

BS EN ISO 4375:2014



BSI Standards Publication

Hydrometry — Cableway systems for stream gauging (ISO 4375:2014)

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee CPI/113/1, Hydrometric methods and instrumentation.

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

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English Version

Hydrometry - Cableway systems for stream gauging (ISO 4375:2014)

Hydrométrie - Systèmes de suspension par câbles aériens
pour le jaugeage en rivière (ISO 4375:2014)

Hydrometrische Messungen - Seilkrananlagen für
Messungen in Fließgewässern (ISO 4375:2014)

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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

Foreword

This document (EN ISO 4375:2014) has been prepared by Technical Committee ISO/TC 113 “Hydrometry” in collaboration with Technical Committee CEN/TC 318 “Hydrometry” 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of an identical text or by endorsement, at the latest by May 2015, and conflicting national standards shall be withdrawn at the latest by May 2015.

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 supersedes EN ISO 4375:2004.

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, 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.

Endorsement notice

The text of ISO 4375:2014 has been approved by CEN as EN ISO 4375:2014 without any modification.

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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. www.iso.org/directives

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 113, *Hydrometric determinations*, Subcommittee SC 5, *Instruments, equipment and data management*.

This third edition cancels and replaces the second edition (ISO 4375:2000), which has been technically revised.

Hydrometry — Cableway systems for stream gauging

1 Scope

This International Standard defines the requirements for equipment, anchorage, supports and accessories for cableway systems for use in stream gauging. Systems which are operated either entirely from the river bank or from a suspended personnel carriage (also called a “cable car”) are discussed. This International Standard is only applicable to the cableway systems to be used for hydrometric measurements. Should the cableway installation be required to be certified as lifting equipment, other standards or regulations may apply. This International Standard does not concern methods for making a discharge measurement which are described in ISO 748.

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

ISO 772, *Hydrometry — Vocabulary and symbols*

ISO 80000-4, *Quantities and units — Part 4: Mechanics*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 772, ISO 80000-4 and the following apply.

3.1

cable

wire rope of simple or complex structure or wire cord, fixed or moving in a cableway system

4 General description of a cableway system

4.1 Elements of a cableway system

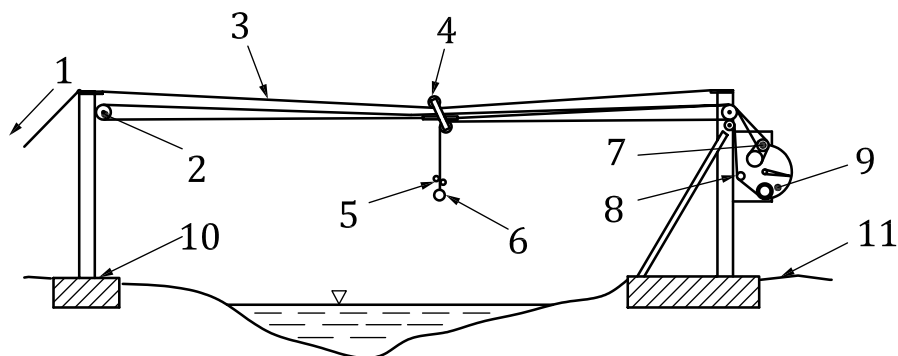
A cableway system can be designed to be operated from the river bank (see [Figures 1](#) and [2](#)) or be designed to be operated from a suspended personnel carriage (see [Figure 3](#)). The general arrangement of the following elements are common to both systems:

- a) towers or cableway supports;
- b) track or main cable;
- c) anchorage;
- d) backstays;
- e) suspension cable.

The main differences are:

- the carriage of a bankside system requires a tow cable;
- a bankside system requires a more complicated winch arrangement;

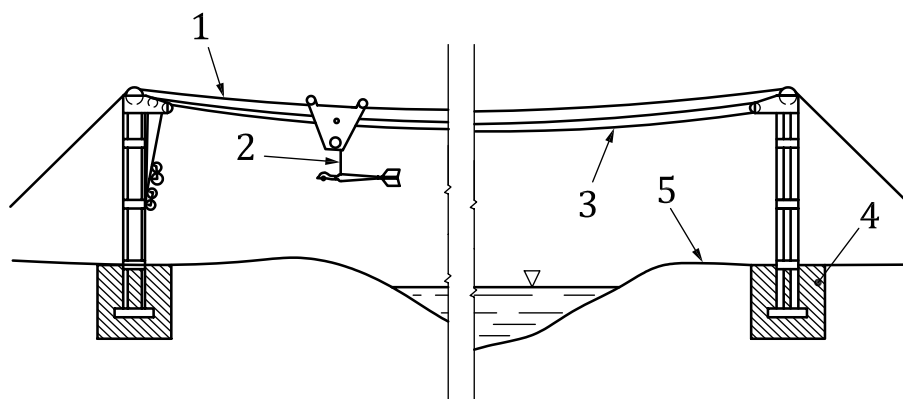
- the personnel carriage has to provide a safe platform for the operator;
- more stringent design requirements may apply to a system which employs a personnel carriage.



