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ICS 23.080

EAST AFRICAN STANDARD

Pumps and pump units for liquids — Common safety requirements

EAST AFRICAN COMMUNITY

Foreword

Development of the East African Standards has been necessitated by the need for harmonizing requirements governing quality of products and services in East Africa. It is envisaged that through harmonized standardization, trade barriers which are encountered when goods and services are exchanged within the Community will be removed.

In order to meet the above objectives, the EAC Partner States have enacted an East African Standardization, Quality Assurance, Metrology and Test Act, 2006 (EAC SQMT Act, 2006) to make provisions for ensuring standardization, quality assurance, metrology and testing of products produced or originating in a third country and traded in the Community in order to facilitate industrial development and trade as well as helping to protect the health and safety of society and the environment in the Community.

East African Standards are formulated in accordance with the procedures established by the East African Standards Committee. The East African Standards Committee is established under the provisions of Article 4 of the EAC SQMT Act, 2006. The Committee is composed of representatives of the National Standards Bodies in Partner States, together with the representatives from the private sectors and consumer organizations. Draft East African Standards are circulated to stakeholders through the National Standards Bodies in the Partner States. The comments received are discussed and incorporated before finalization of standards, in accordance with the procedures of the Community.

Article 15(1) of the EAC SQMT Act, 2006 provides that "Within six months of the declaration of an East African Standard, the Partner States shall adopt, without deviation from the approved text of the standard, the East African Standard as a national standard and withdraw any existing national standard with similar scope and purpose".

East African Standards are subject to review, to keep pace with technological advances. Users of the East African Standards are therefore expected to ensure that they always have the latest versions of the standards they are implementing.

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Introduction

In the preparation of this East African Standard, the following source was consulted extensively:

BS EN 809:1998, *Pumps and pump units for liquids — Common safety requirements*

Assistance derived from this source and others inadvertently not mentioned is hereby acknowledged.

Draft for comments only — Not to be cited as East African Standard

BRITISH STANDARD

**BS EN
809:1998**

*Incorporating
Corrigenda Nos. 1
and 2*

Pumps and pump units for liquids — Common safety requirements

The European Standard EN 809:1998 has the status of a
British Standard

ICS 23.080

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BSi
British Standards

National foreword

This British Standard is the English language version of EN 809:1998, including Corrigendum February 2001 and Corrigendum March 2002, published by the European Committee for Standardization (CEN).

The UK participation in its preparation was entrusted to Technical Committee MCE/6, Pumps and pump testing, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible 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.

A list of organizations represented on this committee can be obtained on request to its secretary.

Cross-references

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Summary of pages

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EUROPEAN STANDARD
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EN 809

July 1998

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Descriptors: pumps, motor-pumps, liquids, safety requirements, accident prevention, safety measures, specifications, inspection, assembling, information, utilization, marking

English version

Pumps and pump units for liquids —
Common safety requirements

Pompes et groupes motopompes pour
liquides — Prescriptions communes de sécurité

Pumpen und Pumpenaggregate für
Flüssigkeiten — Allgemeine
sicherheitstechnische Anforderungen

This European Standard was approved by CEN on 7 November 1997.

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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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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

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Ref. No. EN 809:1998 E

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 197, Pumps, 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 January 1999, and conflicting national standards shall be withdrawn at the latest by January 1999.

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 requirements of EU Directive(s).

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

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, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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Introduction

This standard has been prepared to be a harmonized standard to provide one means of conformity with the essential requirements of the Machinery Directive and associated EFTA Regulations.

The extent to which hazards are covered is indicated in clause 4 of this standard. In addition, machinery shall comply as appropriate with EN 292 for hazards which are not covered by this standard.

1 Scope

This standard establishes the technical safety requirements for:

- constructing;
- assembling;
- erecting;
- operating;
- servicing;

of a liquid pump or pump unit. It contains a list of significant hazards, which can arise with the use of a liquid pump or pump unit, and establishes the requirements and/or measures which will lead to a reduction of the risks.

Liquid pumps are described as:

- rotodynamic pumps;
- rotary positive displacement pumps;
- reciprocating displacement pumps;

supplied separately without driver.

In general, pumps are defined as being terminated by their inlet and outlet connections as well as by their shaft ends.

Pump units comprise the liquid pump types above together with a driver (electric motor or IC engine) including transmission elements, baseplates, and any auxiliary equipment.

This standard does not deal with the technical safety requirements for the design or manufacture of drivers nor of auxiliary equipment. It does not set down requirements for the risks directly arising from means provided for the portability, transportability, and mobility of pump units during or between periods of their operation, nor the requirements for transmission shafts linking a tractor or other self-propelled machinery to a pump.

