BS EN 13204:2016

BSI Standards Publication

Double acting hydraulic rescue tools for fire and rescue service use — Safety and performance requirements

bsi.

National foreword

This British Standard is the UK implementation of EN 13204:2016. It supersedes BS EN 13204:2004+A1:2012 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee FSH/17, Fire brigade equipment.

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Published by BSI Standards Limited 2016

ISBN 978 0 580 85398 2

ICS 11.160; 13.220.10

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 September 2016.

Amendments/corrigenda issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 13204

September 2016

ICS 13.220.10

Supersedes EN 13204:2004+A1:2012

English Version

Double acting hydraulic rescue tools for fire and rescue service use - Safety and performance requirements

Matériels hydrauliques de désincarcération à double effet à usage des services d'incendie et de secours - Prescriptions de sécurité et de performance

Doppelt wirkende hydraulische Rettungsgeräte für die Feuerwehr und Rettungsdienste - Sicherheits- und Leistungsanforderungen

This European Standard was approved by CEN on 8 July 2016.

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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN 13204:2016 E

Contents

Page

European foreword

This document (EN 13204:2016) has been prepared by Technical Committee CEN/TC 192 “Fire service equipment”, the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2017, and conflicting national standards shall be withdrawn at the latest by March 2017.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 13204:2004+A1:2012.

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

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

The significant technical changes between this standard and the previous edition are the following:

- Major editorial changes:
- Clause 2: Normative references, updated
- Clause 4: Requirements and Verification:
  - — Was Section Hazards, which is referenced to Annex A in 4.1.1.
  - — Requirements are now followed directly by verification, these used to be separate Clause 5 Requirements and Clause 6 Verification.
  - — Table 3. Cutting Capacity: Expanded classification to K (was H), square tube 35 × 3 (was 35 × 4)
  - — Cutting table has been expanded to be able to rate larger cutters.
  - — Powerpack and smart systems added
- Clause 5 Information for use, was chapter 7
- Clause 6 Marking, was chapter 8
- Annex A List of Hazards, updated references
- Annex C Product Performance Data Sheet = New, Annex C used to be Additional recommendations, which is now no longer included.
- Annex D General Verification Requirements, added. This is text moved from 6.1.
- Bibliography, updated version of standards

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

Introduction

This document is a type-C standard as stated in EN ISO 12100.

This document is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

— machine manufacturers (small, medium and large enterprises);

— health and safety bodies (regulators, accident prevention organizations, market surveillance, etc.).

Others can be affected by the level of machinery safety achieved with the means of the document by the above-mentioned stakeholder groups:

— machine users/employers (small, medium and large enterprises);

— machine users/employees (e.g. trade unions, organizations for people with special needs);

— service providers, e.g. for maintenance (small, medium and large enterprises);

— consumers (in the case of machinery intended for use by consumers).

The above-mentioned stakeholder groups have been given the possibility to participate at the drafting process of this document.

The machinery concerned and the extent to which hazards, hazardous situations or hazardous events are covered are indicated in the Scope of this document.

When requirements of this type-C standard are different from those which are stated in type-A or -B standards, the requirements of this type-C standard take precedence over the requirements of the other standards for machines that have been designed and built according to the requirements of this type-C standard.

When compiling this document, it was assumed that:

a) the manufacturer shall design and/or use components without specific requirements in accordance with the usual engineering practice and calculation codes, including all failure modes;

b) only trained and competent persons will use and operate the machinery;

c) the machinery is kept in good repair and working order, by a trained and competent person, so that the required characteristics remain despite wear;

d) the working place is adequately lit;

e) negotiations occur between the manufacturer and the purchaser concerning particular conditions for the use and places of use for the machinery related to health and safety;

f) The manufacturer shall consider and minimize the impact to the environment during all stages of the product life cycle.

Battery tools and other powered rescue tools outside of the scope of this document are not covered in this revision of the document. However in future revision these tools will be integrated.

1 Scope

This European Standard specifies safety and performance requirements for double acting hydraulic rescue tools manufactured after the date of publication.

It is applicable to double acting hydraulic rescue tool systems which are intended for use by the firefighting and rescue services, principally for cutting through, spreading or pushing apart the structural parts of road vehicles, ships, trains, aircraft and building structures involved in accidents. They consist of a separate power pack, the tool[s] and the necessary interconnections and intended accessories, as defined in Clause 3 – Terms and definitions.

This document deals with all significant hazards, hazardous situations or hazardous events relevant to the machinery, when it is used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer.

NOTE 1 The aim is to assist while extracting the casualties or to create a working space for paramedical services taking the local conditions into account.

It is **not** applicable to additional requirements for:

a) operation in severe conditions (e.g. extreme environmental conditions such as: temperatures outside the range –20 °C up to +55 °C, corrosive environment, tropical environment, contaminating environments, strong magnetic fields, potentially explosive atmospheres);

b) the risk directly arising from the means provided for the portability, transportability and mobility of double-acting hydraulic rescue tools during periods of their operation.

NOTE 2 For the EU/EEA other Directives can be applicable to the equipment in the scope, for example the Electro Magnetic Compatibility Directive.

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 cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 50565-2:2014, *Electric cables - Guide to use for cables with a rated voltage not exceeding 450/750 V (U0/U) - Part 2: Specific guidance related to EN 50525 cable types*

EN 659, *Protective gloves for firefighters*

EN 837-1, *Pressure gauges - Part 1: Bourdon tube pressure gauges - Dimensions, metrology, requirements and testing*

EN 853, *Rubber hoses and hose assemblies - Wire braid reinforced hydraulic type - Specification*

EN 854, *Rubber hoses and hose assemblies - Textile reinforced hydraulic type - Specification"*

EN 856, *Rubber hoses and hose assemblies - Rubber-covered spiral wire reinforced hydraulic type - Specification*

EN 857, *Rubber hoses and hose assemblies - Wire braid reinforced compact type for hydraulic applications - Specification*

EN 10025-1:2004, *Hot rolled products of structural steels - Part 1: General technical delivery conditions*

EN 10025-2:2004, *Hot rolled products of structural steels - Part 2: Technical delivery conditions for non-alloy structural steels*

EN 10210-2, *Hot finished structural hollow sections of non-alloy and fine grain steels - Part 2: Tolerances, dimensions and sectional properties*

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 60529)*

EN ISO 3949, *Plastics hoses and hose assemblies - Textile-reinforced types for hydraulic applications - Specification (ISO 3949)*

EN ISO 4413, *Hydraulic fluid power - General rules and safety requirements for systems and their components (ISO 4413)*

EN ISO 12100, *Safety of machinery - General principles for design - Risk assessment and risk reduction (ISO 12100)*

EN ISO 1402, *Rubber and plastics hoses and hose assemblies - Hydrostatic testing (ISO 1402)*

EN ISO 10619-1, *Rubber and plastics hoses and tubing - Measurement of flexibility and stiffness - Part 1: Bending tests at ambient temperature (ISO 10619-1)*

EN ISO 3744:2010, *Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Engineering methods for an essentially free field over a reflecting plane (ISO 3744:2010)*

EN ISO 4871, *Acoustics - Declaration and verification of noise emission values of machinery and equipment (ISO 4871)*

EN ISO 7751:1997[1], *Rubber and plastics hoses and hose assemblies — Ratios of proof and burst pressure to maximum working pressure - Amendment 1 — Replacement of "design working pressure" by "maximum working pressure" throughout text (ISO 7751:1991)*

EN ISO 11201, *Acoustics - Noise emitted by machinery and equipment - Determination of emission sound pressure levels at a work station and at other specified positions in an essentially free field over a reflecting plane with negligible environmental corrections (ISO 11201)*

EN ISO 11688-1, *Acoustics - Recommended practice for the design of low-noise machinery and equipment - Part 1: Planning (ISO/TR 11688-1)*

EN ISO 13732-1, *Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces — Part 1: Hot surfaces*

EN ISO 14120, *Safety of machinery - Guards - General requirements for the design and construction of fixed and movable guards (ISO 14120)*

ISO/TR 14121-2, *Safety of machinery — Risk assessment — Part 2: Practical guidance and examples of methods*

---

[1] As impacted by EN ISO 7751:1997/A1:2011.

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 12100 and the following apply.

3.1
accessories
additional attachable parts that are used to adapt a tool enabling it to perform a certain special task

Note 1 to entry: examples are pulling attachments, pulling chains, puling straps, manifolds, saddles, extension tubes, etc.

3.2
detachable parts
parts or components that can be removed by hand (without tools) under no load conditions

3.3
control device
device connected to the hydraulic control circuit and used for controlling the operation of the hydraulic rescue tool

Note 1 to entry: examples are hydraulic valves, relay, magnetically operated valve

3.4
manual control actuator
component of the control device which, when operated, activates the control device, and is designed to be operated by one person

3.5
operator
only person operating the manual control actuator of the tool

3.6
combi tool
hydraulic rescue tool able to perform a minimum of at least three functions namely: spreading, squeezing and cutting without exchange of removable parts

3.7
spreading
outward movement of the jaw(s) or arm(s) to force apart structural parts or elements

3.8
pulling
inward movement of the jaw(s) or arm(s) when fitted with pulling attachments to draw structural parts or elements together

Note 1 to entry: Hoisting or lifting actions do not fall under the definition of pulling.

3.9
squeezing
inward movement of the jaw(s) or arm(s) to compress structural parts or elements

3.10
cutting
inward movement of the cutting area of the jaw(s) or blade(s) to cut or shear structural parts or elements

3.11
spreading force
force at a position within the spreading distance

Note 1 to entry: Force is expressed in kN

3.12
spreading distance
distance of travel at the tips between the fully closed position and fully open position

Note 1 to entry: distance of travel is expressed in mm

3.13
pulling force
force at a position within the pulling distance

Note 1 to entry: Force is expressed in kN

3.14
pulling distance
distance of travel between the fully open position and the fully closed position

Note 1 to entry: distance of travel is expressed in mm

3.15
cutter
hydraulic rescue tool able to perform a cutting function with the aid of one or more blade(s)

3.16
cutter opening
distance between the blade tips when the blades are in an open position

Note 1 to entry: distance is expressed in mm

Note 2 to entry: see Table 2 and Figure 9

3.17
cutter reach
distance from the base of the cutting edge to the midpoint between the tips of the blades when opened

Note 1 to entry: distance is expressed in mm

Note 2 to entry: see Figure 9

3.18
hose assembly
one or more hydraulic hoses complete with hose fittings, one or more quick action couplings and hydraulic fluid

3.19
hose
flexible tube designed for fluid power transfer

3.20
hose fitting
fitting attached at each end of the hose in order to mount the hose to a tool/pump or to equip it with quick action coupling

3.21
quick action coupling
replaceable connector, attached to the fittings of the hose assembly and/or equipment with the purpose of connecting and releasing this hose assembly to/from other matching connector within the system, with the aim to transfer the hydraulic fluid from one item in the system to another

3.22
hose reel
reel fitted with length[s] of hose assemblies

3.23
hydraulic fluid
fluid medium for power transfer

3.24
manual pump
hydraulic pump activated by hand or foot force to power double acting hydraulic rescue tool(s)

3.25
mass of a hydraulic rescue tool
weight of a hydraulic rescue tool measured in the fully closed position, including hydraulic fluid, integrated hose assembly or quick action couplings and detachable parts (where fitted)

Note 1 to entry: mass expressed in kg to one decimal point.

3.26
mass of a power pack
weight of a power pack including all permanently attached components, hydraulic fluid reservoir filled to the maximum fluid level and a full fuel tank

Note 1 to entry: mass expressed in kg to one decimal point.

Note 2 to entry: attached components like i.e. hose reels, integrated hose assemblies or quick action couplings

3.27
mass of hose assembly or hose reel
weight of a hose assembly or hose reel including all permanently attached components, hydraulic fluid

Note 1 to entry: mass expressed in kg to one decimal point.

3.28
power pack
pump comprising a prime mover, a hydraulic pump with a fluid reservoir, valves and tool connections, designed to power double acting hydraulic rescue tool(s)

3.29
prime mover
drive motor and its power source

Note 1 to entry: drive motor can be an electric motor, internal combustion engine, pneumatic motor hydraulic motor, etc.

