INTERNATIONAL STANDARD

ISO 15077

Second edition
2020-03

Tractors and self-propelled machinery for agriculture — Operator controls — Actuating forces, displacement, location and method of operation

Tracteurs et machines agricoles automotrices — Commandes de l'opérateur — Forces de manoeuvre, déplacements, emplacements et modes de fonctionnement

Reference number
ISO 15077:2020(E)

© ISO 2020



COPYRIGHT PROTECTED DOCUMENT

© ISO 2020

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

© ISO 2020 – All rights reserved

Contents

Page

Foreword ... **iv**

Introduction ... **vi**

1 Scope ... **1**

2 Normative references ... **1**

3 Terms and definitions ... **1**

4 Requirements ... **3**

4.1 General ... 3

4.2 Identification ... 3

4.3 Foot-operated controls ... 3

4.4 Control actuating forces and torques, direction of motion, and location ... 3

4.5 Control operation ... 4

Annex A (informative) **Control actuating forces and torques, direction of motion and control location** ... **9**

Annex B (normative) **Operator controls associated with virtual terminals** ... **14**

Annex C (informative) **Identification of hand controls by colour coding** ... **16**

Bibliography ... **18**

© ISO 2020 – All rights reserved

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 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 3, *Safety and comfort*.

This second edition cancels and replaces the first edition (ISO 15077:2008), which has been technically revised.

The main changes compared to the previous edition are as follows.

— In Clause 3:
  — the definition for hybrid power source has been added;
  — the definition for critical VT operator control has been revised.
— In Clause 4:
  — multiple new general requirements have been added;
  — a new subclause (4.2) specifically for identification has been added;
  — additional requirements for stopping and starting has been added in Table 1;
  — provisions for new technologies have been introduced into Table 1;
  — requirements for speed selection pattern in Table 1 related to manual/nonlinear transmission shifting patterns have been clarified;
  — new requirements for remote engine starting have been added in Table 1.
— In Annex A:
  — the annex has been reorganized for clarity and flow;
  — torque values have been added to Table A.1 for rotational controls;

 © ISO 2020 – All rights reserved

  - a new Figure A.1 has been added for clarity;
  - Figure A.2 (former Figure A.1) has been revised to correct the operator's position.
- In Annex B:
  - reference to AEF 006 has been added.
- In Annex C:
  - colour identification numbers have been added to Table C.1.

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.

© ISO 2020 – All rights reserved

Introduction

This document has been developed to provide guidance on methods of operation and requirements for operator controls. These provisions were derived from experience, current practice, human factors literature and existing standards. Specific operating requirements are given for controls common to many tractors and self-propelled agricultural machinery.

© ISO 2020 – All rights reserved

Tractors and self-propelled machinery for agriculture — Operator controls — Actuating forces, displacement, location and method of operation

1 Scope

This document specifies methods of operation and requirements related to manual (for example, hand-, finger-, foot-operated) controls as well as controls associated with virtual terminals intended for a seated operator.

It applies to controls installed on agricultural tractors and self-propelled agricultural machinery.

It also gives recommendations for the control actuating forces and torques, direction of motion and location of these manual controls.

This document also specifies the minimum information relevant to manual controls to be provided in the operator's manual, for use as intended by the manufacturer.

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 3767-1, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Symbols for operator controls and other displays — Part 1: Common symbols*

ISO 3767-2, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Symbols for operator controls and other displays — Part 2: Symbols for agricultural tractors and machinery*

ISO 11783-6, *Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 6: Virtual terminal*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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/

3.1
control
device actuated by an operator to effect a response from the machine, its attachments or its implements

3.2
control actuating force
force exerted at the centre of the control contact surface and in the direction of its movement to effect a control function

© ISO 2020 – All rights reserved

3.3
forward
direction the operator faces while seated in the operator's seat with the machine and the operator's seat in the position for forward travel as defined by the manufacturer

3.4
decelerator pedal
control used on certain machines which, when actuated, reduces the engine speed

3.5
hand-operated control
device manipulated by the operator's hand

3.5.1
hand-operated control with finger/wrist activation
hand control manipulated by the movement of one or more fingers or the wrist, with little or no shoulder/elbow motion

3.5.2
hand-operated control with arm activation
hand control gripped by the hand and moved primarily by shoulder/elbow movement

3.6
auxiliary input unit
electronic control unit (ECU) containing one or more *virtual terminal (VT) operator controls* (3.9) for common use and facilitating the machine operation

Note 1 to entry: See ISO 11783-6.

3.7
non-critical function
machine function which, when actuated, presents a minimal risk to the machine operator or bystanders

3.8
critical function
machine function which, when actuated, can cause an action that could be hazardous to the machine operator or bystanders

3.9
virtual terminal operator control
VT operator control
element of an *auxiliary input unit* (3.6) or of a remote key pad, or virtual terminal soft key or touch screen control or reconfigurable proprietary control meeting the requirements of ISO 11783-6 and those specified in Annex B

3.9.1
non-critical VT operator control
VT operator control (3.9) that is suitable only for the control of *non-critical functions* (3.7)

3.9.2
critical VT operator control
VT operator control (3.9) input suitable for the control of *critical functions* (3.8) with a means of preventing inadvertent operation

3.10
pointing unit control
means of activating and releasing of a function displayed by *virtual terminal operator control* (3.9)

3.11
foot-operated control
device manipulated by the operator’s foot

© ISO 2020 – All rights reserved

3.12
hybrid power source
use of two or more distinct types of power, such as an internal combustion engine to drive an electric generator that powers an electric traction drive motor

4 Requirements

4.1 General

4.1.1 Controls shall be arranged so that their layout, travel and resistance to operation are compatible with the action to be performed, taking account of ergonomic principles.

4.1.2 The unintentional actuation of controls shall be avoided, for example, by suitable design or position.

4.1.3 The incorrect actuation of controls shall be avoided, for example, by suitable design, arrangement, marking or lighting.

4.2 Identification

4.2.1 Control functions and movements shall be identified by symbols conforming to ISO 3767-1 or ISO 3767-2 so that the operator can determine the proper control function and movement. In cases where the ISO 3767 series of standards do not include a suitable symbol that addresses a machine's function (for example, as a result of new technology), it is acceptable for the manufacturer to develop and use an appropriate symbol. The explanation of all symbols shall be included in the operator manual. Identification is not required for controls that have universal recognition by virtue of their shape, colour, location, arrangements or method of actuation, such as a steering wheel, foot-operated clutch pedal, service brake or accelerator pedal.

NOTE The symbols given in the ISO 3767 series are also registered in ISO 7000.

4.2.2 When a control device is designed and constructed to perform several different actions, the actions shall be clearly identified or displayed and subject to confirmation, when necessary.

4.2.3 For identification of manual controls by colour coding, see Annex C.

4.3 Foot-operated controls

Foot-operated controls shall be designed to minimize the risk of the foot slipping off the pedal.

4.4 Control actuating forces and torques, direction of motion, and location

Guidelines for control actuating forces and torques, and generic direction of motion for controls are given in Annex A. Minimum control actuating forces shall be sufficient to avoid inadvertent actuation by the force of a hand or foot resting on the control during anticipated operating conditions.

NOTE ISO 5697 and ISO 10998 specify maximum actuating forces not to be exceeded to meet the braking and steering performance requirements. Actuating forces to be applied for normal operation referred to in this document are usually lower.

© ISO 2020 – All rights reserved