FINAL DRAFT
International Standard

ISO/FDIS 10855-2

Offshore containers and associated lifting sets —

Part 2: Design, manufacture and marking of lifting sets

Conteneurs pour une utilisation en mer et dispositifs de levage associés —

Partie 2: Conception, fabrication et marquage des dispositifs de levage associés

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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 document 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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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 67, *Oil and gas industries including lower carbon energy*, Subcommittee SC 7, *Offshore structures*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 12, *Oil and gas industries including lower carbon energy*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 10855-2:2018), which has been technically revised.

The main changes are as follows:

— hardness requirements have been defined for chain and link components.

A list of all parts in the ISO 10855 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

The ISO 10855 series meets the requirements of IMO MSC/Circ.860 (1998) for the design, construction, inspection, testing and in-service examination of offshore containers and the associated lifting sets which are handled in open seas.

The ISO 10855 series does not cover operational use or maintenance.

Under conditions in which offshore containers are often transported and handled, the 'normal' rate of wear and tear is high, and damage necessitating repair can occur. However, containers designed and manufactured according to the ISO 10855 series have sufficient strength to withstand the normal forces encountered in offshore operations and to not suffer from complete failure even if subject to extreme loads.

Offshore containers and associated lifting sets —

Part 2:
Design, manufacture and marking of lifting sets

1 Scope

This document specifies requirements for lifting sets for use with containers in offshore service, including technical requirements, marking and statements of conformity for single and multi-leg slings, including chain slings and wire rope slings.

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 148-1, *Metallic materials — Charpy pendulum impact test — Part 1: Test method*

ISO 2415, *Forged shackles for general lifting purposes — Dee shackles and bow shackles*

ISO 10474, *Steel and steel products — Inspection documents*

ISO 15613, *Specification and qualification of welding procedures for metallic materials — Qualification based on pre-production welding test*

EN 818-4, *Short link chain for lifting purposes. Safety Chain slings - Grade 8*

EN 13414-1, *Steel wire rope slings — Safety — Part 1: Slings for general lifting service*

3 Terms and definitions

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

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

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

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

3.1
lifting set
items of integrated lifting equipment used to connect the offshore container to the lifting appliance

Note 1 to entry: This can comprise one or multi-leg wire rope or chain slings (with or without a top leg) and shackles, whether assembly secured or not.

3.2
sling
one leg of a lifting set

3.3
assembly secured
fitted to a sling leg and secured by a seal or similar device so as to signal unambiguously whether or not the shackle has been exchanged

Note 1 to entry: Shackles that are assembly secured, i.e. cannot be separated from the lifting set, are considered to be part of the lifting set.

4 Symbols and abbreviated terms

$m_{WLL,s}$	minimum working load limit of each shackle, in t
$m_{WLL,min}$	minimum calculated working load limit from Annex A, in t
$m_{WLL,off}$	maximum lifting capacity of a lifting set to be used on an offshore container, in t

NOTE 1 $m_{WLL,off}$ is the value that is to be marked on the lifting sets and may be higher than m_R.

ϑ	is the angle between a sling leg and the vertical, in degrees
m_R	rating [i.e. the maximum gross mass (MGM), of the container including permanent equipment and its cargo], in kg, but excluding the lifting set
m_T	tare mass (i.e. the mass of an empty container including any permanent equipment but excluding cargo and lifting set), in kg
m_P	payload (i.e. the maximum permissible mass of cargo which can be safely transported by the container), in kg
T_D	design air temperature (i.e. a minimum reference temperature used for the selection of steel grades used in offshore containers and equipment) expressed, in °C
m_S	mass of the lifting set in kg

NOTE 2 $m_P = m_R - m_T$.

NOTE 3 m_R, m_T and m_P are expressed in kg. Where design requirements are based on the gravitational forces derived from these values, those forces are indicated thus as m_Rg, m_Tg and m_Pg, expressed in N.

