position".

9.9 Valves for connections

9.9.1 Steam outlets

The stop valve connecting the boiler to the steam pipe shall be attached directly to the boiler or shall be as near to it as practicable. The valve should preferably be of a type, which positively indicates whether it is open or closed. Where more than one boiler is connected to a common header or steam manifold, the steam connections for each boiler shall be provided with two stop valves or some similar safety method shall be provided.

NOTE It is preferable that the valve nearest the boiler be a non-return type.

9.9.2 Feed connections

Each feed pipe to any boiler shall be provided with a non-return valve and a separate stop valve near the boiler.

If the stop valve and non-return valve are not connected directly to each other, it shall be possible to relieve the pressure in the interconnecting piping.

The feed line and internal pipe connection to the boiler shall be so arranged that in case of leakage in the feed line, the boiler can not empty itself to a level below the uppermost surface of the immersion heaters.

In the event of backflow through a feed pump, where the suction pipework is of a lower pressure rating than the discharge line, then pressure gauges shall be installed to clearly indicate the pressure head. Also, a warning notice shall be provided indicating the possible dangers of closing an isolating valve (if fitted) in the suction line. If a backflow through the suction pipework could not be blocked from discharging into open air (for example by a non-isolatable air break tank in accordance with EN 285) this 4th paragraph shall not apply.

9.10 Feed water supply

The boiler shall be provided with an adequate supply of feed water. The maximum water level shall be prevented from being exceeded.

The feed water supplied to the boiler shall not contain harmful substance (oil, grease, chloride etc).

9.11 Feed water control

The water level shall be controlled automatically.

9.12 Limiting devices

9.12.1 Low water protection

A water level limiter shall be provided to cut off and lock out the heat supply when the water level falls to the "LWL" position.

9.12.2 Pressure limitation

A pressure limiter shall be provided to cut off and lock out the heating energy supply to ensure that the allowable pressure is not exceeded.

10 Operational aspects of steam boilers

Guidance on the operational aspects of steam boilers is given in annex A.

11 Small steam boilers

For equipment for small steam boilers with a pressure volume product less than 200 bar x l, the requirements of clause 9 shall apply with the following exceptions:

— water level indication (see 9.6.1) can be direct or indirect;

— pressure limitation (see 9.12.2) is not required, if safety is achieved by other measures.

Annex A
(informative)

Operational aspects of steam boilers

A.1 All controls and safety devices should be properly maintained to ensure reliability. In addition, an inspection organisation or the supplier's maintenance service should be charged with the checking of this equipment at regular intervals, at least half yearly or more frequently if problems are experienced. All control and limiting devices should be functionally tested during these checks.

A.2 The operation and maintenance of boiler plants should only be assigned to properly trained persons familiar with the special conditions of the plant.

A.3 During operation, the boiler operator should satisfy himself of the proper condition of the boiler plant. This should be done within one hour after each start up and at least once every 24 hours. In the event of failure of the automatic controls or safety devices and where the boiler is capable of being brought under manual control safety, operation under manual control should be in accordance with a clearly defined written emergency procedure that should include the immediate presence of a trained attendant.

Continuous supervision should be provided until the fault has been rectified and a suitable period of time has elapsed to ensure, by testing, that the boiler and its controls are operating normally.

NOTE In the case of a boiler servicing a sterilizer, the sterilizer operator could act as a boiler operator.

A.4 Unless the requirements of 9.5.2 have been provided then during start-up from cold the boiler operator should be present in the installation room. The start-up comprises the period until attainment of that operating condition which permits checking and observation of the proper functioning of all control and monitoring devices.

If an alarm is activated during start up a responsible person should be available to take appropriate action.

A.5 The result of each unit or functional check should be clearly recognizable to the boiler operator.

A.6 Manuals covering operation, maintenance and testing of equipment, including control and safety devices should be provided and located in the installation room.

NOTE In the case of a boiler servicing a sterilizer, the documents could be combined with and kept together with the corresponding sterilizer documents.

A.7 During the period of operation without supervision, the water gauges as defined in 9.6 may be closed off.

Annex ZA
(informative)

Clauses of this European Standard addressing essential safety requirements of the Pressure Equipment Directive

This European Standard has been prepared under a mandate given to CEN 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 European Standard given in Table ZA.1 provides one means of conforming to the specific essential requirements of the Directive concerned and associated EFTA regulations.

Table ZA.1 — Comparison between EN 14222 and the essential safety requirements of the Pressure Equipment Directive 97/23/EC for stainless steel shell boilers

EN 14222 harmonized clauses	Content	Pressure Equipment Directive 97/23/EC, Annex I
9.2	Discharge of pressure relief blow-off	2.3 – 2nd indent
9.8	Means of draining and venting	2.5
9.12	Protection against exceeding limits	2.10
9.4, 9.6, 9.7	Indicators and/or alarms	2.10 (b)
9.4, 9.11, 9.12	Safety accessories	2.10 (a) 2.11.1
9.5, 9.9, 9.10	Minimizing risks from overheating	5

Bibliography

[1] Directive 97/23/EC of the European Parliament and of the Council on 29 May 1997 on the approximation of the laws of the Member States concerning pressure equipment, OJEC L 181.

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