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Refrigerating systems and heat pumps — Liquid level indicating devices — Requirements, testing and marking

bsi.

National foreword

This British Standard is the UK implementation of EN 12178:2016. It supersedes BS EN 12178:2003 which is withdrawn.

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Kälteanlagen und Wärmepumpen - Flüssigkeitsstandanzeiger - Anforderungen, Prüfung und Kennzeichnung

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European foreword

This document (EN 12178:2016) has been prepared by CEN/TC 182, “Refrigerating systems, safety and environmental requirements”, 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of an identical text or by endorsement, at the latest by May 2017, and conflicting national standards shall be withdrawn at the latest by May 2017.

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This document supersedes EN 12178:2003.

EN 12178:2016 includes the following significant technical changes with respect to EN 12178:2003:

a) Introduction of the safety factors in 7.2.1;

b) Harmonisation of Annex ZA with Directive 2014/68/EU.

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.

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1 Scope

This European Standard specifies safety requirements, safety factors, test methods, test pressures and marking of liquid level indicating devices, referred to throughout this standard as “level indicators”, for use in refrigerating systems and heat pumps.

It applies to devices connected to refrigerant vessels (e.g. on high-pressure liquid receivers, intercoolers and low-pressure receivers) and to devices connected to other parts of a refrigerating system (e.g. oil-level sight glasses on a compressor).

This European Standard applies to those types of level indicators that are direct and indirect reading devices (e.g. sight glasses, frosting tubes), and includes electrical and pneumatic indicators.

This European Standard describes the procedure to be followed when designing (by calculation or by an experimental design method) level indicator parts subjected to pressure as well as the criteria to be used for the selection of materials.

This European Standard applies to the design of level indicators with respect to pressure containment and describes methods by which the reduced impact values at lower temperatures may be taken into account in a safe manner.

It also gives guidance on some aspects of application and installation.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 378-1, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 1: Basic requirements, definitions, classification and selection criteria*

EN 378-2, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 2: Design, construction, testing, marking and documentation*

EN 378-4, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 4: Operation, maintenance, repair and recovery*

EN 764-1, *Pressure equipment — Part 1: Vocabulary*

EN 12284:2003, *Refrigerating systems and heat pumps — Valves — Requirements, testing and marking*

EN 60529, *Degrees of protection provided by enclosures (IP Code) (IEC 60529)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 378-1 and EN 764-1 and the following apply.

3.1
min $t_{0\,100}$
lowest temperature at which pressurized parts can be used at a load of up to 100 % of the allowable design stress at 20 °C, taking the safety factors according to EN 12284:2003, Table A.2 into account

3.2
min $t_{0\,75}$
lowest temperature at which pressurized parts can be used, if its load amounts to 75 % maximum of the allowable design stress at 20 °C, taking the safety factors according to EN 12284:2003, Table A.2 into account

3.3
min $t_{0\,25}$
lowest temperature at which pressurized parts can be used, if their load amounts to 25 % maximum of the allowable design stress at 20 °C, taking the safety factors according to EN 12284:2003, Table A.2 into account

3.4
self-closing balls
self-closing shut-off arrangement

Note 1 to entry: The arrangement comprises balls positioned in the connecting channel close to the sight glass in such a manner that the balls will not be affected at low flow rates. At high flow rates the balls will be carried forward with the flow and block the connections to the sight glass.

3.5
reflex glass
glasses having prismatic flutes on the inside, which will break up the incoming light

Note 1 to entry: The liquid zone will absorb the light and will correspondingly appear dark. The gas/vapour zone will reflect the light and will correspondingly appear bright.

3.6
direct reading level indicator
level indicator where it is possible to see the liquid level

3.7
indirect reading level indicator
level indicator where the liquid level is not visible

Note 1 to entry: The level is indicated by auxiliary means; electrically, magnetically or by observing the frost on a tube.

3.8
self-contained unit
level indicator which is assembled and tested by the manufacturer

3.9
add-on unit
level indicator delivered in parts from the manufacturer for mounting directly onto the system and which can only be tested after assembly and connection on site

3.10
level indicator with magnetically operated indication
device which transfers the measured value at any particular moment to an indicating device by means of a float with a built-in permanent magnet system

3.11
sight glass
direct reading level indicator consisting of a glass plate and holder to enable viewing of the liquid surface

Note 1 to entry: The shape of the glass plate can be either circular or oblong. The glass can be smooth or provided with flutes to break up incoming light which will make the liquid-filled part darker than the vapour-filled part. A sight glass can be a self-contained or add-on unit.

