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Draft Indian Standard

Hydraulic Impulse Tools – Specification

ICS 23.140.10

Pneumatic and Hydraulic Tools Sectional
Committee, PGD 08

Last Date of Comment: **10 February 2025**

FOREWORD

(Formal clause will be added later on)

A hydraulic impulse tool is a type of equipment used for fastening or loosening bolts by delivering short, high-torque bursts (impulses) of hydraulic power. It uses hydraulic pressure to generate rapid, high-energy impacts that quickly tighten or loosen bolts with minimal effort from the operator. These tools are often used in heavy-duty applications like construction, oil and gas, and machinery maintenance, where fast and efficient fastening is required. The impulse action reduces the risk of over-tightening and provides more control compared to traditional impact wrenches.

This standard has been developed with input from experts across different industries, technical committees, 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 in choosing the right tool for their specific needs.

In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revised*)’. 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 IMPULSE TOOLS — SPECIFICATION

1 SCOPE

This standard covers requirements for hydraulic automatic shut-off and non-shut-off impulse tools. Hydraulic automatic shut-off impulse tools suitable for applications up to M14 and hydraulic non-shut-off impulse tools suitable for applications up to M24.

2 REFERENCE

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

<i>IS No.</i>	<i>Title</i>
IS 196 : 2024	Atmospheric conditions for testing (<i>second revision</i>)
IS 8669 : 2014	Assembly tools for screws and nuts — Drive ends for hand-and machine-operated screwdriver bits and connecting parts — Dimensions, torque testing (<i>second revision</i>)
IS 554 : 1999	Pipe threads where pressure-tight joints are made on the threads — Dimensions, tolerances and designation (<i>fourth revision</i>)
IS 11609 : 2023	Technical supply conditions for pneumatic tools

2 TERMINOLOGY

2.1 Gauge Pressure — A steady dynamic pressure (on load operating air pressure) of compressed air measured on the gauge located within three meters from the inlet to the hydraulic impulse tools.

2.2 Maximum Air Consumption on Free Run (No Load Condition) — Volume of air corrected to standard atmospheric conditions of temperature and pressure according to IS 196 consumed by the hydraulic impulse tools without any fluctuations of pressure during the test.

2.3 Hydraulic Impulse Tool — A power assembly tool fitted with a motor driving a hydraulic impulse mechanism for tightening threaded fasteners, which applies torque through a hydraulic impulse unit to a fastener in discontinuous increments.

2.4 Hydraulic Automatic Shut-off Impulse Tool — Hydraulic impulse power tool with a device that shuts off or disconnects the power to the tool when a predetermined output level is attained.

2.5 Hydraulic Non-Shut-off Impulse Tool — Hydraulic impulse power tool which continues to apply torque impulses if power is applied to the tool.

2.6 Hydraulic Electronically Controlled Impulse Tool — Hydraulic impulse power tool with electronic control of the shut-off mechanism.

2.7 Straight Hydraulic Impulse Tool — Hydraulic impulse tool with a coaxial motor, handle and output spindle axis. (*see* Fig. 1)

