



**SLOVENSKI STANDARD**  
**SIST EN 14653-1:2005**

**01-julij-2005**

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Manually operated hydraulic shoring systems for groundwork support - Part 1: Product specifications

Manuell gesteuerte hydraulische Grabenverbaugeräte - Teil 1: Produktfestlegungen  
(standards.itech.ai)

Composants des blindages de tranchées - Partie 1: Spécifications du produit

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**Ta slovenski standard je istoveten z: EN 14653-1:2005**

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**ICS:**

93.020	Zemeljska dela. Izkopavanja. Gradnja temeljev. Dela pod zemljo	Earthworks. Excavations. Foundation construction. Underground works
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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 14653-1**

April 2005

ICS 93.020

English version

## Manually operated hydraulic shoring systems for groundwork support - Part 1: Product specifications

Composants des blindages de tranchées - Partie 1:  
Spécifications du produit

Manuell gesteuerte hydraulische Grabenverbaugeräte - Teil  
1: Produktfestlegungen

This European Standard was approved by CEN on 28 February 2005.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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

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## Foreword

This document (EN 14653-1:2005) has been prepared by Technical Committee CEN/TC 53 "Temporary works equipment", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2005, and conflicting national standards shall be withdrawn at the latest by October 2005.

This European Standard with the general title *Manually operated hydraulically shoring systems for groundwork support* consists of the following parts:

*Part 1: Product specifications*

*Part 2: Assessment by calculation or test*

These standards are to be read in conjunction with EN 12811-2 and EN 12811-3.

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, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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**EN 14653-1:2005 (E)****Introduction**

Hydraulically operated shoring systems comprise prefabricated equipment that supports sheeting to the sides of excavations. This document covers two types of equipment whose adjustment in length is by hydraulic or by a combination of hydraulic and mechanical means:

- a) hydraulic bracing frames;
- b) hydraulic waler frames.

A variety of components which when assembled form a full system. The prefabricated components are used to make frame assemblies of different dimensions and structural capacities.

Hydraulic bracing frames and waler frames have two strength classification classes - Class A and Class B.

Class B hydraulic bracing frame legs have a further restriction limiting the length of a single leg to 20 m.

The instruction manual is intended to provide all the necessary information on the safe use of the systems.

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This document gives specific requirements on the main characteristics of manually operated hydraulic pumps, hoses and associated equipment, but does not provide requirements for their specification or assessment in EN 14653-2.

[SIST EN 14653-1:2005](https://standards.iteh.ai/catalog/standards/sist/0e9c0017-41f7-4a31-96d0-173b2c73b34/sist-en-14653-1-2005)

This equipment is frequently used in conjunction with supplementary equipment, e.g. knee braces and intermediate hydraulic bracing struts.

The characteristic resistance values specified in this document form various reference levels.

Annex A gives information about the values of Partial safety factor for materials  $\gamma_M$  and Partial safety factor for actions  $\gamma_F$ . Annex B gives information on their use under site conditions.

## 1 Scope

This document specifies constructional and structural requirements for manually operated hydraulic shoring systems made from steel and aluminium for groundwork support.

It specifies characteristic resistances for the equipment.

## 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 853, *Rubber hoses and hose assemblies — Wire braid 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 1127-1, *Explosive atmospheres — Explosion prevention and protection — Part 1: Basic concepts and methodology*

EN 10002-1, *Metallic materials — Tensile testing — Part 1: Method of test at ambient temperature*

EN 10216 (all parts), *Seamless steel tubes for pressure purposes — Technical delivery conditions*

EN 10217 (all parts), *Welded steel tubes for pressure purposes — Technical delivery conditions*

EN 10305 (all parts), *Steel tubes for precision applications — Technical delivery conditions*

EN 12811-2, *Temporary works equipment — Part 2: Information on materials*

EN 14653-2, *Manually operated hydraulically shoring systems for groundwork support — Part 2: Assessment by calculation or test*

ENV 1993-1-1, *Eurocode 3: Design of steel structures — Part 1-1: General rules and rules for buildings*

ENV 1999-1-1, *Eurocode 9: Design of aluminium structures — Part 1-1: General rules — General rules and rules for buildings*