This standard does not cover pumps and pump units for applications which are excluded from the scope of EC Directive 89/392/EEC, Machinery, as follows:

- pumps and pump units whose only power source is directly applied manual effort;
- pumps and pump units for medical use used in direct contact with the patient;
- pumps and pump units specially designed or put into service for nuclear purposes which, in the event of failure, may result in an emission of radioactivity;
- pumps and pump units for use on seagoing vessels or mobile off-shore units;
- pumps and pump units specially designed for military or police purposes.

Neither does it cover pumps and pump units for hydraulic power transmission.

Specific requirements for particular features of pumps additional to the common requirements set out in this standard can be found in other standards such as prEN 1028, prEN 1151, prEN 1829, and in the European Standards on submersible pump units and for liquid pumps for the use in agrifoodstuff industries.

This standard is for pumps and pump units which are placed on the market after the publication date of the standard.

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.

- EN 292-1, *Safety of machinery — Basic concepts — General principles for design — Part 1: Basic terminology — Methodology.*
- EN 292-2, *Safety of machinery — Basic concepts — General principles for design — Part 2: Technical principles and specifications.*
- EN 292-2/A1, *Safety of machinery — Basic concepts — General principles for design — Part 2: Technical principles and specifications.*
- EN 294, *Safety of machinery — Safety distances to prevent danger zones being reached by the upper limbs.*
- EN 349, *Safety of machinery — Minimum gaps to avoid crushing of parts of the human body.*
- EN 414, *Safety of machinery — Rules for the drafting and presentation of safety standards.*
- EN 418, *Safety of machinery — Emergency stop equipment, functional aspects — Principles for design.*
- EN 563, *Safety of machinery — Temperatures of touchable surfaces — Ergonomics data to establish temperature limit values for hot surfaces.*
- EN 626-1, *Safety of machinery — Reduction of risk to health from hazardous substances emitted by machinery — Part 1: Principles and specifications for machinery manufacturers.*
- EN 626-2, *Safety of machinery — Reduction of risk to health from hazardous substances emitted by machinery — Part 2: Methodology leading to verification procedures.*
- EN 894-1, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 1: Human interactions with displays control actuators.*
- EN 894-2, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 2: Displays.*
- EN 894-3, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 3: Control actuators.¹⁾*
- EN 953, *Safety of machinery — General requirements for the design and construction of guards (fixed, movable).*
- prEN 1028-1, *Fire fighting pumps — Part 1: Requirements of fire fighting centrifugal pumps with primer.*
- prEN 1028-2, *Fire fighting pumps — Part 2: Testing of fire fighting centrifugal pumps with primer.*
- prEN 1037, *Safety of machinery — Isolation and energy dissipation — Prevention of unexpected start-up.*
- EN 1050, *Safety of machinery — Risk assessment.*
- prEN 1151, *Pumps — Rotodynamic pumps — Circulation pumps having an electrical effect not exceeding 200 W for heating installations and domestic hot water installations — Requirements, testing, marking.*
- prEN 1829, *High pressure cleaners — High pressure water jet machines — Safety requirements.*
- prEN 12162, *Liquid pumps — Hydrostatic testing.*
- prEN 12639, *Liquid pumps and pump units — Noise test code — Grade 2 and 3 of accuracy.*
- EN 25199, *Technical specifications for centrifugal pumps — Class II.*
- EN 50081-1, *Electromagnetic compatibility (EMC) — Generic emission standard — Part 1: Residential, commercial and light industry.*
- EN 50081-2, *Electromagnetic compatibility (EMC) — Generic emission standard — Part 2: Industrial, environment.*

¹⁾ In preparation.