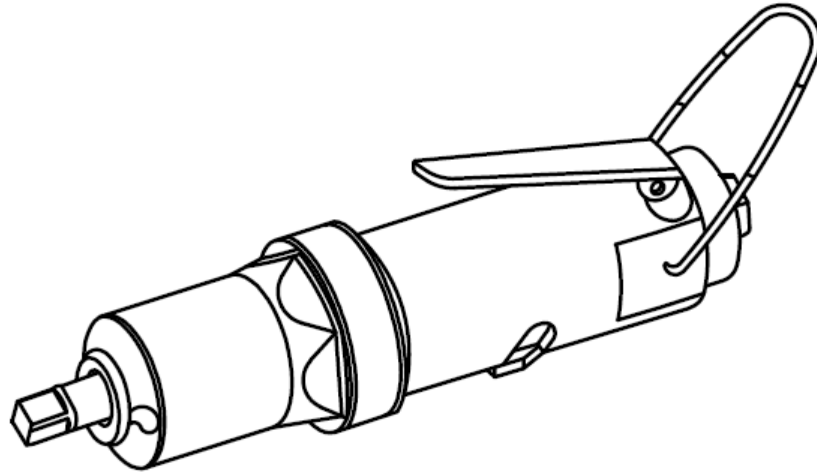


FIG. 1 STRAIGHT HYDRAULIC IMPULSE TOOL

2.8 Pistol Hydraulic Impulse Tool — Hydraulic impulse tool with pistol type handle body. (*see* Fig. 2)

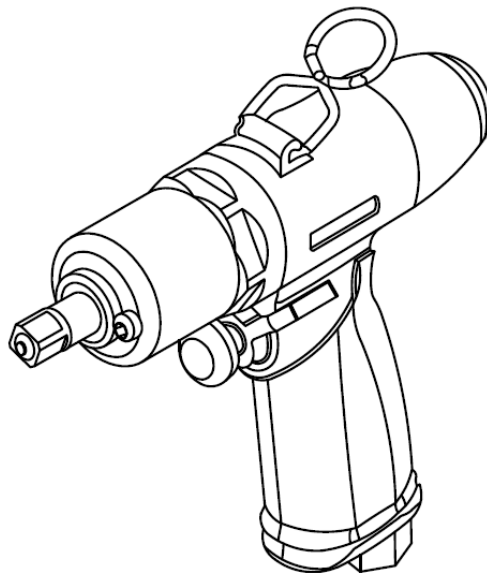


FIG. 2 PISTOL HYDRAULIC IMPULSE TOOL

2.9 Angle Drive Hydraulic Impulse Tool — Hydraulic impulse power tool with the output spindle at an angle to the motor axis. (*see Fig. 3*)

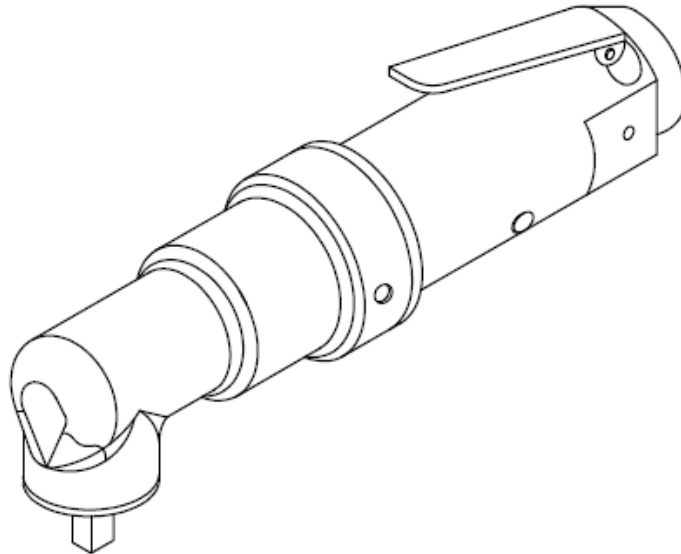


FIG. 3 ANGLE DRIVE HYDRAULIC IMPULSE TOOL

2.10 Hydraulic Impulse Tool with Grip Type Handle — Hydraulic impulse power tool with D type handle. (*see Fig. 4*)

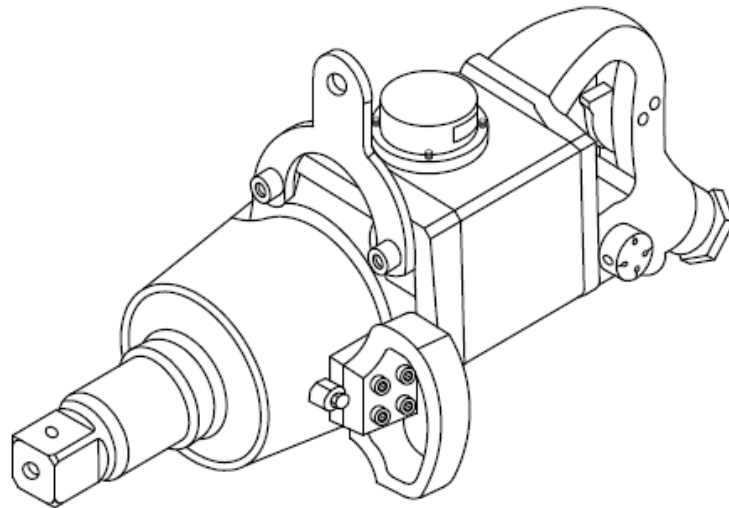


FIG. 4 HYDRAULIC IMPULSE TOOL WITH GRIP TYPE HANDLE

2.11 Start-and-Stop Device/Throttle — Manually operated control on the assembly power tool for threaded fasteners by which the energy supply to the motor can be turned on and off.

