
**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 manœuvre, déplacements, emplacements et
modes de fonctionnement*

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ISO 15077:2008

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

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.

ISO 15077 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 3, *Safety and comfort*.

This first edition of ISO 15077 cancels and replaces ISO/TS 15077:2002, of which it constitutes a technical revision.

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Introduction

This International Standard has been developed to provide preferred 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 agricultural machines.

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

1 Scope

This International Standard specifies the preferred method of operation and requirements related to operator controls actuated by hand and foot, installed in agricultural tractors and self-propelled agricultural machinery and used by a seated operator as intended and under the conditions foreseen by the manufacturer. It also gives recommendations for the maximum control actuating forces, direction of motion and location of these controls.

2 Normative references

The following referenced documents are indispensable for the application 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.

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, perpendicular to that surface and in the direction of its movement, to effect a control function

NOTE This force does not necessarily represent the force typically applied by the operator.

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
minimum control strength
ability of a control system to withstand a single excessive application of effort by the operator without being destroyed or having its primary function impeded

3.5
decelerator pedal
control used on certain machines which, when actuated, reduces the engine speed

3.6
hand control
control manipulated by the operator's hand

3.6.1
hand 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

3.6.2
hand control with arm activation
hand control gripped by the hand and moved primarily by shoulder/elbow movement

3.7
auxiliary input unit
electronic control unit (ECU) containing one or more VT operator controls for common use and facilitating the machine operation

NOTE See ISO 11783-6.

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3.8
non-critical function
machine function which, when actuated, presents a minimal risk to the machine operator or bystanders

3.9
critical function
machine function which, when actuated, can cause an action that could be hazardous to the machine operator or bystanders

3.10
virtual terminal operator control
VT operator control
element of an auxiliary input unit or of a remote key pad, or virtual terminal soft key or touch screen control meeting the requirements of ISO 11783-6 and those specified in Annex B

3.10.1
non-critical VT operator control
VT operator control that is suitable only for the control of non-critical functions

3.10.2
critical VT operator control
VT operator control input suitable for the control of critical functions

NOTE See Annex B.

4 Requirements

4.1 General

4.1.1 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. Identification is not required for controls that have universal recognition by virtue of their shape, location, arrangements or method of actuation, such as a steering wheel, foot-operated clutch pedal, service brake or accelerator pedal.

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

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

4.2 Maximum control actuating force, direction of motion, and location

Guidelines for maximum control actuating forces 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 specified by those International Standards. Actuating forces to be applied for normal operation referred to in this International Standard are usually lower.

4.3 Control operation

The operation of controls, if provided on the machine, shall be in accordance with Table 1.

NOTE The control motion indicated in Table 1 represents the motion of several control types such as levers, rocker switches, pairs of push buttons, or sliders. For example, if a pair of buttons or a rocker switch are used to raise and lower the three-point hitch, the interpretation of Table 1, section 8.1, would be to use the button in the upper or rearward position to raise the hitch and the button in the lower or forward position to lower the hitch.

Table 1 — Control operation

No.	Control	Control operation and requirements
1	Engine	
1.1	Starting/stopping engine	Provision shall be made to prevent the engine starter from engaging unless <ol style="list-style-type: none"> a) the traction transmission(s) is (are) in the neutral or parked position or the traction clutch is disengaged, b) the master implement clutch/PTO clutch is disengaged.
1.1.1	Starting engine (rotational switch)	The control shall be rotated clockwise to operate engine starter.
1.1.2	Engine preheater circuit (rotational switch)	If an engine preheater circuit is provided, this control shall occur before or at the starting position. It may be activated by rotating the control anticlockwise (counter-clockwise) or pushing inwards on the control.
1.1.3	Stopping engine (rotational switch)	The control shall be rotated anticlockwise (counter-clockwise) to the stop position.
1.1.4	Stopping engine (mechanical control)	When the stop control is actuated, controls such as levers or buttons shall automatically remain in the stop position without the application of sustained manual effort. Direction of motion shall be pull to stop. The control shall be located within 150 mm of the engine start control. If the stop control is combined with the speed control, it shall be in the direction of and beyond the low idle position.
1.2	Engine speed	
1.2.1	Foot-operated	The control shall be readily accessible to the operator's right foot. The pedal shall be pushed forward and/or downward to increase engine speed.