- EN 50082-1, *Electromagnetic compatibility (EMC) — Generic immunity standard — Part 1: Residential, commercial and light industry.*
- EN 50082-2, *Electromagnetic compatibility (EMC) — Generic immunity standard — Part 2: Industrial, environment.*
- EN 60204-1, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements.*
- EN 60529, *Degrees of protection provided by enclosures (IP code).*
(IEC 529:1989)
- ENV 61000-2-2, *Electromagnetic compatibility (EMC) — Part 2: Environment — Section 2: Compatibility levels for low frequency conducted disturbances and signalling in public low-voltage power supply systems.*
(IEC 1000-2-2:1990, modified)
- EN 61000-2-4, *Electromagnetic compatibility (EMC) — Part 2: Environment — Section 4: Compatibility levels in industrial plants for low frequency conducted disturbances.*
(IEC 1000-2-4:1994 + Corrigendum 1994)
- EN 61000-3-2, *Electromagnetic compatibility (EMC) — Part 3: Limits — Section 2: Limits for harmonic current emissions (equipment input current ≤ 16 A per phase).*
(IEC 1000-3-2:1995)
- EN 61000-3-3, *Electromagnetic compatibility (EMC) — Part 3: Limits — Section 3: Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current ≤ 16 A.*
(IEC 1000-3-3:1994)
- EN 61000-4-1, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 1: Overview of immunity tests — Basic EMC publication.*
(IEC 1000-4-1:1992)
- EN 61000-4-2, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 2: Electrostatic discharge immunity test — Basic EMC publication.*
(IEC 1000-4-2:1995)
- EN 61000-4-4, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 4: Electrical fast transient/burst immunity test — Basic EMC publication.*
(IEC 1000-4-4:1995)
- EN 61000-4-5, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 5: Surge immunity test.*
(IEC 1000-4-5:1995)
- EN 61000-4-7, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 7: General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto.*
(IEC 1000-4-7:1991)
- EN 61000-4-8, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 8: Power frequency magnetic field immunity test — Basic EMC publication.*
(IEC 1000-4-8:1993)
- EN 61000-4-9, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 9: Pulse magnetic field immunity test — Basic EMC publication.*
(IEC 1000-4-9:1993)
- EN 61000-4-10, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 10: Damped oscillatory magnetic field immunity test — Basic EMC publication.*
(IEC 1000-4-10:1993)
- EN 61000-4-11, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 11: Voltage dips, short interruptions and voltage variations immunity tests.*
(IEC 1000-4-11:1994)
- EN 61000-4-12, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 12: Oscillatory waves immunity tests — Basic EMC publication.*
(IEC 1000-4-12:1995)
- prEN 12723, *Liquid pumps — General terms for pumps and installations — Definitions, quantities, letter symbols and units.*

prEN ISO 14847, *Rotary positive displacement pumps — General requirements.*
(ISO/DIS 14847:1995)

ISO 3864, *Safety colours and safety signs.*

ISO 9905, *Technical specifications for centrifugal pumps — Class I.*

ISO 9908, *Technical specifications for centrifugal pumps — Class III.*

3 Definitions

For the purposes of this standard, the definitions contained in prEN 12723 shall apply.

The following definition also applies.

3.1

auxiliary equipment

components or sub-assemblies mounted as part of the pump unit and necessary for the operation of the pump or pump unit, for example, seal flush system, lubrication system, cooling system, etc.

4 List of hazards

The significant hazards are set out in the following listing based on EN 292-1 and EN 292-2 as well as Annex A of EN 292-2 and on the basis of EN 1050. Also shown are the section references in this standard in which the safety requirements and/or measures or rules are described for showing the conformity to the safety requirements. The arrangement of significant hazards which are treated in the standard correspond to EN 414, Annex A.

Table 1

EN 414 Annex A reference	Significant hazards	EN 809 Reference to subclause	
		Safety measures	Verification
1	Mechanical hazards	5.2.1	6.2.1
1.1; 1.3; 1.4; 1.5; 1.8	Crushing, cutting and severing, entanglement or entrapment, drawing in or trapping, friction or abrasion	5.2.1.1	6.2.1 6.2.6
1.9	High pressure fluid ejection	5.2.1.2 5.2.1.2.2	5.2.1.2 6.2.2 6.2.3 6.2.4
1.10	Ejection of parts	5.2.1.3	6.2.1 6.2.2
1.11	Loss of stability	5.2.1.4	6.2.7
2	Electrical hazards	5.2.2	6.2.2
2.1	Electrical contact	5.2.2.1	6.2.2
2.2	Electrostatic phenomenon	5.2.2.2	6.2.1
2.3	External influences on electrical equipment	5.2.2.3	6.2.2
3	Thermal hazards	5.2.3	6.2.2 6.2.8
4	Hazards generated by noise	5.2.4 5.2.4.1	6.2.2 6.2.5
5	Hazards generated by vibrations	5.2.4.2	6.2.2
7	Hazards generated by materials	5.2.5	6.2.2
7.1	Contact with or inhalation of harmful fluids, gases, mists, steam	5.2.5.1	6.2.1
7.2	Fire and explosion hazards	5.2.5.3	6.2.1 6.2.2 6.2.8
8	Hazards from neglecting ergonomic principles in machine design	5.2.6	6.2.1 6.2.2
10	Hazards caused by failure of energy supply, breaking down of machinery parts and other functional disorders	5.2.7	6.2.1
10.3	Failure, malfunction of control system	5.2.7.2 5.2.7.3 5.2.7.5	6.2.1 6.2.2
10.4	Errors of fitting	5.2.7.1 5.2.7.4	6.2.1
11	Hazards caused by missing and/or incorrectly positioned safety related measures/means	5.2.8	6.2.1
11.1	All kinds of guards	5.2.8.1	6.2.1 6.2.6
11.2	All kinds of safety related protection devices	5.2.8.1 5.2.8.5	6.2.1 6.2.6
11.5	All kinds of information or warning devices	5.2.8.2	6.2.1
11.7	Emergency devices	5.2.8.3	6.2.2
11.9	Essential equipment and accessories for safe adjusting and/or maintenance	5.2.8.4	6.2.2

