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ISO 12858-2

Second edition
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Optics and optical instruments — Ancillary devices for geodetic instruments —

Part 2: Tripods

Optique et instruments d'optique — Équipements annexes pour les instruments géodésiques —

Partie 2: Trépieds

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 172, *Optics and photonics*, Subcommittee SC 6, *Geodetic and surveying instruments*.

This second edition cancels and replaces the first edition (ISO 12858-2:1999), which has been technically revised. It also incorporates the Amendment ISO 12858-2:1999/Amd.1:2013. The changes compared to the previous edition are as follows:

— editorial corrections.

A list of all parts in the ISO 12858 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

ISO 12858 consists of a series of parts which detail specifications for ancillary devices to be used with geodetic instruments in surveying. This second part specifies requirements for tripods.

Additional parts, covering further ancillary devices, may be added to ISO 12858 as the need arises.

Optics and optical instruments — Ancillary devices for geodetic instruments —

Part 2: Tripods

1 Scope

This document specifies the most important requirements of telescopic tripods for surveying instruments and the connection between instrument and tripod.

The requirements in this document enable instruments and tripods of different manufacturers to be joined to one another, without prejudicing their performance and their usefulness.

This document is applicable to tripods which are used for levels, theodolites, tacheometers, GPS equipment, EDM instruments and in combination with targets, reflectors, antennae, etc.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 9849, *Optics and optical instruments — Geodetic and surveying instruments — Vocabulary*

ISO 2768-1, *General tolerances — Part 1: Tolerances for linear and angular dimensions without individual tolerance indications*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 9849 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Design

Two main types of tripod with telescopic legs are used:

— Type L: for light-weight or small instruments, with flat head (LF) or spherical head (LS);

— Type H: for heavy instruments.

5 General features — Dimensions

The mechanical properties of the tripod shall conform to the values given in Table 1. The shape of the tripod and the details as shown in Figure 1 are examples for information only.