Key

- | | |
|--|------------------------|
| 1 backstay | 7 distance measurement |
| 2 traversing cable return pulley | 8 depth measurement |
| 3 track or main cable | 9 cable drum |
| 4 traveller and/or instrument carriage | 10 footing |
| 5 current meter | 11 ground level |
| 6 sinker or sounding weight | |

Figure 1 — Cableway system — Bankside operation, with loop-traversing cable and spooled sounding cable



Key

- | | |
|-----------------------|----------------|
| 1 track or main cable | 4 footing |
| 2 suspension cable | 5 ground level |
| 3 tow cable | |

Figure 2 — Cableway system — Bankside operation, with spooled tow cable and spooled sounding cable

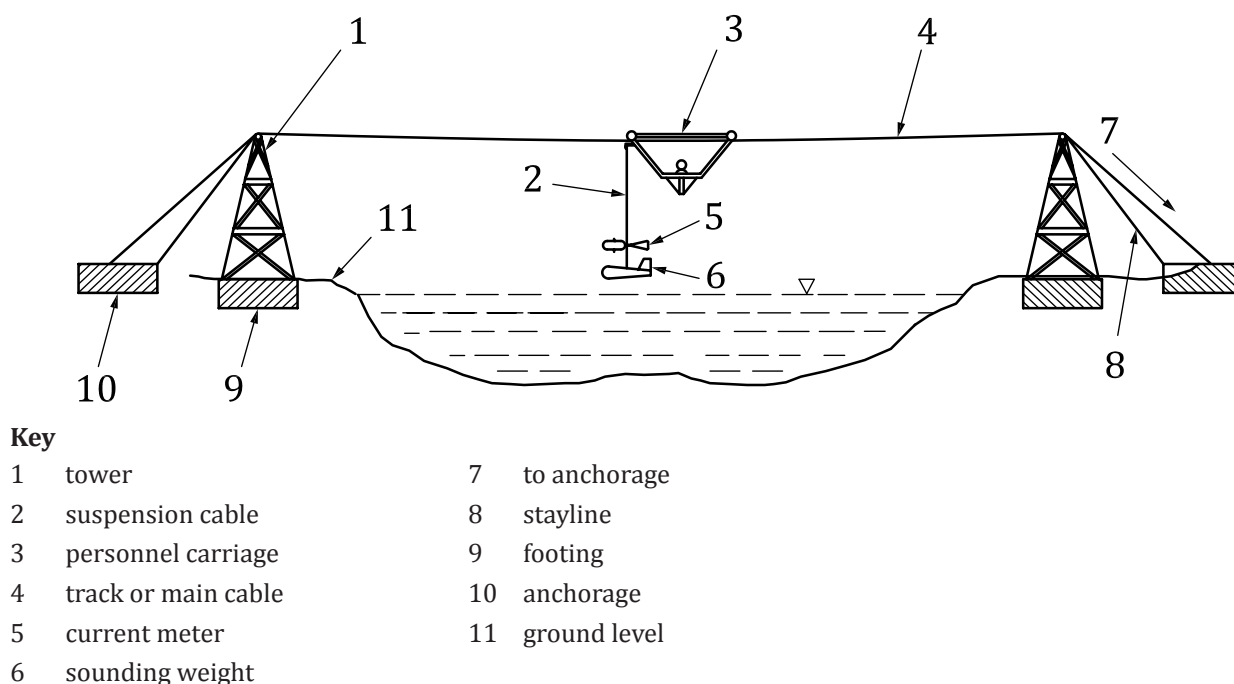


Figure 3 — Cableway system — Suspended personnel carriage

4.2 Cableway supports

The cableway supports, one on each bank, support the main cable span across the stream. They may also provide mountings for the winch and the pulleys (sheaves) carrying the tow and suspension cables.

4.3 Main track or main cable

The track or main cable is designed to carry the whole suspended load. The track may be attached directly to stayed cableway supports or be supported on saddles on the cableway supports and led directly to an anchorage.

4.4 Anchorage

Anchorage points are required to carry the loads induced in the cableway and tower system. Depending upon the design of the system, they may be anchorage points for track and backstays or guy-lines, tower foundations subject to compression or tower foundations subject to compression and moment.

4.5 Tow cable for a bankside system

The tow cable is required to move and position the instrument carriage. Generally the tow cable is arranged as an endless loop from the instrument carriage over guiding sheaves on the winch tower, round a driving pulley or drum, across to an idler pulley (sheave) on the tower on the opposite bank and back to the carriage (see [Figure 1](#)). An alternate arrangement uses a spooled tow cable with a single fixing point on the carriage. This arrangement depends upon the equal and opposite force provided by the suspension cable (see [Figure 2](#)).

