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## Shipbuilding — Trawl winches

*Construction navale — Treuils de pêche*

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Reference number  
ISO 6115:1988 (E)

## 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 6115 was prepared by Technical Committee ISO/TC 8, *Shipbuilding and marine structures*.

This second edition cancels and replaces the first edition (ISO 6115 : 1981) of which it constitutes a minor revision.

Annex A forms an integral part of this International Standard; annexes B and C are given for information only.

# Shipbuilding — Trawl winches

## 1 Scope

This International Standard specifies requirements and characteristics of single-drum and double-drum trawl winches with electric, electro-hydraulic, hydraulic diesel or externally powered drive.

The winches are used for hauling-in, paying-out and holding the trawl rope while fishing by means of trawling fishing gear.

When equipped with additional auxiliary drums, they may also be used for auxiliary operations when hauling-in, paying-out and emptying the trawl net.

## 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 2408 : 1985, *Steel wire ropes for general purposes — Characteristics.*

ISO 2944 : 1974, *Fluid power systems and components — Nominal pressures.*

ISO 3828 : 1984, *Shipbuilding and marine structures — Deck machinery — Vocabulary.*

ISO 4413 : 1979, *Hydraulic fluid power — General rules for the application of equipment to transmission and control systems.*

ISO 6482 : 1980, *Shipbuilding — Deck machinery — Warping end profiles.*

ISO 7825 : 1985, *Shipbuilding — Deck machinery — General requirements.*

IEC 92 : 1965 to 1988, *Electrical installations in ships.*

IEC 529 : 1976, *Classification of degrees of protection provided by enclosures.*

## 3 Definitions

For the purposes of this International Standard, the definitions given in ISO 3828 and the following definitions apply.

**3.1 nominal size:** Drum load on the trawl rope drum, in tonnes, as stated in table 1, for a single-drum trawl winch.

NOTE — For a double-drum trawl winch, the nominal size corresponds to twice the drum load stated in table 1.

**3.2 drum load:** Maximum trawl rope tension, measured at the drum exit with a trawl rope being hauled-in at the nominal speed and being wound onto the appropriate nominal trawl rope winding diameter of the drum.

**3.3 design torque:** Driving torque available at the drum, resulting from the drum load applied to the half-length rope nominal trawl rope winding diameter, for a single-drum winch.

NOTE — For a double-drum winch, the design torque is twice the design torque of a single-drum winch.

### 3.4 Nominal trawl rope winding diameter

**3.4.1 winding diameter full-length rope:** Diameter when the whole design length of the rope has been wound onto the drum, i.e. diameter of the outermost layer of the rope.

**3.4.2 winding diameter half-length rope:** Diameter when half of the design length of the rope has been wound onto the drum.

**3.5 nominal speed of trawl rope:** Maximum hauling-in speed of a rope obtainable by the winch at drum load applied to the appropriate nominal rope winding diameter.

### 3.6 Paying-out speed of trawl rope

**3.6.1 paying-out speed under regenerative braking** (or equivalent type of braking) : Maximum paying-out speed of a rope obtainable by the winch at 0,5 drum load applied to the appropriate nominal rope winding diameter, while paying-out the rope by means other than a friction brake.

**3.6.2 paying-out speed under friction braking** : Twice the nominal speed at 0,5 drum load applied to the appropriate nominal rope winding diameter, while paying-out the rope using the friction brake.