5 Safety requirements and/or measures

5.1 General requirements

The operating conditions and features required of every pump and/or pump unit falling within the scope of this standard shall be defined in a specification. This may be in the form of a manufacturer's description, or as a published national or international standard or in a data sheet within a contract. In the event of essential data not being provided by the purchaser, the manufacturer shall advise the purchaser of the data being adopted for the design and being incorporated into the specification. The supplier shall assess the risks arising from the machine together with its operating conditions and the equipment shall be designed to reduce them to an acceptable level giving full regard to the requirements set out in this standard.

NOTE The technical specifications will vary with the application, and some technical specifications are already stated in EN or ISO Standards, such as:

- EN 25199;
- prEN ISO 14847;
- ISO 9905;
- ISO 9908.

Further safety information from the manufacturer/supplier for:

- planning;
- installation;
- operation;
- maintenance;

shall be contained in the information/instruction for use, including personnel protection equipment required and warning notices.

5.1.1 *Environmental and working conditions*

In constructing the specification for the pump or pump unit particular attention shall be given to any special environmental and/or working conditions. Examples of such special conditions are, amongst others:

environmental conditions at the place of installation, such as:

- abnormal temperature;
- high humidity;
- corrosive atmospheres;
- explosive and/or fire danger zones;
- dust, sandstorms;
- earthquakes and other external imposed such conditions;
- vibrations;
- altitude;
- flooding;

type of liquid to be pumped, such as:

- pumped liquid (denomination);
- mixture (analysis);
- solid containing (solid matter content);
- gaseous (content);

property of the liquid when being pumped, such as:

- flammable;
- toxic;
- corrosive;
- abrasive;
- crystallizing;
- polymerizing;
- viscosity;

operating fluctuation in the system, such as:

- temperature;
- pressure;
- flow rate;
- dry running of the pump.

5.2 Special requirements

5.2.1 Requirements to avoid mechanical hazards

5.2.1.1 Crushing, cutting and entanglement

Exposed moving parts may create a hazard and means shall be incorporated to reduce the risk. Such means shall include as appropriate:

- barriers conforming to EN 294 preventing contact with moving parts;
- gaps at the end-of-travel conforming to EN 349;
- guards conforming to EN 953.

Rotating shafts with exposed keys, keyways or other projections liable to cut or catch shall be protected or guarded. Guards or permanent enclosures shall be used for rotating or reciprocating transmission couplings or crossarms.

Guards for the reduction of risks from contact with parts of a pump or pump unit shall be removable only with the use of a tool. Movable or removable guards giving access for adjustment or setting of controls or sensors whilst the pump is in operation shall not be required to be interlocked and shall be secured against unintended disturbance. Movable guards which remain attached to the pump shall be secured also when in the opened position. Removable guards shall be completely disengaged from the pump.

Unhindered access to the shaft seal where required for checking of its function and/or for its adjustment shall be permitted.

Machined or cut parts which are exposed or likely to be exposed at any stage during the installation, operation, or servicing of the pump or pump unit shall be treated to remove burrs, rags and sharp edges by radiusing or chamfering.

5.2.1.2 High pressure fluid ejection

5.2.1.2.1 Shaft, piston rod or plunger sealing system

The pump shall be equipped with a shaft-, piston rod- or plunger sealing system compatible with the pumped fluid and appropriate to the hazard likely to result from a leakage of that fluid. In assessing the compatibility attention shall be given concerning the nature of the liquid, the pressure, and temperature. Because of the range of characteristics of pumped liquids it is not possible to give any precise requirements to reduce the risks.

5.2.1.2.2 Pressure containing elements

Pressure containing parts and components of a pump are to be designed to be suitable for the maximum allowable working pressure. Movement resulting from the loss of pressure shall not create a hazard.

For reciprocating displacement pumps the maximum allowable working pressure is the highest value for the mean pressure in the outlet section of the pump.

In the case where the pump potentially can generate pressure in any part greater than the maximum allowable working pressure of that part, the supplier shall either provide a pressure relief valve or other device to prevent the pressure in the part exceeding 90 % of the hydrostatic test pressure (see 6.2.4), or shall advise the user of the need to make such a provision.

