



SLOVENSKI STANDARD
SIST EN 13204:2005+A1:2012
01-november-2012

**Dvojno delujoče hidravlične reševalne naprave za gasilske in reševalne enote -
Zahteve za varnost in obnašanje v uporabi**

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

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

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

<https://standards.iteh.ai/catalog/standards/sist/5f026fb-b702-4185-b5c8-0985d5207fd/sist-en-13204-2005a1-2012>

Ta slovenski standard je istoveten z: EN 13204:2004+A1:2012

ICS:

11.160	Prva pomoč	First aid
13.220.10	Gašenje požara	Fire-fighting

SIST EN 13204:2005+A1:2012 **en,fr,de**

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 13204:2005+A1:2012](#)

<https://standards.iteh.ai/catalog/standards/sist/5f026f3b-b702-4185-b5c8-0985d5207f2d/sist-en-13204-2005a1-2012>

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 13204:2004+A1

June 2012

ICS 13.220.10

Supersedes EN 13204:2004

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 27 October 2004 and includes Amendment 1 approved by CEN on 13 May 2012.

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, 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.

[SIST EN 13204:2005+A1:2012](https://standards.iteh.ai/catalog/standards/sist/5f0263b-b702-4185-b5c8-0985d52072d/sist-en-13204-2005a1-2012)

<https://standards.iteh.ai/catalog/standards/sist/5f0263b-b702-4185-b5c8-0985d52072d/sist-en-13204-2005a1-2012>



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

Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

	page
Foreword	4
Introduction.....	5
1 Scope.....	6
2 Normative references.....	6
3 Terms and definitions	7
4 Hazards.....	10
5 Requirements.....	11
5.1 Safety requirements	11
5.1.1 General	11
5.1.2 Spreaders	13
5.1.3 Cutters	15
5.1.4 Combi tools.....	15
5.1.5 Rams.....	16
5.1.6 Power packs.....	17
5.1.7 Manual pumps	18
5.1.8 Hose and hose assemblies	18
5.1.9 Hose reels	19
5.1.10 Accessories	19
5.1.11 Noise.....	19
5.2 Performance requirements.....	20
5.2.1 General	20
5.2.2 Spreaders	20
5.2.3 Cutters	21
5.2.4 Combi tools.....	23
5.2.5 Rams.....	24
5.2.6 Power pack.....	25
5.2.7 Manual pumps	26
5.2.8 Hoses assemblies and hose reels	26
5.2.9 Accessories	26
6 Verification	26
6.1 General	26
6.2 Verification of safety requirements	27
6.2.1 General. Verify from manufacturers data	27
6.2.2 Spreaders	29
6.2.3 Cutters	30
6.2.4 Combi tools.....	30
6.2.5 Rams.....	31
6.2.6 Power packs.....	31
6.2.7 Manual pumps	32
6.2.8 Hoses and hose assemblies	32
6.2.9 Hose reels	32
6.2.10 Accessories	32
6.2.11 Noise.....	32
6.3 Verification of performance requirements.....	33
6.3.1 General	33
6.3.2 Spreaders	33



6.3.3	Cutters.....	33
6.3.4	Combi tool	34
6.3.5	Rams.....	34
6.3.6	Power pack	34
6.3.7	Manual pump.....	35
6.3.8	Hose assemblies and hose reels.....	36
6.3.9	Accessories	36
7	Information for use	36
7.1	General.....	36
7.2	Training	36
7.3	Safe and efficient operation	36
7.4	Stowage and cleaning	37
7.5	Inspection and testing	37
8	Marking	37
Annex A (normative)	List of hazards	39
Annex B (normative)	Noise test code (Grade 2 of accuracy)	42
Annex C (informative)	Additional recommendations.....	45
Annex D (informative)	Examples of technical measures for noise reduction.....	46
Annex ZA (informative)	Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC	47
Bibliography	48

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 13204:2005+A1:2012](https://standards.iteh.ai/catalog/standards/sist/5f0263b-b702-4185-b5c8-0985d5207f2d/sist-en-13204-2005a1-2012)

<https://standards.iteh.ai/catalog/standards/sist/5f0263b-b702-4185-b5c8-0985d5207f2d/sist-en-13204-2005a1-2012>

EN 13204:2004+A1:2012 (E)**Foreword**



This document (EN 13204:2004+A1:2012) has been prepared by Technical Committee CEN/TC 192 “ Fire and rescue 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 December 2012, and conflicting national standards shall be withdrawn at the latest by December 2012.