3.30
smart system
device for automatic energy management

3.31
ram
hydraulic rescue tool able to perform a pushing function with the aid of removable or integral feet at both ends of the tool operated by a single, double or telescopic piston(s)

3.32
pushing
outward movement of the piston(s) to push structural parts or elements apart

3.33
stroke
distance of travel of the hydraulically operated piston(s) from a fully closed to an open position

Note 1 to entry: distance of travel expressed in mm

3.34
pushing force
force at a position within the range of the stroke

Note 1 to entry: force expressed in kN

3.35
spreader
hydraulic rescue tool able to perform a minimum of three functions namely: Spreading – Pulling – Squeezing, without exchange of removable parts, pulling attachments excluded

3.36
tool integrity
capability of a hydraulic rescue tool to maintain the position it has reached and to withstand the effects of internal pressure intensification

3.37
nominal
manufacturers claimed characteristics used for classification

3.38
allowable pressure
maximum operating pressure for each component of the system

Note 1 to entry: pressure expressed in bar or MPa.

3.39
hold-to-run control device
control device which initiates and maintains machine functions only as long as the manual control actuator is actuated

[SOURCE: EN ISO 12100:2010, definition 3.28.3]

4 Requirements and verification

4.1 Safety Requirements and/or protective/risk reduction measures and verification

4.1.1 General

4.1.1.1 Introduction

General Verification requirements shall be as specified in Annex E.

Rescue tools and their accessories shall comply with the safety requirements and/or protective/risk reduction measures of this clause.

In addition, they shall be designed according to the principles of ISO 12100 for relevant but not significant hazards which are not dealt with by this document (see Annex A).

The safe operation of rescue tools and their accessories also depends on the safe environment associated with the use of personal protective equipment (PPE), such as gloves, footwear, eye and head protective equipment, as well as safe working procedures (see Clause 5).

For the application of type B standards such as EN ISO 4413 and EN 60204-1, the manufacturer shall carry out an adequate risk assessment.

NOTE This specific risk assessment is part of the general risk assessment relating to the hazards not covered by this type C standard.

Particular attention should be given to protection against parts and/or materials ejected during use of the tool(s).

Hydraulic rescue tool systems shall comply with all safety requirements specified in EN ISO 4413.

All electric power supply cables on the equipment covered by this standard shall comply to standard EN 50565-2:2014, 4.3, type H07RN-F.

All electric components in the equipment covered by this standard shall comply to EN 60529 and provide a minimum protection level of IP44.

All electric components in the equipment covered by this standard shall have sufficient immunity to electromagnetic disturbances to enable them to operate safely as intended and not fail to danger when exposed to the levels and types of disturbances as specified in EN 60204-1.

Verification:

Perform a documentary check on all items above

4.1.1.2 Speed

The opening or closing times of any hydraulic rescue tools shall not be less than 2 s.

Verification:

Connect the tool to the power pack designated by the manufacturer for use with that tool. Conduct a functional test by operating the manual control actuator for maximum speed. Measure and record the

times for each full cycle (e.g. fully open to fully closed) five times. Repeat the test for each direction. Verify that all the times are longer than 2 s.

4.1.1.3 Manual control actuator

4.1.1.3.1 The manual control actuator shall be:

a) located on the tool itself;

b) designed to be activated by one operator only;

c) designed to enable to operate the tools with a variable speed;

d) designed as a hold-to-run control device;

e) designed for operators wearing gloves (complying to EN 659) during the operation.

Verification:

a) Conduct a visual inspection.

b) Operate the manual control actuator by one person.

c) Conduct a functional test.

d) Conduct a functional test.

e) Conduct a functional test.

4.1.1.3.2 When the manual control actuator is engaged the arm(s)/jaw(s)/blade(s) or in the case of rams the feet, shall only move in the direction that is indicated on the tool or the actuator itself.

Verification:

Operate the manual control actuator and verify that the movements are in accordance with the indication(s) on the tool or the actuator.

4.1.1.3.3 When the manual control actuator is released from the engaged position to the neutral position, all moving parts (i.e. arms, blades, jaws, feet) of the tool shall stop within 0,5 s and remain within 1 % of the nominal opening distance at their respective positions for at least 5 min ± 15 s while the power pack is providing hydraulic fluid to the tool.

Verification:

Operate the manual control actuator to different operating positions, including the maximum position and allow the tool to move. Hold the manual control actuator in an operating position for 3 s. Release the manual control actuator from the different operating positions. Verify that the manual control actuator returns to the neutral position and verify that the moving parts of the tool stop within 0,5 s and remain in their respective positions for a period of at least 5 min ± 15 s. Record any movement and verify that any movement does not exceed 1 % of the nominal opening distance.

4.1.1.3.4 In all operating directions, there shall be no movement under nominal load more than 1 % of the nominal opening distance of all tools (cutters excluded), when the manual control actuator is in the neutral position for 5 min ± 15 s. The tool shall be allowed a settling time of no more than 5 min.

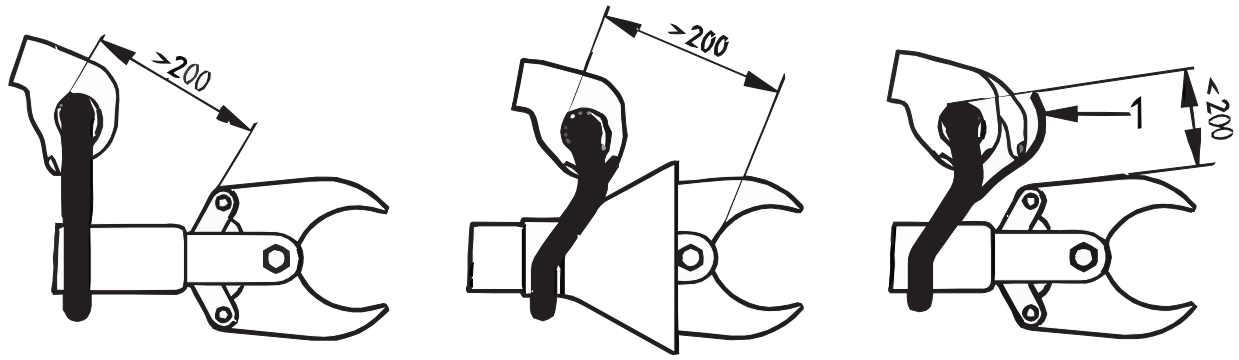
Verification:

Operate the manual control actuator in spreading (pushing) mode to allow the tool to reach under nominal load at approximately half its spreading distance or stroke. Release the manual control actuator. After a settling time of no more than 5 min. record any movement during the next 5 min ± 15 s period. Repeat the test in the pulling (closing) mode. Verify that the movement (if any) does not exceed 1 % of the nominal opening distance.

4.1.1.4 Handling positions

4.1.1.4.1 Tools, power packs and hose reels shall be equipped with carrying means (handles) designed to carry and /or operate the equipment safely. Handles installed to carry tools shall be designed to prevent the operator extending his finger(s) and contacting any moving parts (i.e. arms, blades, jaws) which are within 200 mm and likely to create a hazard (as listed in **Annex A**) (Figure 1 shows examples).

Dimensions in millimetres



Key

1 Guard

Figure 1 — Examples how to measure distance

Verification:

Conduct a visual inspection and measure the distance

4.1.1.4.2 Where size or shape prevents the use of carrying handles, such as with small single hand operated tools, the location of intended handling positions to safely carry and/or operate the tool shall be unambiguous. Their location and/or design shall prevent the operator extending his finger(s) and contacting any moving parts (i.e. arms, blades, jaws) which are likely to create a hazard (as listed in Annex A) while operating the tool.

Verification:

Operate according to the manufacturers operating instructions, conduct a functional test and measure the distance if necessary.

4.1.1.4.3 Tools, power packs or hose reels with a mass exceeding 25 kg, shall be provided with adequate handles and/or handling positions to facilitate extra person(s) to assist the operator carrying and operating the tool. For power packs and hose reels the design shall be such that the centre of gravity is always below these means.

Verification:

If the mass exceeds 25 kg:

- verify it can be carried by adequate number of persons, and

- for power packs and hose reels conduct a functional test to verify the centre of gravity is below the multiple persons carrying handle(s)

4.1.1.4.4 Carrying handles and or handling positions of tools (rams excluded) shall be positioned and designed to create equilibrium where the main axis of the tool deviates no more than 10° of the horizontal.

Verification:

Conduct a functional test.

4.1.1.5 Hydraulic fluid

4.1.1.5.1 Hydraulic fluid shall not have an acute and dangerous health risk when coming into direct contact with persons.

Verification:

Perform a documentary check

4.1.1.5.2 Hydraulic fluid shall have a flash point of no less than 90 °C.

Verification:

Perform a documentary check

4.1.1.6 Mass

4.1.1.6.1 The maximum mass of a hydraulic rescue tool or power pack or hose reel designed to be carried and operated by one person shall not exceed 25 kg.

Verification:

Measure the mass and perform a documentary check.

4.1.1.6.2 Tools, power packs or hose reels with a mass exceeding 25 kg shall be designed to be carried by 2 or more persons depending on multiples of 25 kg.

Users should consider the ergonomic conditions under which they require the hydraulic rescue tool system to be operated and may after a risk assessment specify the appropriate masses (see Introduction, negotiations).

Verification:

Measure the mass and conduct a functional test. Verify mass marking.

4.1.1.7 Quick action couplings

4.1.1.7.1 Hydraulic rescue tools shall be supplied with an attached hose assembly or quick action couplings.

Verification:

Conduct a visual inspection.

4.1.1.7.2 Quick action couplings for pressure and return connection shall not be interchangeable.

Verification:

Conduct a functional test.

4.1.1.7.3 Quick action couplings shall be provided with a locking action or device to prevent accidental uncoupling during operation thereby causing a hazard.

Verification:

Conduct a functional test.

4.1.1.7.4 Quick action couplings shall withstand an axial pulling force of 1 000 N ± 10 N for a period of 5 min when not pressurized and when pressurized to the allowable pressure (see EN 764-1:2015) while coupled. The quick action couplers, the hose fittings and the hose shall not show any visible permanent deformation nor shall they leak fluid after the test.

Verification:

Apply an axial pulling force of 1 000 N ± 10 N to a connected pair (male and female) of quick action couplings while at allowable pressure and without pressure. Observe for any failure e.g. leakage.

4.1.1.7.5 Quick action couplings shall be designed to prevent continuous leakage of fluid during connecting or disconnecting.

Verification:

Pressurize and depressurize each half of the coupling. Connect and disconnect Then visually inspect each half of the coupling for continuous leakage.

4.1.1.7.6 Disconnected quick action couplings shall not leak fluid continuously.

For connecting/disconnecting purposes, quick action couplings shall allow for the release of pressure.

NOTE This will enable users to release pressures of hose assemblies resulting from expansion due to external heat.

Verification:

Pressurize each half of the disconnected coupling to the allowable pressure for at least 60 s. Visually inspect each half of the coupling for leakage.

Verify the manufacturer's instructions and conduct a functional test.

Quick action couplers with integrated by-pass that will not reach allowable pressure, shall not leak when connected to a pump delivering flow of hydraulic fluid.

4.1.1.8 Tool integrity

4.1.1.8.1 In the event of a system pressure drop, e.g. hose rupture, external to the tool and during operation of the manual control actuator, all moving parts of the tool shall stop within 0,5 s and remain within 1 % of the nominal opening distance at that position for a period of at least 5 min ± 15 s.

Verification:

Simulate a sudden pressure loss in the pressure line while the manual control actuator is being operated with the tool at allowable pressure. Verify that the movable parts of the tool stop within 0,5 s and record any movement and verify that any movement does not exceed 1 % of the nominal opening distance during 5 min ± 15 s.

4.1.1.8.2 Tool integrity shall be maintained for 15 s ± 5 s while connected to a power pack which is providing a constant flow of hydraulic fluid, with the return line blocked or disconnected, without load, and while:

a) the manual control actuator is in the neutral position and

b) the manual control actuator is permanently and fully engaged to operate the tool in each direction, 5 times.

Verification:

a) While the tool is connected to a power pack which is providing a constant flow of hydraulic fluid to the tool, at 50 % ± 5 % of its maximum open position simulate a sudden return line disconnection or blockage and return the manual control actuator to the neutral position. Allow the power pack to provide the flow of hydraulic fluid to the tool for 15 s ± 5 s and verify that the tool is capable to withstand the internal pressure intensification. Fluid leakage from an activated safety device is acceptable as long as this causes no inherent harm to the user.

b) Repeat the above test 5 times with the manual control actuator permanently engaged in each of the maximum open and close positions instead of returning it to the neutral position. Fluid leakage from an activated safety device is acceptable as long as this causes no inherent harm to the user. Verify that the tool is capable to withstand the internal pressure intensification. The moving parts of the tool may, as a result of the fluid leakage, continue to move in the direction selected as long as the manual control actuator is kept the respective position.