5 Technical requirements

5.1 General requirements

5.1.1 Slings shall be rated for their intended angle of use. In all cases 4-leg slings shall be rated as for 3-leg slings. Maximum sling leg angle to the vertical shall be 45°.

NOTE Top legs are calculated as single legs.

The minimum working load limit for each sling leg shall be calculated as per Table 1.

For chain slings the alternative method of rating in EN 818-4 Annex A shall be applied.

5.1.2 Where two 2-leg slings are selected to function as a 4-leg sling, they shall be calculated as for a 4-leg sling.

5.1.3 Hinge type coupling components shall not be used.

NOTE This restriction is to avoid the possibility of the coupling seizing in the folded position due to corrosion and subsequently failing when forced straight under load.

5.2 Dimensions and strength of lifting sets

5.2.1 To allow for the dynamic amplification that is experienced in offshore lifting in adverse weather and sea states, the working load limit of the lifting sets for offshore containers shall be determined using Annex A. Except for containers with ratings below 2 000 kg, the container rating m_R shall be multiplied by an enhancement factor to give the minimum working load limit ($m_{WLL,min}$) of the lifting set. For intermediate container ratings the $m_{WLL,min}$ values shall be interpolated.

5.2.2 The $m_{WLL,min}$ from Annex A shall be used for determination of the nominal size of the lifting set.

The master link which is to be attached to the crane hook shall have minimum dimensions of 270 mm × 140 mm internally.

5.2.3 The minimum working load limit of each shackle ($m_{WLL,s}$) shall be calculated as given in Table 1.

Table 1 — Required minimum shackle working load limit ($m_{WLL,s}$)

4-leg sling	2-leg sling	Single leg sling
$m_{WLL,min}$ /(3 × cos ϑ)	$m_{WLL,min}$ /(2 × cos ϑ)	$m_{WLL,min}$

5.2.4 The lifting set should be of sufficient length to allow easy handling by operators. The top link or master link shall be able to reach down to a height of no more than 1,3 m above the container bottom when the sling hangs over the long side of the container.

5.3 Chain slings

Chain slings shall meet all requirements of EN 818-4.

5.4 Wire rope slings

5.4.1 Wire rope slings shall meet all the requirements of EN 13414-1 with restrictions as specified in 5.4.2 and 5.4.3.

5.4.2 The wire rope shall be 6-stranded and of type 6 × 19 or 6 × 36.

5.4.3 The termination of wire rope shall be a ferrule secured thimble.

As an aid to in-service inspection, ferrules which permit the tail end of the rope to be visible should be used.

5.4.4 Wire rope grade 1770 or 1960 shall be used. The working load limit shall be calculated on the basis of the actual rope grade used.

NOTE This also applies when slings are rated and marked in accordance with 5.1.1, NOTE.

5.5 Shackles

5.5.1 Shackles shall be of Grade 6 or Grade 8 and meet all the requirements of ISO 2415, with the additional requirement that the tolerance on the nominal diameter of the shackle pin shall be −0 +3 %.

NOTE EN 13889 and EN 1677-1 are considered alternative standards to ISO 2415.

5.5.2 Shackles shall be restricted to bolt type pin with a hexagon head, hexagon nut and split cotter pin.

5.6 Materials

5.6.1 Impact testing

Steels in chains, links, shackles and couplings shall be impact tested by the Charpy impact (V-notch) method in accordance with ISO 148-1. The impact test temperature shall be equal to the design air temperature T_D and the minimum average impact energy shall be 42 J. However, for welded components (e.g. chains, links,) it shall be sufficient only to take impact test samples in the weld with the notch centred in the fusion line. The position of the weld shall be accurately identified by etching with a suitable reagent before cutting the notches. The minimum average impact energy of the weld shall be 27 J.

Where the cross section of the material to be tested is too small to allow the standard test specimen to be taken (10 mm × 10 mm), the required energy values shall be reduced as follows:

— 10 mm × 7,5 mm: $\frac{5}{6}$ of the minimum average impact energy for standard size specimens;

— 10 mm × 5,0 mm: $\frac{2}{3}$ of the minimum average impact energy for standard size specimens.

