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Draft Indian Standard

Hydraulic Torque Wrenches – Specification

ICS 23.140.10

Pneumatic and Hydraulic Tools Sectional Committee, PGD 08	Last Date of Comment is 15 February 2025
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FOREWORD

(Formal clause will be added later on)

Hydraulic torque wrenches utilize a hydraulic power pack driven by an electric motor or gasoline engine to produce a reciprocating motion. They are designed for tightening and loosening threaded fasteners professionally.

This standard has been developed with input from experts across different industries, and professionals involved in designing, manufacturing, and using hydraulic torque wrenches. It covers key aspects of hydraulic torque wrench performance, such as design, torque capacity, pressure ratings, accuracy, safety features, and testing methods. By providing clear and consistent guidelines, this standard will help manufacturers create tools that meet high standards of quality, reliability, and safety, while also helping users choose the right tool for their specific needs.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*). The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

HYDRAULIC TORQUE WRENCHES — SPECIFICATION

1 SCOPE

The standard covers the requirements of low profile and square drive hydraulic torque wrenches suitable for steel bolts of any size, conforming to properties given in IS 1367 (Part 3).

2 REFERENCE

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreement based on standards are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS No.</i>	<i>Title</i>
IS 1367 (Part 3) : 2017	Technical supply conditions for threaded steel fasteners: Part 3 Mechanical properties of fasteners made of carbon steel and bolts, screws and studs (<i>fifth revision</i>)
IS 7996 : 1976	Specification for driving squares for power socket wrenches
IS 11609 : 2023	Technical supply conditions for pneumatic tools

3 TERMINOLOGY

3.1 Gauge Pressure — A steady dynamic pressure (on load operating oil pressure) of oil measured on the gauge located on hydraulic pump.

3.2 Torque Wrench — A tool used for setting and adjusting the tightness and looseness of nuts and bolts to a desired value.

3.3 Hydraulic Torque Wrench — A hydraulic tool used to exert torque to achieve proper accuracy in tightening or loosening of a fastener.

3.4 Hydraulic Pump — The hydraulic pump supplies hydraulic pressure to the hydraulic torque wrench. It can be powered by an electric motor or gasoline engine.

4 CLASSIFICATIONS

Hydraulic wrenches are classified in two groups as per their application:

- a) Square drive; and
- b) Low profile direct hex drive.

5 REQUIREMENTS

5.1 Nominal Size

5.1.1 Square Drive

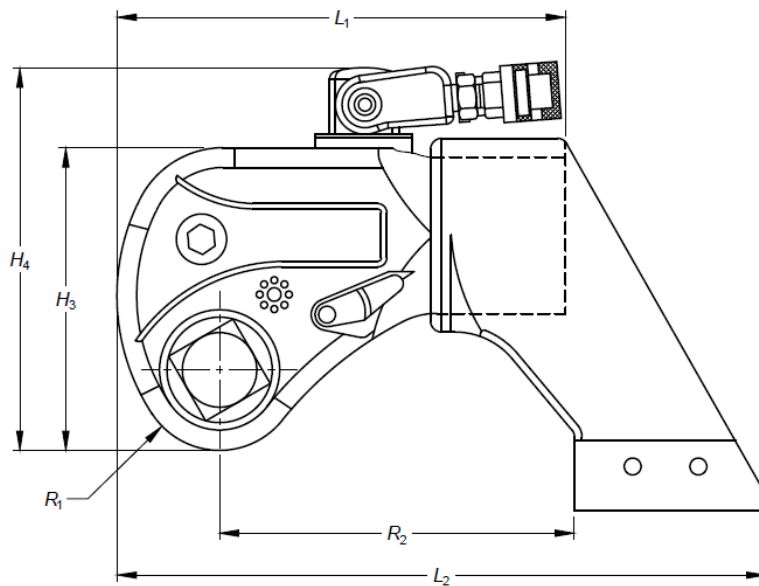
The dimension of across flat and across corners of the driving square shall conform to IS 7996.

5.1.2 Low Profile, Direct Hex Drive

The dimensions of across flats and across corners of the hex shall conform to respective fastener standard for metric or imperial sizes as applicable standards.

5.2 Tool Dimensions

The dimension for square drive tools and hex drive tools shall be as given in Fig. 1 and Fig. 2 respectively. Overall length and mass are given for guidance of the manufacturers and users only.