4.1.2 Spreaders

4.1.2.1 Overload capability

4.1.2.1.1 Spreaders shall withstand a mechanical overload while spreading, corresponding to 1,5 times the allowable pressure for at least 60 s, at 10 % ± 5 %, 50 % ± 5 % and 90 % ± 5 % of their spreading distance, without showing continuous external leakage, visible permanent deformation or visible surface cracks. Then they shall operate as intended.

Verification:

Position the spreading tips, within 25 mm of the end of the tips, between two fixed points at 10 % ± 5 % of the maximum spreading distance. Operate the spreader to achieve 1,5 times the

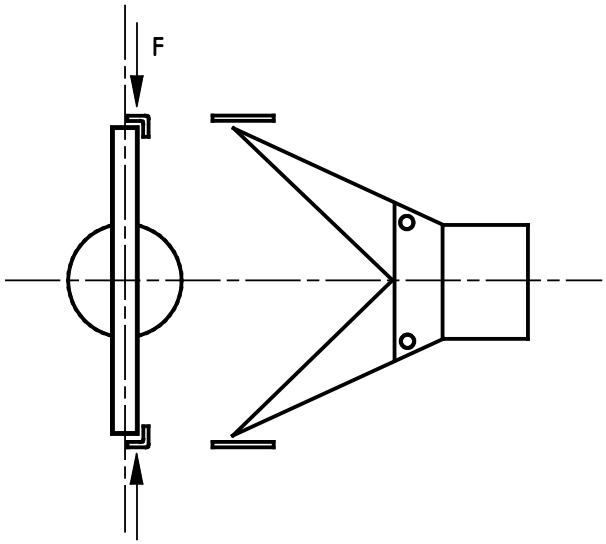
allowable pressure to the spreader within 25 s and maintain for at least 60 s. Repeat the test at 50 % ± 5 % and 90 % ± 5 % of the maximum spreading distance. Conduct a visual inspection and a functional test after each test sequence.

4.1.2.1.2 Spreaders shall withstand a mechanical overload while pulling, corresponding to 1,5 times the allowable pressure for at least 60 s, at 10 % ± 5 %, 50 % ± 5 % and 90 % ± 5 % of their maximum pulling distance, without showing continuous external leakage, visible permanent deformation or visible surface cracks. Then they shall operate as intended.

Verification:

Position the spreader with its pulling devices attached and connected to fixed points at 90 % ± 5 % of the maximum pulling distance. Operate the spreader to achieve 1,5 times the allowable pressure to the spreader within 25 s and maintain for at least 60 s. Repeat the test at 50 % ± 5 % and 10 % ± 5 % of the maximum pulling distance. Conduct a visual inspection and a functional test after each test sequence.

4.1.2.1.3 Spreaders shall withstand an off-centre force at 50 % ± 5 % of the tips width while spreading, corresponding to 1,25 times the maximum spreading force for at least 60 s, applied at 50 % ± 5 % of the maximum spreading distance without showing continuous external leakage, visible permanent deformation or visible surface cracks. Then they shall operate as intended (see Figure 2).



Key
F Force

Figure 2 — Off-centre capability spreader and combi tools

Verification:

Operate the spreader to 50 % ± 5 % of the maximum spreading distance between the two fixed anvils, as shown in Figure 2. Apply the force on the same side of the tool within 25 mm of the end of the tips while it covers 50 % ± 5 % of the width of the tip. Increase the pressure of the tool to 1,25 times the allowable pressure and maintain for at least 60 s. Conduct a visual inspection and a functional test after each test sequence.

4.1.2.2 Spreading tips and arms

4.1.2.2.1 Spreaders equipped with detachable parts e.g. tips, shall be designed to ensure that those do not become detached unintentionally.

Verification:

Conduct a functional test

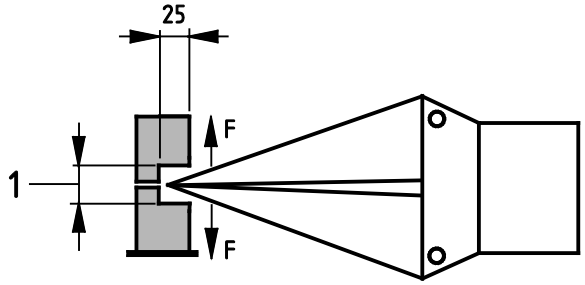
4.1.2.2.2 The working area of the tip(s) or arm(s) of spreaders shall be profiled at least within 25 mm of the end of the tip(s) or arm(s) to form a gripping surface for squeezing (see Figure 7). The tool shall remain in position for at least 60 s while squeezing a mild steel bar with a diameter of 10 % (±1 %) of the nominal spreading distance

Verification:

Position the tips of the tool within 25 mm of the end of the tips over a mild steel round solid bar having a diameter which is 10 % ± 1 % of the nominal spreading distance. Operate the tool to allowable pressure for at least 60 s. No ejection of the hydraulic tool or bar is allowed within 60 s.

4.1.2.2.3 The working area of the tip(s) or arm(s) of spreaders shall be profiled at least within 25 mm of the end of the tip(s) or arm[s] to form a gripping surface for spreading (see Figure 7). When spreading from fully closed position, the tool shall not be ejected out of two parallel mild steel anvils, when pressurized to the allowable pressure for at least 60 s (see Figure 3).

Dimensions in millimetres



Key

1 Distance between two parallel mild steel anvils

F Force

Figure 3 — Test between anvils for spreaders and combi tools

Verification:

Insert the tips of the closed tool between two mild steel parallel anvils, see Figure 3, with vertical sides adjustable to the width of the closed tips when inserted between the anvils to a depth of 25 mm. Lock the anvils in position and operate the tool to allowable pressure for at least 60 s. No ejection of the hydraulic tool is allowed within 60 s.

4.1.3 Cutters

4.1.3.1 Cutters shall withstand a hydrostatic and mechanical overload by cutting 5 times into a solid steel round bar at 1,5 times the allowable pressure for at least 15 s and shall not show continuous

external leakage, visible permanent deformation or visible surface cracks. The strength and/or diameter of the test bar shall be beyond the cutting capacity at 1,5 times the allowable pressure. Afterwards they shall operate as intended

Verification:

Position the cutter with the fully opened cutter blades on the test bar with the bar as close as possible to the pivot point of the blades. Operate the cutter allowing the blades to adopt their normal position on the bar. Pressurize the cutter to 1,5 times the allowable pressure for at least 15 s. Repeat the test at 5 different locations on the bar. Conduct a visual inspection and a functional test after the test sequence.

4.1.4 Combi tools

4.1.4.1 Overload capability

4.1.4.1.1 Combi tools shall withstand a mechanical overload while spreading, corresponding to 1,5 times the allowable pressure for at least 60 s, at 10 % ± 5 %, 50 % ± 5 % and 90 % ± 5 % of their spreading distance, without showing continuous external leakage, visible permanent deformation or visible surface cracks. Then they shall operate as intended.

Verification:

Position the jaws within 25 mm of the end of the tips, between two fixed points at 10 % ± 5 % of the maximum spreading distance. Apply 1,5 times the allowable pressure to the combi tool within 25 s and maintain for 1 min. Repeat the test at 50 % ± 5 % and 90 % ± 5 % of the maximum spreading distance. Conduct a visual inspection and a functional test after each test sequence.

4.1.4.1.2 If designed for pulling, combi tools shall withstand a mechanical overload while pulling, corresponding to 1,5 times the allowable pressure for at least 60 s, at 10 % ± 5 %, 50 ± 5 % and 90 ± 5 % of their maximum pulling distance, without showing continuous external leakage, visible permanent deformation or visible surface cracks. Then they shall operate as intended.

Verification:

Position the combi tool (if designed for pulling) with pulling devices attached and connected to fixed points at 90 % ± 5 % of the maximum pulling distance. Apply 1,5 times the allowable pressure to the combi tool within 25 s and maintain for 1 min. Repeat the test at 50 ± 5 % and 10 ± 5 % of the maximum pulling distance. Conduct a visual inspection and a functional test after each test sequence.

4.1.4.1.3 Combi tools shall withstand an off-centre force at 50 % ± 5 % of the tips width while spreading, corresponding to 1,25 times the maximum spreading force for at least 60 s, applied at 50 % ± 5 % of the maximum spreading distance without showing continuous external leakage, visible permanent deformation or visible surface cracks. Then they shall operate as intended (see Figure 2).

Verification:

Operate the combi tool to 50 ± 5 % of the maximum spreading distance between the two fixed anvils, as shown in Figure 2. Apply the force on the same side of the tool within 25 mm of the end of the tips while it covers 50 % ± 5 % of the width of the tip of the jaw. Increase the pressure of the tool to 1,25 times the allowable pressure for at least 60 s. Conduct a visual inspection and a functional test after each test sequence.

4.1.4.1.4 Combi tools shall withstand a hydrostatic and mechanical overload by cutting 5 times into a solid steel round bar at 1,5 times the allowable pressure for at least 15 s and shall not show continuous external leakage, visible permanent deformation or visible surface cracks. The strength and/or diameter of the test bar shall be beyond the cutting capacity at 1,5 times the allowable pressure. Afterwards they shall operate as intended

Verification:

Position the combi tool with the fully opened jaws on the test bar with the bar as close as possible to the pivot point of the blades at the base of the cutting edge(s). Operate the combi tool allowing the jaws to adopt their normal position on the bar. Pressurize the combi tool to 1,5 times the allowable pressure for at least 15 s. Repeat the test at 5 different locations on the bar. Conduct a visual inspection and a functional test after the test sequence.

4.1.4.2 Jaws

4.1.4.2.1 Combi tools equipped with detachable parts (tips, cutting sections) shall be designed to ensure that those parts do not become detached unintentionally.

Verification:

Conduct a functional test and verify that detachable parts have not become detached.

4.1.4.2.2 The working area of the jaw[s] of a combi tool shall be profiled within 25 mm of the end of the tip (see Figure 7) to form a gripping surface for spreading. When spreading from fully closed position, the tool shall not be ejected from 2 parallel mild steel anvils (see Figure 3), when pressurized to the allowable pressure for at least 60 s.

Verification:

Insert the tips of the closed jaws of the combi tool between two mild steel parallel anvils with vertical sides adjustable to the width of the closed tips when inserted between the anvils to a depth of 25 mm, see Figure 3. Lock the anvils in position and operate the tool to allowable pressure for at least 60 s. No ejection of the hydraulic tool is allowed within 60 s.

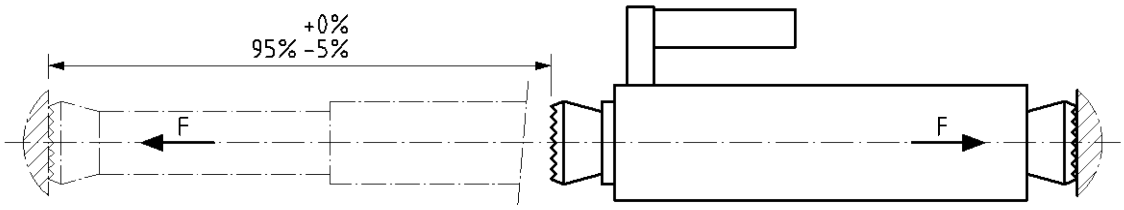
4.1.4.2.3 The working area of the jaw[s] of a combi tool shall be profiled within 25 mm of the end of the tip (see Figure 7) to form a gripping surface for squeezing. The tool shall remain in position for at least 60 s while squeezing a mild steel bar with a diameter of 10 % ± 1 % of the nominal spreading distance (see Table 4).

Verification:

Position the jaws of the combi tool within 25 mm of the end of the tips over a mild steel round solid bar having a diameter which is 10 % ± 1 % of the nominal spreading distance. Operate the tool to allowable pressure for at least 60 s. No ejection of the hydraulic tool or bar is allowed within 60 s.

4.1.5 Rams

4.1.5.1 Rams shall withstand a hydrostatic and mechanical overload 1,5 times its allowable pressure for at least 60 s while creating a pushing force against a mild steel object at the centre of the feet at 10^{0}_{-5} % and 95^{0}_{-5} % of their stroke without showing continuous external leakage, visible permanent deformation or visible surface cracks. Then they shall operate as intended (see Figure 4).