5.2.1.2.3 Permitted forces and moments on pipe connections

The permitted forces and moments on pump inlet and outlet branches are to be stated by the manufacturer/supplier. For rotodynamic pumps typical values for permissible forces and moments can be taken from EN 25199, ISO 9905, ISO 9908.

For rotary positive displacement pumps typical values for permissible forces and moments can be taken from prEN ISO 14847.

Other connections shall be capable of withstanding the forces and moments which may arise from normal operation and from foreseeable misuse.

5.2.1.3 Ejection of transmission parts

The upper and lower limits for torque, speed, and loads, for coupling, gears, links, etc. shall not be exceeded.

5.2.1.4 Loss of stability

The pump or pump unit shall remain stable in all phases of transport, assembly, dismantling in the conditions foreseen when tilted to an angle of 10° in any direction from its normal position. If the pump or pump unit does not meet this requirement the manufacturer/supplier shall define the supporting devices needed to achieve stability, or include specific reference to their need in the information for use/instruction for use. The supporting devices shall be treated as special tools (see 5.2.8.4), and details of their use shall be provided in the information for use/instruction for use.

When the pump is installed it shall be made stable by the use of holding-down bolts or by the use of other anchoring methods. Holding-down bolts or other anchoring methods shall be strong enough to prevent unintended bodily movement of the equipment.

5.2.2 Requirements to avoid electrical hazards

The electrical equipment of a pump unit shall satisfy the general requirements set out in EN 60204-1. Particular features shall conform to the particular clauses of EN 60204-1 as indicated in this standard.

Electrical equipment shall be selected for safe operation in the intended application when used in the specified environment and working conditions, and on the declared characteristics and tolerances of the electrical supply taking into account predictable malfunctions (EN 60204-1, clauses 4, 7, 8, 13, and 18).

The electrical supply on the pump unit shall be provided with means for its isolation from energy supply, or recommendations shall be included in the information for use/instruction for use. Such means shall allow for switching-off during normal operation and/or in an emergency (EN 60204-1, clauses 5, 18, and 5.2.8.3 of this standard).

Access to connections shall be restricted by devices e.g. shrouds or enclosures, which shall be adequate to prevent the entry of predictable fluids or solids and will require tools for removal (EN 60204-1, clauses 4, 13, and 16).

The pump unit shall be protected by an earth terminal against the build-up of positive charge. The earth terminal shall be connected directly to an earth conductor. Unbonded pipe connections shall not be considered as providing a continuous earth path. Conductors shall be adequately sized for the maximum power load and insulated against the supply voltage and its tolerances, and be unambiguously identifiable by means of colour or other indicators (EN 60204-1, clauses 6, 7, 8, 14, 15 and 18).

Systems provided for the operational control of the pump unit shall be constructed from components and conductors meeting the requirements of this clause, and take into account the appropriate requirements and considerations set out in EN 60204-1, clauses 9, 10, 12, 18, and 19.

5.2.2.1 Electrical contact

Enclosures of electrical motors and control systems on the pump unit shall as a minimum give protection in accordance with EN 60529 IP 22.

5.2.2.2 Electrostatic phenomena

In order to prevent the build-up of electrostatic charge, an electrical potential balance for the related equipment is to be provided, if necessary by the use of an earthing route. Care shall be taken to ensure that the electrical potential balance of the pump is not changed by lining, coating or similar treatment.

5.2.2.3 External effects on electrical equipment

Electrical enclosures and other protection arrangements together with their means of fitting shall be so constructed that no operating conditions occur which can lead to danger to personnel.

5.2.2.4 Electromagnetic compatibility

The equipment shall conform to the requirements set out in EN 50081 parts 1 or 2, and to EN 50082 parts 1 or 2 and relevant parts of EN 61000 with regard to electromagnetic compatibility.

5.2.3 Requirements to avoid thermal hazards

The pump or pump unit shall have reduced hazards to personnel arising from temperatures which result from the operation of the pump. This standard does not deal with means to reduce hazards from surface temperatures which derive from the temperature at which the pumped fluid is delivered to the pump inlet.

Steps shall be taken to minimize contact with or to warn operator/users of any surface which in normal operation will achieve a temperature exceeding those set out in Table 2.

The safety instructions required shall be set out in the information for use/instruction for use.

Table 2 — Maximum permitted temperatures for unprotected accessible surfaces on the pump/pump unit during normal operation

	Surfaces required to be touched in normal operation, or which may be touched unintentionally in a restricted zone ¹⁾	Surfaces which may be touched unintentionally in an unrestricted zone
Metal ²⁾	68 °C	80 °C
Ceramics	73 °C	84 °C
Plastic	80 °C	90 °C

¹⁾ This table recognizes that if a touched surface is in a position where withdrawal action may be delayed by restriction to movement (a restricted zone) the contact time may be extended unwillingly and a lower maximum temperature should be required.
²⁾ Painted or unpainted.