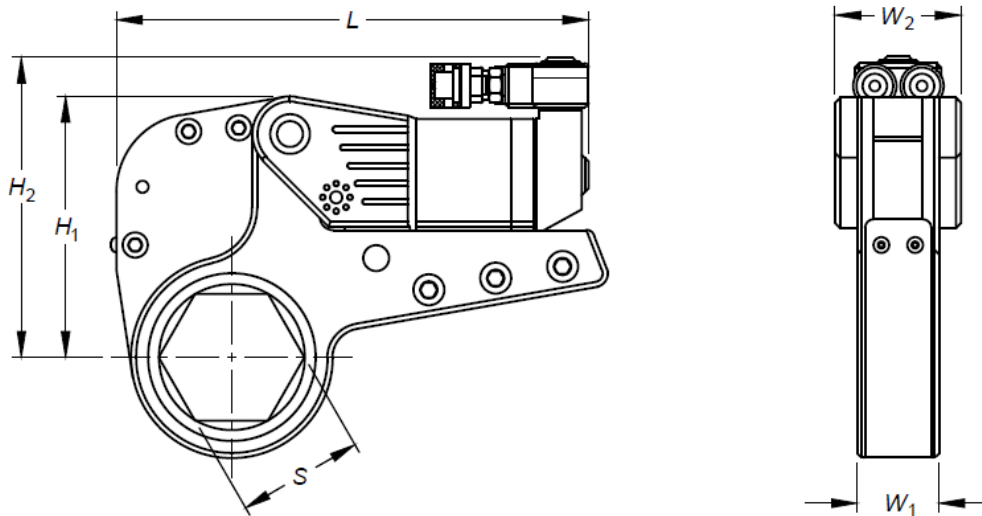
Torque, Nm, <i>Max</i> , ± 5 percent	Size, inch	R, mm, <i>Max</i>	L^1 , mm	H^1 , mm	Weight, Kg, <i>Max</i>
1200	$\frac{3}{4}$	21.0	160	105	1.5
1800	$\frac{3}{4}$	25.0	160	105	2.6
4500	1	33.0	213	135	4.5
7500	$1\frac{1}{2}$	41.0	254	163	8.8
10000	$1\frac{1}{2}$	45.0	291	182	9.0
15500	$1\frac{1}{2}$	50.0	313	198	14.0

20000	$2\frac{1}{2}$	58.7	373	232	23.0
27500	$2\frac{1}{2}$	58.0	390	237	30.0
36500	$2\frac{1}{2}$	63.0	415	259	34.0
78500	$2\frac{1}{2}$	79.0	522	292	65.0
130000	$3\frac{1}{2}$	95.0	619	349	110.0

NOTE

- 1) Given dimensions are for reference only.
- 2) Additional ranges for cases where bolting application needs sizes or torque range outside the above two tables, the manufacturer may confirm feasibility and design tool as required by user.
- 3) Size has been given in inch as per preventing practice.

FIG. 1 SQUARE DRIVE HYDRAULIC TORQUE WRENCH



Torque, Nm, <i>Max, ±5 percent</i>	S, Hex size, mm		C, mm, <i>Max</i>	L*, mm	H*, mm	W*, mm
	<i>Min</i>	<i>Max</i>				
2800	27	60	11.5	167	103	31.8
6000	36	80	14	203	144	41.8
14500	48	90	16	253	180	52.4
23900	70	115	24	330	194	64
47900	80	165	32	390	278	82.3

NOTE

- 1) Given dimensions are for reference only.
- 2) Additional ranges for cases where bolting application needs sizes or torque range outside the above two tables, the manufacturer may confirm feasibility & design tool as required by user.

FIG. 2 LOW PROFILE HYDRAULIC TORQUE WRENCH

5.3 Material

Material shall be of uniform quality and shall be free from defects and imperfections that might affect the serviceability of the finished product.

6 GENERAL REQUIREMENTS

6.1 Lubrication

An arrangement shall be made to lubricate bearings, gears, and other moving parts not lubricated from the inline oil lubricator.

6.2 Oil Inlet and Outlet Connection

The hydraulic torque wrench shall be equipped with appropriately fitted hydraulic oil inlet and outlet couplers, ensuring a secure connection to the hydraulic pump via hoses for the efficient supply of oil.