2.12 Rated Air Pressure — Air pressure, required at an air tool inlet port to assure rated performance of the tool, also considered the maximum pressure at which the tool may be operated.

2.13 Rated speed — Speed of an air tool at no load and rated air pressure at the tool inlet port.

NOTE — The rated speed is expressed in revolutions per minute.

2.14 Suspension device — Device, which is attached to the tool and when the same is connected on a spring balancer or articulating arm, by doing so primary purpose is to reduce the strain on the operator caused by the weight of the tool which enhances ergonomics.

3 CLASSIFICATION

3.1 Based on Direction of Rotation

- a) Type NR — Non-reversible
- b) Type R — Reversible

3.2 Based on Design of Handle

- a) Straight Type (*see* Fig. 1)
- b) Pistol Type (*see* Fig. 2)
- c) Angle Type (*see* Fig. 3)
- d) Grip Type (*see* Fig. 4)

3.3 Based on Type of Anvil

- a) Square type anvil (*see* Fig. 5)
- b) Driver type anvil (*see* Fig. 6)

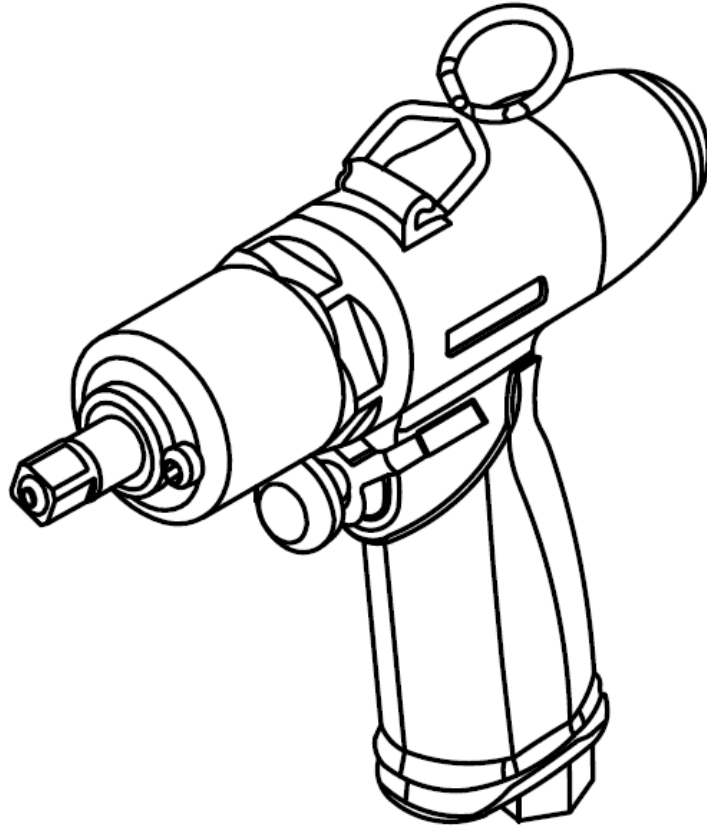


FIG. 5 SQUARE TYPE ANVIL

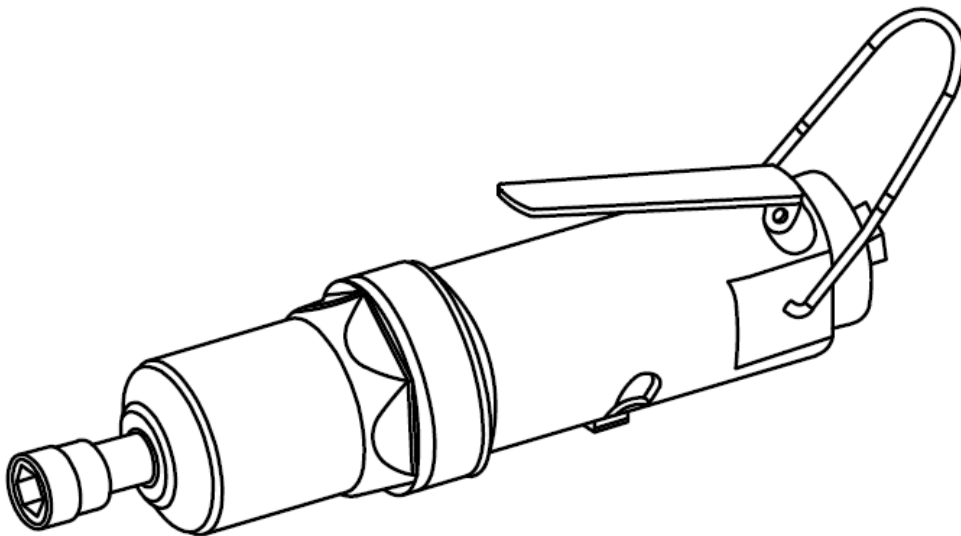


FIG. 6 DRIVER TYPE ANVIL

4 MATERIAL, WORKMANSHIP AND FINISH

Material shall be of uniform quality and shall be free from defects and imperfections that might affect the serviceability of the finished product. The hydraulic impulse tool shall be free from harmful flaws, cracks, burrs and other imperfections and shall be finished satisfactorily.

5 REQUIREMENTS