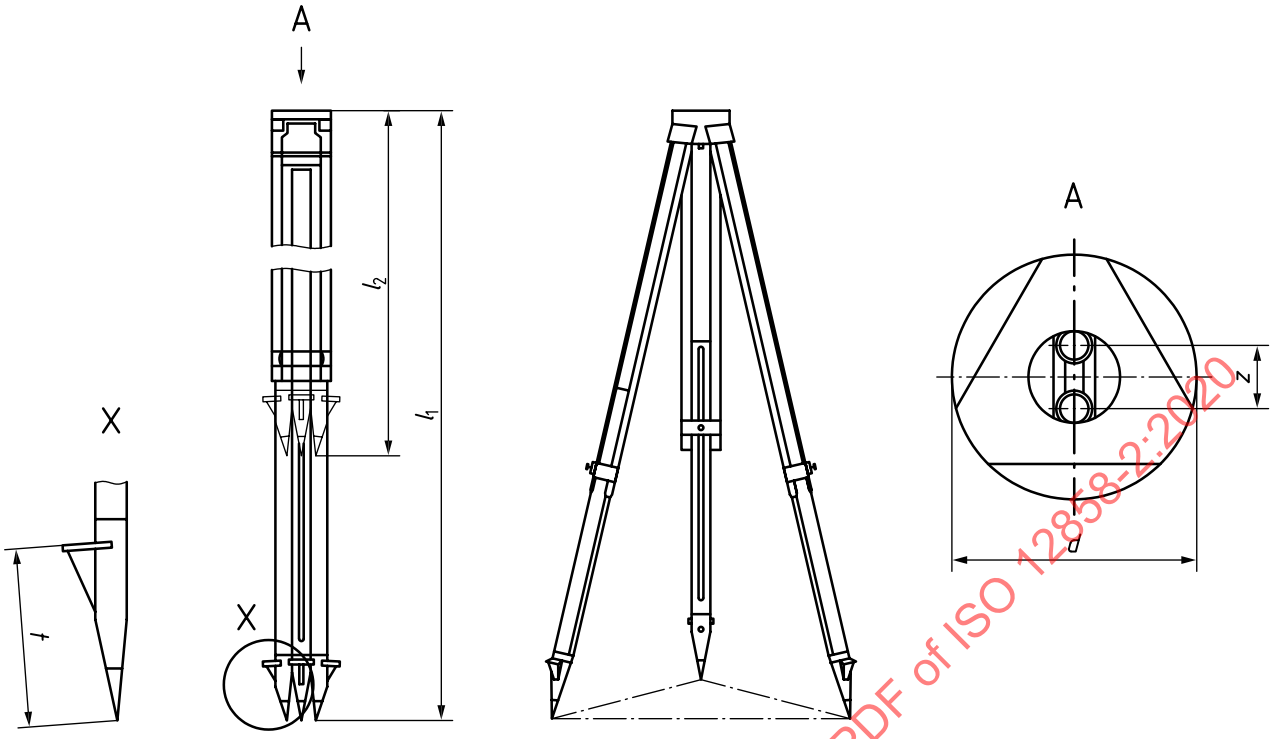


Figure 1 — Design of tripod

Table 1 — Mechanical properties

Parameter		Type of head		
		Flat head		Spherical head
Description	Unit	Type LF	Type H	Type LS
Design		light-weight	heavy-weight	light-weight
Mass of tripod	kg (max.)	5,5	7	5,5
Suitable for instruments weighing	kg (max.)	5	15	5
Symbol[a] in Figure 1				
l_1	mm	1 650	1 700	1 650
l_2	mm	1 200	1 200	1 200
d	mm	125	150	125
z	mm	25	35	25
t	mm	110	125	110

[a] Where

l_1 is the minimum length of tripod, legs extended;

l_2 is the maximum length of tripod, legs retracted;

d is the minimum diameter of tripod platform;

z is the minimum diameter of rotating piece;

t is the minimum distance between step and point.

6 Requirements

6.1 Tripod head

An instrument set on the tripod shall be able to be rotated easily and evenly on the tripod head when the clamping screw is loosened. Additional devices fixed to the tripod head shall not hamper the ability of the tripod to be used with instruments from different manufacturers. Either flat or spherical heads may be used with the tripod.

6.2 Joints

The joints on the tripod legs shall be designed in such a way that the tripod can be set up quickly. The friction of the joints shall be adjustable.

6.3 Clamping screw

The clamping screw shall be provided with a 5/8 in (inch) bolt thread and the instrument base plate with a 5/8 in nut thread. The clamping screw shall be securely fixed to the tripod head such that the centring of the instrument shall not be hindered. The clamping screw shall be hollow with an internal diameter of at least 8 mm, in order that optical centring devices can be used. The suspension point of a plumb line or solid plumb shall be arranged in such a way that a centring accuracy of 2 mm is ensured.

The dimensions given in Figure 2 and Table 2 (for flat heads) and in Figure 3 and Table 3 (for spherical heads) respectively shall be observed.