5.2.4 Requirements to avoid the danger of noise and vibrations

5.2.4.1 Requirements to avoid the danger of noise

This standard does not deal with the reduction of risks of hearing loss arising from prolonged exposure to noise from pumps and pump units. The pump manufacturer shall not take into account the effects of the installation in assessing the noise level.

5.2.4.2 Requirements to avoid the danger of vibrations

This standard does not deal with the reduction of risks arising from the prolonged exposure to vibrations generated by the pump or pump unit.

5.2.5 Requirements to avoid hazards from materials

The wide and varied nature of pump applications makes it not possible to specify precise combinations and grades of materials in a standard of common requirements. Materials shall be selected taking into account the chemical and mechanical characteristics of the liquid to be pumped and of the operating environment, its ability to safely withstand operating loads, its working life and the effect of fatigue, ageing, abrasion, thermal, electrostatic and any other factor which it is expected may arise from the application and impact upon the materials.

Full attention shall be given to local regulations regarding materials suitable for particular purposes such as use with potable water, with foodstuffs, designated for fire protection reasons, etc.

Materials used shall not endanger the health and safety of personnel.

Materials used shall be appropriate with the liquid being pumped and identified in the specification, and with any lubricants, cooling/heating means, barrier or other fluids that may be introduced.

5.2.5.1 Disposal of liquid

A pump or pump unit operating on a flammable, toxic, corrosive or otherwise hazardous liquid, or on a liquid at a temperature of more than 60 °C shall be provided with a means such as a pipe connection, for use by the user, to collect for safe disposal any drained liquid or leakage from the shaft seal or discharge from a pressure relief valve.

Due to the varied nature of the liquid it is not possible to specify more precise means of disposal.

5.2.5.2 Disposal of gases

Pump units driven by an IC engine shall be provided with a means to collect exhaust gases for safe disposal. Advice on safe disposal of exhaust gases, and the provision of combustion air into the room of installation, shall be included in the information for use/instruction for use.

5.2.5.3 Fire and explosion hazards

Equipment supplied for installation in zones designated in degrees of hazard shall meet the technical requirements set down for such zones in local regulations. Where required, the equipment shall be appropriately certificated or otherwise approved.

Materials shall be selected to minimize the possibility of them providing a source of ignition during normal operation or by the inadvertent contact of moving parts. Where excessive heat generated during the operation of the pump or pump unit is to be dissipated, the means of dissipation is to be provided, or details of what is needed are to be given in the information for use/instruction for use.

5.2.6 Requirements to avoid hazards from neglecting ergonomic principles of machine design

Pump units incorporating signal displays and/or control actuators shall be designed in accordance with the principles set down in EN 894. Signals shall be arranged to be easy to read and unambiguous in meaning. Manual controls and other operating devices shall be easy to reach and operable without unreasonable effort. In particular, starting and stopping devices shall be clearly identified. Steps shall be taken, including marking if necessary, to avoid errors arising from confusion.

5.2.7 Requirements to avoid hazards caused by failure of energy supply, breakdowns of machinery components and other malfunctions

5.2.7.1 Errors of fitting

Hazards arising from misassembly of parts shall be eliminated by design.

If fasteners with special requirements are used, then interchangeable parts from other fasteners shall have the same quality.

5.2.7.2 Non-return device

If after switching off the pump unit, risks of hazards can occur through reverse flow in the pump, the manufacturer/supplier shall advise the necessity of a non-return device.

5.2.7.3 Direction of rotation of the pump

The direction of rotation of the pump shall be indicated in a distinctive place with a suitable arrow in a permanent form.

5.2.7.4 Auxiliary piping

Auxiliary piping necessary for the operation of the pump is to be set out in the information/instruction for use and/or arrangement drawing.

Where functions of connections may be confused, leading to an unacceptable risk of hazard, connections shall be marked permanently on the pump.

5.2.7.5 Unexpected start-up

When the hazard exists the requirements of prEN 1037 shall be fulfilled.

5.2.8 Requirements to avoid hazards through breakdown and/or wrong installation of protection devices

5.2.8.1 All types of guards

Removeable or openable guards shall be designed so that the reduction in risk will not be diminished by incorrect replacement.

5.2.8.2 Measuring instruments and measuring instrument connections

If for reasons of operating security of the pump or pump unit monitor and/or alarm devices are necessary, the necessary connections for them shall be made available.

