
INTERNATIONAL STANDARD



4510

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Earth-moving machinery — Maintenance and adjustment tools

Engins de terrassement — Outils pour l'entretien et le réglage

First edition — 1976-12-15

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Descriptors : earth-handling equipment, tools, hand tools, assembly tools, adjusting, maintenance, nomenclature

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 4510 was drawn up by Technical Committee ISO/TC 127, *Earth-moving machinery*, and was circulated to the Member Bodies in December 1975.

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It has been approved by the Member Bodies of the following countries :

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No Member Body expressed disapproval of the document.

Earth-moving machinery – Maintenance and adjustment tools

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1 SCOPE AND FIELD OF APPLICATION

This International Standard sets forth, for guidance, the hand tool groupings for operator use in performing routine adjustment and maintenance on earth-moving machinery. Manufacturers should choose suitable tools from table 1 for routine adjustment and maintenance.

ISO 3316, *Assembly tools for screws and nuts – Attachments for hand-operated square drive socket wrenches – Torque testing.*

ISO 3318, *Assembly tools for screws and nuts – Open-end double-head engineers' wrenches, double-head box wrenches and combination wrenches – Maximum outside dimensions of heads.*

2 REFERENCES

ISO 1085, *Combinations of double-ended wrench gaps.*

ISO 1703, *Assembly tools for screws and nuts – Nomenclature.*

ISO 2380, *Screwdriver blades for slotted head screws.*

ISO 2725, *Assembly tools for screws and nuts – Power and hand operated square drive sockets – Metric series.*

ISO 2936, *Assembly tools for screws and nuts – Hexagon socket screw keys – Metric series.*

ISO 3315, *Assembly tools for screws and nuts – Driving parts for hand-operated square drive socket wrenches – Torque testing.*

3 TYPES AND SIZES


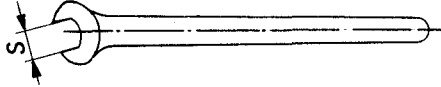
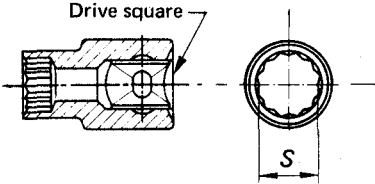
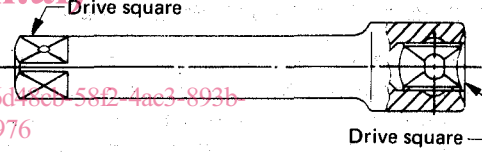
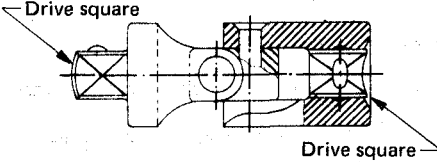
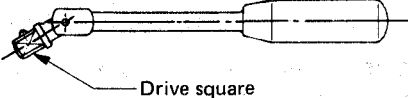
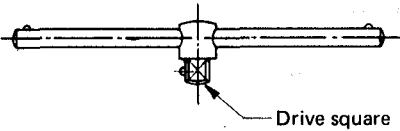
The metric and inch sizes shown under "Nominal dimension" in table 1 are not intended to be equivalent, but represent actual dimensional sizes for adjustment tools to the metric and inch nomenclature.

4 APPLICATION OF HAND TOOL GROUPS

The annex of this International Standard sets forth, as a general guide, the application of the hand tool groups of table 1. It is intended primarily for the operator when performing the normal maintenance and routine adjustments on the machines when at the work site.