Key

F Force

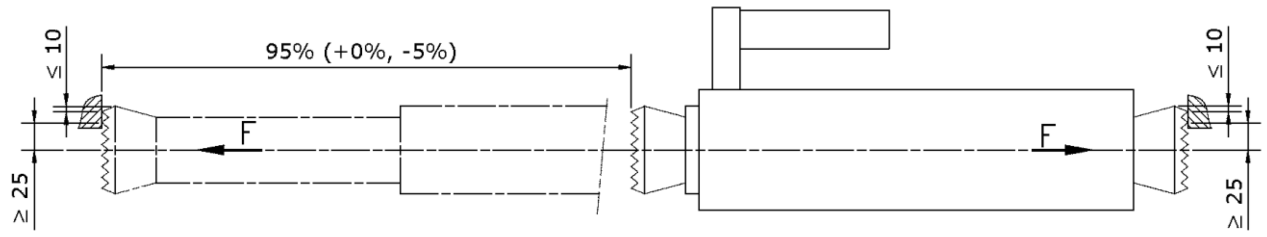
Figure 4 — Overload capability rams

Verification:

Position the feet of the ram centred between two fixed points, see Figure 4. Operate the ram to reach $10\,^{0}_{-5}$ *% of the nominal stroke. Pressurize the ram to achieve 1,5 times the allowable pressure and maintain pressure for at least 60 s. Repeat the test at* $95\,^{0}_{-5}$ *% of the stroke. Conduct a visual inspection and a functional test after each test sequence.*

4.1.5.2 Rams shall withstand an off-centre load 1,25 times their maximum force for at least 60 s without showing continuous external leakage, visible permanent deformation or visible surface cracks and then operate as intended. The off-centre load shall be applied at no less than $95\,^{0}_{-5}$ % of the stroke at least 25 mm off the centre axis of the ram but no more than 10 mm from the furthest extremity of the feet (see Figure 5).

Dimensions in millimetres



Key

F Force

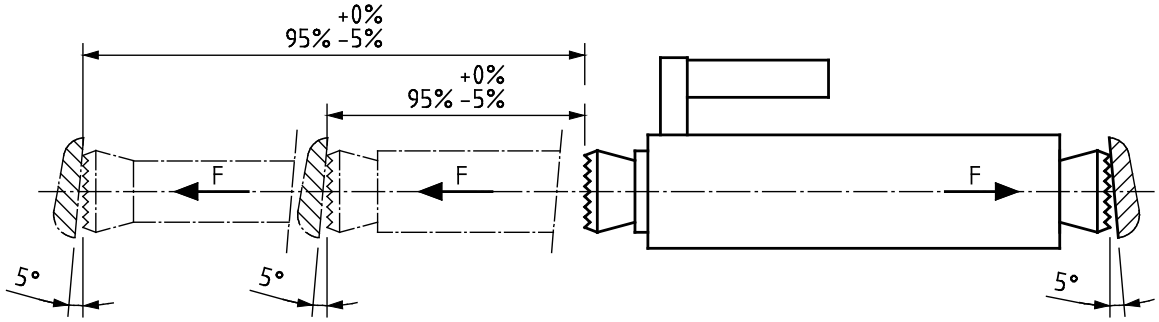
Figure 5 — Off-centre load capability rams

Verification:

Position the feet of the ram off-centre between two fixed points, see Figure 5. Operate the ram to reach $95\,^{0}_{-5}$ *% of the nominal stroke. Pressurize the ram to achieve 1,25 times the allowable pressure and maintain pressure for at least 60 s. Conduct a visual inspection and a functional test.*

4.1.5.3 The feet of rams shall be profiled to form a gripping surface. This gripping surface shall cover the total contact area of the feet. Rams shall not be ejected from their position while pushing

against mild steel anvils at least at 95^{0}_{-5} % of the stroke of each stage at allowable pressure for at least 60 s as shown in **Figure 6**.



Key

F Force

Figure 6 — Gripping requirement rams

Verification:

Position the feet of the ram between inclined fixed mild steel anvils (see Figure 6). Operate the ram to reach 95^{0}_{-5} % *of the stroke of each stage and pressurize to the allowable pressure during at least 60 s. No ejection of the hydraulic tool is allowed within 60 s.*

If the standard feet prevent the test load being applied as specified, then test feet shall be used.

4.1.6 Power packs

4.1.6.1 Power packs shall be fitted with a tamper resistant pressure relief valve(s), pre-set by the manufacturer to operate within ± 10 % of the allowable pressure.

Verification:

The power pack shall be connected to the maximum number of tools as designated for use with that Type with pressure indicators connected in the supply line(s). After starting the pump the tool(s) shall be operated 5 times at maximum working pressure for a period of at least 10 s, individually for Type STO, alternatively for Type ATO, or simultaneously for Type MTO. The interval between each of the 5 sequential operations shall be no more than 60 s. Record the maximum pressure at each of the 5 sequential operations and verify that the recorded values are within ± 10 % of the allowable pressure.

4.1.6.2 Power packs shall neither tip over, nor leak, nor move for at least 60 s, when positioned on a 30° ± 3° inclined smooth trowelled concrete surface without the prime mover running [see **Figure 12**].

Verification:

Place the power pack without the prime mover running on a smooth trowelled concrete surface without tools or hoses deployed inclined at 30° ± 3°. Observe for leakage of fluids during a period of at least 60 s. Repeat this procedure for each of the other three orientations (Figure 12). Verify that the power pack does not tip over, leak or move.

4.1.6.3 Heat generating components of the power pack shall be provided with fixed guards or devices to prevent unintentional contact in accordance to EN ISO 13732-1, contact duration 0,5 s.

Verification:

Measure the temperature and conduct a visual inspection

4.1.6.4 Rotating parts of the power pack shall be guarded to prevent unintentional contact in accordance to EN ISO 14120.

Verification:

Conduct a visual inspection and functional test

4.1.6.5 Power packs shall be provided with an emergency stop device causing the prime mover to stop within the shortest time compatible with the safety of the system.

Verification:

Verify from manufacturer's data and conduct a functional test.

4.1.6.6 On/off switch, choke/accelerator, emergency stop device and any other devices for the operation of the prime mover shall be integral parts of the power pack.

Verification:

Conduct a visual inspection and functional test.

4.1.6.7 All pressure containing parts of power packs shall withstand a pressure of 1,5 times the allowable pressure at least 60 s.

Verification:

A pressure of 1,5 times the allowable pressure, obtained from an external pump, shall be applied to the supply outlet for at least 60 s without the prime mover running. Repeat the test for each other individual supply outlet. Observe for leakage. Then conduct a functional test.

4.1.6.8 Hydraulic fluid reservoirs shall be provided with an integrated fluid level indicator showing the maximum and minimum fluid level required for operation.

Verification:

Conduct a visual inspection

4.1.6.9 The lateral movement of power packs, when positioned on a smooth trowelled concrete surface, shall not exceed 300 mm in any direction within 5 min, while the prime mover is running at idle and maximum speed.

Verification:

Place the power pack on a horizontal smooth trowelled concrete surface without hoses or tools deployed. Start the power pack and run the prime mover at idle speed and at maximum speed for at least 5 min. Record the movement of the power pack. Verify that the lateral movement is less than 300 mm.

4.1.6.10 The filling opening for fuel and/or hydraulic fluid shall be as such that spilling fuel and/or hydraulic fluid is avoidable during refilling.

Verification:

Conduct a visual inspection and a functional test.

4.1.7 Manual pumps

4.1.7.1 Manual pumps shall be fitted with a tamper resistant pressure relief valve, pre-set by the manufacturer, to operate within ± 10 % of the allowable pressure.

Verification:

Connect a pressure gauge to the outlet[s] of the pump. Operate the pump and record the maximum pressure achieved. Continue pumping for a further 5 cycles of operation and record the maximum pressure achieved

4.1.7.2 The force required to operate a manual pump by hand shall not exceed 350 N, by foot 400 N.

Verification:

Attach a measuring instrument to the free end of the operating handle(s) or pedal. Apply a force to move the handle or pedal through its full range in all operating directions and record the required maximum force to achieve the allowable pressure.

4.1.8 Hose and hose assemblies

4.1.8.1 Hoses and hose assemblies shall have a minimum resistance against abrasion, fluids and ozone as stated in EN 853, EN 854, EN ISO 3949, EN 856 and EN 857. The manufacturer shall provide data regarding the applicable choices/tables in these standards.

Verification:

Perform a documentary check

4.1.8.2 Hydraulic hoses shall conform to EN ISO 7751:1997, Table 1[2], and position 2 (burst pressure to allowable pressure ratio of 4:1).

Verification:

Perform a documentary check

4.1.8.3 Hose assemblies shall withstand a proof pressure of at least 2 times the allowable pressure when tested according to EN ISO 1402 and shall not leak nor show any visible permanent deformation after the test.

Verification:

Perform a documentary check

4.1.8.4 Hydraulic hoses shall have a bend radius not exceeding 75 mm when tested in accordance with EN ISO 10619-1

[2] As impacted by EN ISO 7751:1997/A1:2011.

Verification:

Perform a documentary check

4.1.8.5 Hose assemblies shall be provided with an anti-kink protection at each end, e.g. spring guards.

Verification:

Conduct a visual inspection.

4.1.9 Hose reels

4.1.9.1 Pressure confining parts of the hose reels shall be capable of withstanding 1,5 times the allowable pressure without external leakage.

Verification:

Apply 1,5 times the allowable pressure to all pressure confining parts of the hose reel for 60 s ± 5 s with the hose assembly fully unwound. Observe for any external leakage at the reel.

4.1.9.2 Reels shall be designed not to rotate uncontrolled under the following conditions:

a) during transportation and handling;

b) while being pressurized to the allowable pressure;

c) after winding/unwinding is ceased.

Verification:

Conduct a functional test for a, b and c.

4.1.9.3 Hose reels actuated by a prime mover shall be fitted with a hold-to-run control device

Verification:

Conduct a visual inspection and functional test.

4.1.9.4 The design of the means to lift and carry portable hose reels shall be such that the centre of gravity is always below these means.

Verification:

Conduct a functional test.

4.1.10 Accessories

4.1.10.1 Accessories fitted to the tool(s) they are designated for, shall be capable to withstand 1,5 times the maximum forces/pressures those tools are designed for.

Verification:

Test the manufacturer's designated accessories during the relevant test(s) of the tool(s).

4.1.10.2 Accessories shall be so designed that it is not possible to attach them on the tool in another manner than their intended location and/or orientation.

Verification:

Conduct a functional test

4.1.10.3 All components of pulling attachments shall be rated with a minimum 2:1 safety factor, (i.e. breaking load: max. achievable pulling force of the tool).

While determining the actual safety factor, the manufacturer shall take all failure modes into account and shall consider the possibility of reaching the maximum pulling force with a tool. When using alternative pulling components, such as straps (webbing material), steel cables, their recommended safe working load shall prevail.

Accessories designed to allow alternative or multiple tool operation shall protect the system against the effects of potential pressure intensification.

Verification:

Perform a documentary check.

4.1.11 Noise

4.1.11.1 General

Measurements of noise emission values shall be carried out according to Annex B.

Verification:

Check in the information for use if the declared dual-number noise emission values according to Annex B are present.

4.1.11.2 Noise reduction at source by design

The noise of power packs shall be as low as practicable by design (e.g. using measures as given in Annex D) in accordance with EN ISO 11688-1.

NOTE Useful information on noise generating mechanisms in machinery is given in EN ISO 11688-2.

Verification:

Perform a documentary check

4.1.11.3 Noise reduction by protective measures

If it is not possible to achieve the noise reduction at the source by design methods, the manufacturer shall whenever practical, equip the power packs with devices such as mufflers, noise reduction covers, etc.

NOTE EN ISO 11546 and EN ISO 11820 give methods for measuring the acoustical performance of enclosures and silencers respectively.

Verification:

Perform a documentary check

4.1.11.4 Noise control by information

The declared dual-number noise emission values shall be given in the information for use (see 5.3.3.B).

Verification:

Perform a documentary check

4.2 Performance requirements and verification

4.2.1 General

4.2.1.1 Hydraulic fluid

Hydraulic fluid shall maintain all its operational characteristic between a temperature of – 20 °C ± 1 °C and + 80 °C ± 1 °C.

Verification:

Perform a documentary check.

