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Automatic change-over valves having a maximum outlet pressure of up to and including 4 bar with a capacity of up to and including 100 kg/h, and their associated safety devices for butane, propane or their mixtures

Automatische Umschaltventile mit einem höchsten Ausgangsdruck bis einschließlich 4 bar und einem Durchfluss bis einschließlich 100kg/h für Butan, Propan oder deren Gemische, sowie die dazugehörigen Sicherheitseinrichtungen

Inverseurs automatiques de débit inférieur ou égal à 100 kg/h, à pression de détente nominale maximale inférieure ou égale à 4 bar, et leurs dispositifs de sécurité associés, pour butane, propane ou leurs mélanges

Ta slovenski standard je istoveten z: EN 13786:2004

ICS:

23.060.20

SIST EN 13786:2004

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ICS 23.060.20

English version

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This European Standard was approved by CEN on 2 February 2004.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists 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 Central Secretariat has the same status as the official versions.

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN 13786:2004) has been prepared by Technical Committee CEN/TC 181 "Dedicated liquefied petroleum gas appliances", the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by October 2004, and conflicting national standards shall be withdrawn at the latest by October 2004.

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.

This European Standard covers only type testing.

Items relating to quality assurance systems, production testing and particularly certificates of conformity are not covered in this standard.

This text is the third part of a series of standards covering different applications of the equipment considered. Two complementary documents have been elaborated:

- EN 12864, *Low pressure, non adjustable regulators having a maximum outlet pressure of less than or equal to 200 mbar, with a capacity of less than or equal to 4 kg/h, and their associated safety devices, for butane, propane and their mixtures;*
- prEN 13785, *Regulators with a capacity of up to and including 100 kg/h, having a maximum nominal outlet pressure of up to and including 4 bar, other than those covered by EN 12864 and their associated safety devices for butane, propane or their mixtures.*

The annexes A, B, C, D, E, F, G, H and I are normative.

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

1 Scope

This European Standard defines the constructional and operational characteristics, the safety requirements and test methods, and the marking of automatic change over devices with a capacity of less than or equal to 100 kg/h and having a maximum regulated pressure of less than or equal to 4 bar for butane, propane or their mixtures only in the vapour phase.

NOTE 1 bar = 10⁵ Pa

Liquefied gases containing methylacetylene and propadiene are not covered by this standard.

This European Standard also covers safety devices likely to be fitted onto automatic change over devices. The characteristics of these devices are given in annex A.

The requirements of this European Standard generally cover designs where regulation is in one stage, using a single diaphragm. These requirements do not exclude designs using more than one diaphragm, provided that these diaphragms are integrated in a single automatic change over devices complying with the requirements of this European Standard.

For specific uses in caravans and leisure vehicles, the automatic change over devices function may also be carried out by an assembly of regulators, forming a "automatic change over devices system" as defined in 3.1.2. This standard covers such an assembly as follows:

- special requirements for the manufacture, adjustment and operation of regulators forming a automatic change over devices system, as well as the corresponding test methods are given in annex B;
- except for these special requirements, and unless otherwise stated, constructional and performance characteristics given in the body of the standard are also applicable to the devices in annex B.

The requirements apply generally to automatic change over device used in locations where the temperature likely to be reached during use is between -20 °C and +50 °C. When the devices are used at temperatures outside this range they shall comply with special requirements defined in annex C.

This standard does not include the installation rules for automatic change over devices. In this matter, reference should be made to national regulations in force in the member countries.

This standard only covers type testing.

WARNING NOTICE: The figures in annexes G and H show the types of connections used according to the country of use of the regulators.

The top part of these figures (above the horizontal line) applies to the regulator and is normative. The bottom part of these figures (below the horizontal line) applies to the part to be connected to the regulator.

This is given as a guide for the tests and is not normative.

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 their publications apply to this European Standard only when incorporated in it by amendment or revision. For undated reference the latest edition of the publication referred to applies (including amendments).

EN 437:2003, *Test gases – Test pressures – Appliance categories.*

EN 549, *Rubber materials for seals and diaphragms for gas appliances and gas equipment.*

EN 1949, *Specification for the installation of LPG-systems for habitation purposes in leisure accommodation vehicles and in other road vehicles.*

prEN 1763, *Flexible rubber and plastics hose, tubing, nozzles and assemblies for use with propane and butane in the vapour phase – Specification*

EN 12164, *Copper and copper alloys – Rod for free machining purposes.*

EN 12165, *Copper and copper alloys – Wrought and unwrought forging stock.*

EN 12864:2001, *Low pressure, non adjustable regulators having a maximum outlet pressure less than or equal to 200 mbar, with a capacity of less than or equal to 4 kg/h, and their associated safety devices for butane, propane or their mixtures.*

prEN 13785, *Regulators with a capacity of up to and including 100 kg/h, having a maximum nominal outlet pressure of up to and including 4 bar, other than those covered by EN 12864 and their associated safety devices for butane, propane or their mixtures.*