3.12
frosting tube
device, the principle of which is based on the frosting of the humidity of the surrounding air, and which consists of a corrosion protected tube arranged vertically outside the vessel and connected to the vessel at top and bottom. It is especially suitable for refrigerant temperatures below – 3° C and ambient temperature above freezing point. The top level of the frosting on the tube will indicate the liquid level in the vessel

3.13
auxiliary powered level indicator
device which operates electrically or pneumatically to indicate the level by means such as the following:

a) differential pressure transducer;

b) capacitive transducer;

c) inductive transducer;

d) ultrasonic transducer;

e) displacement principle with a displacement float

3.14
operating range
temperature and pressure conditions at which the liquid level can be safely operated

3.15
nominal size [DN]
alpha-numeric designation of size for components of a pipework system

[SOURCE: EN ISO 6708:1995]

3.16
nominal pressure (PN)
value of a pressure in the range of the maximum allowable pressure for planning a plant or a component

[SOURCE: ISO 7268]

4 List of Symbols

For symbols, see EN 12284:2003, Clause 4 (Table 1).

5 General requirements

5.1 Installation and operation

Level indicators shall be designed for installation and operation in accordance with EN 378-1, EN 378-2 and EN 378-4.

5.2 Components under pressure

All parts of the level indicator shall be designed and manufactured to remain leakproof and withstand the pressures which may occur during operation, standstill and transportation, taking into account the thermal, physical and chemical stresses to be expected.

5.3 Excessive mechanical stress

After installation, level indicators, especially in systems where hot gas defrosting is used, shall not be under excessive mechanical stress from fitting of the pipe or from temperature variations during operation.

NOTE Hot gas defrosting can produce hydraulic shocks resulting in transient pressures in excess of *PS*. Further information can be obtained from EN 378 (all parts).

5.4 Leakage

See EN 12284:2003, 5.4.

6 Materials

6.1 Material properties

Materials, including welding filler metals, solders, braze, sealant and glass, shall allow for the thermal, chemical and mechanical stresses arising in system operation. The material shall be resistant to the refrigerants, solvents (in absorption systems) and refrigerant-oil mixtures used in each particular case.

6.2 New materials

New materials shall be tested in accordance with EN 12284:2003, Annex A to Annex D.

6.3 Using non-metallic materials

See EN 12284:2003, 6.1.2.

6.4 Requirements for materials to be used for pressurized parts

See EN 12284:2003, 6.2.

6.5 Compatibility of connections

Materials, which are to be physically linked, shall be suitable for an effective connection, depending on the particular materials used and on the dimensions of piping specified.

6.6 Ductility

Materials which are to be considerably deformed shall be sufficiently ductile and capable of being heat treated where necessary.

6.7 Brittle fracture

Level indicators shall be designed and constructed so that they are not subject to brittle fraction at the minimum operating temperature (min t_o) using the method specified in EN 12284: 2003, Annex D.

6.8 Ageing

Materials for pressurized parts shall not be significantly affected by ageing.

6.9 Castings

Castings shall exhibit a low residual stress level. If they are not subjected to stress relief heat treatment, controlled cooling shall be ensured after the casting process and after any heat treatment that may have been applied.

6.10 Forged and welded components

Forged and welded components shall be fabricated from suitable materials, (e.g. weldable close grain low carbon steel) and shall be heat treated where the combination of operating temperature, operating pressure and wall thickness indicates by calculation that heat treatment is necessary.

6.11 Nuts, bolts and screws

Materials for nuts, bolts and screws for jointing housing parts subject to pressure loads shall exhibit the correct characteristics for the material over the full range of the application limits for the nuts, bolts and screws defined by the operating temperature. Thereby the following minimum values for the elongation at fracture and notched impact strength at the corresponding temperature shall be achieved. The test piece for impact strength measurements shall be taken parallel to the drawing or rolling direction, and the notch orientation shall be perpendicular to the drawing or rolling direction.

a) For ferritic materials an elongation at fracture $A_s \geq 14$ %;

b) For cold-formed austenitic materials an elongation at fracture A_L shall be at least or equal 0,4 times the diameter of the rod;

c) Notched impact strength *KV* at 20 °C for tempered alloyed steels of at least 52 J and of at least 40 J for tempered carbon steels (ISO V test-piece).

The following values shall be achieved at the lowest operating temperature:

d) Notched impact strength *KV* for tempered alloyed steels and tempered carbon steels of at least 27 J(ISO V test-piece).

NOTE Some suitable materials are given in EN 12284:2003, Annex E.

6.12 Glass materials

Glass shall be free from blisters, crystalline enclosures and surface irregularities.

Thermal reinforcement (tempering) should only be applied for strength reasons.