The performance characteristics of hydraulic automatic shut-off impulse tools, and non-shut-off impulse tools shall be as given in Table 1 and Table 2 respectively.

Table 1 Performance Characteristics of Hydraulic Automatic Shut-Off Impulse Tools
(Clause 5)

Sl No.	Capacity Bolt Size, mm	Free Speed, RPM	Torque Adjustment Range, N-m		Square Drive Shank, mm	Weight, kg	Overall Length, mm	Air Inlet Thread, BSP	Air Hose Size, mm	Air Pressure, kg/cm ²
			Min	Max						
(1)	(2)	(3)	(4)		(5)	(6)	(7)	(8)	(9)	(10)
i)	M5	7500	9	15	9.5	0.9	171	1/4	9.5	6
ii)	M8	7000	20	35	9.5	1.25	184	1/4	9.5	6
iii)	M8	7000	18	32	6.35 ¹⁾	1.25	189	1/4	9.5	6
iv)	M8	6500	20	35	9.5	1.2	232	1/4	9.5	6
v)	M8	6500	18	32	6.35 ¹⁾	1.2	237	1/4	9.5	6
vi)	M8-M10	6000	40	60	9.5	1.4	206.5	1/4	9.5	6
vii)	M8-M10	6000	40	57	6.35 ¹⁾	1.4	209	1/4	9.5	6
viii)	M8-M10	6000	40	60	9.5	1.4	257	1/4	9.5	6
ix)	M10-M12	6000	85	110	12.7	2.3	216	1/4	9.5	6
x)	M14	4800	120	210	19	4.0	260	3/8	12.7	6

¹⁾ Suffix the above tools with 'D' for driver type anvil-D according to IS 8669.

Table 2 Performance Characteristics of Hydraulic Non-Shut-Off Impulse Tools
(Clause 5)

Sl No.	Capacity Bolt Size, mm	Free Speed, RPM	Torque Adjustment Range, N-m		Square Drive Shank, mm	Weight, kg	Overall Length, mm	Air Inlet Thread, BSP	Air Hose Size, mm	Air Pressure, kg/cm ²
			Min	Max						
(1)	(2)	(3)	(4)		(5)	(6)	(7)	(8)	(9)	(10)
i)	M5	7500	9	15	9.5	0.81	139	1/4"	9.5	6
ii)	M5	7500	8	13	6.35 ¹⁾	0.82	147.5	1/4"	9.5	6