TABLE 1 — Routine adjustment and maintenance tools

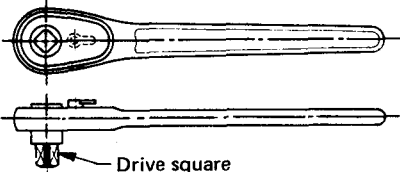
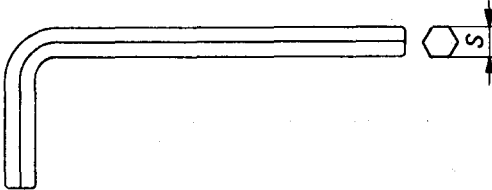
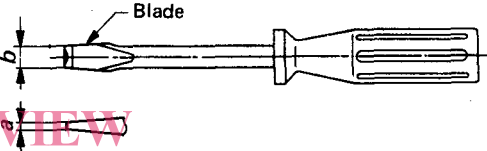
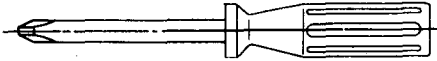
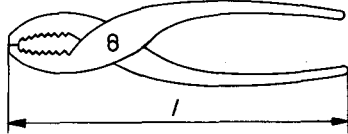
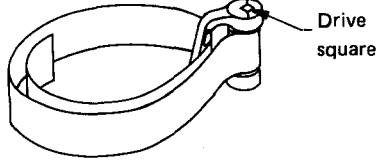
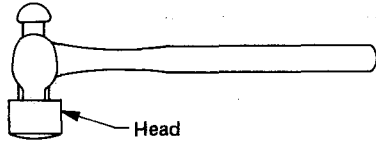
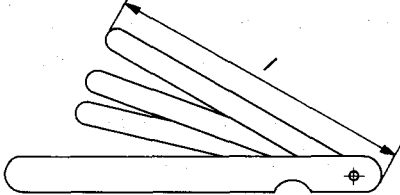
Dimensions in millimetres (inches)

No.	Nomenclature	Nominal dimension	Illustration
1	Combination wrench ¹⁾	$S =$ 8, 10, 12, 13, 14, 17, 19, 22, 24, 27, 30, 32 (5/16, 3/8, 7/16, 1/2, 9/16, 5/8, 11/16, 3/4, 13/16, 7/8, 15/16, 1 1/8)	
2	Engineer's wrench, single head	$S =$ 36, 41, 46, 50, 55, 60 (1 5/16, 1 1/2, 1 11/16, 1 7/8, 2 1/16, 2 1/4, 2 3/8)	
3	Socket wrench	12,5 (1/2) square drive 20 (3/4) square drive $S =$ 10, 12, 13, 14, 17, 19, 22, 24, 27, 30, 32, 36, 41, 46, 50 (3/8, 7/16, 1/2, 9/16, 5/8, 11/16, 3/4, 13/16, 7/8, 15/16, 1 1/8, 1 5/16, 1 1/2, 1 11/16, 1 7/8, 2 1/16, 2 1/4)	
4	Extension bar	12,5 (1/2) square drive 20 (3/4) square drive	
5	Universal joint square drive	12,5 (1/2) square drive 20 (3/4) square drive	
6	Nut spinner, flex head	12,5 (1/2) square drive 20 (3/4) square drive	
7	Tee handle, square drive	12,5 (1/2) square drive 20 (3/4) square drive	

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TABLE 1 (continued)

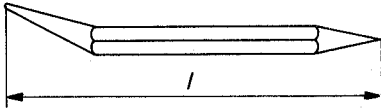
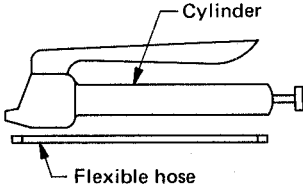
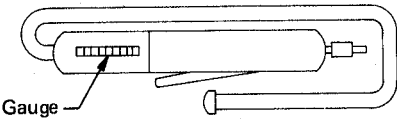
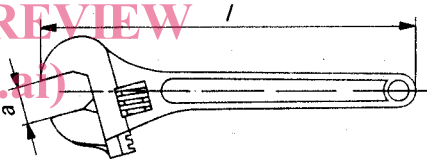

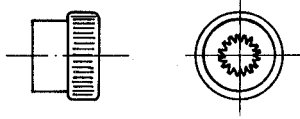
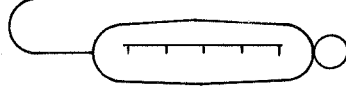
Dimensions in millimetres (inches)

No.	Nomenclature	Nominal dimension	Illustration
8	Ratchet handle, reversible	12,5 (1/2) square drive 20 (3/4) square drive	 <p>Drive square</p>
9	Key, hexagon, socket screws	$S =$ 3, 4, 5, 6, 8, 10, 14, 17 (3/16, 7/32, 1/4, 5/16, 3/8, 7/16, 1/2, 9/16, 5/8)	
10	Screwdriver for slotted head screws	Blade type 3 $a \times b =$ 0,8 x 5,5 1,2 x 8 (1/32 x 7/32) (3/64 x 5/16)	 <p>Blade</p>
11	Screwdriver for recessed head screws	For screws M3, M4 and M5 (UNo.5, UNo.6, UNo.8 and UNo.10) ²⁾	
12	Slip joint pliers	$l =$ 150 (6)	
13	Strap wrench	12,5 (1/2) square drive	 <p>Drive square</p>
14	Ball peen hammer	Mass of head = 0,7 kg (1.5 lb)	 <p>Head</p>
15	Feeler gauge	$l =$ 75 (3)	