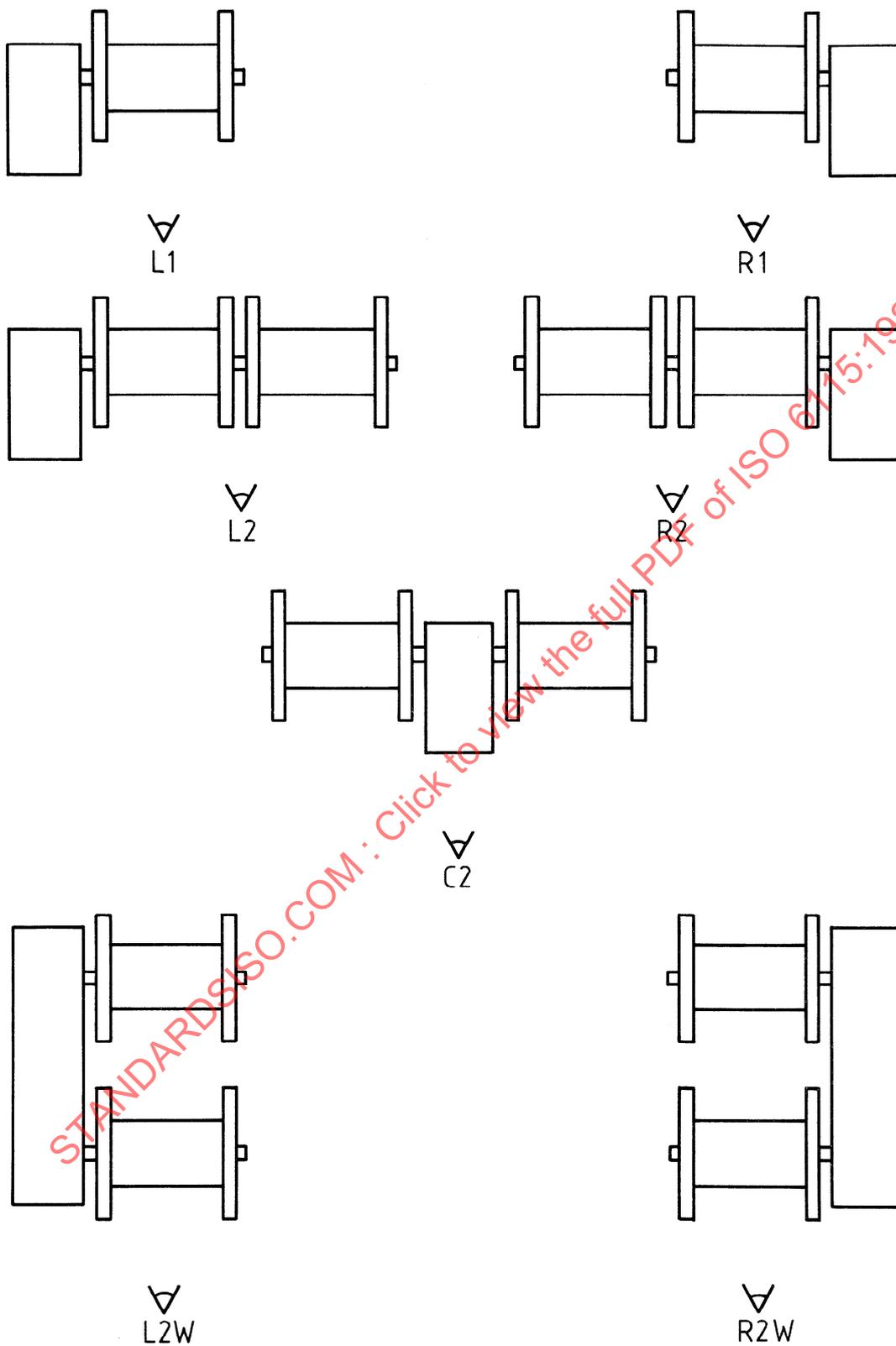


Figure 1 – Examples of right-hand (R), left-hand (L) and central (C), single- and double-drum trawl winches

**3.7 single-drum trawl winch:** Winch equipped with one main trawl rope drum. (See figure 1: L1 or R1).

**3.8 double-drum trawl winch:** Winch equipped with two main trawl rope drums, double in-line or waterfall, provided with a common drive. (See figure 1: L2, R2, C2, L2W or R2W.)

### 3.9 Single-drum trawl winch side

**3.9.1 right-hand winch:** Winch where the reduction gear or the drum drive is on the right-hand side of the main drum, in relation to an observer situated on the side of the motor, power supply or controller.