EN ISO 75-3, *Determination of temperature of deflection under load*

EN ISO 178, *Plastics – Determination of flexural properties (ISO 178:2001).*

EN ISO 180, *Plastics – Determination of Izod impact strength (ISO 180:2000).*

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

EN ISO 527-4, *Plastics – Determination of tensile properties*

EN ISO 3166-1, *Codes for the representation of names of countries and their subdivision – Part 1: Country codes (ISO 3166-1:1997).*

EN ISO 4892-3, *Plastics – Methods of exposure to laboratory light sources – Part 3: Fluorescent UV lamps (ISO 4892-3:1994).*

EN ISO 9773, *Plastics - Determination of burning behaviour of thin flexible vertical specimens in contact with a small-flame ignition source (ISO 9773:1998)*

ISO 7-1, *Pipe threads where pressure-tight joints are made on the threads – Part 1: Dimensions, tolerances and designation.*

ISO 301, *Zinc alloy ingots intended for casting.*

ISO 565, *Test sieves – Metal wire cloth, perforated metal plate and electroformed sheet – Nominal sizes of openings.*

ISO 7005-2, *Metallic flanges – Part 2: Cast iron flanges.*

3 Terms and definitions

For the purposes of this European Standard, the following terms and definitions apply.

3.1 General terms and definitions

3.1.1

automatic change over devices

device which maintains the gas supply continuity by automatically using a gas from a "reserve" cylinder or series of cylinders when the supply pressure from a "service" cylinder or series of cylinders preselected by the user drops below a set value. This device allows regulation of the gas with upstream pressure within set limits, to a specified

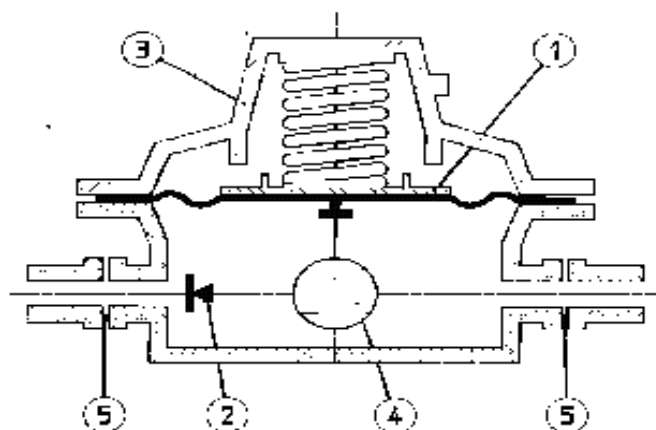
regulated pressure. It controls the operation of a supply-reserve indicator, allowing the identification of the cylinder or series of cylinders in use

The terminology used is shown in Figure 1. The diagram is shown as a guide, no other method is excluded.

3.1.2

automatic change over devices system

system of several regulators designed and adjusted in such a way as to operate like an automatic change over device as in 3.1.1 (see annex B)



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Key






1	Pressure sensing subassembly		SIST EN 13786:2004
2	Regulation subassembly		https://standards.iteh.ai/catalog/standards/sist/ccd0d354-979b-4de4-bcd9-5a3ce4bf3ce3/sist-en-13786-2004
3	Back pressure subassembly		
4	Mechanical connection subassembly		
5	Connection subassembly		

Figure 1 — Diagram of a automatic change over devices

3.1.3

fixed automatic change over device

automatic change over device whose regulated pressure is adjusted by the manufacturer and fixed and whose adjustment cannot be modified by the user

3.1.4

variable automatic change over device

automatic change over device whose regulated pressure may be modified by the user simple manipulation between two fixed limits

3.1.5

adjustable automatic change over device

automatic change over device whose regulated pressure may only be modified by a specialist at the time of installation; it is then fixed fashion

3.1.6**tap**

device for closing the gas flow which requires an intentional manual action (for example on a lever, a knob, etc...)