EN ISO 898-1, *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 1: Bolts, screws and studs (ISO 898-1:1999)*

EN ISO 4287, *Geometric product specifications (GPS) — Surface texture: Profile method — Terms, definitions and surface texture parameters (ISO 4287:1997)*

ISO 10100, *Hydraulic fluid power — Cylinders — Acceptance tests*

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**EN 14653-1:2005 (E)****3 Terms and definitions**

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

**3.1 rams****3.1.1 hydraulic ram**

adjustable component that withstands force and whose length can be varied by the application of hydraulic pressure (see Figure 1, Figure 2 and Figure 3)

NOTE 1 A separate manually operated pump activates the ram.

NOTE 2 The term 'ram' has been adopted to distinguish the component from the more general term 'cylinder'. Rams only receive static loading from ground pressure and do not require specific duty cycles or cycle rates.

**3.1.2 single acting ram (SA)**

hydraulic ram that under hydraulic pressure only extends and cannot retract hydraulically

NOTE 1 A single acting ram can only support compressive forces.

NOTE 2 There are three types of single acting ram available a, b and c (see Figures 1 and 2).

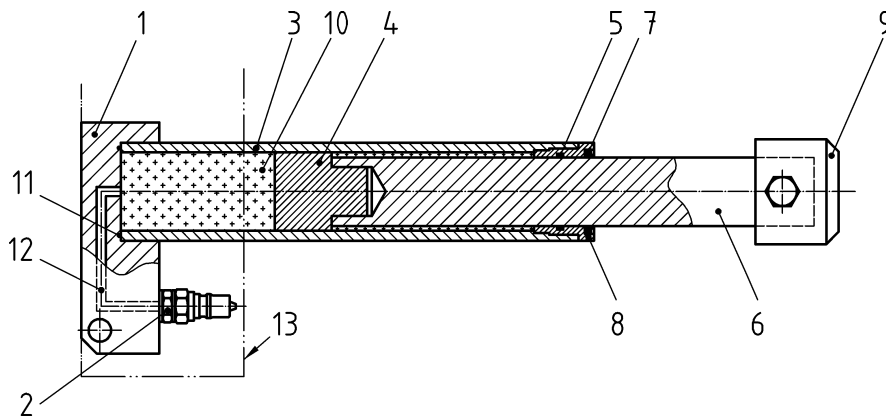
a) Displacement type (D) see Figure 1 a);

b) Piston type (P) see Figure 1 b);

c) Multi-stage rams; these rams may be piston types, displacement types or a combination of both (M).

NOTE 3 A single acting ram may be supplied with a mechanical spring return (**SR**), which provides a double-acting action without the requirement for a hydraulic return. The spring takes effect when the hydraulic pressure is released, (see Figure 2).

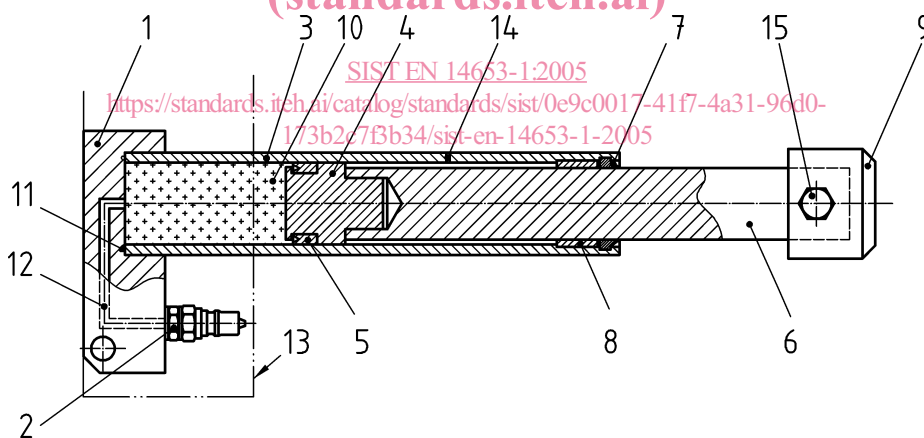


**Key**

- |   |                            |    |                             |
|---|----------------------------|----|-----------------------------|
| 1 | Cylinder end block         | 8  | Gland                       |
| 2 | Male quick release coupler | 9  | Piston rod end block        |
| 3 | Cylinder tube              | 10 | Full bore side of piston    |
| 4 | Bypass piston              | 11 | 'O' ring seal               |
| 5 | Seal                       | 12 | Location of optional valves |
| 6 | Piston rod                 | 13 | Water rail                  |
| 7 | Wiper ring                 |    |                             |