4.6 Suspension cable

The suspension cable provides the means of raising and lowering sensing or sampling equipment in the stream. The free end of the cable is fitted with connectors to attach equipment and sounding weights. The suspension cable is likely to contain an insulated conducting core to provide a signal path from suspended instruments.

4.7 Instrument carriage for a bankside system

The instrument carriage is provided with one or more track wheels running on the main cable (track), a pulley to support the suspension cable and a point of attachment for the tow (traveller) cable.

4.8 Personnel carriage

The carriage from which gauging observations are made, travels along the main cable. It is suspended from track wheels running on the main cable. The carriage may be moved along the main cable manually or by a power unit. The carriage can be designed to be operated from either the standing or sitting position or both. A cableway employing a personnel carriage shall comply with the safety requirements for passenger cableways where such standards exist specially for horizontal fixed cableways, in all aspects not covered by this International Standard.

4.9 Winch arrangements for a bankside system

A double drum winch is one that provides both traversing and sounding functions within one piece of equipment. One drum controls the suspension cable, the other controls the movement of the carriage. The latter may be a spooling drum or take the form of a friction drive pulley driving an “endless” loop. Both drums may be driven simultaneously in traversing mode or, in sounding mode, the traversing drum may be locked to allow operation of the suspension cable drum only. This operation may also be carried out using two single drum winches. Measuring counters may be fitted to record horizontal and vertical cable movement.

4.10 Winch arrangements for a personnel carriage

A winch (sounding reel) is attached to the carriage (cable car) to raise and lower the sounding weight. The winch is required to operate properly under the load of the sounding weight but both the winch and its mountings should be capable of accommodating the breaking load of the suspension cable with a factor of safety (FoS) of two. The winch may be hand operated or power driven.

4.11 Lightning protection

In areas where electrical storms are considered a risk to cableway operators, provision shall be made to reduce the likelihood of injury from a lightning strike on the cableway system. In countries where lightning is infrequent and lightning protection not considered necessary, work instructions should allow for abandonment of operations in the event of an electrical storm.

5 Functional requirements of cableway components

5.1 Safety factors

5.1.1 General

Factors of safety shall be applied to ensure that the equipment is able to cope with normal working without failure and to protect the operator in case of abnormal but foreseeable incidents.

The most likely risk of failure of properly maintained cableway systems lies with the possibility of the suspended equipment becoming caught up on a large floating object. Trees being carried down in a flood are the most likely source of this danger. The excess loading is applied to the system through the suspension cable. In a bankside system, the tension in this cable is equal to, and balanced by, the tension in the “return” side of the tow cable. In both bankside systems and systems with personnel carriages, the load in the suspension cable is also applied to the main cable (track) through the carriage.

For both arrangements, the FoS for normal working shall be achieved by specifying the suspension cable in relation to a maximum working load. The specification of all other cables shall be with respect to the breaking load of the specified suspension cable.

5.1.2 Suspension cable

The suspension cable shall be selected to provide a minimum FoS of 5 in relation to the maximum authorized suspended load. The maximum authorized suspended load is the sum of the maximum authorized sounding weight plus an allowance for the mass of sensing/sampling equipment.

5.1.3 Tow cable

The tow (traversing) cable shall be selected to provide a FoS of 1,25 with respect to the breaking load of the suspension cable.

5.1.4 Track cable

The track cable shall be selected to provide a FoS, with respect to the breaking load of the suspension cable, as follows:

- a) bankside cableway system with instrument carriage: 2
- b) cableway with suspended personnel carriage: 5

5.1.5 Marking

Cableways shall be clearly marked to indicate maximum authorized sounding weights and approved suspension cable specification. At an established site, the use of a suspension cable with a breaking load greater than specified at an established site reduces the FoS with respect to the track cable.

5.2 Cableway supports

5.2.1 Approaches

A safe and convenient approach should be available throughout the year on both banks so that personnel may have easy access to the installation for inspection and operation. It is recognized that access to the far bank may not always be possible in difficult terrain. If this is the case, it should be recognized in the operation procedures for that site.

5.2.2 Design load

The cableway supports shall be designed to withstand the breaking load of the track cable selected plus allowance for relevant wind loading. Attention shall be paid to lateral loading as a consequence of drag on the suspended load and allowance made for the extreme condition as the suspension cable approaches breaking point.

5.2.3 Foundation placement

The foundation of the tower should extend from below the frost line to at least 300 mm above ground level. The size and design of the foundation is dependent on soil conditions and is beyond the scope of this International Standard.

5.2.4 Height

The height of the cableway support shall be such that all parts of the equipment, suspended from the centre of the span, shall be at least 1m above the highest flood level to be measured, but at no time present a hazard to navigation or wildlife. Consideration should also be given to marking the cableway in areas where canoes and aircraft are used in its vicinity. In certain localities, high structures may be governed by regulations requiring the provision of aircraft warning markers or warning lights on the track cable.