4.2.1.2 Speeds

The duration of an opening or closing cycle over the full travel distance including reaching allowable pressure of any hydraulic rescue tool for which this standard applies, shall not exceed 80 s when connected to a power pack designated by the manufacturer for use with that tool.

Verification:

Connect the tool to the power pack designated by the manufacturer for use with that tool. Activate the manual control actuator to open or close the functional parts of the tool up to the maximum open or closed position and to reach the allowable pressure and verify the time required for each cycle.

4.2.2 Spreaders

4.2.2.1 Spreaders shall have a minimum spreading force as shown in Table 1, measured within 25 mm of the end of the tip [Figure 7] from fully closed position up to 95 % of the spreading distance over all the spreading distance at the allowable pressure.

Dimensions in millimetres

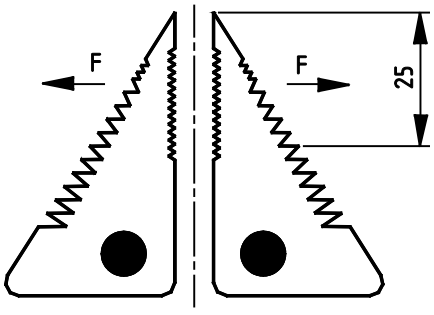


Figure 7 — Location of force measurement

Verification:

Measure the spreading forces at a maximum of 50 mm intervals from the fully closed position of the spreader to the fully open position within 25 mm from the tips, see Figure 7, operating the tool at allowable pressure. Record the results in graph form of spreading distance against spreading force and verify the minimum spreading force.

4.2.2.2 Spreaders shall have a minimum spreading distance "A" (see Figure 8) as shown in Table 1, measured at the end of the tips from the closed position to the fully open position.

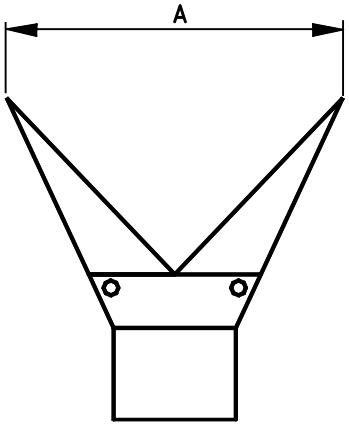


Figure 8 — Spreading distance (A)

Verification:

Activate the spreaders manual control actuator and bring the arms to the fully open position. Measure the opening distance at the tips, see Figure 8, and verify the manufacturer's data.

4.2.2.3 Spreaders shall be classified by the manufacturer according to Table 1 and marked according to Clause 6. Designation of a type shall be based on the lowest recorded spreading force in the graph, the spreading distance and the mass.

EXAMPLE 1 A spreader with 35 kN min. force and 750 mm spreading distance shall be designated as a type AS 35/750-X where X stands for the mass. These data are the nominal data for the tool.

EXAMPLE 2 A spreader with 55 kN min. force and 810 mm spreading distance shall be designated as a type BS 55/810-X where X stands for the mass. These data are the nominal data for the tool.

Table 1 — Spreader classification

Type	Minimum spreading force	Minimum spreading distance
	(kN)	(mm)
AS	20	600
BS	50	800
CS	80	500

Verification:

Perform a documentary check and check the marking of the spreader.

4.2.2.4 Spreaders shall have a minimum pulling force of at least 60 % of the nominal spreading force achieved. This pulling force is to be measured while using the pulling attachments.

Verification:

Measure the pulling force at a maximum of 50 mm intervals from the fully open position to the fully closed position at the manufacturers designated pulling connection points using the manufacturer's designated pulling devices with the tool operating at allowable pressure. Record the results in graph form of pulling distance against pulling force and verify the minimum pulling force.

4.2.2.5 Spreaders shall have a minimum pulling distance of at least 60 % of the nominal spreading distance achieved. This pulling distance is to be measured from the full open to the fully closed position while using the pulling attachments.

Verification:

Determine the pulling distance at the pulling connection points with the pulling devices connected by subtracting the distance in the closed position from the distance in the maximum open position, measured at the pulling points under a no load condition. Verify the manufacturer's data.

4.2.3 Cutters

4.2.3.1 Cutters shall be classified by the manufacturer according to Tables 2 and 3 and marked according to Clause 6. Designation of a type shall be based on the lower of the cutter opening or the cutter reach (see 4.2.3.3) measured at the tool, the fully achieved minimum cutting category and the mass.

Table 2 — Cutter classification

Type	Minimum. cutter opening[a]	Minimum Cutting capacity achieved according to Table 3
	(mm)	
AC	< 150	A – K
BC	150 to < 200	A – K
CC	≥ 200	A – K
[a] See 4.2.3.3. for the relation with the cutter reach		

EXAMPLE 1 A cutter with a cutter opening of 138 mm, a cutter reach of 105 mm and a minimum cutting capacity category F, shall be designated as a type AC138F-X where X stands for the mass. These data are the nominal data for the tool.

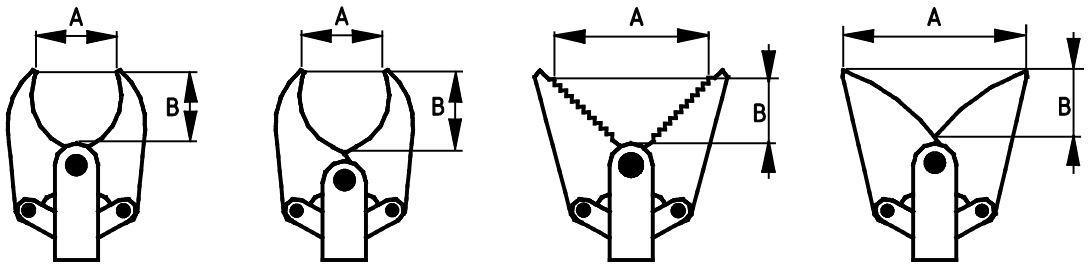
EXAMPLE 2 A cutter with a cutter opening of 152 mm, a cutter reach of 95 mm and a minimum cutting capacity category E, shall be designated as a type AC126E-X where X stands for the mass. The measured cutter reach lowers the nominal cutter opening, i.e. 100/75x95. These data are the nominal data for the tool.

EXAMPLE 3 A cutter with a cutter opening of 160 mm, a cutter reach of 140 mm and a minimum cutting capacity category H, shall be designated as a type BC160H-X where X stands for the mass. These data are the nominal data for the tool.

Verification:

Perform a documentary check and check the marking of the cutter.

4.2.3.2 Cutters shall have a minimum nominal cutter opening as shown in Table 2, measured at dimension "A" (see Figure 9 for examples).



Key

A Cutter opening

B Cutter reach

Figure 9 — Explanation of cutter opening/reach

The nominal cutter opening for cutters with blades of different configuration than the examples shown above, are to be measured at the tips of the cutting section of the blades at their maximum open position.

Verification:

Measure the nominal cutter opening and verify the manufacturer's data.

4.2.3.3 Cutters shall have a cutter reach of not less than 75 % of the nominal cutter opening. The measurement of the cutter reach shall be taken from the base of the cutting edge to the midpoint between the tips of the cutting section of the blades while the blades are in an open position (Figure 9 shows examples only).

Verification:

With the cutter blades opened as in 4.2.3.2, measure the cutter reach. Verify that the cutter reach is not less than 75 % of the nominal cutter opening.

Where the cutter reach is less than 75 % of the cutter opening, the nominal cutter opening has to be scaled down to 100/75x cutter reach.

4.2.3.4 Cutters shall be capable of cutting a total of 60 undeformed (maximum deformation from nominal shape 10 %) pieces of steel profiles as stated in Table 3. These 60 cuts need to be evenly distributed over the number of profiles for that cutters relevant category. Cuts shall be at least 100mm apart. Cutters shall be tested to cut the largest material specimen per profile type to achieve the highest category letter per profile type. The category letter used for classification shall indicate the minimum category result achieved. Each cut shall be achieved in one single continuous cutting action. To achieve a category letter all the requirements of that category shall be satisfied. This test is to show the durability of the blades together with an indication of the performance.

EXAMPLE 1 Category A = 20 × 1A and 20 × 2A and 20 × 3A.

EXAMPLE 2 Category A = 20 × 1C and 20 × 2A and 20 × 3B.

EXAMPLE 3 Category C = 15 × 1F and 15 × 2C and 15 × 3C and 15 × 4C.

EXAMPLE 4 Category *F* = 12 × 1H and 12 × 2F and 12 × 3G and 12 × 4G and 12 × 5F.

Verification:

Operate the cutter to cut sections of at least 100 mm length in a single continuous action and cut 60 test pieces corresponding to the maximum cutting category per profile type claimed by the manufacturer on the standardized product performance datasheet as per Annex C and cutting Table 3. The test pieces shall be cut sequentially, i.e. cutting round bar, flat bar, round tube, square tube and rectangular tube in the order as appropriate up to a total of 60 cuts. Verify the categories as claimed and verify that the minimum category is used to specify the category in the classification of the tool.

4.2.3.5 Manufacturers shall provide the test results of the cutting capacity of a cutter on the standardized product performance sheet as per template in Annex C.

Verification:

Verification of cutting performance presented on the product performance data sheet as per Annex C.

4.2.3.6 Cutters shall be able to make one cut through a 2 mm steel plate. The length of the cut shall not be less than 80 % of the cutter reach. The steel plate shall be at least 50 % greater than the cutter reach (see Figure 9). The steel plates shall conform to EN 10025-2:2004, Table 7, and type S235.

Verification:

Insert the cutter to its maximum reach at approximately 100 mm from the side of a rigidly mounted steel plate having dimensions at least 50 % wider than the maximum reach of the cutter. Operate the cutter to perform the cut in the steel plate during one single motion.

Table 3 — Cutting capacity

Category letter	1. Round bar ● (mm)	2. Flat bar ▬ (mm)	3. Round Tube ○ (mm)	4. Square tube □ (mm)	5. Rectangular tube ▭ (mm)
A	≥ 14	30 × 5	21,3 × 2,3		
B	≥ 16	40 × 5	26,4 × 2,3		
C	≥ 18	50 × 5	33,7 × 2,6	35 × 3	
D	≥ 20	60 × 5	42,6 × 2,6	40 × 4	50 × 25 × 2,5
E	≥ 22	80 × 8	48,3 × 2,9	45 × 4	50 × 30 × 3,0
F	≥ 24	80 × 10	60,3 × 2,9	50 × 4	60 × 40 × 3,0
G	≥ 26	100 × 10	76,1 × 3,2	55 × 4	80 × 40 × 3,0
H	≥ 28	110 × 10	76,1 × 4,0	60 × 4	80 × 40 × 4,0
I	≥ 32	120 x10	88,9 × 4,0	60 × 5	80 × 40 × 5,0
J	≥ 36	130 × 10	88,9 × 5,0	70 × 4	100 × 50 × 4,0
K	≥ 40	140 × 10	101,6 × 4,0	70 × 5	100 × 50 × 5,0
The steel profiles shall conform to EN 10025–2:2004, Table 8, type S235. Dimensions of hollow sections according to EN 10210–2.					

4.2.4 Combi tools

4.2.4.1 Combi tools shall have a minimum spreading force as shown in Table 4, measured within 25 mm of the end of the jaws (see Figure 7) over all the spreading distance at the allowable pressure.

Verification:

Measure the spreading forces at a maximum of 50 mm intervals from the fully closed position of the combi tool to the fully open position within 25 mm from the tip of the jaw with the tool operating at allowable pressure. Record the results in graph form of spreading distance against spreading force and verify the minimum spreading force.

4.2.4.2 Combi tools shall have a minimum spreading distance "A" as shown in Table 4, measured at the end of the jaws from the closed position to the fully open position (see Figure 8).

Verification:

Activate the combi tool manual control actuator and bring the arms to the fully open position. Measure the opening distance at the tips, see Figure 8, and verify the manufacturer's data.

4.2.4.3 Combi tools shall be classified by the manufacturer according to Tables 3 and 4 and marked according to Clause 6. Designation of a type shall be based on the lowest recorded spreading force in the graph, the spreading distance, the minimum cutting category and the mass.

EXAMPLE A combi tool with 27 kN min. force, 400 mm spreading distance and a minimum cutting capacity category H, shall be designated as a type BK27/400-H-X where X stands for the mass. These data are the nominal data for the tool.

Verification:

Perform a documentary check and check the marking of the combi tool.