6.3 Ratchet Link

The ratchet link used for driving the wrench shall exhibit high wear resistance. It should not demonstrate excessive run-out, which could potentially hinder the operation of the wrench. The actuation of the ratchet link shall be carried out by a hydraulic cylinder. Link design shall provide for safe release of tool or suitable release provision for ratchet lock mechanism.

6.4 Hydraulic Cylinder

Hydraulic cylinder shall be designed to convert torque from the hydraulic pump into reciprocating hydraulic torque wrench and then transmit these to the ratchet link. The tools under these specifications are to be designed for a max working pressure of 70 Mpa. Tool design must confirm to a minimum flow of 1 LPM at maximum working pressure of 70 Mpa.

NOTE 1 LPM = $1.67 \times 10^{-5} \text{ m}^3/\text{s}$

6.5 Hydraulic Hose

The hydraulic hose connects the hydraulic pump to the hydraulic torque wrench and carries hydraulic fluid to transmit the torque. It is crucial that the hose is correctly fitted to both the hydraulic pump and the hydraulic torque wrench, ensuring a secure and proper connection. Furthermore, the hose should be thoroughly inspected to ensure that there are no leaks or any potential points of fluid loss.

6.7 Reaction Arms

Reaction arm of a square drive must have provision to be set at different angles about its mounting, to facilitate tool application for different reaction points.

6.7 Hydraulic Connections

Standard tools shall be designed to hydraulic connection size $G \frac{1}{4}$ couplings for safe and fast connection.

6.8 Accessories by Types

Tools shall have provision to accommodate various accessories to cover different application requirements. Standard accessories for both type of tools are as shown below:

- a) Square drive hydraulic torque wrench (see Fig. 3); and
- b) Low profile hydraulic torque wrench (see Fig. 4).