5.2.8.3 Emergency stop

If a dangerous situation arises which has to be stopped through manual intervention, then an emergency stop facility shall be provided conforming with the requirements of EN 418, or instructions shall be provided for its provision.

If it can be shown that a normal cut-off device functions as an emergency stop with the same efficiency this is admissible and it shall be marked as such.

5.2.8.4 Special tools

If special tools are required to install, set up, or start the pump, or during its maintenance, they shall be fully specified and offered for supply by the manufacturer/supplier.

5.2.8.5 Safety devices (by-pass, control valve, pressure relief valve)

Safety devices which are adjustable shall be adjustable only by the use of tools or shall be contained in enclosures which can only be opened by the use of tools.

The manufacturer shall include warnings of the risks arising from adjusting such devices incorrectly.

6 Verification of the safety requirements and/or measures

6.1 General reference

Compliance with the safety requirements set out in clause 5 shall be verified by the use of one or more of the methods set out in 6.2. The appropriate method for a particular safety requirement can be found in clause 4, Table 1 in the column headed "Verification".

Verification shall be carried out with the equipment assembled for normal use as intended. Accessories and covers may or may not be fitted as long as the effect is not to obscure the validity of the test.

When dimensions, mass, or other factors make particular tests on complete equipment impractical, tests on sub-assemblies or components are permitted provided that it is verified that the result can be considered representative of the fully assembled equipment.

The verification in accordance with the safety requirements may be carried out in any sequence.

6.2 Specific methods of verification

6.2.1 Inspection

Verification shall be by appropriate physical examination and measurements of the pump or pump unit, of the specification defining it, and of the labelling and documentation describing it.

6.2.2 Review of documentation

The stated performance and features of the pump or pump unit shall be compared with those specified in the data sheet, standard, suppliers' data, or any other appropriate source to demonstrate compliance.

6.2.3 Calculations

Calculations used to establish compliance with a requirement shall be recorded by the manufacturer, be checked, and be retained for subsequent examination.

6.2.4 Hydrostatic pressure test for pressure containing parts

All pressure containing parts shall be hydrostatically pressure tested in accordance with prEN 12162. The test pressure shall be related by a factor to the maximum allowed working pressure set out in the specification. In no case shall the factor be less than 1,3.

6.2.5 Noise measurement

The noise emission of the equipment shall be assessed by reference to measured values. These may be measured on the equipment concerned or from similar equipment operating under similar conditions. Noise emissions shall refer to the unit fully assembled with all auxiliary equipment, guards, and any noise control elements. The noise measurements shall be made in accordance with prEN 12639.

6.2.6 Guarding

Guards provided to prevent contact with surfaces or with moving parts shall be considered adequate if contact is not made when tested with the test fingers defined in EN 60529 with respect to penetration, rigidity, and impact.

6.2.7 Stability

The conformity can be demonstrated by test, or by calculation for equipment other than for portable units.

If a test is to be undertaken, the fully assembled pump shall be mounted on its usual base or feet and with all ancillary equipment fitted. If the unit is wheel-mounted, the wheels shall be positioned in the worst orientation for the test.

The base shall be tilted to up to 10° and no loss of stability shall be acceptable. Care should be taken during the test to ensure that in the event of instability no damage can occur to people or to property.

If calculations are to be the basis of conformity checking, they shall be based upon the centres of gravity method and shall not show any likely instability up to displacements of 12,5°.

6.2.8 Surface temperatures

Temperatures of touchable external surfaces are to be measured in accordance with the method defined in EN 563:1994.

7 Information for use

7.1 General

The information for use shall correspond to the rules set out in EN 292-2, clause 5.

7.2 Instruction for use — instruction handbook

7.2.1 General

The instruction for use/instruction handbook shall correspond to the rules set out in EN 292-2, 5.5.

The customer/purchaser shall receive the instruction handbook not later than when the pump or the pump unit is delivered by the manufacturer.

An instruction handbook shall be included with the delivery.

7.2.2 Contents

The instruction handbook shall include safety information on the following subjects as far as they are relevant for the pump or pumping unit and any auxiliary equipment supplied and if they are necessary for reducing the risks during use:

- general;
- transport and intermediate storage;
- description of the pump or pump unit;
- installation/assembly;
- commissioning startup, operation, shutdown;
- maintenance and servicing;
- faults; cause and remedies;
- relevant documentation.

Additional information may be provided.

7.2.2.1 General

- Fields and limits of application or use, intended or permissible use, including any site conditions;
- details of the pump/pump unit:
 - a) details which relate the operating manual to particular product;
 - b) manufacturer, importer or supplier;
 - c) designation, type, size;
 - d) version no. and/or date of issue of instruction handbook;
 - e) noise emission.