3.1.7**valve**

component part of the regulation subassembly which ensures soundness between the part of the automatic change over devices at supply pressure and the part of the automatic change over devices at regulated pressure, when this is equal to the lockout pressure

3.1.8**sealing**

any arrangement of any device, for example an adjuster, such that any interference likely to change its setting causes the breaking of the device or sealing material making the interference apparent

3.1.9**nominal diameter (DN)**

numerical designation common to all the components of a same pipe-work other than those named by their external diameter or by the size of the thread. It is a whole number used as a reference and related approximately to the manufacturing dimensions

[EN 88]

3.2 Terms and definitions concerning gas**3.2.1****butane**

mixture of third family gases whose vapour pressure (p_v) at 50 °C is greater than or equal to 4,3 bar and at most equal to 7,5 bar, of mean volumetric mass in the gas phase equal to 2,4 kg/m³

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3.2.2**propane**

mixture of third family gases whose vapour pressure (p_v) at 50 °C is greater than or equal to 7,5 bar or at most equal to 16 bar, of mean volumetric mass in the gas phase equal to 1,85 kg/m³

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3.2.3**LPG**

mixture of third family gases whose vapour pressure (p_v) at 50 °C is greater than or equal to 4,3 bar or at most equal to 16 bar, of mean volumetric mass in the gas phase equal to 2,12 kg/m³

3.3 Terms and definitions concerning pressures

Values of pressures given in the text are to be considered as values of relative pressure and are expressed in bar (bar) or millibar (mbar).

3.3.1**supply pressure**

p

value of the gas pressure measured at the automatic change over device's inlet

3.3.2**regulated pressure**

value of the gas pressure measured at the automatic change over device outlet or of the automatic change over device system as described in annex B

3.3.3**nominal regulated pressure**

p_d

value of the regulated pressure corresponding:

- either to the normal pressure for appliances as defined in 3.6 of EN 437:2003;
- or to the normal pressure for appliances operating outside the scope of EN 437;
- or to an intermediate pressure allowing the supply of a second stage regulator under the conditions of 6.2.

From this pressure the operational limits of the automatic change over devices are obtained. This pressure is marked on the automatic change over devices.

3.3.4

lockout pressure

p_0

maximum regulated pressure obtained at no rate and for which all the values of the supply pressure between the limits given in 6.1

3.3.5

minimal admitted pressure

p_{Mg}

minimal value of the regulated pressure delivered by the automatic change over device for all values of the supply pressure and all values of the flow rate

3.3.6

maximal admitted pressure

p_{Mp}

maximal value of the regulated pressure delivered by the automatic change over device for all values of the supply pressure and all values of the flow rate in the operational area

3.3.7

change over nominal pressure

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p_{di}

value of the nominal regulated pressure of the change over function, in case of two stages automatic change over devices, integrating a change over function and a regulator

3.4 Terms and definitions concerning rates

3.4.1

guaranteed rate

M_g

mass flow of gas that can be obtained, for any value of the supply pressure, at the "working" and "reserve" pressures between the specified limits

NOTE The guaranteed rate is expressed in grams per hour (g/h).

3.4.2

pilot rate

M_p

for automatic change over device up to 4 kg/h and for pressures complying with EN 437, the pilot rate is the gas flow (15 g/h) necessary for the supply of the ignition system of the appliance, generally called pilot

NOTE The pilot rate is expressed in grams per hour (g/h).

3.4.3

closing area

for automatic change over device over than 4 kg/h or for pressures not complying with EN 437 the closing area is the range between 0 % and 5 % of the guaranteed rate

3.4.4 operational area

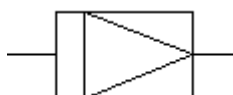
rate range between the pilot rate or the maximum of the closing area and 100 % of the guaranteed rate

4 Types of automatic change over devices

4.1 Introduction

There are typically two types of automatic change over device with pressure reduction:

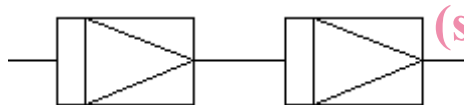
1 – Single stage:



Single stage automatic change over devices

- the supply pressure of the automatic change over device is equal to the pressure of the LPG supply containers;
- the automatic change over device supplies a gas appliance.

2 – Two or more stages:



First stage automatic change over device

Regulator

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- the supply pressure of the automatic change over devices is equal to the pressure of the LPG supply containers;
- the supply pressure of the regulator depends on the regulated pressure of the automatic change over device and on the pressure losses in the intermediate line;
- this regulator, covered by prEN 13785, supplies a gas appliance or another regulator.

4.2 Automatic change over devices for installations where the final regulator supplies a pressure specified in EN 437

Where an automatic change over device is a single stage it shall be fixed.

It is recommended that a first stage automatic change over device is fixed.

For interchangeability the recommended nominal values of regulated pressures (p_d) of the first stage automatic change over device are the following:

3 – 1,5 – 1 – 0,75 – 0,5 – 0,4 – 0,3 – 0,15

4.3 Other automatic change over devices installation

To supply appliances with pressures which are different from those specified by EN 437 fixed, variable or adjustable automatic change over devices are used.

5 Constructional characteristics

5.1 General

Automatic change over devices shall be designed, manufactured and assembled in such a way that their operation is satisfactory under the installation and service conditions specified by the manufacturer.

Safety devices likely to be fitted to automatic change over devices covered by this standard shall, if applicable, be designed and constructed in accordance with the requirements given in annex A.