**3.9.2 left-hand winch:** Winch where the reduction gear or the drum drive is on the left-hand side of the main drum, in relation to an observer situated on the side of the motor, power supply or controller.

## 4 Design and operation

### 4.1 General requirements

Trawl winches shall meet the general requirements for deck equipment in ISO 7825 and the specific requirements given in 4.2 to 4.12.

### 4.2 Auxiliary equipment

**4.2.1** Trawl winches may be also fitted with auxiliary drums and warping-ends: if these are fitted, their positions and characteristics shall be agreed between the purchaser and manufacturer.

For the profile of warping-ends, see ISO 6482.

**4.2.2** A spooling gear is to be fitted to the main drum in order to achieve uniform winding of the trawl rope, unless otherwise agreed between the purchaser and manufacturer.

The auxiliary drums may also have spooling gears, if agreed between the purchaser and manufacturer.

Provision shall be made for manual adjustment of any spooling gear fitted.

Mechanical spooling gear (if fitted) shall be designed to operate against the drum load, at fleet angles up to 6° per side in horizontal and vertical planes.

If the spooling gear is automatically driven, it shall be possible to disengage the spooling carriage. Subject to agreement between the manufacturer and purchaser, the spooling gear shall be adaptable to wires of more than one diameter.

### 4.3 Control and measuring instruments

**4.3.1** A trawl winch may have an instrument to measure the tension in the trawl rope, if agreed between the purchaser and manufacturer. The equipment shall be capable of measuring

the tension while the rope is being paid-out, hauled-in and when trawling the fishing gear. The measurement of tension may be replaced by the measurement of torque at the drum whilst trawling, if agreed between the purchaser and manufacturer. It is recommended, for winches greater than nominal size 4 (see table 1), that the tension should be measured without contact of the measurement instruments (pick-up) with the trawl rope.

**4.3.2** A trawl winch may have an instrument to measure the length of paid-out trawl rope, if agreed between the purchaser and manufacturer. Instrument error shall not exceed 0,15 % of the trawl rope lengths.

**4.3.3** A trawl winch may have instruments to measure the electrical and/or hydraulic values as agreed between the purchaser and manufacturer.

### 4.4 Signalling devices

If agreed between the purchaser and manufacturer, a trawl winch may be fitted with adequate signalling devices giving necessary information on

- a) the winch and its components being ready for operation;
- b) which components of the winch are being operated;
- c) the engaging of clutches and/or drum brakes;
- d) failure of winch components;
- e) overloads and other dangerous conditions, for example:
  - the trawl rope being down to the first layer on the drum while paying-out the fishing gear,
  - no release of the automatic brake,
  - allowable temperature of the electric motor windings being exceeded,
  - slipping of the trawl drum while trawling the fishing gear,
  - overloading of the spooling gear.

### 4.5 Protection

**4.5.1** Overload protection of trawl winches shall be provided during hauling-in. It shall operate under overload not exceeding 1,5 times the value of drum load at the outermost layer of a trawl rope being fully wound onto the drum, unless a higher value is agreed between the purchaser and manufacturer. A time interval protection device shall be fitted to overcome the transient overloads experienced in service. When the protection device of one winch has operated, the second winch shall stop simultaneously.

**4.5.2** Facilities for paying-out the rope under conditions of winch overload, while still trawling the fishing net, shall be provided. For overloads up to 1,5 times the drum load at the outermost layer, a multistep or continuous control of such device shall be possible. If agreed between the purchaser and manufacturer, the device may operate automatically in which case means of switching off the device shall exist. Brake release shall be provided as well, if agreed between the purchaser and manufacturer.

**4.5.3** Means protecting against paying-out of the whole length of a trawl rope from the main drum may be fitted. Not less than 20 windings of the trawl rope shall still remain wound onto the drum when such means have operated, unless otherwise agreed between the purchaser and manufacturer.