Table 4 — Combi tool classification

Type	Minimum spreading force (kN)	Minimum spreading distance (mm)	Minimum cutting capacity achieved according to Table 3
AK	< 25	< 250	A – K
BK	25 – 35	250 – 350	A – K
CK	> 35	> 350	A – K

4.2.4.4 Combi tools designed for pulling shall have a minimum pulling force of at least 60 % of the nominal spreading force achieved. This pulling force is to be measured while using the pulling attachments.

Verification:

If designed for pulling, measure the pulling force at a maximum of 50 mm intervals from the fully open position to the fully closed position at the manufacturer's designated pulling connection points using the manufacturers designated pulling devices with the tool operating at allowable pressure. Record the results in graph form of pulling distance against pulling force and verify the minimum pulling force.

4.2.4.5 Combi tools designed for pulling shall have a minimum pulling distance of at least 60 % of the nominal spreading distance achieved. This pulling distance is to be measured from the full open to the fully closed position while using the pulling attachments.

Verification:

Determine the pulling distance at the pulling connection points with the pulling devices connected by subtracting the distance in the closed position from the distance in the maximum open position measured at the pulling points under a no load condition.

4.2.4.6 Combi tools shall be capable of cutting a total of 60 undeformed (maximum deformation from nominal shape 10 %) pieces of steel profiles as stated in Table 3. These 60 cuts need to be evenly distributed over the number of profiles for that combi tool relevant category. And following the requirements as stipulated in 4.2.3.4 and 4.2.3.5 for cutter classification. This test is to show the durability of the blades together with an indication of the performance.

Verification:

Operate the combi tool to cut sections of at least 100 mm length in a single continuous action and cut 60 test pieces corresponding to the maximum cutting category per profile type claimed by the manufacturer on the standardized product performance datasheet as per Annex C and cutting Table 3.

The test pieces shall be cut sequentially, i.e. cutting round bar, flat bar, round tube, square tube and rectangular tube in the order as appropriate up to a total of 60 cuts. Verify the categories as claimed and verify that the minimum category is used to specify the category in the classification of the tool.

4.2.4.7 Manufacturers shall provide the test results of the cutting capacity of a combitool

Verification:

Use the presentation of product performance data sheet according to Annex C

4.2.4.8 The squeezing section of the jaw(s) of a combi tool shall contact each other parallel and symmetrically when in the fully closed position (see Figure 10 which shows an example).

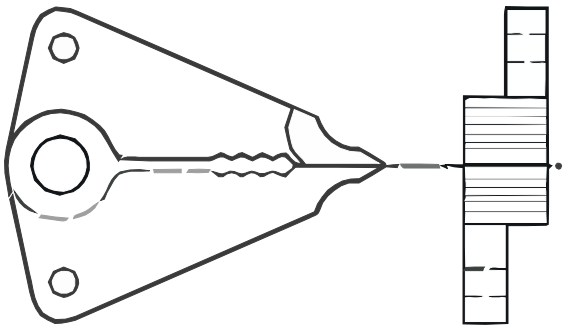


Figure 10 — Squeezing section jaws

Verification:

Conduct a visual inspection

4.2.5 Rams

4.2.5.1 Rams shall be classified by the manufacturer and marked according to **Clause 6**. Designation of a type shall be based on the pushing force in kN, the stroke expressed in mm and the mass. The pushing force of any piston of the ram, at the centre ± 10 mm of the contact area of the feet over the stroke, shall not be less than 60 kN

NOTE Where a ram has multiple pistons, the stroke is the sum of the full distances travelled by each piston.

EXAMPLE 1 A ram with a pushing force of 70 kN and a stroke of 150 mm, shall be designated as a type R70/150-X where X stands for the mass.

EXAMPLE 2 A ram with a pushing force of 180 kN and a stroke of 950 mm, shall be designated as a type R180/950-X.

EXAMPLE 3 A telescopic ram with 2 telescopic extending pistons, the main piston exerting 180 kN force over a stroke of 300 mm and the second piston exerting 60 kN force over a stroke of 150 mm, shall be designated as a type TR180/300–60/150-X.

Verification:

Record the pushing force of each piston at 95^{0}_{-5} *% of its stroke. Verify that the pushing force of each piston of the ram is not less than 60 kN. Perform a documentary check and check the marking of the ram.*

4.2.6 Power pack

4.2.6.1 Power packs shall be designated according to the operating mode and shall be able to operate for at least 5 min at the allowable pressure ± 10 % individually for Type STO or alternatively for the ATO and simultaneously for the MTO in all variations or modes:

a) STO for Single Tool Operation.

b) ATO for Alternative Tool Operation (two or more).

c) MTO for simultaneous Multiple Tool Operation.

Verification:

Power packs shall be connected to the maximum number of tool(s) as designated for use with that type. After starting the pump the tools shall be operated for at least 5 min at allowable pressure individually for Type STO, alternatively for Type ATO or simultaneously for Type MTO. Verify the manufacturer's data.

4.2.6.2 Prime movers shall start and provide the necessary power within 1 min to drive the hydraulic pump under the following conditions:

a) Altitude : 0 - 1 000 m

b) Humidity : 0 - 95 %

Verification:

Verify(a) and (b) from manufacturers data.

4.2.6.3 Requirements for energy sources:

a) The contents of the fuel tank [where fitted] of a prime mover shall allow the power pack to operate at maximum speed for at least one hour with a tool connected to each supply outlet while the manual control actuator of each tool is in the neutral position.

b) Power packs equipped with smart systems or power packs powered by alternative energy sources shall be capable of providing the allowable pressure according to 4.2.6.6. This requirement shall be performed without exchanging recharging or refilling the energy source.

c) Power packs equipped with replaceable energy sources shall allow for exchange of the energy source within 15 s without the use of any tools

d) Power packs shall be capable of reaching the allowable pressure within 10 s after a designated tool for that power pack is activated while in its fully closed position.

Verification:

a) The fuel tank of the power pack shall be filled to its maximum level as indicated. The power pack is then placed in a horizontal position (±2°), with a tool connected to each supply outlet utilizing the hose. The power pack shall be started using its normal starting means and run continuously at maximum speed for at least 1 h.

b) Verify that the test as described under 4.2.6.6. is achieved without replacing, refilling or recharging the initial energy source.

c) Conduct a functional test.

d) Conduct a functional test.

4.2.6.4 The prime mover of the power pack shall be restarted and run within 60 s after being tilted through 90° ± 1° for 10 s ± 1 s, in the positions (D1-D4) as shown in **Figure 11** and repositioned.

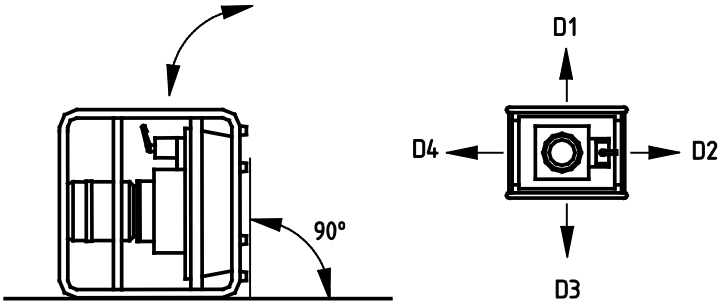


Figure 11 — Tilting to 90°

Verification:

The power pack shall be placed in a horizontal position (±2°). Started by using its normal starting means and run at maximum speed for at least 60 s. The prime mover shall then be stopped and the power pack shall be turned through 90° in the vertical plane and left in this position for 10 s ± 1 s. The power pack shall then be returned to its original position and the prime mover shall be started again, using the normal starting means. The time of the restart sequence shall be recorded and the unit shall run for a continuous period of at least 60 s at maximum speed. This procedure shall be conducted for each of the positions as shown in Figure 11.

4.2.6.5 Power packs shall operate the number of tool[s] as designated by the manufacturer under the following conditions:

a) conditions see 4.2.6.2 for prime movers;

b) low temperature: −20 °C ± 1 °C;

c) high temperature: +55 °C ± 1 °C;

d) Inclined plane : 20° angle (α) ± 1° and positioned as per Figure 12, (D1-D4).

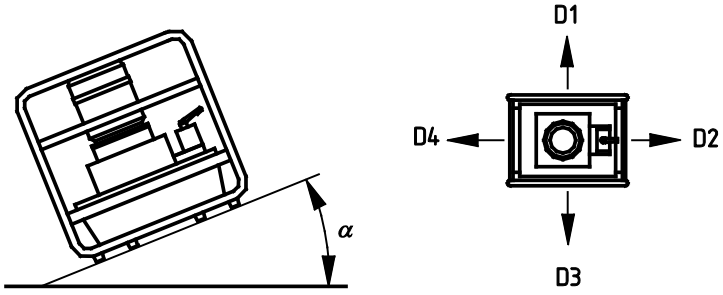


Figure 12 — Inclined plane

Verification:

Test under various conditions.

a) Verify from manufacturers data.

b) Low temperature. The power pack shall be connected to the other equipment as designated by the manufacturer and stored at a temperature of –20 °C ± 1 °C for 5 +1/-0 h. Within 3 min of removing the equipment from the climate chamber, the power pack shall be started using its normal starting means. Within 3 min of commencing the starting sequence measure, record and verify the pressure.

c) Repeat the test (b) at a temperature of 55 +5/-1 °C.

d) Inclined plane. The power pack shall be placed on a horizontal plane and the fuel tank filled to its maximum indicated level and the hydraulic oil tank filled to the minimum indicated level. Connect the tool(s) which require the largest volume of hydraulic fluid as designated by the manufacturer for use with that power pack. The power pack shall then be placed on an inclined table, see Figure 12, with the fuel tank, if fitted, at its lowest position relative to the carburettor system (if applicable) and left to stand for 15 min ± 1 min. Start the power pack using the normal starting means and measure and record the time to start. Operate each tool(s) until the power pack has delivered the maximum volume of hydraulic fluid to the tool and measure and record the maximum pressure that is reached. This test shall be repeated for the other positions of the power pack as shown in Figure 12.

4.2.6.6 Power packs shall maintain their allowable pressure during a continuous series of 10 cycles each of 120 s ± 5 s at no pressure and 60 s ± 5 s at allowable pressure (±10 %) while delivering hydraulic fluid to the rescue tool(s) specified by the manufacturer.

Verification:

Connect the tool(s) which require the largest volume of hydraulic fluid as designated by the manufacturer for use with that power pack. Operate each tool until the power pack has delivered the maximum volume of hydraulic fluid to the tool(s). Activate the manual control actuator of the tool[s] to run the cycles as required. Record the maximum pressure at the initial and final pressure sequence. Verify that the pressures are within the tolerances. Continue with 4.2.6.7.

4.2.6.7 Define the number of cycles as in 4.2.6.6. until the energy source is depleted.

Verification:

Continue the test as in 4.2.6.6. (cooling brakes allowed) until the energy source is depleted and record the full cycles achieved.

Verify manufacturers data.

4.2.6.8 Power packs outside the scope of 4.2.6.3.a. or the exchangeable energy sources themselves shall be equipped with a level indicator to show the remaining energy.

Verification:

Conduct a visual inspection.

4.2.6.9 It shall be possible for the operator to uncouple and re-couple a tool within 30 s ± 1 s, per hydraulic circuit, while the prime mover is running at maximum speed.

Verification:

Conduct a functional test

4.2.7 Manual pumps

The requirements as stated in item 4.2.6.5 (b and c) shall apply for the manual pumps.

Verification:

Test under various conditions.

a) Low temperature. The manual pump shall be connected as in 4.2.6.5 and stored at a temperature of –20 °C ± °1 °C for 5+1/-0 h. Within 3 min of removing the equipment from the climate chamber the manual pump shall be operated. Measure, record and verify the pressure.

b) High temperature. Repeat this test after conditioning at 55 +5/-1 °C for 5+1/-0 h.

4.2.8 Hoses assemblies and hose reels

4.2.8.1 Hose reels shall have the capability to manually rewind the hoses.

Verification:

Conduct a visual inspection.

4.2.8.2 Hose reels shall be provided with a device to prevent jamming and / or kinking the hose.

Verification:

Conduct a visual inspection.

4.2.8.3 Hose reels shall allow transfer of hydraulic fluid at allowable pressure with any length of hose assembly wound-off.

Verification:

Conduct a functional test fully unwound and 2m unwound.

4.2.9 Accessories

Chains, straps or similar used in pulling attachments shall have an individual length of no less than 1,5 m and shall be provided with a device(s) to adjust the length.