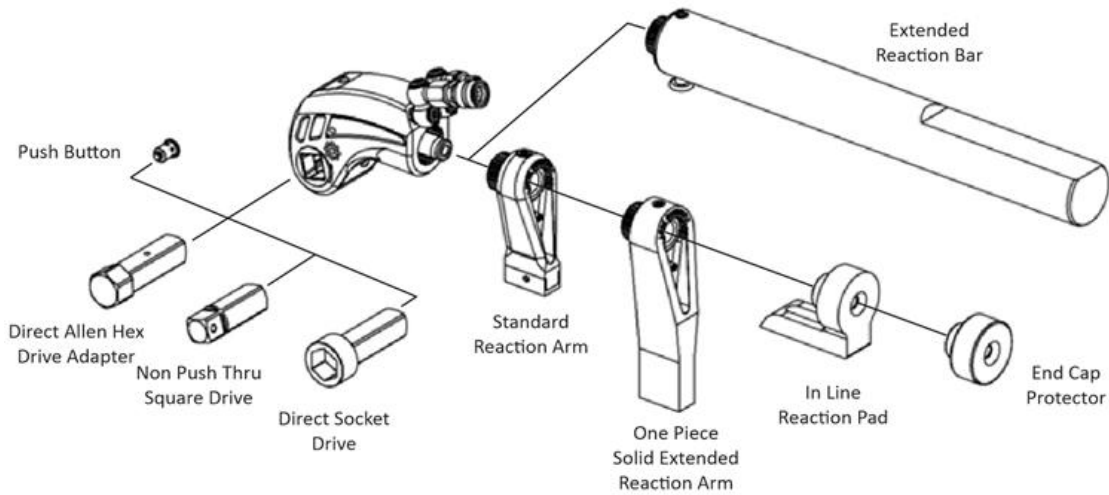


FIG. 3 SQUARE DRIVE HYDRAULIC TORQUE WRENCH

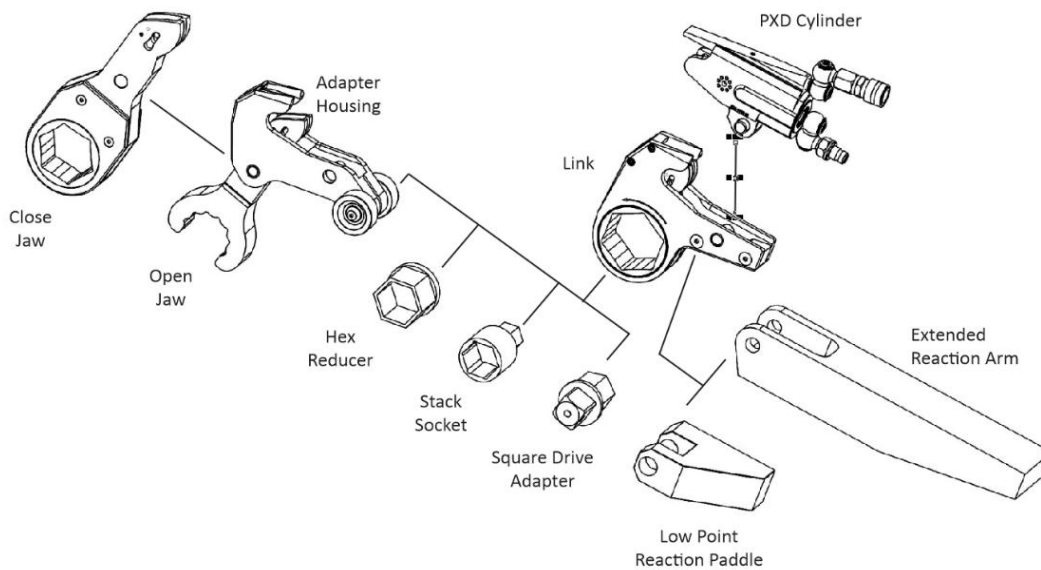


FIG. 4 LOW PROFILE HYDRAULIC TORQUE WRENCH

6.9 Workmanship and Finish

The hydraulic torque wrench shall be in modular construction. It shall be free from harmful flaws and other imperfection and shall be finished satisfactorily.

6.10 Remote Control

The hydraulic torque wrenches shall be operated using a hydraulic pump equipped with remote control functionality. The remote control allows for safe and convenient operation of the hydraulic torque wrenches.

6.11 Operation

The wrenches shall possess reversible functionality, allowing for both tightening and loosening operations.

6.12 Instruction Manual

An instruction manual shall be supplied with each tools. Data to be provided in the instruction manual shall be in accordance with IS 11609.

7 TESTS

7.1 Functional Test

The functional test of the hydraulic torque wrench shall involve conducting operations as its maximum operating pressure, which is specified as 70 Mpa.

7.2 Performance Test

The test shall consist of operating the hydraulic torque wrench to tighten a nut on the test rig to a predetermined torque. The wrench shall be able to tighten the nut on the rig to the ultimate torque as per the 'declared values' and accuracy.

7.2.1 The test rig (*see* Fig. 5) shall consist of a calibrated stat meter having a graduated scale and a nut, or the test rig should have transducer (load cell) (*see* Fig. 6) with track or peak hold function enabling the torque display with desired value.

7.2.2 To conduct the test, secure the hydraulic torque wrench onto the nut on the test rig. Then operate the wrench at variable pressure using hydraulic pump for both the operations of tightening and loosening of the nut.

7.2.3 To check the correctness of torque value within the range of ± 3 percent, place the wrench on the calibration unit (test rig) and then adjust the hydraulic pressure on hydraulic pump according to desired value and verify it with the torque value displayed on the display unit.

7.2.4 The Hydraulic Torque Wrench conforming to the standard shall have the torque value within the range of ± 3 percent of desired torque value.

7.2.5 The re-calibration of tool is required only in case of any repair or alteration affecting hydraulic area or leverage.