**4.5.4** An emergency means of stopping the winch shall exist. It shall be fitted at the winch position and at the remote control position, where such exists, and near the rope sheaves. For single-drum trawl winches, the single operation, where practicable, shall cause the stopping of both winches.

**4.5.5** Protection against overspeeding of the drive during paying-out shall be provided.

## **4.6 Control**

### **4.6.1 Control position**

For each trawl winch, a local or remote control (or a combined remote and local control) shall be provided.

For single-drum trawl winches, separate control of each trawl winch shall be provided.

NOTE — Some national authorities require local control on all trawl winches.

### **4.6.2 Direction of motion of operating devices**

The direction of motion of operating devices shall be such that the trawl rope or auxiliary rope is hauled-in by clockwise movement at a hand-wheel or crank handle or alternatively by movement of a hand-lever towards the operator. The direction of operation of all control handles shall be clearly and permanently marked.

### **4.6.3 Remote control**

By agreement between the purchaser and manufacturer, the remote control shall provide operating conditions for simultaneous, common and synchronous operation on main drums.

## **4.7 Brakes and braking**

### **4.7.1 Brakes**

Each winch shall have an automatic braking system which operates when bringing the operation device to zero, or to the braking position, and also when there is no power supply on the winch. Means shall exist for manual release of the brake.

### **4.7.2 Selective brake**

Each declutchable drum of the winch shall have its own selective brake. The drum brake may also act as an automatic brake of normally closed type. The brake handle force during manual braking shall not exceed 0,25 kN.

### **4.7.3 Braking torque**

The total available braking torque shall be at least 1,5 times the design torque. The brakes shall be adjustable, unless otherwise agreed between the purchaser and manufacturer.

### **4.7.4 Regenerative braking**

For regenerative braking, the rated load of the brakes shall be 0,5 times the design torque. In this case the paying-out speed of the trawl rope is related to the number of revolutions of the driving motor and its characteristics.

### **4.7.5 Friction braking**

The drum brake of a trawl winch when paying-out the rope shall be capable of absorbing the power at a torque equal to 0,5 times the design torque and at drum revolutions corresponding to twice the nominal speed. The power shall be absorbed for two periods equal to rope length multiplied by winch speed separated by 15 min. Cooling of brakes to meet this specification is acceptable. The use of friction braking does not exclude the use of regenerative braking.

## **4.8 Ambient temperature**

The winches shall be designed for satisfactory operation of their components at a temperature range within  $-25\text{ }^{\circ}\text{C}$  to  $+45\text{ }^{\circ}\text{C}$ , when located on open decks, and within  $-10\text{ }^{\circ}\text{C}$  to  $+45\text{ }^{\circ}\text{C}$  when located in enclosed compartments; a different lower limit may however be agreed between the purchaser and manufacturer.

## **4.9 Material stresses**

The winch manufacturer shall be responsible for determining the strength requirements of the component parts of the winch to withstand all the loads of each nominal size of trawl winch respectively.

## **4.10 Basic calculations**

**4.10.1** When a trawl winch with a trawl rope being wound on the outermost layer is loaded with the drum load, the allowed calculated stresses, based on simple elastic theory, of any part of the winch shall be not greater than 0,4 times the 0,2 % proof stress of the material but not more than 0,28 times the breaking strength of the material.

**4.10.2** The relevant parts of a winch and its fixing to the base plate shall be designed with due regard to the possibility of rupture of a trawl rope being wound on the appropriate nominal number of rope layers on the drum. In such a case, the allowed calculated stresses shall be not greater than 0,9 times the 0,2 % proof stress of the material.

**4.10.3** The relevant parts of a winch shall be designed taking into account the maximum torque of the prime mover and maximum braking torque. In such a case, the allowed calculated stresses shall be not greater than 0,8 times the 0,2 % proof stress of the material.

**4.10.4** The selection of design trawl ropes shall preclude the possibility of their rupture under loads derived from the winch prime mover.

#### 4.11 Drum design

NOTE — Attention is drawn to the existence of certain national safety requirements.