Verification:

Conduct a visual inspection, measurement and functional test

5 Information for use

5.1 General

With each double acting hydraulic rescue tool and/or system, manufacturers shall supply all relevant documentation on the recommended training, safe operation, cleaning, stowage, inspection, maintenance and periodic testing of the system. The documentation may be in the form of a manual and/or information pack and shall at least contain the information stated in 5.2 through 5.6.

5.2 Training

5.2.1 Manufacturers shall supply information necessary for training operators and maintaining their competency, including information on how the rescue tool system operates and any relevant warning as to foreseeable limitations of use.

5.2.2 Manufacturers shall supply information regarding possible loss of performance of power packs used at higher altitudes than in 4.2.6.2 (a).

5.2.3 Manufacturers shall provide performance data for manual pumps and information as to which tools they can operate.

5.3 Safe and efficient operation

5.3.1 The instruction manual shall give information on the need for carrying out for each specific operation a risk assessment in accordance with ISO/TR 14121-2.

Specific attention should be given to protection against parts and/or materials ejected during use of the tool(s).

5.3.2 The instruction manual shall give information on the necessity to use personal protective equipment (PPE), such as gloves, footwear, eye and head protective equipment, as well as safe working procedures.

5.3.3 Manufacturers shall provide, in the instruction manual information on:

a) the meaning of safety signals or pictograms that are fitted to the equipment;

b) noise emission, in particular the declaration of noise emission made in accordance with Annex B;

c) performance product data sheet as per the template in Annex C;

d) number of cycles achieved during the test at 4.2.6.7;

e) information for the safe refilling of fuel and/or hydraulic fluid including the required quantities and measures to prevent air in the hydraulic system.

5.3.4 Manufacturers shall specify all intended combinations of tools with different accessories e.g. extension tubes, saddles etc.

5.3.5 Manufacturers shall provide recommendations on the service life of components (i.e. hose assemblies, fluid) of the system taking account of the requirements of 5.4 and 5.5. In the case of hose assemblies, manufacturers shall also provide criteria how to test and when to replace them. For specific maintenance manufacturers may require trained personnel and indicate this in the manual.

5.3.6 Manufacturers shall supply a Technical Data Sheet and MSDS for the hydraulic fluid.

5.3.7 Manufacturers shall supply information on the best practice of operating the system; the following is not an exhaustive list but gives an indication of the points to be considered:

a) transportation, carrying, handling and positioning the system components;

b) protecting the components from hazardous chemicals;

c) the safe use of the accessories;

d) minimum safe bend radius of hoses and hose assemblies.

5.3.8 Manufacturers shall provide information in the instruction manual (and sales literature describing the performance characteristics) about the vibration total value for the portable hand-held or hand-guided tools, to which the hand-arm system is subjected, if it exceeds 2,5 m/s^2. However, experience has shown that for the hydraulic tools in the scope the magnitude of hand-arm vibration is in general significantly below 2,5 m/s^2. In this case it is sufficient to mention that the emission is below 2,5 m/s^2.

5.4 Stowage and cleaning

5.4.1 Manufacturers shall supply information on how the system should be stowed.

5.4.2 Manufacturers shall supply procedures for care and cleaning of the system.

5.5 Inspection and testing

5.5.1 Manufacturers shall supply information showing how and when periodic inspections should be conducted on the system components and what particular signs of wear and tear to look for. e.g. blades, jaws, spreader tips, ram feet, hose assemblies.

5.5.2 Manufacturers shall supply information regarding the competence required for repairs and any subsequent testing and regular inspection required on the system.

5.5.3 Manufacturers shall supply specifications of the spare parts to be used, when these effect the health and safety of operators.

5.6 Environmental provision

Manufacturers shall supply information on the impact of a product on the environment during its use, maintenance and end-of-life. (e.g. recycling programs by manufacturers or local authorities / regulations)

6 Marking

6.1 General

The marking of equipment covered by this document shall be indelible and shall show at least the following:

6.2 The marking of equipment

a) the business name and contact details of the manufacturer and, where applicable, his authorized representative;

b) designation of the equipment;

c) designation of series or type;

d) the year of construction, that is the year in which the manufacturing process is completed;

e) serial number;

f) allowable pressure;

g) CE marking;

h) mass (if greater than 25 kg).

NOTE 1 For machines and their related products intended to be put on the market in the EEA, CE marking as defined in the applicable European Directive(s), e.g. Machinery.

NOTE 2 Manufacturers may mark any individual parts for traceability required by their Quality Management System (for example EN ISO 9001:2015).

6.3 Marking of the control device

The control device shall be indelibly marked (or labelled) to show all directions of operation.

6.4 Marking of hose assemblies

All hose assemblies shall be marked with at least:

a) identification of manufacturer of the hose assembly (this may be the hose manufacturer);

b) quarter and year of production of the hose;

c) allowable pressure.

6.5 Marking of power packs

Power packs shall be marked with the dual-number noise declaration values according to Annex B.

6.6 Marking of manual pumps

The mass of a manual pump containing the minimum hydraulic fluid for operation and without hose(s) shall be clearly marked on the tool.

6.7 Marking of accessories

Pulling attachments shall be marked with the working load limit (WLL) and intended use (text: PULLING ONLY) for that particular part / component.

Annex A
(normative)

List of hazards

This annex specifies the significant hazards, hazardous situations and significant hazardous events that have been identified as being significant for the rescue tools and their accessories- within the scope of this document and which require specific action by the designer or manufacturer to eliminate or reduce the risk.

Table A.1 — List of hazards

Reference in EN ISO 12100:2010	**Situation/area**	**Clause reference in this standard**
1 Mechanical hazards		
Crushing		4.1.1.3.3 / 4.1.1.3.4 / 4.1.1.4.1 / 4.1.1.4.2 / 4.1.1.8.1 / 4.1.1.8.2
Cutting or severing		4.1.1.3.3 / 4.1.1.3.4 / 4.1.1.4.1 / 4.1.1.4.2 / 4.1.1.8.1 / 4.1.1.8.2
Entanglement		4.1.6.4 / 4.1.9.3
Drawing in or trapping	Powered hose reels	4.1.9.2 / 4.1.9.3
Fluid injection		4.1.1.7.2 / 4.1.8.1 / 4.1.8.2 / 4.1.8.3 / 4.1.8.5 / 4.1.9.1
Impact (Ejection of parts)	Tool itself	4.1.2.1.1 / 4.1.2.1.2 / 4.1.2.1.3 / 4.1.2.2.3 / 4.1.4.1.1 / 4.1.4.1.2 / 4.1.4.1.3 / 4.1.4.1.4 / 4.1.4.2.2 / 4.1.5.1 / 4.1.5.2 / 4.1.5.3
	Parts of tool	4.1.2.1.1 / 4.1.2.1.2 / 4.1.2.1.3 / 4.1.2.2.1 / 4.1.2.2.2 / 4.1.2.2.3 / 4.1.3 / 4.1.4.1.1 / 4.1.4.1.2 / 4.1.4.1.3 / 4.1.4.1.4 / 4.1.5.1 / 4.1.5.2 / 4.1.5.3
	Work piece	4.1.1.1 / 4.1.1.3.4 / 4.1.2.2.2 / 4.1.3 / 4.1.4.1.4 / 4.1.4.2.3
	Coupling	4.1.1.7.2 /4.1.1.7.3 / 4.1.1.7.4
	Accessories	4.1.2.2.1 / 4.1.2.2.2 / 4.1.4.2.1 / 4.1.10.1
Loss of stability		4.1.1.3.4 / 4.1.1.4.3 / 4.1.1.4.4 / 4.1.1.6.1 / 4.1.1.6.2 / 4.1.6.9
Slip, trip, fall		4.1.1.6.1 / 4.1.1.6.2

Reference in EN ISO 12100:2010	**Situation/area**	**Clause reference in this standard**
2 Electrical hazards		
Contact of persons with live parts (direct contact)	Power pack Contact electrical wire	
Contact of persons with live parts (indirect contact)		
	External influences on electrical equipment	
3 Thermal hazards		
Burns and scalds		4.1.6.3
4 Noise hazard		
Hearing loss		4.1.11.3 / 4.1.11.4
Interference with speech		4.1.11.2 / 4.1.11.3 / 4.1.11.4
7 Materials and substances hazards		
Fluids, gases, mists, fumes and dusts	Contact with or inflation of harmful fluids	4.1.1.5.1 / 4.1.6.10
	Fire or explosion hazards Power packs tools	4.1.1.5.2 / 4.1.6.10
	Biological and microbiological hazards	4.1.1.5.1 / 4.1.1.7.5 / 4.1.1.7.6
8 Ergonomic hazards		
Unhealthy postures, excessive efforts	Due to weight	4.1.1.4.3 / 4.1.1.6.1 / 4.1.1.6.2 / 4.1.7.2 / 4.1.9.4
Human anatomy	Operation with gloves	4.1.1.3.1
	Required force of control	4.1.1.3.1 / 4.1.7.2
Area lighting		
Human error	Neglected use of personal protection	4.1.1.1
	Mental overload or under load, stress, etc.	
	Wrong operation	4.1.1.4.1
	Other persons making mistakes	
	Missing parts of tool	
Inadequate design, location or identification of manual controls	Due to handles and/or control	4.1.1.3.2 / 4.1.1.4.1 / 4.1.1.4.2
	Due to balance of tool	4.1.1.4.3 / 4.1.1.4.4

Reference in EN ISO 12100:2010	**Situation/area**	**Clause reference in this standard**
10 Combination of hazards		
Failure of energy	No pressure and no flow	
	overpressure	4.1.6.1 / 4.1.7.1
	Re-energizing	
Failure of control system		4.1.6.7 / 4.1.7.1
Errors of fitting		
Unexpected ejection of parts or fluids		4.1.1.8.2 / 4.1.6.1
Overturn, loss of stability		4.1.1.4.3 / 4.1.6.2
Missing and/or incorrectly positioned safety related measures/means		4.1.10.2

Annex B
(normative)

Noise test code (Grade 2 of accuracy)

B.1 Scope

B.1.1 This noise test code applies to power packs for double acting hydraulic rescue tools as defined in this document.

B.1.2 This annex provides the information necessary to carry out efficiently and under standardized conditions the determination, declaration and verification of noise emission values of the power packs.

B.1.3 The use of this annex ensures the reproducibility of the determination of noise emission values within specified limits determined by the grade of accuracy of the basic noise standard for the determination of noise emission values used. Methods for the determination of these noise emission values according to this annex are engineering methods. Measurements shall be taken preferably outside (see Annex A of EN ISO 3744:2010).

B.2 Emission sound pressure level determination

B.2.1 A-weighted emission sound pressure levels shall be measured in accordance with EN ISO 11201, Grade 2 of accuracy. The measurement time shall be more than 20 s.

B.2.2 A-weighted emission sound pressure levels shall be measured along a path around the power packs:

- at a distance of 1 m from the power pack (where operators are normally located);
- at a height of 1,60 m;
- with a maximum distance of 1,50 m between each measuring point.

B.2.3 Since the power pack has no defined workstation, the workstation is defined conventionally as the set of points at 1 m from the power pack and 1,6 m above the ground defined in B.2.2. The maximum value measured according to B.2.2 is the A-weighted emission sound pressure level at the workstation, L_{pA}, of the machine. This value shall be reported and declared according to B.8 in both the instruction manual and the technical documentation.

B.3 Sound power level determination

If the A-weighted emission sound pressure level at the workstation determined according to B.2 is more than 80 dB, the A-weighted sound power level, L_{WA}, shall be determined. The preferred method for this determination is that prescribed in EN ISO 3744.

When using this method, a parallelepiped measurement surface shall be chosen (see 7.2.4 and Annex C of EN ISO 3744:2010). The distance “d” from the measurement surface to the reference box enveloping the power pack shall be of 1 m.

The measurement time shall be more than 20 s.

EN ISO 9614-1 and EN ISO 9614-2 (intensity measurements) may be used instead of EN ISO 3744.

The declaration shall be made according to B.8.

B.4 Installation and mounting conditions

B.4.1 The installation and mounting conditions shall be the same for the determination of the sound power level and the emission sound pressure level at the workstation.

B.4.2 The surface of the measurement site shall be flat, dry and free from snow. During the duration of the measurement, the distance of the power pack from large objects shall be greater than 20 m.

The ambient temperature shall be in the range –5 °C to + 35 °C. The wind speed on the measurement site measured at a height of approximately 1,60 m shall not exceed 5 m/s.