For tests where the size of the test piece is too small (diameter less than 13 mm), tests may be carried out on sample material which shall be of the same specification and heat treatment.

5.6.2 Hardness testing

Chains and link components should not exceed hardness value of 38 HRC. See ISO 18265 for hardness conversion values.

5.6.3 Welding

In addition to the requirements of EN 818-4, qualification of the welding process shall be in accordance with ISO 15613.

5.6.4 Corrosion protection

Corrosion protection coatings shall only be applied under the control of the manufacturer of the component.

5.6.5 Material certificates

The materials used in all components shall be supplied with an inspection certificate in accordance with either ISO 10474, type 3.1, or, in the case of materials in ferrules and thimbles, ISO 10474, type 2.2, with content as detailed in Clause 6.

6 Certificates

6.1 Preparation of certificates

Certificates provided in support of claims of conformity to the requirements of this document shall be prepared in accordance with ISO 10474 and contain the information specified in the relevant product standard, together with that specified in 6.2 or 6.3 as appropriate.

6.2 Single component certificates

Single components used in slings conforming to this document shall have certificates as specified in 5.6.5, containing the information specified in the relevant product standard together with the following, as a minimum:

— manufacturer's name, mark and contact location;

— date of issue for the certificate (YYYY-MM-DD);

— certificate number;

— description of the component;

— identification of the relevant product standard;

— material specification including chemical composition and mechanical properties;

— results from tests specified in the relevant product standard and this document;

— record of the unique identification number or mark carried by the component;

— manufacturer's authorized signature.

6.3 Sling certificates

Slings conforming to this document shall be supplied with a certificate (type ISO 10474:2013, 3.1) containing the information specified in the relevant product standard together with the following, as a minimum:

— manufacturer’s name, mark and contact location;

— date of issue for the certificate (YYYY-MM-DD);

— sling certificate number;

— description of the sling, including unique identification number or mark;

— reference to each single component's unique identification mark (if new components are installed before re-certification, this shall include reference to the previous certificate number and the new component's unique identification mark);

— nominal size and length of the sling;

— $m_{WLL,off}$ together with the appropriate angle to the vertical for multi-leg slings and the method of rating;

— date of sling manufacture or re-certification;

— a statement that the sling described has been designed, manufactured and tested in accordance with this document;

— manufacturer's authorized signature.

In addition:

— for wire rope slings, the grade of terminal fittings and the rope together with a statement that the sling conforms to EN 13414-1;

— for chain slings, the grade mark 8 and a statement confirming that the sling conforms to EN 818-4 and providing cross reference to the results of any final testing of mechanical properties after heat treatment.

7 Marking

7.1 In addition to the marking required by the relevant individual component standards, the requirements of 7.2 to 7.4 apply.

7.2 Shackles fitted to a sling, without being assembly secured, shall be indelibly marked with a unique identification.

Marking should be applied to shackles that are not assembly secured using 'low stress' stamps, with a minimum text height of 5 mm, and positioned away from areas of highest tensile stress, i.e. applied to the straight section of the body adjacent to the eye.

7.3 Slings shall normally be marked with an identification tag permanently attached to the top assembly of the sling. The tag shall be permanently embossed or stamped. The tag shall be 8-sided for chain slings and round for wire rope slings.

As an alternative to marking slings with a tag, one of the following methods may be used for marking.

— Method 1: The marking required by 7.5 may be marked on a ferrule on wire rope slings.

— Method 2: Slings may be marked with a small tag with only an ID number on it. All other information required by 7.5 shall be available, either electronically or by other means.

NOTE Dropped objects such as an identification tag on an offshore container lifting set can be a major health and safety issue. The risk of such accidents can be reduced or removed if one of the alternative solutions are used. However, such alternative marking can be unaccepted by national authorities or other stakeholders.

