
**Reciprocating internal combustion
engines — Handle starting equipment —**

Part 1:
Safety requirements and tests

Moteurs alternatifs à combustion interne — Dispositifs de démarrage à la manivelle —

Partie 1: Exigences de sécurité et essais



Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 11102-1 was prepared by Technical Committee ISO/TC 70, *Internal combustion engines*.

ISO 11102 consists of the following parts, under the general title *Reciprocating internal combustion engines — Handle starting equipment*:

- *Part 1: Safety requirements and tests*
- *Part 2: Method of testing the angle of disengagement*

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Reciprocating internal combustion engines — Handle starting equipment —

Part 1: Safety requirements and tests

1 Scope

This part of ISO 11102 specifies requirements for handle starting equipment used on reciprocating internal combustion engines for land, rail and marine use, excluding engines used to propel road vehicles and aircraft. It may be applied to engines used to propel road construction, earth moving machines and for other applications where no suitable International Standards exist.

In addition to the technical safety requirements, this part of ISO 11102 describes procedures for checking adherence to these requirements.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this part of ISO 11102. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this part of ISO 11102 are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 11102-2:1997, *Reciprocating internal combustion engines — Handle starting equipment — Part 2: Method of testing the angle of disengagement*.

3 Definitions

For the purposes of this part of ISO 11102 the following definitions apply.

3.1 handle starting system

starting system using a crank handle to rotate the engine up to the required firing speed

3.2 automatic disengagement device

device which automatically interrupts the connection between the engine and the starting handle once the engine is running, thus preventing the handle from being turned by the engine

3.3 guide

that part of the handle starting system which guides the starting handle during starting and prevents its being thrown out after disengagement

3.4 kick back limiter

that part of the handle starting system which, when used in accordance with the instructions and when maintained correctly, prevents or limits the kick back travel to such an extent as to avoid the risk of injury

3.5 kick back

the sudden change of direction of rotation of the starting handle, caused by compression or combustion pressure of the engine during starting procedure

3.6 disengagement travel

the circumferential distance which the grip of the starting handle travels from the point of its change of rotational direction to its disengagement from the starting shaft, measured at the centre of the grip

3.7 angle of disengagement

the angle through which the shank of the starting handle turns from the point of change of rotational direction to its disengagement from the starting shaft

3.8 kick back travel

the distance which the grip of the handle travels from the point of its change of rotational direction until it comes to the rest, measured at the centre of the grip

3.9 kick back angle

the angle through which the shank of the starting handle turns from the point of its change of rotational direction until it comes to the rest

4 Other regulations and requirements

4.1 For engines used on board ships and offshore installations which have to comply with rules of a classification society, the additional requirements of the classification society shall be observed. If this applies the name of the classification society shall be stated by the customer prior to placing the order.

For engines which do not require such classification, any additional requirements shall in each case be subject to agreement between the manufacturer, supplier and customer.

4.2 If special requirements from regulations of any other authority, e.g. inspecting and/or legislative authorities, have to be met, the authority shall be stated by the customer prior to placing the order.

4.3 Any further additional requirements shall be subject to agreement between the manufacturer, supplier and customer.

5 Technical safety requirements

5.1 Introduction

When a reciprocating internal combustion engine, which is being manually started using a starting handle, suddenly changes its direction of rotation, the handle is subject to an acceleration in the opposite direction to the start of rotation (see figure 1).

The resulting angular velocity is at a maximum at the point of disengagement. Due to its inertia, the handle will turn further until all of the kinetic energy has been dissipated in overcoming friction and the force exerted by the operator or until it comes up against a stop.

For this reason, the kick back travel and angle are larger, by an undefined amount, than the disengagement travel and angle respectively.

The main factor which leads to injury is not the force itself with which the handle kicks back but the distance during which this force can act upon the operator.

Limitation of the kick back force can therefore not be accepted as a measure to prevent accidents when correctly using a starting handle. Instead, the concern is to limit the kick back travel.

5.2 General requirements

5.2.1 The handle starting system shall be equipped with an automatic disengagement device (see 3.2). The handle shall be prevented from re-engaging when the engine is running.