**a) Example of a displacement type ram**

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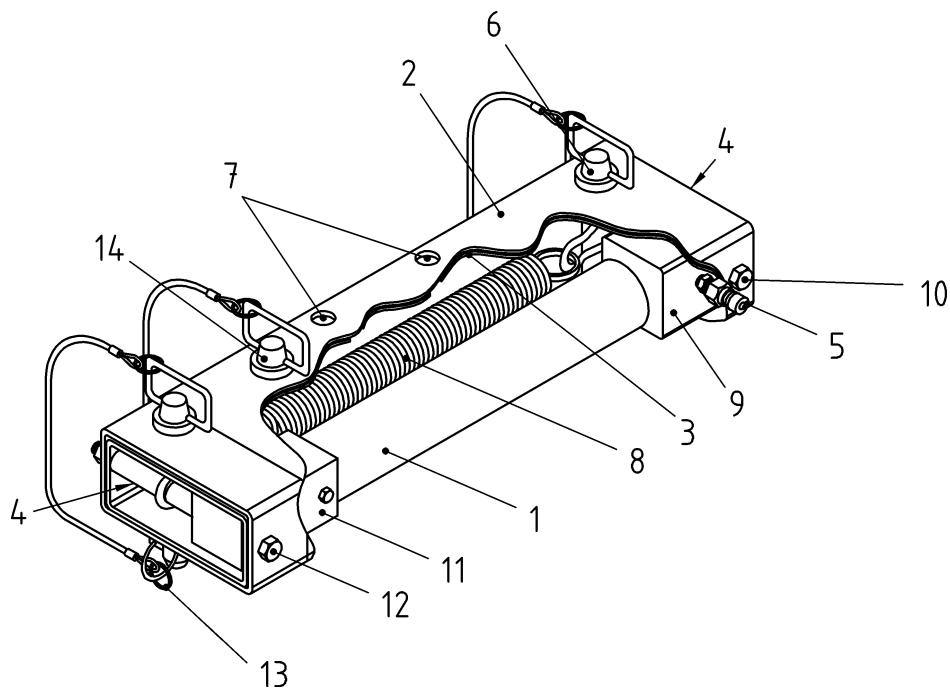
**Key**

- |   |                            |    |                             |
|---|----------------------------|----|-----------------------------|
| 1 | Cylinder end block         | 8  | Gland                       |
| 2 | Male quick release coupler | 9  | Piston rod end block        |
| 3 | Cylinder tube              | 10 | Full bore side of piston    |
| 4 | Sealed piston              | 11 | 'O' ring seal               |
| 5 | Seal                       | 12 | Location of optional valves |
| 6 | Piston rod                 | 13 | Water rail                  |
| 7 | Wiper ring                 | 14 | Blow-off hole               |
|   |                            | 15 | Mounting bolt or pin        |