7.4 Where two 2-leg slings are selected to function as a 4-leg sling, both shall be marked as a 4-leg sling.

7.5 The marking on tags for chain and wire rope slings shall include:

— reference to this document;

— unique identification reference of the sling;

— number of legs;

— diameter of chain or wire rope used, including the top leg, where fitted;

— $m_{\mathrm{WLL,off}}$ in t;

— shackle size in t;

— maximum angle of the sling legs to the vertical;

NOTE An example of an identification tag for chain slings is shown in Annex B.

Annex A
(normative)

Determination of minimum required working load limit ($m_{WLL,min}$) of the lifting set

Table A.1 shows determination of minimum required working load limit.

Table A.1 — Determination of minimum required working load limit

Container rating (m_R) (kg)	Enhancement factor	Minimum required working load limit of the lifting set $m_{WLL,min}$ (t)
500	—	7,00
1 000	—	7,00
1 500	—	7,00
2 000	3,500	7,00
2 500	2,880	7,20
3 000	2,600	7,80
3 500	2,403	8,41
4 000	2,207	8,83
4 500	2,067	9,30
5 000	1,960	9,80
5 500	1,873	10,30
6 000	1,766	10,60
6 500	1,733	11,26
7 000	1,700	11,90
7 500	1,666	12,50
8 000	1,633	13,06
8 500	1,600	13,60
9 000	1,567	14,10
9 500	1,534	14,57
10 000	1,501	15,01
10 500	1,479	15,53
11 000	1,457	16,03
11 500	1,435	16,50
12 000	1,413	16,96
12 500	1,391	17,39
13 000	1,368	17,78
13 500	1,346	18,17
14 000	1,324	18,54
14 500	1,302	18,88
15 000	1,280	19,20
15 500	1,267	19,64
16 000	1,254	20,06

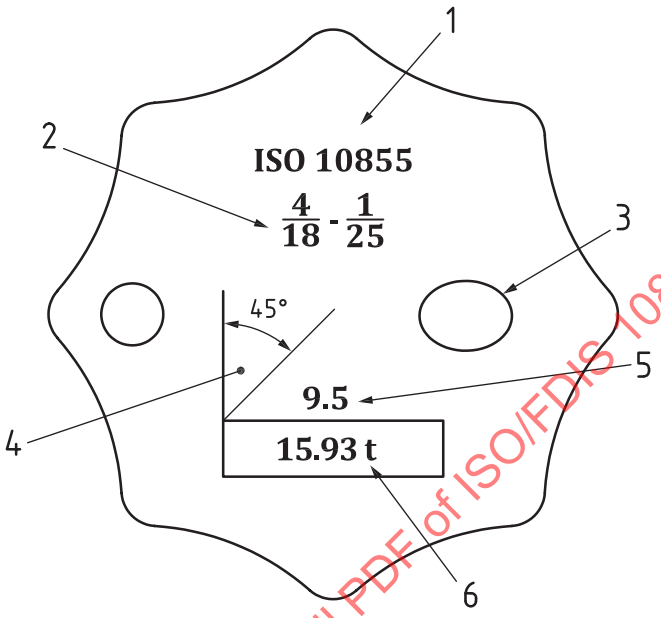
Table A.1 *(continued)*

Container rating (m_R) (kg)	**Enhancement factor**	**Minimum required working load limit of the lifting set** $m_{WLL,min}$ (t)
16 500	1,240	20,46
17 000	1,227	20,86
17 500	1,214	21,25
18 000	1,201	21,62
18 500	1,188	21,98
19 000	1,174	22,31
19 500	1,161	22,64
20 000	1,148	22,96
20 500	1,143	23,43
21 000	1,139	23,92
21 500	1,135	24,40
22 000	1,130	24,86
22 500	1,126	25,34
23 000	1,121	25,78
23 500	1,117	26,25
24 000	1,112	26,69
24 500	1,108	27,15
25 000	1,104	27,60

Annex B
(informative)