iii)	M5	8000	9	15	9.5	0.95	220	1/4"	9.5	6
iv)	M5	8000	8	13	6.35 ¹⁾	0.96	225	1/4"	9.5	6
v)	M6-M8	6500	25	35	9.5	0.95	155	1/4"	9.5	6
vi)	M8	7000	15	35	9.5	1.19	146	1/4"	9.5	6
vii)	M8	7000	15	30	6.35 ¹⁾	1.19	151	1/4"	9.5	6
viii)	M8	8200	15	35	9.5	1.2	221	1/4"	9.5	6
ix)	M8	8200	15	30	6.35 ¹⁾	1.2	226	1/4"	9.5	6
x)	M8	7000	15	35	9.5	1.64	256	1/4"	9.5	6
xi)	M8-M10	6000	35	70	9.5	1.3	168	1/4"	9.5	6
xii)	M8-M10	6000	30	60	6.35 ¹⁾	1.3	171	1/4"	9.5	6
xiii)	M8-M10	6500	35	70	9.5	1.25	245	1/4"	9.5	6
xiv)	M8-M10	6500	30	60	6.35 ¹⁾	1.25	250	1/4"	9.5	6
xv)	M8-M10	5500	30	60	9.5	1.8	292	1/4"	9.5	6
xvi)	M12	5800	70	120	12.7	2.04	196	1/4"	9.5	6
xvii)	M16	2800	120	200	12.7	3.65	210	1/4"	9.5	6
xviii)	M18	2400	200	300	19.05	4.9	240	3/8"	12.7	6
xix)	M18-M20	4000	300	400	19.05	6.5	270	3/8"	12.7	6
xx)	M24	3500	300	550	25.4	12.5	443	3/4"	12.7	6

¹⁾ Suffix the above tools with 'D' for driver type anvil-D according to IS 8669.

6 GENERAL REQUIREMENTS

6.1 Lubrication

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

6.2 Air Inlet Connection

6.2.1 Air inlet connection shall be fitted with an air strainer or screen which shall be effective in retaining solid particles from compressed air supply. Moreover, it shall be possible to clean the strainer and screen easily.

6.2.2 Air inlet connection shall have pipe threads conforming to IS 554.

6.2.3 The position of the air inlet connection shall not hinder the working of tool when connected with air hose.

6.3 Throttle

The design of the throttle shall be provided for admitting and shutting the supply of compressed air. It shall be such that the operator can easily operate the tool with their fingers. The throttle design should be ambidextrous. For reversible tools, a non-leakable reversing throttle shall be provided, with the mechanism operating smoothly to reverse the operation.

6.4 Suspension Link

Provision should be made for suspending the tool during operations.

6.5 Bearings

Bearings shall be suitably housed and adequately sealed to prevent leakage of lubricant and entrance of dirt and dust.

6.6 Spindle

6.6.1 *For Square Type Anvil*

The driving square of the spindle shall be wear-resistant. The driving square, when fitted with a suitable socket, shall not show excessive run-out which may adversely affect operation of the wrench.

6.6.2 *For Driver Type Anvil*

The driving hexagon of the spindle shall be worn resistant. The driving hexagon, when fitted with a suitable tool bit shank, shall not show excessive run out which may adversely affect operation of the tool.

6.7 Ease of Torque Adjustment

Torque should be easily set by Allen key externally without dismantling the tool.