Table 1 (continued)

No.	Control	Control operation and requirements
1.2.2	Hand-operated variable speed	The control shall be positioned in front of, or to the right of, the operator. Direction of motion shall be in a plane generally parallel to the longitudinal axis of the vehicle. The control shall be moved away from the operator (generally forward) to increase engine speed.
1.2.3	Hand-operated discrete settings	The control shall be positioned in front of, or to the right of, the operator. The actuation of the part of the control which is generally away from the operator shall select higher speed settings.
1.2.4	Decelerator pedal	If provided, the control shall be positioned in front of, or to the right of, the operator and be readily accessible to the operator's right foot. The direction of motion shall be forward and/or downward to decrease engine speed. A foot-operated engine speed control as described in 1.2.1 shall not be provided.
2	Steering (when travelling in a forward direction)	
2.1	Steering wheel	When a steering wheel control is provided, a clockwise rotation shall effect a right turn, and an anticlockwise (counter-clockwise) rotation shall effect a left turn.
2.2	Two levers	When two levers are provided for steering, moving the right-hand lever rearward and/or the left-hand lever forward shall effect a right turn; moving the left-hand lever rearward and/or the right-hand lever forward shall effect a left turn.
2.3	One lever	When one lever is provided for steering, a lateral motion of the lever to the right shall effect a right turn and a lateral motion to the left shall effect a left turn.
3	Brakes	
3.1	Service brake	ISO 15077:2008
3.1.1	Foot-operated	Pedal(s) shall be readily accessible to the operator's right foot. The direction of motion shall be forward and/or downward for engagement. 4.2.1 and 4.2.2 take precedence over this provision. Where separate brake pedals are provided for the independent right-hand and left-hand brake control, it shall be possible to obtain combined control with one foot.
3.2	Park brake	
3.2.1	Hand-operated with finger/wrist activation (e.g. electrical switch)	The control shall be moved forward or away from the operator to apply the park brake. (See Annex A for direction of motion for various surfaces.) The park brake shall remain applied without manual effort. Provision shall be made to prevent unintentional release.
3.2.2	Hand-operated with arm activation	The control shall be pulled to apply the brake. A device shall be provided to retain brake(s) in the applied position. Provision shall be made to prevent unintentional release.
3.2.3	Foot-operated	The direction of motion shall be forward and/or downward for engagement. A device shall be provided to retain brake(s) in the applied position. Provision shall be made to prevent unintentional release.
3.2.4	Combination parking and transmission control	Provision shall be made to prevent unintentional disengagement.
3.3	Secondary braking system	
3.3.1	Hand-operated with finger/wrist activation (e.g. electrical switch)	The control shall be moved forward or away from the operator to apply the secondary brake.
3.3.2	Hand-operated with arm activation	The control shall be pulled to apply the brake.
3.3.3	Foot-operated	The direction of motion shall be forward and/or downward for engagement.

Table 1 (continued)

No.	Control	Control operation and requirements
4	Transmission	
4.1	Clutch (includes combined transmission and PTO) See also PTO control, section 7.	
4.1.1	Foot-operated	The control shall be readily accessible to operator's left foot. The pedal shall be pushed forward and/or downward for disengagement.
4.1.2	Hand-operated with arm activation	The control shall be moved rearward or towards the operator for disengagement. Positive means shall be provided for holding the clutch control in the disengaged position so that it is incapable of being re-engaged unless manually operated. It is recommended that the clutch be operable only from the operator's seat.
4.2	Combination ground speed and forward/reverse direction (continuously variable combined control)	Provision shall be made to prevent unintentional movement of the control from a) neutral to forward or reverse, b) forward to reverse, c) reverse to forward, or, alternatively: the machine motion due to unintentional movement of this control shall be prevented. The neutral position shall be clearly identified and easy to select.
4.2.1	Foot-operated — one pedal, or two pedals longitudinally related to simulate one pedal	The control shall be readily accessible to the operator's right foot. The control shall have the effect of a pedal being pivoted under the operator's foot and shall remain at rest in the neutral position. Forward and/or downward motion of the front of the pedal shall cause forward motion and increasing forward speed; downward motion of the rear of the pedal shall cause reverse motion and increasing reverse speed. The requirement of 3.1.1 does not apply in this case.
4.2.2	Foot-operated — two pedals (side by side)	The control shall be readily accessible to the operator's right foot. Forward and/or downward motion on the outer pedal shall cause rearward motion and increasing rearward speed; forward and/or downward motion on the inner pedal shall cause forward motion and increasing forward speed. The requirement of 3.1.1 does not apply in this case.
4.2.3	Hand-operated	The control shall be moved from neutral position forwards and/or upwards for forward motion and increasing forward speed; rearwards and/or downwards for reverse motion and increasing reverse speed.
4.3	Speed selection	
4.3.1	Hand-operated	The control shall be moved in an upward, forward and/or outward direction to increase speed.
4.3.2	Foot-operated	The control shall be pushed forward or down for higher speed.
4.4	Direction control (forward-reverse non-variable speed)	Provision shall be made to prevent unintentional movement of the control from a) neutral to forward or reverse, b) forward to reverse, c) reverse to forward, or, alternatively: the machine motion due to unintentional movement of this control shall be prevented. The neutral position shall be clearly identified and easy to select.