##### 4.11.1 Design rope

For design purposes, the drum shall be based on the use of 6 × 24 steel wire rope in accordance with ISO 2408.

##### NOTES

1 This rope has tensile grade 1 570 N/mm<sup>2</sup>, A-galvanized surface finish and fibre core.

2 The design requirement does not preclude the use of other types of ropes in service.

##### 4.11.2 Drum diameter

The drum diameter shall be not less than 14 times the design rope diameter.

##### 4.11.3 Drum flange height

When all the rope is reeled, the flange shall project at least twice the rope diameter above the outermost layer, when spooling gear is fitted. When no spooling gear is fitted, the projection shall be at least 4 times the rope diameter.

##### 4.11.4 Drum clutch

The drums of double-drum trawl winches and of winches with auxiliary drums or warping-ends shall be of the declutchable type.

#### 4.12 Drive equipment

**4.12.1** Electrical drives and control equipment shall conform to the requirements of IEC 92. Deck-mounted enclosures shall conform to IEC 529 IP 56.

**4.12.2** Hydraulic drives and control equipment shall conform to the requirements of ISO 4413. System nominal pressure shall be selected from ISO 2944 and the drive shall operate at a pressure 10 % below the selected nominal pressure, if agreed between the manufacturer and purchaser.

NOTE — For hydraulic diesel drive, see also ISO 2710, ISO 3046, Parts 1 to 6, and ISO 6826.

## 5 Performance

The trawl winch shall be capable of fulfilling the characteristics specified in this International Standard and indicated in table 1.

Trawl winches shall have smooth speed control adjustment; stepped control is also allowed. The minimum hauling-in speed shall not exceed 15 m/min. When agreed between the manufacturer and purchaser, the necessary special conditions for rewinding trawl rope shall be provided.

## 6 Acceptance tests

### 6.1 Rules concerning winch acceptance tests by purchaser

**6.1.1** No-load test without the use of the rope : In hauling-in and paying-out directions at nominal speed for 10 min and, where appropriate, with maximum speed for 1 min.

**6.1.2** Test of hauling-in of the trawl rope at approximately the design torque on the drum for approximately the full length of the trawl rope.

**6.1.3** Test of hauling-in of the trawl rope at 125 % of drum load on appropriate nominal rope winding diameter for 3 min with stopping and reversing.

NOTE — The tests specified in 6.1.2 and 6.1.3 may be carried out with equivalent weights. Interruptions are allowed.

The pull value, while carrying out the tests with a trawl rope, may be determined depending on the layer of rope being wound in relation to that at the design torque.

**6.1.4** Each braking system shall be tested with 1,5 times the design torque applied to the winch drum.

**6.1.5** While testing, the following shall be checked :

- a) presence of abnormal temperature of bearings;
- b) presence of abnormal noise;
- c) power consumption;
- d) minimum design hauling-in speed;
- e) pressure values;
- f) easy and satisfactory operation of components;
- g) proper operation of spooling gear, if fitted;
- h) operation of measuring instruments, if fitted;
- i) operation of protecting devices, interlocks and switches, where practicable;
- j) operation of signalling devices, where fitted;
- k) operation of controls.

Table 1 – Design data for trawl winches

Type	Nominal size	Minimum drum load kN		Minimum nominal speed of trawl rope m/s	Design rope diameter mm	Design length of trawl rope m	
		full-length rope (see 3.4.1)	half-length rope (see 3.4.2)			min.	max.
A	0,63	5	6,3	1	14	500	800
	1	7,5	10	1	14	500	800
	1,6	12	16	1	16	500	1 000
	2	16	20	1	16	800	1 200
	2,5	18,5	25	1,33	18	800	1 600
	3,2	25	31,5	1,33	20	1 500	1 800
	4	30	40	1,67	22	1 000	2 000
	6,3	47	63	1,67	24	1 250	2 500
	8	60	80	1,67	28	1 500	3 000
B	4,7	47	63	2	24	2 000	3 000
	6	60	80	2	28	2 500	3 500
	7,5	75	100	2	28	3 000	4 500
	9,4	94	125	2	28	3 000	4 500
	12	120	160	2	32	3 000	4 500
	15	150	200	2	36	3 500	5 000
C	9	63	85	1	24	1 000	1 500
	11	80	106	1	28	1 250	2 000
	17	125	166	1	28	1 500	2 500
	19	140	186	1	28	1 500	2 500
	21	160	212	1	32	1 500	2 500
	27	200	266	1	36	1 500	2 500