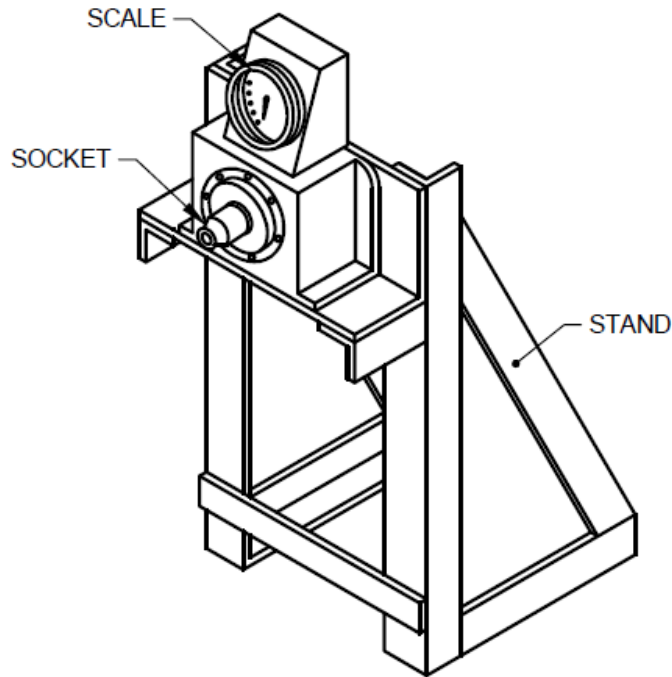


FIG. 5 TEST RIG (TYPICAL)

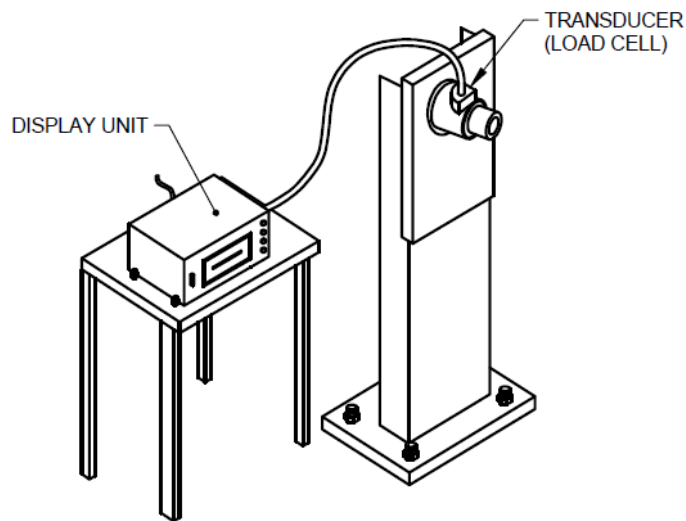


FIG. 6 TEST RIG WITH LOAD CELL AND DISPLAY UNIT (TYPICAL)

7.3 Endurance Test

7.3.1 For Type Approval

Each sample that conforms to the specification shall undergo a 100 cycle run on the test rig in the manufacturer's test room to disseminate energy. The 100 cycle run may be conducted over a period of time and does not need to be completed consecutively. Following the test, the tool shall be disassembled, and a thorough examination of all parts shall be carried out. It shall be required that no part either breaks during the test or is found broken, cracked, or deformed.

7.3.2 For Routine Testing

Routine testing shall be conducted exclusively for newly developed tools. For orders comprising 50 pieces or more, one percent, with a minimum of one tool, shall undergo a 15-cycle run on the test rig. The test cycles need not be consecutive. Subsequently, the tool shall be disassembled, and all components thoroughly examined. During field use, no part should break, and upon examination, no signs of breakage, cracking, deformation, or excessive wear should be observed.

7.4 Operation Tests

Every hydraulic torque wrench must undergo comprehensive testing to ensure compliance with quality standards. This includes evaluations for rated pressure, oil leakages, and thorough visual inspections. Additionally, the wrench should be tested in both forward and reverse directions to assess its functionality. The ease of fitment and removal of the socket on the square drive or ratchet link should also be verified. Throughout the testing process, it is essential to monitor for any abnormal noise or excessive temperature rise, which could indicate potential issues. The hydraulic torque wrench must exhibit flawless performance without any defects discovered during the testing procedures.

8 PACKAGING AND MARKING

8.1 Packaging

The tool shall be packed as per IS 11609. Prior to packaging, it is essential to ensure the adequate protection of each tool by sealing the inlet, outlet, and other openings to prevent the entry of dust and other potentially damaging substances.

8.2 Marking

8.2.1 The hydraulic torque wrenches shall be marked at a suitable place so that during normal use the markings shall not get damaged or defaced. The impact wrench shall be marked with following

information:

- a) Minimum and maximum torque;
- b) Manufacturer's name or trade-mark; and
- c) Serial number and the year of manufacture.

8.2.2 *BIS Certification Marking*

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the Bureau of Indian Standards Act, 2016 and the Rules and Regulations framed thereunder, and the product(s) may be marked with the standard mark.