**b) Example of a sealed piston type ram**

**Figure 1 — Examples of single acting rams**

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**Key**

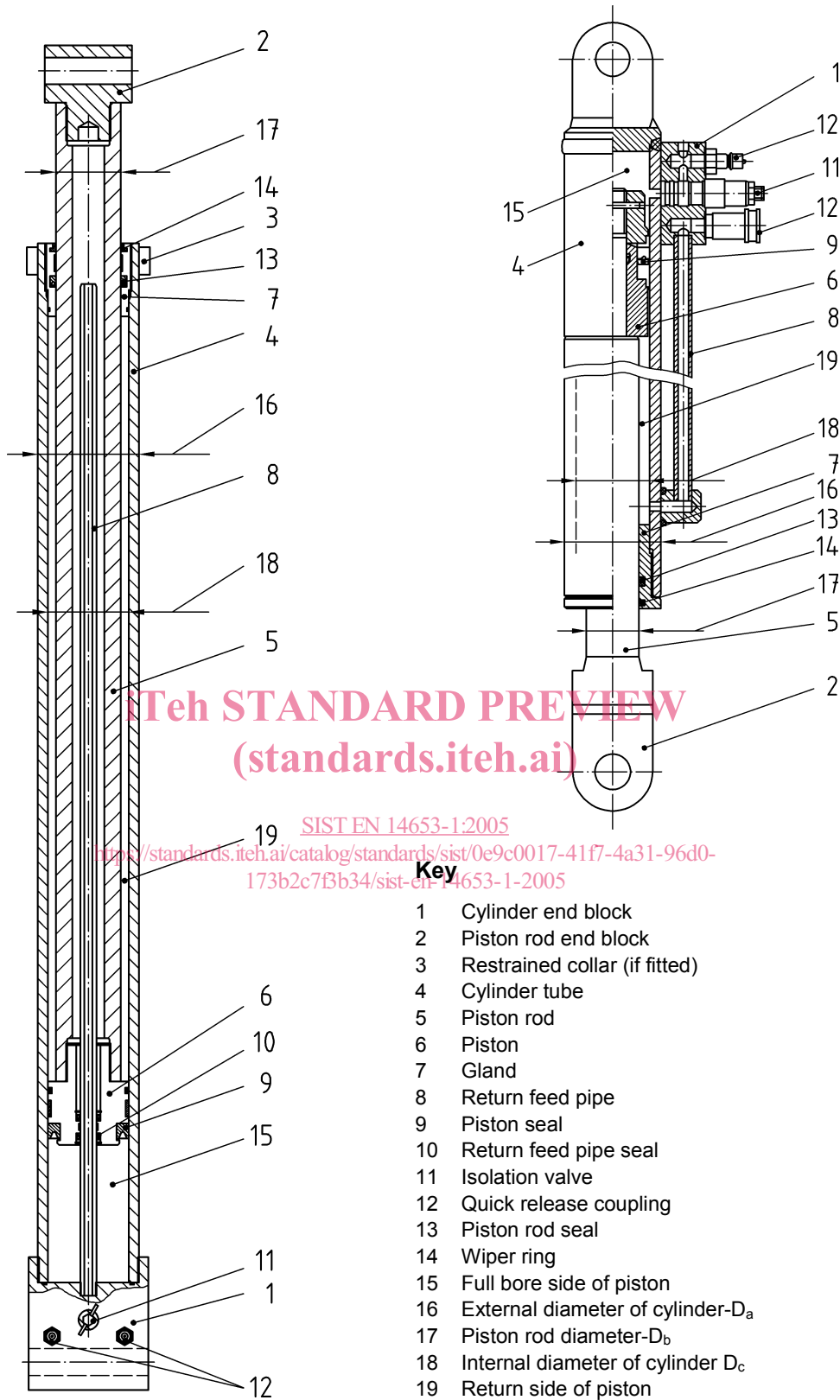
- |   |  |    |                                |
|---|--|----|--------------------------------|
| 1 | Single acting ram                                      | 8  | Return spring                  |
| 2 | Outer section  | 9  | Cylinder end block             |
| 3 | Inner section  | 10 | End block pin                  |
| 4 | Waler rail is positioned at both ends 90° to the strut | 11 | Piston rod end block           |
| 5 | Quick release coupler                                  | 12 | Non-load bearing mounting bolt |
| 6 | Rail pin   | 13 | Retaining clip                 |
| 7 | Alternative locking pin positions                      | 14 | Locking pin                    |

**Figure 2 — Example of a telescopic waler strut with spring return**

**3.1.3****double acting ram (DA)**

hydraulic ram that both extends and retracts under hydraulic pressure (see Figure 3)

NOTE These rams primarily take compressive loads but also have a tensile capacity.



a) Example of a double acting ram with an internal return feed pipe

b) Example of a double acting ram with an external return hydraulic feel

Figure 3 — Examples of double acting rams

**EN 14653-1:2005 (E)****3.2 ram components** (see Figures 1, 2 and 3)**3.2.1****piston (sealed or bypass)**

component that transmits the force created by the fluid pressure to the piston rod (see Figures 1 and 3)

**3.2.2****piston rod**

telescoping inner load bearing component that is terminated with a piston (sealed or bypass type) at one end and an end block at the other end

**3.2.3****cylinder tube**

outer cylinder of the ram that resists the internal pressure

**3.2.4****cylinder end block**

component at the end of the cylinder tube that provides a connection for attaching hydraulic fittings and isolation valves and connection points to the surrounding structure

NOTE The end block may consist of two parts with a separate block for the hydraulic fittings and valves.