NOTES

1 The rope lengths and diameters quoted for design purposes in the table do not preclude the fitting of ropes of other qualities, diameters or lengths in service.

2 For appropriate use of types A, B and C, see annex B.

6.2 The winch shall be subjected to final acceptance tests during mooring trials of the ship and/or during her fishing trials at sea, according to her test programme, to the extent agreed between the purchaser and manufacturer.

h) number and, where applicable, position of warping-ends: R or L (see 4.2.1);

i) information on motive power: voltage and frequency of electric current, or hydraulic fluid pressure and flow rate.

## 7 Designation

Trawl winches conforming to this International Standard shall be designated by the following indications, in the order given:

- a) denomination: trawl winch;
- b) number of this International Standard: ISO 6115;
- c) type of winch: E for electric, D for diesel, H for hydraulic, EP for externally powered;
- d) nominal size (according to table 1);
- e) side of winch (see figure 1): C for central, R for right-handed, L for left-handed;
- f) drum arrangement (see figure 1): 1 for single-drum, 2 for double-drum in-line, 2W for double-drum waterfall;
- g) number and, where applicable, position of auxiliary drum (AD): R or L (see 4.2.1);

## EXAMPLE

Designation of a trawl winch according to ISO 6115, electro-hydraulic powered (H), of nominal size 12, right-handed (R), with double-drum waterfall (2W), with one auxiliary drum on the left and one warping end on the left, voltage 440 V and frequency 60 Hz:

**Trawl winch ISO 6115-H-12-R-2W-1 AD L-1L-440/60**

## 8 Marking

Trawl winches complying with this International Standard shall be permanently marked with the following information:

- a) number of this International Standard: ISO 6115;
- b) nominal size (see 3.1).

## EXAMPLE:

**ISO 6115-12**

## Annex A

### (normative)

### Mechanical characteristics of winches

If agreed between the purchaser and manufacturer, the trawl winches may have a mechanical characteristic (revolutions, torque on the drum) corresponding to the constant output curve for hauling-in the net.

The maximum torque within the constant output curve shall amount to not less than 1,5 times the design torque.

In addition, it is recommended that the number of revolutions of the drum be increased by 1,5 times with respect to the number of revolutions at design torque when the torque decreases below the rated value within the constant output curve.

## Annex B

### (informative)

### Winch type and use

The winch types referred to in table 1 are as follows:

- type A is primarily intended for demersal fishing;
- type B is primarily intended for deep water fishing;
- type C is primarily intended for pelagic fishing.

## Annex C

### (informative)

### Bibliography

ISO 2710 : 1978, *Reciprocating internal combustion engines — Vocabulary.*

ISO 3046-1 : 1986, *Reciprocating internal combustion engines — Performance — Part 1: Standard reference conditions and declarations of power, fuel consumption and lubricating oil consumption.*

ISO 3046-2 : 1977, *Reciprocating internal combustion engines — Performance — Part 2: Test methods.*

ISO 3046-3 : 1979, *Reciprocating internal combustion engines — Performance — Part 3: Test measurements.*

ISO 3046-4 : 1978, *Reciprocating internal combustion engines — Performance — Part 4: Speed governing.*

ISO 3046-5 : 1978, *Reciprocating internal combustion engines — Performance — Part 5: Torsional vibrations.*

ISO 3046-6 : 1982, *Reciprocating internal combustion engines — Performance — Part 6: Overspeed protection.*

ISO 6826 : 1982, *Reciprocating internal combustion engines — Fire protection.*