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

This document includes Amendment 1, approved by CEN on 2012-05-13.

This document supersedes EN 13204:2004.

The start and finish of text introduced or altered by amendment is indicated in the text by tags  .

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

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

This document includes a Bibliography.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, 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 1070.

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

When provisions of this type C standard are different from those which are stated in type A or B standards, the provisions of this type C standard take precedence over the provisions of the other standards, for machines that have been designed and built according to the provisions 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 whilst wearing gloves (which comply to EN 659), will use and operate the machinery;
- c) the machinery is kept in good repair and working order, 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.

iTeh STANDARD PREVIEW
(standards.iteh.ai)
SIST EN 13204:2005+A1:2012
<https://standards.iteh.ai/catalog/standards/sist/5f0263b-b702-4185-b5c8-0985d52072d/sist-en-13204-2005a1-2012>

EN 13204:2004+A1:2012 (E)**1 Scope**

This document deals with the technical requirements to minimise the risks of hazards listed in Clause 4 which can arise during the operation and/or maintenance of double acting hydraulic rescue tool systems, when carried out as intended by the manufacturer or his authorised representative.

All the safety requirements of this document apply to double acting hydraulic rescue tools manufactured after the date of publication.

Double acting hydraulic rescue tool systems are intended for use by the fire fighting and rescue services, principally for cutting through, spreading or pushing apart the structural parts of road vehicles, ships, trains, aircraft's and building structures involved in accidents. They consist, as defined in Clause 3 of a separate power pack, the tool[s] and the necessary interconnections and intended accessories.

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

This document does not establish the additional requirements for:

- a) operation in severe conditions (e.g. extreme environmental conditions such as: temperatures outside the range $-20\text{ }^{\circ}\text{C}$ $+55\text{ }^{\circ}\text{C}$, 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.

[SIST EN 13204:2005+A1:2012](https://standards.iteh.ai/catalog/standards/sist/5f0263b-b702-4185-b5c8-0985d52072d/sist-en-13204-2005a1-2012)

<https://standards.iteh.ai/catalog/standards/sist/5f0263b-b702-4185-b5c8-0985d52072d/sist-en-13204-2005a1-2012>

2 Normative references

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

EN 563, *Safety of machinery — Temperatures of touchable surfaces — Ergonomics data to establish temperature limit values for hot surfaces*

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* **A1**

EN 855, *Plastic hoses and hose assemblies — Thermoplastics 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 953, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards*

EN 982, *Safety of machinery — Safety requirements for fluid power systems and their components — Hydraulics*

EN 1050:1996, *Safety of machinery — Principles for risk assessment*

EN 1070:1998, *Safety of machinery — Terminology*

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

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

EN 13202, *Ergonomics of the thermal environment — Temperatures of touchable hot surfaces — Guidance for establishing surface temperature limit values in production standards with the aid of EN 563*

EN 60204-1, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements*

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

EN ISO 1402, *Rubber and plastic hoses and hose assemblies — Hydrostatic testing (ISO 1402:1994)*

EN ISO 1746, *Rubber or plastics hoses and tubing — Bending tests (ISO 1746:1998, including technical corrigendum 1:1999)*

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 4871:1996)*

EN ISO 7751:1997, *Rubber and plastic hoses and hose assemblies — Ratios of proof and burst pressure to design working pressure (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 11688-1:1995)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1070:1998 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, e.g.: pulling attachments, manifolds, saddles, extension tubes, etc.