Example of identification tag for chain slings

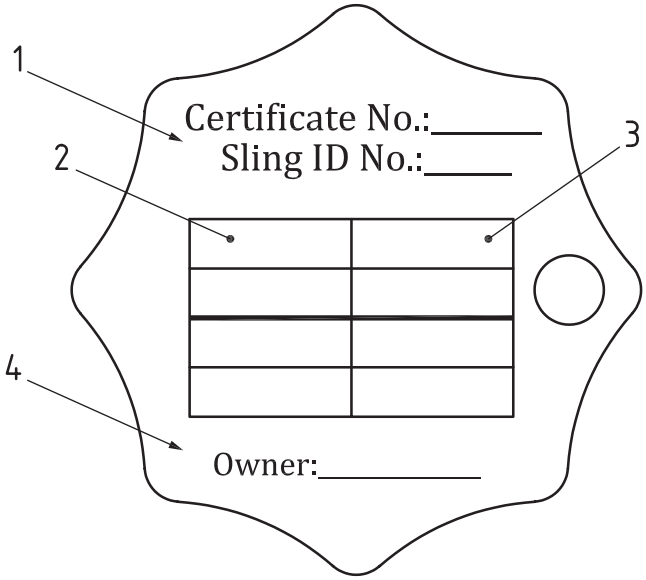
Figures B.1 and B.2 show an example of an identification tag for chain slings.



Key

1 ISO number
2 four legs of 18 mm, one top leg of 25 mm (example)
3 manufacturer's mark
4 sling leg angle
5 shackle size
6 $m_{WLL,off}$ (t)

Figure B.1 — Front of identification tag



Key

1 unique identification reference

2 column 1: inspectors mark, inspection suffix and date of periodic inspections (shall be of format YY-MM)

3 column 2: shackle ID number

4 the owner's name may optionally be included

Figure B.2 — Back of identification tag

Annex C
(informative)

Regulations for offshore containers

C.1 General

This annex contains information about various regulatory requirements which apply for offshore containers. Designers, manufacturers and users of offshore containers must be aware of these requirements.

Several international and national certification schemes are applicable for various categories of portable containers. Several of these certification schemes are applicable for offshore containers as defined in this document.

C.2 General certification requirements for offshore containers

The International Maritime Organization (IMO) has issued guidelines for certification of offshore containers, in circular MSC/Circ.860.

The circular is intended to guide national authorities ("the Administration") in developing approval and certification requirements for offshore containers. The circular recommends that offshore containers be approved, prototype tested, certified and periodically inspected by duly authorized bodies ("the Approving Competent Authority").

C.3 International requirements for freight containers

IMO's International Convention for Safe Containers (CSC) requires freight containers, as defined in that Convention, to be certified to CSC. Offshore containers, as defined in MSC/Circ.860, are not covered by the CSC. However, some offshore containers which are used internationally for transport of cargo, will also fall within the definition of a container in the CSC. For such offshore containers the requirements of both MSC/Circ.860 and the CSC are applicable.

C.4 Tank containers for dangerous goods

All tank containers intended for marine transport of dangerous goods must be certified to the International Maritime Dangerous Goods Code (the IMDG Code). The IMDG Code is a mandatory code under IMO's SOLAS Convention.

C.5 Gas Cylinder Bundles

Gas Cylinder Bundles, as defined in Chapter 6.2 in the IMDG Code, may be designed as offshore containers. The IMDG Code requires such offshore gas cylinder bundles to be approved, tested and certified to Chapter 6.2 in the IMDG Code, and to ISO 10961 and to the requirements in this document.

NOTE Local regulations that apply to Gas Cylinder Bundles can apply, e.g. European ADR/RID regulations.

C.6 Additional requirements for offshore service containers

In addition to the transport related requirements covered by the ISO 10855 series and the regulations referred to above, offshore containers may be designed or equipped for special service tasks, e.g. laboratories, control stations, workshop, accommodation, stores, power plants, process units.