B.5 Operating conditions

B.5.1 The operating conditions shall be the same for the determination of both the sound power level and the emission sound pressure level at the workstation.

B.5.2 The power pack shall be operated with the prime mover to reach normal operating temperature before the measurements start. The rescue tool(s) shall be connected with a 10 m ± 1 m hose and pressure gauge to the power pack and operated to reach the maximum power output (pressure) of the power pack. The value of the pressure shall be recorded and reported.

B.6 Measurement uncertainties

B.6.1 Two measurements shall be made at each measurement position. If the spread of results of the A-weighted sound pressure levels obtained under any measuring condition exceeds 3 dB, further measurement(s) shall be made until the readings of two successive measurements are within 3 dB.

B.6.2 The uncertainty of the determination of A-weighted sound power levels using this European Standard shall be in accordance with EN ISO 3744. However where a sound level meter of class 2 is used, the uncertainty contributor to be added is 0,5 dB.

NOTE According to EN ISO 4871, estimated values of K (value of the measurement uncertainty associated with a measured noise emission value) which may be used for the sound power level are 2,5 dB for grade 2 measurement.

B.6.3 The uncertainty of the determination of A-weighted emission sound pressure levels at a work station using this European Standard shall be in accordance with EN ISO 11201. However where a sound level meter of class 2 is used, the uncertainty contributor to be added is 0,5 dB.

B.7 Information to be recorded and reported

B.7.1 The information to be recorded is that required by the basic standard(s) used for determining the noise emission quantities.

B.7.2 The information to be given in the test report is that required by the basic standard(s) used for determining the noise emission quantities.

B.7.3 The microphone positions chosen according to B.2.2 shall be recorded and reported.

B.8 Declaration and verification

B.8.1 Noise emission values shall be declared in such a fashion that the values can be verified according to the procedures given in EN ISO 4871. The noise declaration shall include the following:

- the words "the measured A-weighted emission sound pressure level at the workstation is below 70 dB", if it is the case;
- the A-weighted emission sound pressure level at the workstation determined according to B.2 if it exceeds 70 dB;
- If the A-weighted emission sound pressure level at the workstation determined according to B.2 is more than 80 dB, the A-weighted sound power level measured according to B.3.

The values shall be declared according to the dual-number declaration as defined in EN ISO 4871 (see examples in Table B.1).

B.8.2 The noise declaration shall state that the declared values have been obtained according to this noise test code. If this statement is not true, the noise declaration shall indicate clearly what the deviations are from this noise test code and/or from the basic standard(s) used. Reference of the basic measurement standard(s) used shall be given in the declaration.

Table B.1 — Example of noise declaration

Declared dual-number noise emission values.

The declaration should appear as follows:

Machine Model Number, Operating conditions, and other identifying information: Type ……., Model ……. Maximum working pressure…….. bar
DECLARED DUAL-NUMBER NOISE EMISSION VALUES in accordance with EN ISO 4871 Measured A-weighted emission sound pressure level L_{pA}, in dB re 20μPa ……. Uncertainty, K_{pA}, in dB …… Measured A-weighted sound power level (if necessary) …….. L_{WA} in dB re 1 pW …… Uncertainty, K_{WA}, in dB ……. Values determined according to Annex B of EN 13204 using the basic standards EN ISO 3744 and EN ISO 11201. NOTE the sum of a measured noise emission value and its associated uncertainty represents an upper bound of the range of values which can occur in measurements.

Annex C
(normative)

Product Performance Data Sheet

EN 13204 ANNEX C: STANDARDIZED PRODUCT PERFORMANCE DATASHEET

CUTTING PERFORMANCE AS PER TABLE 3 FOR CUTTERS AND COMBI TOOLS

Manufacturer	Brand X
Tool name and type	supercutter-3000e

CLAIMED CLASSIFICATION;

TYPE	CUTTER OPENING	CLASSIFICATION BASED ON MIN CUTTING PERFORMANCE	WEIGHT (1 decimal accurate)	CUTTING PERFORMANCE
CC	210	I	22.4	1J-2K-3J-4I-5K

PROFILE TYPE →	1 Round bar	2 Flat bar	3 Round tube	4 Square tube	5 Rectangular tube
CATEGORY LETTER ↓	●	—	○	□	▭
A	≥ 14	30 × 5	21,3 × 2,3		
B	≥ 16	40 × 5	26,4 × 2,3		
C	≥ 18	50 × 5	33,7 × 2,6	35 × 3	
D	≥ 20	60 × 5	42,6 × 2,6	40 × 4	50 × 25 × 2,5
E	≥ 22	80 × 8	48,3 × 2,9	45 × 4	50 × 30 × 3,0
F	≥ 24	80 × 10	60,3 × 2,9	50 × 4	60 × 40 × 3,0
G	≥ 26	100 × 10	76,1 × 3,2	55 × 4	80 × 40 × 3,0
H	≥ 28	110 × 10	76,1 × 4,0	60 × 4	80 × 40 × 4,0
I	≥ 32	120 × 10	88,9 × 4,0	60 × 5	80 × 40 × 5,0
J	≥ 36	130 × 10	88,9 × 5,0	70 × 4	100 × 50 × 4,0
K	≥ 40	140 × 10	101,6 × 4,0	70 × 5	100 × 50 × 5,0

The manufacturer must fill and highlight the testresults reached during 4.2.3.4 and/or 4.2.4.6

NOTE: the highlighted fields on this sheet are used as an example.

Annex D
(informative)

Examples of technical measures for noise reduction

This list of technical measures for noise reduction at the source gives only examples and is not meant to be complete:

a) reduction of vibrations through the static and dynamic balancing of the rotating parts;

b) reduction of vibrations within the machine by reducing both the mass of the moving parts and their acceleration;

c) choice and design of energy transfer components to eliminate bouncing;

d) choice and design of the transmission components, e.g. gears, pulleys, belts, bearings;

e) design of the machine structure to take into account vibration damping and by avoidance of structural resonance;

f) choice and design of muffler silencers and location of exhausts remote from workstations;

g) choice and design of engine mounts;

h) choice and design of cooling fans with optimum clearance and possible inclusion of fluid or magnetic over speed limiters;

i) sound deadening of pneumatic discharges and vibration damping of hydraulic circuits;

j) encapsulation of machine parts.

NOTE Alternative measures with identical or higher efficiency can be used.

Annex E
(normative)

General verification requirements

Methods of verification given in the following paragraphs relate directly to the requirements.

Tested tools and accessories shall accurately reflect those products intended for normal production and supply to the market. Adaptations for the purpose of testing is not allowed unless specifically stated in the appropriate clause in this standard. Unless otherwise required for performance tests (see Introduction, negotiations), all tests shall be conducted at ambient temperature which for the purpose of these tests shall be defined as 25 °C ± 10 °C.

Test materials and the equipment shall be conditioned within the same temperature range. Unless otherwise required by this standard for specific tests the following conditions for testing shall apply for power packs:

- Operation of the power pack shall be in accordance with the manufacturers operating procedures and instructions.
- The power pack shall have a full fuel tank (or charge) according to the manufacturers maximum specified capacity.
- The power pack shall be placed in a horizontal position (±2°).
- The engine shall be adjusted for sea level operation.
- The normal starting means for the engine shall be used.
- The hydraulic fluid tank reservoir shall be filled to no more than the minimum level required for operation indicated on the fluid level indicator.

The same hydraulic fluid shall be used for all tests and shall not be changed during testing.

Hoses with a minimum length of 10 m shall be used. For the purpose of overload tests any integrated safety devices which limit the operating pressure may be disengaged in order to reach overload pressures. Visible permanent deformation will include all components of a tool except the normal wear parts, i.e. spreading tips, cutting edge of blades, jaws, feet.

For the purpose of these tests, mild steel shall be considered to be steel conforming to EN 10025-1:2004, Table 5, Type S235.

Except during overload testing, the tools shall be operated / held in the hands to reflect the practical use. Test aids are allowed as long as they do not limit the natural degrees of freedom of the tool movement. e.g weight compensation measures or pneumatic actuators.

For the purpose of this standard pressure gauges shall comply with the requirements of EN 837-1, Class 1.

When testing, gloves complying with EN 659, shall be used where manual actions are required.

Unless otherwise specified in Clause 4 the following methods of verification apply:

- Visual inspection: the intention of which only being to establish, whether something is present on the specific component or the system (e.g. guarding, marking) or that documents, drawings are provided and are adequate to meet the requirements of the standard.

- Measurement: the intention of which being to establish whether the stated measurable parameters have been met (e.g. geometric dimensions, mass, pressure, safety distances, noise).

- Functional test: the intention of which being to establish whether, in working operation under nominal load, the component or the system, including all safety devices, works as intended and all functions comply with the requirements and with the provided technical information.

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide one means of conforming to Essential Requirements of the New Approach Directive 2006/42/EC on machinery.

Once this standard is cited in the Official Journal of the European Union under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this standard, except Clause 4.2 confers, within the limits of the scope of this standard, a presumption of conformity with the relevant Essential Requirements of that Directive and associated EFTA regulations.

WARNING - Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this document.

Bibliography

[1] CEN Guide 414, *Safety of machinery — Rules for the drafting and presentation of safety standards*

[2] EN ISO 13850, *Safety of machinery - Emergency stop function - Principles for design (ISO 13850)*

[3] EN 547-2, *Safety of machinery - Human body measurements - Part 2: Principles for determining the dimensions required for access openings*

[4] EN 764-1, *Pressure equipment - Part 1: Vocabulary*

[5] EN ISO 13857, *Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO 13857)*

[6] EN ISO 13849-1, *Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design (ISO 13849-1)*

[7] EN 1005-2, *Safety of machinery - Human physical performance - Part 2: Manual handling of machinery and component parts of machinery*

[8] EN 1746, *Safety of machinery - Guidance for the drafting of the noise clauses of safety standards*

[9] EN 10083-2, *Steels for quenching and tempering - Part 2: Technical delivery conditions for non alloy steels*

[10] EN ISO 9001, *Quality management systems - Requirements (ISO 9001)*

[11] EN ISO 9614-1, *Acoustics - Determination of sound power levels of noise sources using sound intensity - Part 1: Measurement at discrete points (ISO 9614-1)*

[12] EN ISO 9614-2, *Acoustics - Determination of sound power levels of noise sources using sound intensity - Part 2: Measurement by scanning (ISO 9614-2)*

[13] EN ISO 11546-2, *Acoustics - Determination of sound insulation performances of enclosures - Part 2: Measurements in situ (for acceptance and verification purposes) (ISO 11546-2)*

[14] EN ISO 11688-2, *Acoustics - Recommended practice for the design of low-noise machinery and equipment - Part 2: Introduction to the physics of low-noise design (ISO/TR 11688-2)*

[15] EN ISO 11820, *Acoustics - Measurements on silencers in situ (ISO 11820)*

[16] EN ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025)*

[17] EN 61310-3, *Safety of machinery - Indication, marking and actuation - Part 3: Requirements for the location and operation of actuators*

[18] ISO 5598, *Fluid power systems and components — Vocabulary*

[19] EN 61000-6-1, *Electromagnetic compatibility (EMC) - Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments*

[20] EN 61000-6-3, *Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments*

This page deliberately left blank

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Copyright in BSI publications

All the content in BSI publications, including British Standards, is the property of and copyrighted by BSI or some person or entity that owns copyright in the information used (such as the international standardization bodies) and has formally licensed such information to BSI for commercial publication and use.

Save for the provisions below, you may not transfer, share or disseminate any portion of the standard to any other person. You may not adapt, distribute, commercially exploit, or publicly display the standard or any portion thereof in any manner whatsoever without BSI's prior written consent.

Storing and using standards

Standards purchased in soft copy format:

- A British Standard purchased in soft copy format is licensed to a sole named user for personal or internal company use only.
- The standard may be stored on more than 1 device provided that it is accessible by the sole named user only and that only 1 copy is accessed at any one time.
- A single paper copy may be printed for personal or internal company use only.

Standards purchased in hard copy format:

- A British Standard purchased in hard copy format is for personal or internal company use only.
- It may not be further reproduced – in any format – to create an additional copy. This includes scanning of the document.

If you need more than 1 copy of the document, or if you wish to share the document on an internal network, you can save money by choosing a subscription product (see 'Subscriptions').

Reproducing extracts

For permission to reproduce content from BSI publications contact the BSI Copyright & Licensing team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email subscriptions@bsigroup.com.

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Useful Contacts

Customer Services
Tel: +44 345 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 345 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

bsi.