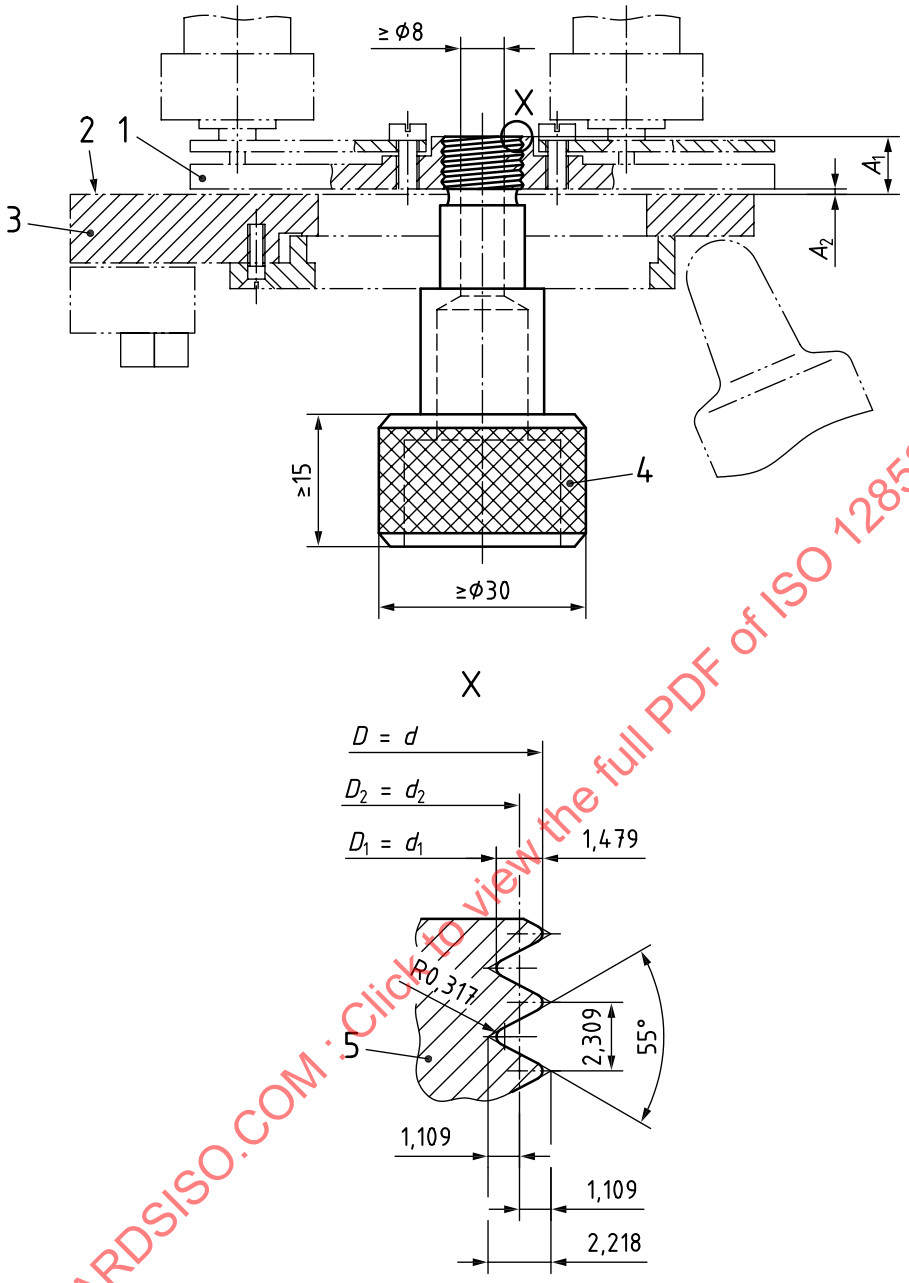
6.4 Tripod legs

For tripods with wooden legs, the wood-metal connections shall be sufficiently adjustable so that even after shrinkage the fittings sit firmly.

6.5 Tripod shoes

The tripod shoes shall be provided with a step. The tips of the tripod shoes shall be made of unhardened steel.

Dimensions in millimetres



Key

1 baseplate
2 level contact surface
3 tripod headplate
4 clamping screw
5 external screw thread (number of threads 11 to 25,4)

Mechanical tolerances shall be according to ISO 2768-1, tolerance class m.

NOTE See Annex A for dimensions D/d, D_1/d_1 and D_2/d_2.