3.2

detachable parts

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

EN 13204:2004+A1:2012 (E)**3.3****control device**

device connected to the hydraulic control circuit and used for controlling the operation of the tool (e.g. 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**

for the purpose of this document the operator [EN 1070] is only the person operating the manual control actuator of the tool

3.6**combination tool (combi tool)**

hydraulic rescue tool able to perform a minimum of four functions namely: spreading, pulling, squeezing and cutting

3.6.1**spreading**

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

3.6.2**pulling**

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

3.6.3**squeezing**

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

3.6.4**cutting**

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

3.6.5**spreading force**

force at a position within the spreading distance, expressed in kN

3.6.6**spreading distance**

distance of travel at the tips between the fully closed position and fully open position, expressed in mm

3.6.7**pulling force**

force at a position within the pulling distance, expressed in kN

3.6.8**pulling distance**

distance of travel between an open position and the fully closed position, expressed in mm

3.7**cutter**

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

3.7.1**cutter opening**

distance between the blade tips when in the blades are in an open position, expressed in mm

3.7.2**cutter reach**

distance from the base of the cutting edge to the midpoint between the tips of the blades when opened, expressed in mm

3.8**hose assembly**

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

3.8.1**hoses**

flexible tubes fabricated of natural and/or synthetic materials

3.8.2**hose fittings**

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

3.8.3**quick action couplings**

replaceable connectors, attached to the fittings of the hose assemblies and/or equipment with the purpose of connecting and releasing these hose assemblies to/from other matching connectors within the system, with the aim to transfer the hydraulic fluid from one item in the system to another

3.9**hose reel**

reel fitted with length[s] of hose assemblies

SIST EN 13204:2005+A1:2012

<http://www.iso.org/standards/catalog/standards/sist/5f0263b-b702-4185-b5c8-0985d52072d/sist-en-13204-2005a1-2012>

3.10**hydraulic fluid**

fluid medium for power transfer

3.11**manual pump**

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

3.12**mass****3.12.1****mass of a hydraulic rescue tool**

measured in the fully closed position, including hydraulic fluid, integrated hose assemblies or quick action couplings and detachable tips (where fitted), expressed in kg

3.12.2**mass of power packs**

including all permanently attached components (i.e. hose reels, integrated hose assemblies or quick action couplings) hydraulic fluid reservoir filled to the maximum fluid level and a full fuel tank, expressed in kg

3.12.3**mass of hose assemblies or hose reels**

including all permanently attached components, hydraulic fluid, expressed in kg

EN 13204:2004+A1:2012 (E)**3.13****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)

3.13.1**prime mover**

electric motor, internal combustion engine, pneumatic motor or hydraulic motor

3.14**ram**

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

3.14.1**pushing**

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

3.14.2**stroke**

distance of travel of the piston(s) from a fully closed to an open position, expressed in mm

3.14.3**pushing force**

force at a position within the range of the stroke, expressed in kN

3.15**spreader**

hydraulic rescue tool able to perform a minimum of three functions namely: Spreading – Pulling – Squeezing

3.16**tool integrity**

capability of a hydraulic rescue tool:

iTeh STANDARD PREVIEW
(standards.iteh.ai)
SIST EN 13204:2005+A1:2012
<https://standards.iteh.ai/catalog/standards/sist/5f0263b-b702-4185-b5c8-0985d52072d/sist-en-13204-2005a1-2012>

a) to maintain the position it has reached;

b) to withstand the effects of internal pressure intensification

3.17**competent person**

designated person, suitably trained (see EN ISO 9001:2000, 4.18) qualified by knowledge and practical experience, and provided with the necessary instructions to enable the required (operation, test and/or examination) to be carried out safely

3.18**nominal**

where requirements refer to nominal characteristics, these will be the manufacturers claimed characteristics used for classification

4 Hazards

This clause contains the hazards and hazardous situations, as far as they are dealt with in this document, identified by risk assessment significant for this type of machinery and which require action to eliminate or reduce risk. These hazards are listed in Annex A (normative).

5 Requirements

5.1 Safety requirements

5.1.1 General

5.1.1.1 General requirements

For the application of type B standards such as EN 982 and EN 60204-1, the manufacturer shall carry out an adequate risk assessment for the requirements thereof where choice is necessary.

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

Hydraulic rescue tool systems shall comply with all safety requirements specified in EN 982.

Next the systems 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 intended by the manufacturer.

5.1.1.2 Speed

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

5.1.1.3 Manual control actuator

5.1.1.3.1 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 during the operation.

5.1.1.3.2 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.

5.1.1.3.3 When the manual control actuator is moved 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 in their respective positions for at least 5 min \pm 15 s whilst the power pack is providing hydraulic fluid to the tool.