6.13 Gasket materials

Gasket materials shall be such that re-tightening is not required.

Attention should be paid to packing against glass.

7 Design

7.1 General

See EN 12284:2003, 7.1 to 7.6.

7.2 Requirements for glass

7.2.1 Where glass plate is used, the following formulae for the calculation of minimum thickness can be used:

for circular plates: $d = 0{,}55 \times D_{\mathrm{m}} \sqrt{\frac{PS \times S}{10 \times \alpha_{\mathrm{bz}}}}$ (1)

for oblong plates: $d = \alpha \times B \sqrt{\frac{PS \times S}{10 \times \alpha_{\mathrm{bz}}}}$ (2)

where:

d thickness, in millimetres;

0,55 constant;

D_{m} $\frac{\text{inner diameter} + \text{outer diameter}}{2}$ of the gasket, in millimetres, or the diameter where the glass is supported;

PS maximum allowable pressure (PS) for which the equipment is designed as specified by the manufacturer, in MPa;

S safety factor for circular plates S = 5, for oblong plates S = 8

α_{bz} bending tensile strength, in Newton per square millimetres (typical values: annealed glass: 40 N/mm² to 60 N/mm²; thermally reinforced glass: 100 N/mm² to 150 N/mm²);

α factor depending on $\frac{\text{length}}{B}$ (see Table 1)

B $\frac{\text{inner width} + \text{outer width}}{2}$

Table 1 — Factor α

Length / *B*	2,0	3,0	4,0	5,0	> 5
α	0,780	0,854	0,860	0,864	0,865

7.2.2 Where glasses are used it shall be possible to read the liquid level precisely or to decide if the liquid level is outside the reading range by for example:

a) reflex glass;

b) reflecting devices with illuminated casing, produced by a red-white matt glass plate;

c) sight glasses with a float;

d) two circular sight glasses positioned above the permissible liquid level, arranged in such a manner that the liquid level can be observed through the one sight glass and the inside of the vessel can be illuminated through the other.

7.2.3 At temperatures below 0 °C effective measures shall be taken to prevent frosting or formation of ice on the glass by for example:

a) anti-frost glass, e.g. made of acrylic glass, adhesively bonded to the sight glass or set in with a suitable glazing sealant. The thickness of the anti-frost glass will depend on the minimum temperature that can possibly occur and shall be at least 1 mm per Kelvin below 0 °C;

b) a second glass plate installed in front of the basic plate, the space between them being heated in order to prevent misting or frosting.

7.2.4 Glass tubes shall not be used.

7.3 Surface requirements

See EN 12284:2003, 8.12.

7.4 Corrosion protection

See EN 12284:2003, 8.13.

7.5 Inner cleanness

See EN 12284:2003, 8.14.

8 Fitting requirements

8.1 Shut-off valves arranged in the lower connecting line between the level indicator and the vessel shall be mounted with their spindle horizontal.

8.2 For level indicators with shut-off devices consideration shall be given to the prevention of damage from liquid expansion.

8.3 Frosting tubes shall be durably protected against corrosion, e.g. by hot-dip galvanizing or by using stainless steel and shall have a diameter of at least DN 50.

8.4 The connecting lines between frosting tube and vessel shall have a diameter of at least DN 25.

8.5 The connecting lines between frosting tube and vessel shall be arranged in such a manner that no moisture can penetrate into the thermal insulation of the vessel.

8.6 Level indicators shall be installed so that liquid refrigerant or oil in the vapour phase control line has no effect on the indication.

8.7 Electrical connections for level indicators, which are equipped with electrical feedthroughs into the refrigerant pressure chamber, shall have suitable protection conforming at least to enclosure type IP 65 in accordance with EN 60529.

9 Testing

See EN 12284:2003, 9.1 to 9.4.

10 Application

10.1 Liquid hammer

Level indicators shall be protected against liquid hammer emanating, for example, from quick filling.

10.2 Frosting tubes

Frosting tubes shall only be used at liquid temperatures below –3 °C.

10.3 Liquid level indicators with magnetically operated indication

Level indicators with magnetically controlled indication shall be suitable for the temperature application range and are to be used particularly for refrigerants of groups A2L, A2, B1, B2L, B2, A3 and B3 (see EN 378–1).

10.4 Maximum and minimum liquid level

10.4.1 The level indicator shall be installed in such a way that the liquid level can be clearly seen and judged in relation to the permissible liquid levels.