**3.2.5****piston rod end block**

component at the end of the piston rod that provides a connection point for attaching to the surrounding structure

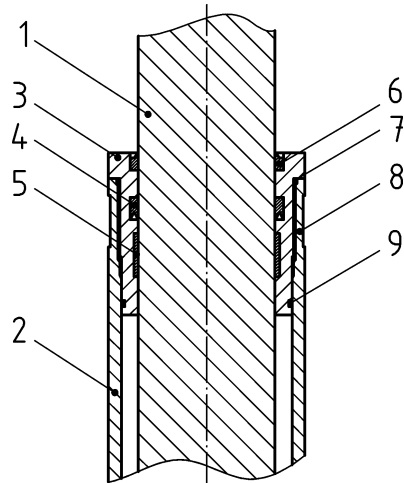
**3.2.6****gland**

component that centralizes the piston rod and may incorporate seals, bearing rings and wiper rings, (see Figure 4)

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**Key**

1	Piston rod	6	Wiper ring
2	Cylinder tube	7	'O' ring
3	Gland	8	Gland retaining thread
4	Piston rod seal	9	'O' ring
5	Bearing ring		

Figure 4 — Example of a gland

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### 3.2.7 mounting fasteners

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#### 3.2.7.1 <https://standards.iteh.ai/catalog/standards/sist/0e9c0017-41f7-4a31-96d0-173b2c7f3b34/sist-en-14653-1-2005> load bearing mounting fastener

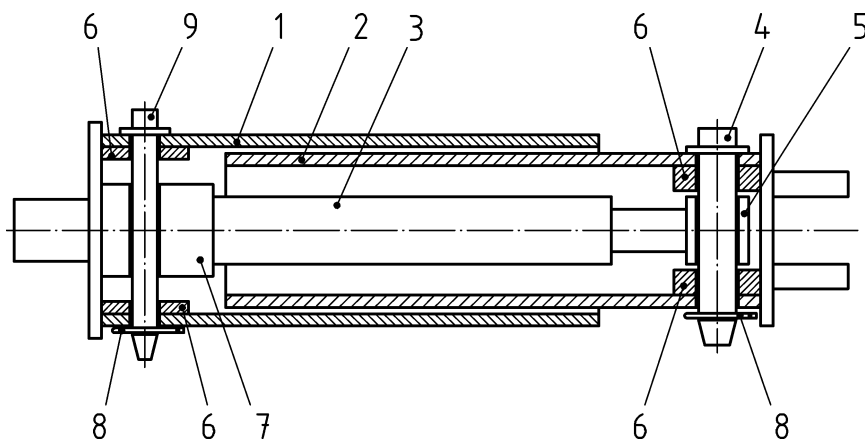
pin or bolt that transfers the full load of the ram from the piston rod end block or from the cylinder end block to the surrounding structure, (see Figure 5)

NOTE The pinhole diameter normally provides a clearance tolerance and not an interference fit for the pin.

#### 3.2.7.2 non-load bearing mounting fastener

pin or bolt that retains a ram in position only (see Figure 5)