All the parts of an automatic change over devices shall be free of sharp corners or edges capable of causing deterioration, injury or faulty operation.

Parts shall be clean internally and externally.

Holes for screws, pins, etc., intended for the assembly of the automatic change over devices components and for their fixing shall not open into the gas ways. The thickness of the wall between these holes and the gas ways shall be at least 1 mm.

Holes necessary for machining which join gas ways to the atmosphere, but which have no influence on the operation of the automatic change over devices, shall be permanently closed metallicly. Appropriate additional sealing compounds may be used.

Gas tight threads shall be in accordance with ISO 7-1, where pressure-tight joints are made on the threads or with ENPT.

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Devices capable of modifying the operation of the automatic change over device shall not go out of adjustment and shall be sealed. In particular, the automatic change over device body and cover shall be assembled in such a way that a separation is not possible without permanent damage of these parts or of this sealing.

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<https://standards.iteh.ai/catalog/standards/sist/ccd0d354-979b-4de4-bcd9-5e8ce4bfbce3/sist-en-13786-2004>

5.2 Materials

The quality of materials, the dimensions used and the means of assembling the various components shall be such that the construction and performance characteristics are secure. Performance characteristics shall not alter significantly during the life expectancy mentioned in the literature when the automatic change over device is installed and used in accordance with the manufacturer's instructions. Under these conditions all components shall withstand the mechanical, chemical and thermal conditions to which they may be submitted during their use, under normal conditions.

The automatic change over devices shall withstand the action of organic substances, either of vegetable or animal origin.

The body shall be made of metallic material.

Internal parts and parts of the cover not related to pressure (except for the connections, see Figure 1), may be made of non metallic (thermoplastic or thermal setting) materials, provided that the following requirements are met:

- materials used shall meet the requirements of annex E;
- whole automatic change over devices shall withstand the various tests described in the body of the standard;
- automatic change over device with its non metallic parts removed shall resist a pressure test as in 7.2.1.3 remaining sound in the sense of 5.5 and without causing any danger.

Zinc alloys shall only be used if they are of the Zn Al4 or Zn Al4 Cu1 quality, in accordance with ISO 301 and if, as for non metallic components, zinc alloy parts are not likely to be exposed to a temperature greater than 80 °C. Brass alloys shall comply with EN 12164 or EN 12165.

The rotating threaded parts of connections, whether they are male or female, shall be made of brass in accordance with EN 12164 or EN 12165 or another standard, or of steel. The materials and manufacturing processes used shall not cause subsequent risk of stress corrosion.

Steel internal parts shall be protected against corrosion.

Threaded fixed parts of connections shall be made of metallic material, non threaded fixed parts of connections may be made of non metallic material, provided that they comply with the tests specified in annex E.

The assembly of parts of the gas ways intended to assure soundness shall not be made with solder whose lowest temperature in the melting range, after application, is below 450 °C.

Non metallic (thermoplastic or thermal setting) components used in the construction of an automatic change over device shall meet the special requirements of annex E.

Elastomeric components shall comply with the requirements defined in EN 549, within the temperature range specified in clause 1, including, for diaphragms, the requirements concerning resistance to ozone. In addition, reinforced materials shall comply with the additional requirements defined in annex F.

5.3 Special requirements

5.3.1 Pressure sensing subassembly

The dimensions, the shape and the method of assembly of the components of the pressure sensing subassembly shall avoid any risk of damaging the diaphragm.

The pressure sensing subassembly shall be manufactured in such a way that the operation of the automatic change over device complies with the requirements defined in clause 6 in all possible positions of the automatic change over device on the installation specified by the manufacturer in his instructions. The automatic change over device shall meet the lockout pressure requirements in all the specified mounting positions.

Whatever the position taken by the diaphragm, the spring shall not be fully compressed.

The diaphragm shall withstand, without rupture or slipping out of its fixing, the tests described in 7.2.1.2.

5.3.2 Regulation subassembly

At the lockout position, the regulation subassembly shall act as a seal between the supply pressure and the regulated pressure. It shall not move accidentally in use.

The soundness and function of the regulation subassembly shall not be affected by the tensile strength and bending tests on the connections.

After the test defined in 7.2.3, the valve, as defined in 3.1.6, shall not be displaced or come out of its housing.

5.3.3 Back pressure subassembly

The support surfaces of the cover and of the body shall be designed in such a way that they maintain the diaphragm firmly in its housing and make it capable of resisting the pressure tests defined in 7.2.1.

Vent holes shall be:

- mounted or placed in such a way that the risks of accidental blockage are reduced and to avoid against penetration of rain water, particularly if their cross section is greater than 3 mm²;
- constructed in such a way that it does not allow accidental damage to the internal parts of the device by any object introduced by the vent,

when the automatic change over device is installed in accordance with the instructions.