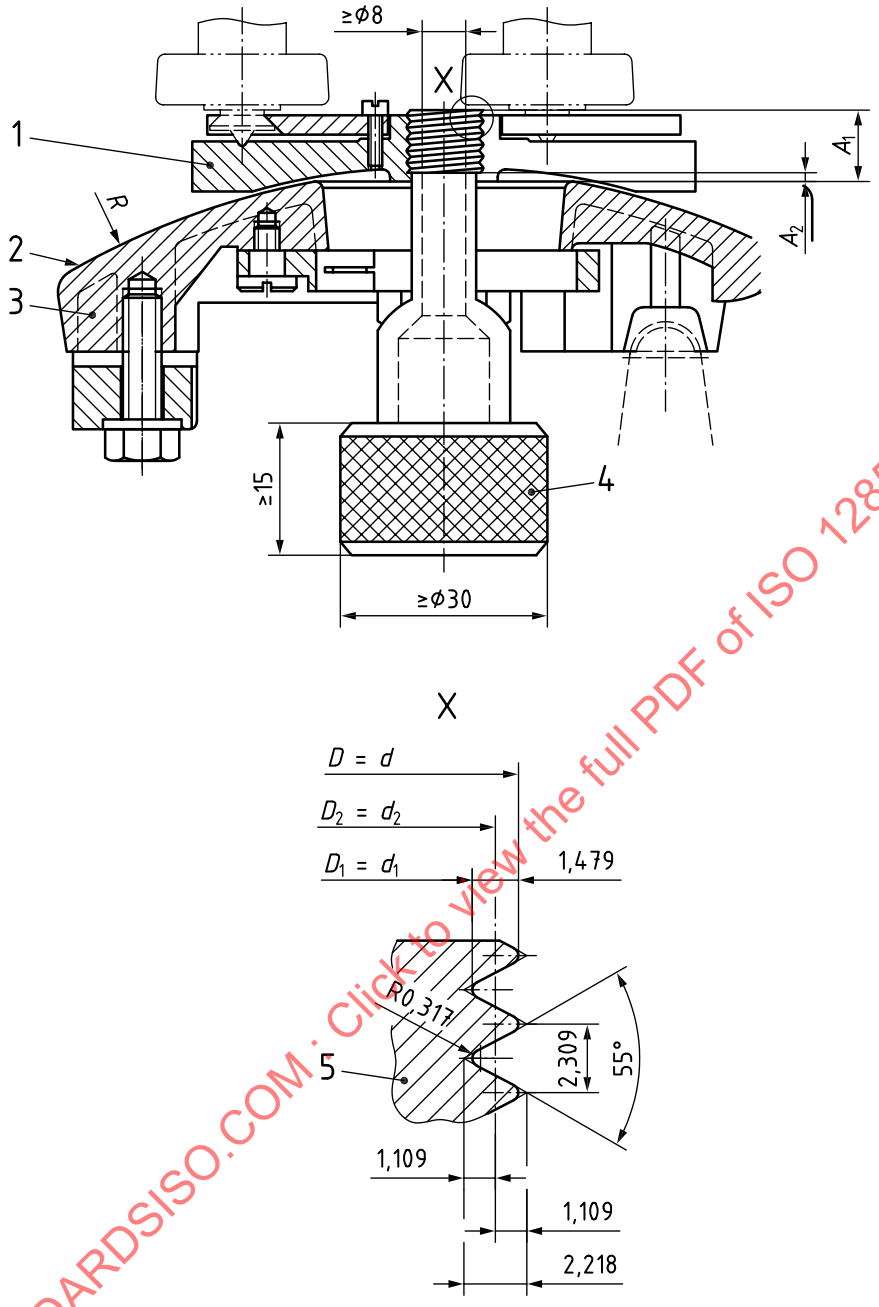
Figure 2 — Connection between instrument and tripod with flat head

Table 2 — Limits of dimensions A_1 and A_2 for tripods with flat head

Dimensions in millimetres

Size	A_1	A_2
Maximum	14	3
Minimum	8	0,5

Dimensions in millimetres



Key

1 baseplate
2 level contact surface
3 tripod headplate
4 clamping screw
5 external screw thread (number of threads 11 to 25,4)

Mechanical tolerances shall be according to ISO 2768-1, tolerance class m.

NOTE See Annex A for dimensions D/d, D_1/d_1 and D_2/d_2.

Figure 3 — Connection between instrument and tripod with spherical head

Table 3 — Limits of dimensions A_1 and A_2 for tripods with spherical head

Dimensions in millimetres

Size	A_1	A_2
Maximum	14	3
Minimum	8	0,5

6.6 Torsional rigidity

The tripod shall be capable of absorbing, without lasting deformation, the torsion which occurs when the instrument is used.

When testing the torsion rigidity, set up the tripod on an unyielding surface in such a way that the tips of the completely extended tripod legs are 1,0 m from each other. The tips should rest in depressions in the ground. Turn the tripod head and theodolite by 60'' (20 mgon) with the help of two diametrically acting tangential forces. The residual torsion shall not exceed the values given in Table 4.

Table 4 — Maximum residual torsion

Tripod type	Maximum residual torsion
L	10'' (3 mgon)
H	3'' (1 mgon)

6.7 Height stability under load

When loading the tripod headplate with double the maximum instrument mass, the tripod headplate shall not sink by more than 0,05 mm in reference to the tips of the tripod shoes.

The change in height which occurs may be measured with a levelling instrument with parallel-plate micrometer clamped on, by observing a levelling staff before, during and after application of the load.

6.8 Material

Tripod head, clamping screw and fittings: choice of material at the manufacturer´s discretion.

Tripod legs: at the manufacturer´s discretion either plastic, metal or well-seasoned, knot-free, straight-grained wood.

6.9 Protection from corrosion

All components shall be resistant to, or protected from, corrosion. The tripod legs may be painted with a warning colour.

7 Tools

The tools required for adjusting the hinge friction (see 6.2) and for adjusting the connections between legs and head (see 6.4) shall be supplied with the tripod.

8 Designation and marking

The marking shall indicate at least the name or trademark of the manufacturer (or the responsible supplier) of the tripod.

The tripod may be marked additionally with the designation, as shown below for the example of a telescopic tripod for a light-weight instrument with flat head: