# International Standard 3789/2

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# Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Location and method of operation of operator controls — Part 2 : Controls for agricultural tractors and machinery



*Tracteurs, matériels agricoles et forestiers, matériel à moteur pour jardins et pelouses — Emplacement et mode de fonctionnement des commandes de l'opérateur — Partie 2 : Commandes pour tracteurs et matériels agricoles*



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**Descriptors** : agricultural machinery, tractors, self-propelled machines, mode of operation, control devices, positioning, direction (of movement), specifications.

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# Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up 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.

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.



International Standard ISO 3789/2 was developed by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, and was circulated to the member bodies in March 1981.



It has been approved by the member bodies of the following countries :



| | | |
|---|---|---|
| Australia | Iran | South Africa, Rep. of |
| Austria | Iraq | Spain |
| Canada | Italy | Sweden |
| China | Korea, Dem. P. Rep. of | Switzerland |
| Czechoslovakia | Korea, Rep. of | Turkey |
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| India | Romania | |

The member bodies of the following countries expressed disapproval of the document on technical grounds :

Belgium
Finland

International Standards ISO 3789, Parts 1 to 4 cancel and replace International Standard ISO 3789-1976, of which they constitue a technical revision.



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# Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Location and method of operation of operator controls — Part 2 : Controls for agricultural tractors and machinery

## 0 Introduction

This document forms part of a series dealing with operator controls, location and method of operation.

Other parts in the series will be as follows :

Part 1 : Common controls.

Part 3 : Controls for powered lawn and garden equipment.

Part 4 : Controls for forestry machinery.



## 1 Scope and field of application

This part of ISO 3789 specifies the type, location and method of operation (including direction of motion) of operator controls for agricultural tractors and machinery. The operator control location and method of operation specified in this part of ISO 3789 are supplementary to the requirements established in ISO 3789/1.

The operator controls are divided into two categories :

a) ride-on machines (agricultural tractors and self-propelled machines);

b) pedestrian-operated machines.

The controls included in this International Standard are those which are located at the operator's normal working position.

The common operator controls given in ISO 3789/1 and the operator controls given in this part of ISO 3789 are not required on all machines, but when provided on a machine they shall conform to the requirements specified herein and in ISO 3789/1.

This part of ISO 3789 applies to the following agricultural equipment :

a) agricultural tractors;

b) self-propelled machines;

c) implements;

d) combinations of tractors, implements and self-propelled machines;

e) pedestrian-operated machines designed primarily for use in agricultural operations.

## 2 References

ISO 3767, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Symbols for operator controls and other displays —*

*Part 1 : Common symbols.*

*Part 2 : Symbols for agricultural tractors and machinery.*

ISO 3789, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Location and method of operation of operator controls —*

*Part 1 : Common controls.*

*Part 3 : Controls for powered lawn and garden equipment.*

## 3 General

The movement of the control, in appropriate circumstances, shall be clearly indicated (see ISO 3767/1 and ISO 3767/2).

## 4 Type, location and operation of controls

The type, location and method of operation of the operator controls are laid down in table 1 for ride-on machines (agricultural tractors and self-propelled machines), and in table 2 for pedestrian-operated machines.

Table 1 — Ride-on machines (agricultural tractors and self-propelled machines)

| No. | Control | Location | Operation |
|---|---|---|---|
| 1 | **Engine** | | |
| 1.1 | **Starting** | | It shall be impossible for the engine to be started unless :<br>1) the traction transmission(s) is (are) in the neutral or park position or<br>2) the traction clutch is disengaged or<br>3) the operator is in the operator's seat (station). |
| 1.1.1 | Ignition switch (if separate from starter switch) | Easily accessible from the operator's seat. | Move control to "on" position. |
| 1.1.2 | Starter switch (if separate from ignition switch) | Easily accessible from the operator's seat. | Move control to start position. |
| 1.1.3 | Starter/ignition switch (spark ignition) | Easily accessible from the operator's seat. | Rotate switch in a clockwise direction to positive ignition position. Any auxiliary positions provided shall be located between the "off" and ignition positions. |
| 1.1.4 | Starter switch (compression ignition) | Easily accessible from the operator's seat. | Move control to start position. If a rotational switch is provided, rotate clockwise to operate engine starter. If an engine preheater circuit is provided, this control shall occur before the starter position or may be activated be rotating the control counter-clockwise. |
| 1.2 | **Speed** | | |
| 1.2.1 | Foot-operated | Shall be readily accessible to the operator's right foot and preferably to the right of the brake pedal(s). | Push pedal forward and/or downward to increase engine speed. |
| 1.2.2 | Hand-operated | See ISO 3789/1, sub-clause 1.2.2. | |
| 1.3 | **Stop** | | |
| 1.3.1 | Spark ignition | Easily accessible from the operator's seat. | Rotate starter ignition switch counter-clockwise to "off" (open circuit) position. |
| 1.3.2 | Compression ignition | Easily accessible from the operator's seat. Colour of the control or the position "stop" shall contrast with background and any other control. | Move control to stop position. Control shall automatically remain in the stop position without the application of sustained manual effort. |
| 2 | **Steering** | Forward of the operator. | When a steering wheel control is provided, a clockwise rotation shall effect a right turn, and a counter-clockwise rotation shall effect a left turn.<br>When two levers are provided for steering, to achieve a right turn the right-hand lever shall move rearward; to achieve a left turn the left-hand lever shall move rearward.<br>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. |

Table 1 — (*continued*)

| No. | Control | Location | Operation |
|---|---|---|---|
| 3 | **Brakes** | | |
| 3.1 | **Service** | | |
| 3.1.1 | Foot-operated | See ISO 3789/1, sub-clause 3.1.1. | |
| 3.1.2 | Hand-operated | Convenient to the operator. | Pull motion to apply is preferred. Where means are provided for independent right and left hand operation, it shall be possible to obtain combined control such that there is no undue deviation from a straight path of travel. |
| 3.2 | **Parking** | | |
| 3.2.1 | Hand-operated | Convenient to the operator. | Pull motion to apply is preferred. A device shall be provided to retain brake(s) in the applied position. The device shall not be liable to accidental release. |
| 3.2.2 | Foot-operated | | Depress brake pedal and lock in position. |
| 3.3 | **Braking of trailers or towed equipment** | | |
| 3.3.1 | Foot-operated | Combined with the pedal(s) of service brake. | |
| 3.3.2 | Hand-operated | Separate right-hand lever. | Pull motion to apply. |
| 4 | **Transmission** | | |
| 4.1 | **Clutch** (includes combined transmission and P.T.O.) See also P.T.O. control | | |
| 4.1.1 | Foot-operated | Convenient to the operator's left foot. | Push pedal forward or downward for disengagement. |
| 4.1.2 | Hand-operated | Within convenient reach of the operator. | Move rearward for disengagement.<br>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 direction** (continuously variable combined control) | | |
| 4.2.1 | Foot-operated | See ISO 3789/1, sub-clause 4.2.1. | |
| 4.2.2 | Hand-operated | See ISO 3789/1, sub-clause 4.2.2. | |

**Table 1** (*continued*)

| No. | Control | Location | Operation |
|---|---|---|---|
| 4.3 | **Gear selection** | | |
| 4.3.1 | In-line operation (hand-operated) | See ISO 3789/1, sub-clause 4.3.1. | |
| 4.3.2 | Non-in-line operation (hand-operated) | See ISO 3789/1, sub-clause 4.3.2. | |
| 4.4 | **Direction control** (forward-reverse non-variable speed) Hand-operated | See ISO 3789/1, sub-clause 4.4. | |
| 4.5 | **Master implement, header or gathering unit clutch** Self-propelled machines | | |
| 4.5.1 | Hand-operated | Convenient to the operator. | Movement shall be generally rearward and/or downward 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. The clutch shall be operable only from the operator's seat. |
| 4.5.2 | Foot-operated | Preferably convenient to the operator's left foot. | Push pedal forward or downward for disengagement. |
| 5 | **Differential lock** | Preferably convenient to the operator's right foot or hand. | Move forward or downward for engagement. There shall be clear indication when differential lock is engaged. |
| 6 | **Power take-off** | | |
| 6.1 | **Clutch** | | |
| 6.1.1 | Foot-operated | Convenient to the operator's left foot. | Push pedal forward and/or downward for disengagement. In the case of a combined traction-drive/P.T.O. clutch the P.T.O. disengagement shall be the second stage. |
| 6.1.2 | Hand-operated | See ISO 3789/1, sub-clause 6.1.2. | |
| 6.2 | **P.T.O. shaft engagement** | Convenient to the operator. | The disengaged position shall be clearly marked and visible from the operator's seat. Controls shall be operable only with the operator in the operator's station. |

**Table 1** (*concluded*)

| No. | Control | Location | Operation |
|---|---|---|---|
| 7 | **Implements and auxiliaries** | | |
| 7.1 | **Lift mechanism** | | It shall be possible to lock the control lever(s) or mechanism in position during road transport and servicing, or adjusting of implements in the raised position, unless other means are provided. |
| 7.1.1 | Hand-operated | Convenient to the operator's right hand. | Move levers upward and/or rearward to raise; downward and/or forward to lower. |
| 7.1.2 | Foot-operated | Convenient to the operator's right foot. | Downward movement of the forward part of the pedal to lower and downward movement of the rear part to raise. |
| 7.2 | **Services selector(s)** | | Clearly marked to identify function in each position. |
| 7.2.1 | Hydraulic | Optional, but readily visible from the operator's normal position. | |
| 7.2.2 | Electric | Optional. | |

**Table 2 — Pedestrian-operated machines**

| No. | Control | Location | Operation |
|---|---|---|---|
| 1 | **Engine** | | |
| 1.1 | **Starting** | | It shall be impossible for the engine to be started unless :<br>1) the traction transmission is in neutral or park position, or<br>2) the traction clutch is disengaged. |
| 1.1.1 | Starter/ignition switch (spark ignition) | Situated so that it can only be operated from the normal operating position. | Rotate switch in a clockwise direction to positive ignition position. |
| 1.1.2 | Starter switch (compression ignition) | Situated so that it can only be operated from the normal operating position. | Move control to start position. If a rotational switch is provided, rotate clockwise to operate engine starter. This start position shall always be the final position. If an engine preheater circuit is provided, this shall occur immediately before the starter position. |
| 1.1.3 | Recoil type | Recoil starter handle should be so located that it cannot be operated from the front of the machine. | Pull grip. |
| 1.1.4 | Inertia type | Should not be operable from the front of the machine. | Wind handle and release control.<br>It shall be impossible to release the inertia mechanism unless :<br>1) the traction transmission is in neutral or park position, or<br>2) the traction clutch is disengaged. |
| 1.2 | **Speed** | | |
| 1.2.1 | Hand accelerator | | |
| 1.2.1.1 | Lever | Accessible to the operator's right hand and when at normal operating position. | The direction of motion of the control shall be in a plane parallel to the longitudinal axis of travel of the vehicle. The direction of motion shall be forward and/or upward to increase engine speed. |
| 1.2.1.2 | Turning handle | Accessible to the operator's right hand. | Counter-clockwise to accelerate. |
| 1.3 | **Stop** | | |
| 1.3.1 | Spark ignition | Control to be forward and within easy reach of the operator in the operator's position. Colour of the control to contrast with background and any other control. | Rotate starter ignition switch counter-clockwise to "off" (open circuit) position. With pull switch, pull out; with stop button, press button. |
| 1.3.2 | Compression ignition | | Move control to stop position. Control shall remain in the stop position without the application of sustained manual effort. |

**Table 2** (*concluded*)

| No. | Control | Location | Operation |
|---|---|---|---|
| 2 | **Traction-drive** | | |
| 2.1 | **Clutch** | | |
| 2.1.1 | Hand-operated (main transmission excluding 2.1.2) | Preferably convenient to the operator's left hand. | Move rearwards or upward 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. |
| 2.1.2 | Hand-operated (main transmission of the type requiring sustained manual effort) | Preferably convenient to the operator's left hand. | To engage clutch, move control forward or downward. |
| 2.2 | **Gear selection** | As near to the centre line of the machine as possible and within easy reach of the operator, and clearly visible by the operator while in the operator's zone. | Shifting pattern should be simple and clearly marked. In particular the neutral position shall be clearly identified and easy to select.<br><br>When a reverse gear is fitted, it shall only engage as a result of the operator applying sustained manual pressure to a control. |
| 3 | **Auxiliary machine elements** | | |
| 3.1 | **Clutch** | Convenient to the operator's left hand but mounted to the right of the main transmission clutch control. | Move rearwards for disengagement.<br><br>Positive means should be provided for holding the control in the disengaged position so that it is incapable of being re-engaged unless manually operated. |
| 4 | **Element adjustment** | | |
| 4.1 | **Screw-operated** | Optional. | Clockwise rotation should move components affected upwards, rearwards or to the right. |
| 4.2 | **Lever-operated** | Optional. | For moving components in any plane, the lever should move in the same general direction as the components. |