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TABLE 1 (concluded)

Dimensions in millimetres (inches)

No.	Nomenclature	Nominal dimension	Illustration
16	Pinch bar	$l =$ 400, 750 (16, 30)	
17	Grease gun with flexible hose	Capacity of cylinder = 300 ml (10 fl oz)	
18	Inflator gauge, pneumatic type ^{3) 6)}	Capacity of cylinder = 1 MPa (10 kgf/cm ²) (140 lbf/in ²)	
19	Adjustable wrench, open end ⁴⁾	$a \times l =$ 0 to 29 x 250 (0 to 1 1/8 x 10)	
20	Torque wrench	12,5 (1/2) square drive 20 (3/4) square drive	
21	Battery post cleaner		
22	Belt tension gauge		

NOTES

- 1) The combination wrench may be replaced by engineer's wrench, double head, open end, or by box wrench, double head in the given «S» dimensions.
- 2) UNo.5 indicates unified screws No. 5.
- 3) Inflator gauge is used for rubber-tyred machines.
- 4) Tools with a specific fixed end should normally be used, and an adjustable wrench should only be used when such a specific tool is not available.
- 5) For tool for drain plug with square hole, use 12,5 mm (1/2 in) or 20 mm (3/4 in) square drive handle.
- 6) 1 bar = 10⁵ Pa = 10⁵ N/m².

ANNEX

GENERAL OPERATOR'S GUIDE TO HAND TOOL APPLICATION IN THE PERFORMANCE OF NORMAL MAINTENANCE AND ROUTINE ADJUSTMENT ACTIVITIES BY OPERATORS AT THE WORK SITE

The operator of earth-moving machinery has to oil, grease, check and adjust the machine before, during and after operation respectively in order to maintain it in good condition.

Table 2 sets out a general guide for the operator as to the basic tool to be used to service items on the machine. It is not to be considered as a design guide.

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TABLE 2 — Application guide

No (A)	Division (B)	Item to be served (C)	Manually (D)	Combination wrench (E)	Engineer's wrench single head (F)	Socket wrenches and handles (G)	Key, hexagon socket screws (H)	Screw-driver (I)	Ship joint pliers (J)	Strap wrench (K)	Ball peen hammer (L)	Feeler gauge (M)	Pinch bar (N)	Grease gun (O)	Infinitor gauge (P)	Adjustable wrench *** (Q)	Socket and torque wrench (R)	Battery post cleaner (S)	Bolt tension gauge (T)		
1	Engine	1) Engine oil	o																		
		2) Pump (water and fuel)	o	o											o						
		3) Filter element	o	o							o							o			
		4) Bolt and nut (relating to exhaust and intake manifold, turbo-charger, air cleaner)	o	o																	
		5) Valve clearance	o	o					o				o								
2	Gauges and meters	1) Engine tachometer	o	o																	
		2) Speedometer	o	o					o												
		3) Ammeter	o	o																	
		4) Temperature gauge	o	o																	
		5) Pressure gauge	o	o																	
3	Air intake, cooling, fuel system	1) Fuel system	o	o																	
		2) Radiator	o	o																	
		3) Cylinder head and cylinder block	o	o																	
		4) Air cleaner	o	o																	
		5) Filter element (main and auxiliary)	o	o																	
		6) Fuel injection nozzle	o	o																	
		7) Fan belt	o	o																	
4	Electrical system	1) Battery	o	o																o	
		2) Lighting system	o	o																	
		3) Starting system	o	o																	
		4) Generator	o	o																	
		5) Regulator	o	o																	
5	Power train (include work attachment control)	1) Clutch	o	o																	
		2) Transmission	o	o																	
		3) Steering	o	o																	
		4) Final drive	o	o																	
		5) Universal joint	o	o																	
		6) Hydraulic units	o	o																	
6	Controls	1) Engine control	o	o																	
		2) Steering control	o	o																	
		3) Brake	o	o																	
7	Under carriage	1) Carrier roller																			
		2) Track roller																			
		3) Idler																			
		4) Track shoe																			
		5) Main spring																			
		6) Track tension adjustment a) Adjust rod type b) Grease type																			
		7) Tyre																			

* "Manually" means maintenance and adjustment by hand without using tools.
 ** Combination wrench and socket wrench are also used for retightening of bolts and nuts of machines.
 *** The adjustable wrench is used only when a combination wrench, engineer's wrench, or socket wrench is not available.