10.4.2 The maximum permissible liquid level shall be marked as follows:

a) In the case of direct reading level indicators the maximum level shall be at least 10 mm below the upper edge of the sight glass. In the case of smaller direct reading level indicators the maximum level shall not be more than 20 mm above the centre of the sight glass.

b) In the case of intercommunicating level indicators the maximum level shall be at least 20 mm below the upper connection, measured from the deepest point of the inside of the connection.

c) In the case of frosting tubes the maximum level can be marked by a corrosion protected ring welded to the tube.

d) In the case of two sight glasses mounted as described in 7.2.2d) the maximum level shall be durably marked on the inside of the vessel so that it can be read through one of the sight glasses.

NOTE To ensure compliance with the maximum liquid level requirements, an automatic float switch that triggers a warning signal and closes the liquid inlet, may be fitted.

11 Marking and additional information

11.1 General

Marking of level indicators of nominal size greater than DN 25 shall include at least the information specified in 11.2 and 11.3 and shall be durably marked on the body or the flange or shall be given on a plate or label permanently attached to the level indicator.

11.2 Marking

a) Level indicator manufacturer's trade mark;

b) Type identification;

c) Year of manufacture;

d) Maximum allowable pressure at maximum temperature $PS_{TS\ max}$;

e) Maximum allowable pressure at minimum temperature $PS_{Ts\ min}$;

f) Highest operating temperature TS_{max};

g) Lowest operating temperature TS_{min};

h) Nominal size DN together with Nominal pressure *PN* if appropriate;

i) Arrow indicating the direction of flow, if applicable.

11.3 Level indicators of nominal size DN 25 and smaller

Marking of level indicator of nominal size DN 25 and smaller shall include at least:

— a), b) and i) according to 11.2

12 Documentation

12.1 Documentation for level indicators

The manufacturer shall be able to supply the following documentation containing information relevant to safety:

a) Assembly and installation instructions;

b) Adequate operation instructions;

c) Intended use of the device;

d) Maintenance and user inspection instructions;

e) Information requested in Clause 11;

f) Drawings and diagrams necessary to understand the instructions;

g) Warnings against possible dangers caused by misuse of the valve assembly;

h) Reference to this standard;

i) Refrigerants for which the device is suitable;

j) Material designation in respect of body parts subject to pressure;

k) Pressure and temperature service ranges for operated control valves;

l) Maximum allowable pressure (*PS*) as a function of the minimum and maximum allowable temperature (*TS*).

NOTE The following Table 2 provides an example of how to give the pressure as a function of the temperature.

Table 2 — Pressure as a function of temperature within the documentation of a level indicator (example)

PS **Mpa[a]**	***TS*** **°C**
2,2	50,1 to 150
2,8	– 10,0 to 50,0
2,1	– 10,1 to – 60,0
0,7	– 60,1 to – 85
[a] 1MPa = 10 bar	

12.2 Documentation for level indicators of nominal size DN 25 and smaller

The manufacturer of level indicators of nominal size DN 25 or smaller shall be able to supply the following documentation containing information relevant to safety:

a) Permanent marking after testing by an authorizised representative of the manufacturer;

b) Adequate instruction for use of the level indicator.

Annex ZA
(informative)

Relationship between this European Standard and the essential requirements of EU Directive 2014/68 EU of the European Parliament and of the Council of 15 May 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of pressure equipment aimed to be covered

This European Standard has been prepared under a Commission's standardization request to provide one voluntary means of conforming to essential requirements of EU Directive 2014/68 EU of the European Parliament and of the Council of 15 May 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of pressure equipment.

Once this standard is cited in the Official Journal of the European Union under that EU Directive 2014/68 compliance with the normative clauses of this standard given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding essential requirements of that Directive and associated EFTA regulations.

Table ZA.1 — Correspondence between this European Standard and EU Directive 2014/68 EU of the European Parliament and of the Council of 15 May 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of pressure equipment

Essential Requirements of EU Directive 2014/68 EU	Clause(s)/sub-clause(s) of this EN	Remarks/Notes
Annex I 4, 4.1, 7.5	6.1, 6.11	Material characteristics
Annex I 2.2.2	Clause 7	Design for adequate strength
Annex I 3.3	Clause 11	Marking and labelling
Annex I 3.4	Clause 12	Operating instructions

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WARNING 2 — Other Union legislation may be applicable to the product(s) falling within the scope of this standard.

Bibliography

EN 764-4, *Pressure equipment — Part 4: Establishment of technical delivery conditions for metallic materials*

EN 764-5, *Pressure equipment —Part 5: Inspection documentation of metallic materials and compliance with the material specification*

EN ISO 6708:1995, *Pipework components — Definition and selection of DN (nominal size) (ISO 6708:1995)*

ISO 7268, *Pipe components — Definition of nominal pressure*

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