5.2.2 The handle starting system shall be fitted with a guide (see 3.3) which allows the handle to be removed from the engine only when it is disengaged. This can be achieved, for example, when the handle is not being turned, or being turned only very slowly, or when turning it in the direction opposite to the starting rotation.

5.2.3 The starting handle shall be fitted with a non-removable grip which can freely rotate and shall guarantee safe operation when used properly. These requirements also apply to the use of sleeves.

5.2.4 Starting handles are to be permanently marked with the manufacturer's or supplier's identification.

5.3 Requirements in the event of kick back

The angle of disengagement shall not exceed 35° and the disengagement travel shall not exceed 100 mm.

6 Tests

6.1 Checking angle of disengagement and travel

The requirements of 5.3. shall be checked by reference to the manufacturer's design data. If required, tests in accordance with ISO 11102-2 shall be made.

6.2 Checking of other requirements.

All other requirements shall be checked by reference to the manufacturer's data and by physical tests.

These must include a visual check for functional suitability of the starting pin, the starting dog and the starting handle guide.

7 Test report

The manufacturer/importer or his agent shall supply a test report which contains at least the following:

- a) starting handle identification:
 - type;
 - manufacturer/supplier;
- b) engine identification:
 - type;
 - manufacturer/supplier;
- c) description of the kick back limiter;

- d) angle of disengagement;
- e) disengagement travel;
- f) methods used for measuring d) and e);
- g) results of the tests according to 6.2;
- h) date on which tests were carried out.

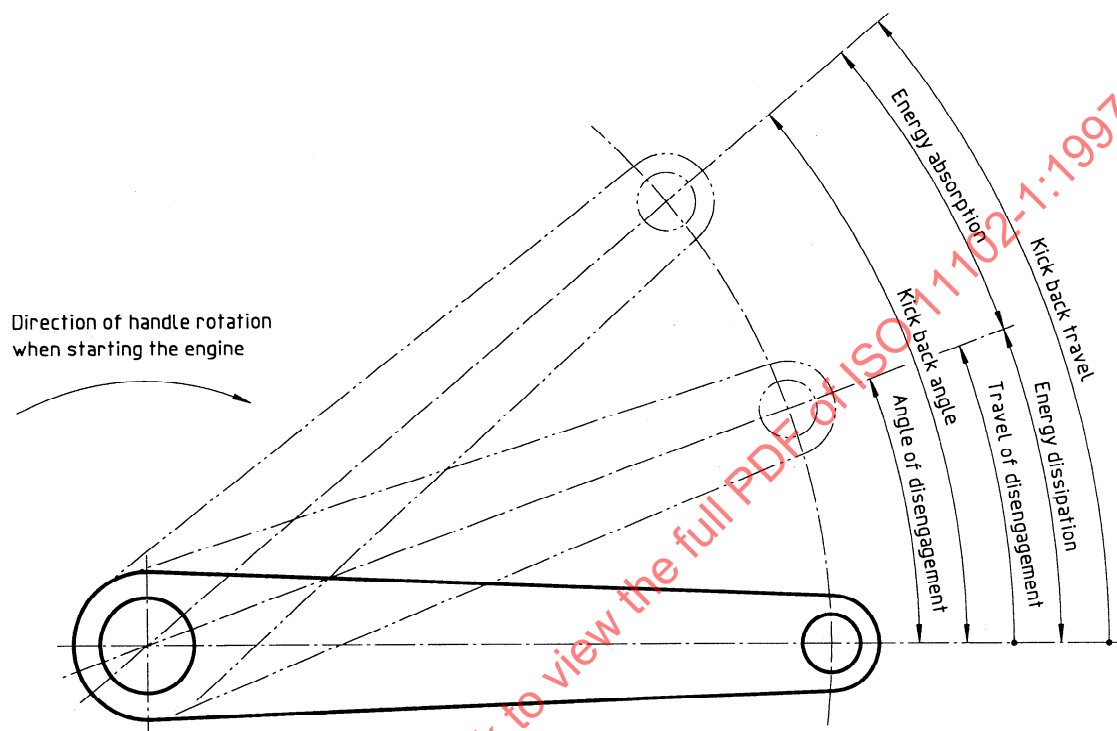


Figure 1 — Direction of rotation of handle