5.1.1.3.4 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. The tool shall be allowed a settling time of no more than 5 min. The measurement shall start immediately after the settling time and shall terminate after 5 min \pm 15 s.

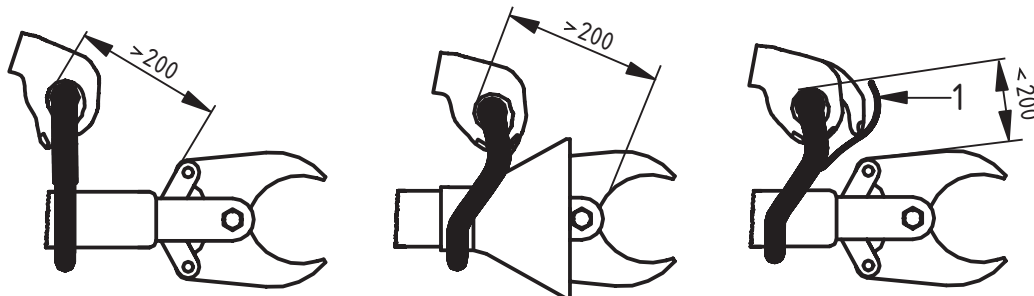
5.1.1.4 Handling positions

5.1.1.4.1 Tools, power packs and hose reels shall be equipped with carrying means (handles) designed to carry and /or operate the equipment safely.

EN 13204:2004+A1:2012 (E)

5.1.1.4.2 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

5.1.1.4.3 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) whilst operating the tool.

SIST EN 13204:2005+A1:2012

<https://standards.iteh.ai/catalog/standards/sist/5f0263b-b702-4185-b5c8-076b52072d/sist-en-13204-2004-a1-2012>

5.1.1.4.4 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.

5.1.1.4.5 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.

5.1.1.5 Hydraulic fluid

5.1.1.5.1 Hydraulic fluid shall not have toxic or allergic effects when coming into direct contact with persons.

5.1.1.5.2 Hydraulic fluid shall have a flash point not less than 90 °C.

5.1.1.6 Mass

5.1.1.6.1 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.

5.1.1.6.2 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.

NOTE 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).

5.1.1.7 Quick action couplings

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

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

5.1.1.7.3 Quick action couplings shall be provided with a locking device to prevent accidental uncoupling during operation.

5.1.1.7.4 Quick action couplings shall withstand an axial pulling force of $1\ 000\ \text{N} \pm 10\ \text{N}$ for a period of 5 min when not pressurised and when pressurised to the allowable pressure (see EN 764) whilst 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.

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

5.1.1.7.6 Disconnected quick action couplings shall not leak at allowable pressure.

5.1.1.7.7 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.

5.1.1.8 Tool integrity

5.1.1.8.1 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 in that position for a period of at least $5\ \text{min} \pm 15\ \text{s}$.

5.1.1.8.2 Tool integrity shall be maintained for $15\ \text{s} \pm 5\ \text{s}$ whilst connected to a power pack which is providing a constant flow of hydraulic fluid, with the return line disconnected, without load, and whilst:

- 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 and to reversing direction 5 times.

5.1.2 Spreaders

5.1.2.1 Overload capability

5.1.2.1.1 Spreaders shall withstand a mechanical overload whilst spreading, corresponding to 1,5 times the allowable pressure, at 10 %, 50 % and 90 % ($\pm 5\%$) of their spreading distance, without showing continuous external leakage, visible permanent deformation or visible surface cracks. Thereafter they shall operate as intended.

5.1.2.1.2 Spreaders shall withstand a mechanical overload whilst pulling, corresponding to 1,5 times the allowable pressure, at 10 %, 50 % and 90 % ($\pm 5\%$) of their maximum pulling distance, without showing continuous external leakage, visible permanent deformation or visible surface cracks. Thereafter they shall operate as intended.

5.1.2.1.3 Spreaders shall withstand an off-centre force at $50\ \% \pm 5\ \%$ of the tips width whilst spreading, corresponding to 1,25 times the maximum spreading force, applied at $50\ \% \pm 5\ \%$ of the maximum spreading distance without showing continuous external leakage, visible permanent deformation or visible surface cracks. Thereafter they shall operate as intended (see Figure 2).