The sound pressure level of the pump or pump unit shall be shown as either 70 dBA, if this value is not exceeded or its actual value. The peak C-weighted instantaneous sound pressure level shall be quoted where it exceeds 63 Pa (130 dB in relation to 20 μ Pa). Where the continuous A-weighted sound pressure level exceeds 85 dBA it shall be shown also as the sound power level.

NOTE Should the situation arise, then noise reducing measures should be agreed between purchaser and manufacturer/supplier.

- f) utility requirements e.g. electrical supplies, water supplies;
- warnings against foreseeable misuse.

The following signs are to be adopted into the instruction handbook.

Safety instructions given in this manual non-compliance with which would affect safety are identified by the following symbol:



or where electrical safety is involved, with:



Safety instructions which shall be considered for reasons of safe operation of the pump or pump unit and/or protection of the pump or pump unit itself are marked by the sign:

ATTENTION

7.2.2.2 *Transport and intermediate storage*

- Preservative measures:
 - a) durability of protection;
 - b) any subsequent preservation;
 - c) removal of protection;
- protection against environmental influences.

7.2.2.3 *Description of the pump or pump unit*

- General description;
- design and function;
- design, function and use of safety protection devices;
- additional descriptions for accessories;
- dimensions, mass, centres of gravity, capacities.

7.2.2.4 *Installation/assembly*

- Special assembly tools;
- initial installation;
- data on installation site:
 - a) space requirement for operation and maintenance;
 - b) inspection before start of installation;
 - c) details of base, foundation;
 - d) installation of pump assembly;
 - e) alignment requirements including flexible couplings;
- assembly of driver and accessories;
- correct installation of safety devices and control systems;
- electrical connection, connecting cables;
- grouting and other completion work;
- pipework:
 - a) general;
 - b) allowable forces and moments on inlet and outlet branches;
- tightening torques for screw threads.

7.2.2.5 Commissioning startup, operation, shutdown

- Documentation:
 - a) measuring point and piping diagrams (e.g. PI-diagram);
 - b) list of lubricants;
- making the product ready for operation:
 - a) bearings;
 - b) shaft seal;
 - c) filling up/venting;
 - d) electric connections;
 - e) check of direction of rotation;
- control and monitoring devices:
 - a) functional testing;
 - b) setting values;
 - c) additional facilities (cooling, circulating, heating etc.);
 - d) motor protection (setting);
 - e) emergency switch;
- safety devices:
 - a) mechanical (e.g. guards for coupling or belts);
 - b) sound insulation (e.g. protective hood);
 - c) splash protection (e.g. hood);
 - d) relevant electrical regulations;
 - e) special devices;
- commissioning:
 - a) initial commissioning;
 - b) start after interruptions to the operation;
 - c) pump-related requirements to the plant;
 - d) activation/switching frequency;
 - e) operation and start-up with close valve;
 - f) special information (e.g. stand-by mode, faults);
- shutdown:
 - a) switching off;
 - b) draining;
 - c) preservation;
 - d) storage;
- other measures.

7.2.2.6 Maintenance and servicing

- Maintenance and inspection:
 - a) consumable items including spare parts;
 - b) monitoring during operation;
 - c) any preventive action to be taken (e.g. regarding parts subject to wear, lubrication, sealing medium);
- disassembly and re-assembly:
 - a) tools;
 - b) re-assembly procedure;
- tightening torques for screw threads.

7.2.2.7 *Faults; cause and remedies*

- Faults:
 - a) hydrodynamic;
 - b) mechanical;
 - c) electrical;
- remedying of causes using product-related check list.

7.2.2.8 *Relevant documentation*

As agreed between manufacturer/supplier and customer/purchaser.

8 Marking

The pump or pump unit shall carry the following minimum marking:

- name and address of the manufacturer/supplier;
- type, designation;
- year of manufacture, serial number (if any);
- for pump units with electric motor, information about the electrical data, e.g.:
 - a) voltage;
 - b) frequency;
 - c) power rating.

Additional details may be provided for the pump as, e.g.:

- rate of flow;
- head;
- speed of rotation.

Annex ZA (informative)

Relationship with EU Directives

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 requirements of the following EU Directives:

Directive 89/392/EEC — Machinery, as amended by 91/368/EEC, 93/44/EEC and 93/68/EEC.

Directive 73/23/EEC — Low Voltage, as amended by 93/68/EEC.

Directive 89/336/EEC — Electromagnetic Compatibility, as amended by 91/263/EEC, 92/31/EEC and 93/68/EEC.

Compliance with this standard provides one means of conforming with the specific essential requirements of the Directive concerned and associated EFTA regulations.

WARNING Other requirements and other EU Directives may be applicable to the products falling within the scope of this standard.

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