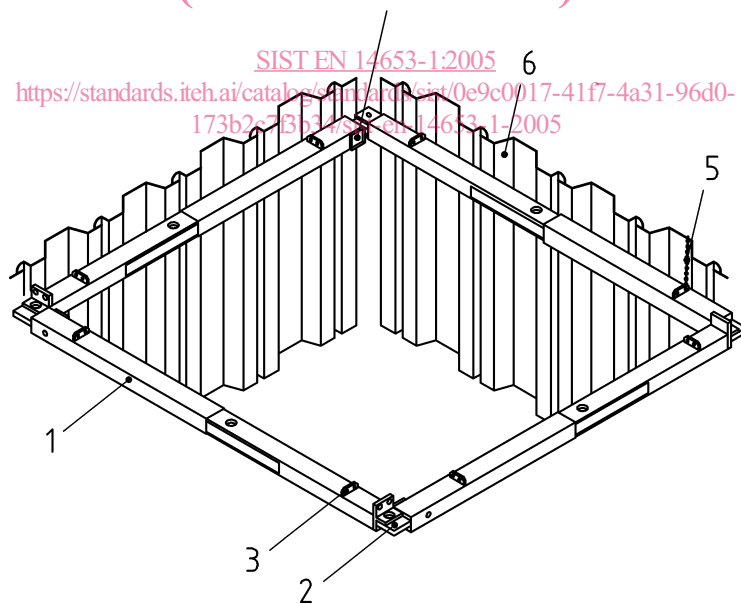
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## Key

- |   |                                  |   |                               |
|---|----------------------------------|---|-------------------------------|
| 1 | Outer tube of the adjustable leg | 6 | Mounting structure            |
| 2 | Inner tube of the adjustable leg | 7 | Cylinder end block            |
| 3 | Ram                              | 8 | Retaining clips               |
| 4 | Load bearing mounting block pins | 9 | Non-load bearing mounting pin |
| 5 | Piston rod end block             |   |                               |

**Figure 5 — Example of mounting blocks and pins**  
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## Key

- |   |                                |   |                                   |
|---|--------------------------------|---|-----------------------------------|
| 1 | Hydraulic bracing frame leg    | 4 | Valve housing and hose connection |
| 2 | Corner detail with pin         | 5 | Restraining chain                 |
| 3 | Handling and restraining point | 6 | Sheet piling                      |

**Figure 6 — Example of a hydraulic bracing frame**

**3.3****piston stroke**

difference between the fully retracted length of the ram and the fully extended length of the ram

**3.4****hydraulic bracing frame**

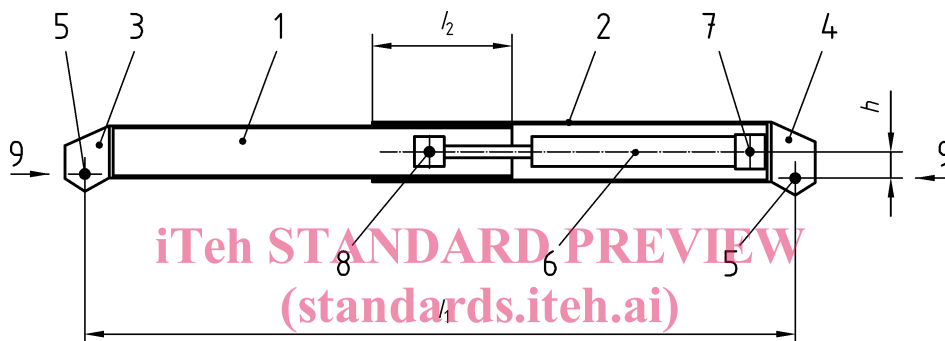
four-sided assembly that is designed to resist the applied loading on all sides (see Figure 6)

**3.5****hydraulic bracing frame leg**

telescopic assembly of components, whose length is adjusted by a hydraulic ram (see Figure 7)

NOTE 1 Each end of the leg has a pin connection. The leg may be capable of extension with an extension bar using a suitable connection (see Figure 8). The leg can also have a telescopic mechanical adjustment. Two strength classifications of frame legs are available Class A and Class B

NOTE 2 Class B hydraulic bracing frame legs are limited to a length of 20,0 m for the purposes of this document.

**Key**

1	Inner adjustable tube	6	Ram
2	Outer adjustable tube	7	Cylinder end block pin
3	Female corner connection	8	Piston rod mounting pin
4	Male corner connection	9	Axial load $F_K$
5	Corner pin		

$l_1$  Maximum pin to pin leg dimension

$l_2$  Minimum overlap of the outer tube to the inner tube

$h$  Eccentricity of  $F_K$  related to the centre line of the leg

**Figure 7 — Example of a hydraulic bracing leg without extension bars**