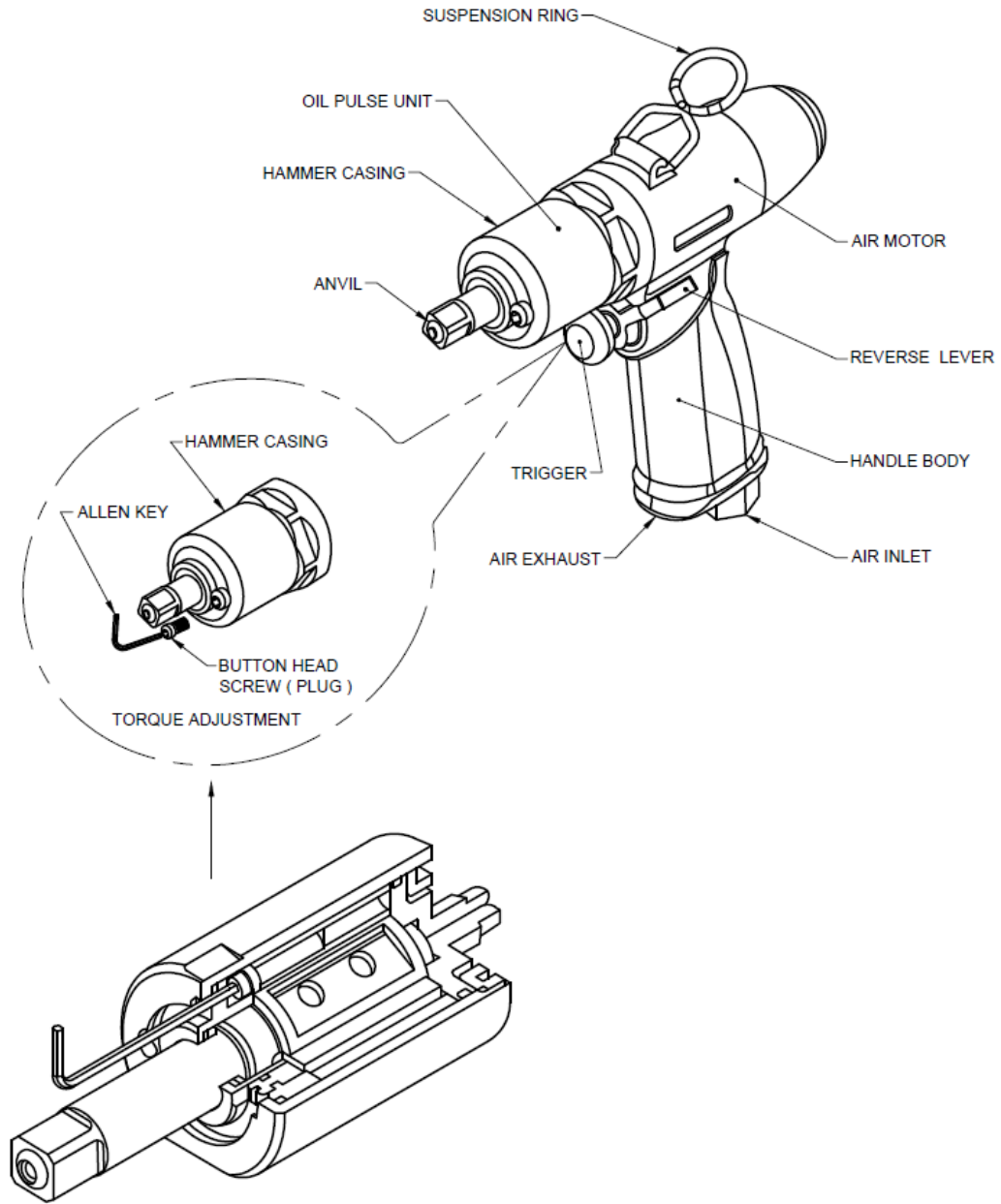


FIG. 7 EASY TORQUE ADJUSTMENT

7 OPERATION

7.1 For rated performance of hydraulic shut-off impulse tools and non-shut-off impulse tools, the stable dynamic air pressure at the inlet of tool when it is running shall be $6 \text{ bar} \pm 0.5 \text{ bar}$ and $6 \text{ bar} \pm 1 \text{ bar}$ respectively.

Note — $1 \text{ bar} = 10^5 \text{ Pa}$

7.2 Inlet air shall be dry, clean and lubricated.

7.3 Before calibrating the tool for torque, the pulse tool shall be run on load at least 10 to 20 s to bring the pulse unit to the working condition. Then measure the applied torque & adjust the torque setting if required as per application need.

7.5 The hydraulic impulse tool shall always be set up during operation using the same hoses, sockets, and air pressure as those used in normal running conditions.

7.6 Machine shall not get excessively heated up when continuously operated for eight hours minimum.

7.7 No twisting thrust, or reaction shall be experienced by the operator during operation.

7.8 The tools shall be reversible. The rotational direction of the tool shall be controlled by a conveniently located mechanical device independent of throttle.

8 INSTRUCTION MANUAL

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

9 TESTS

9.1 Air Consumption Test

The air flow meter or any other equally suitable instrument shall be used to determine the quantity of the air consumed per minute at $6 \text{ bar} \pm 0.5 \text{ bar}$ pressure measured at not more than three metres from the tool.

Note — $1 \text{ bar} = 10^5 \text{ Pa}$

9.2 Performance Test

9.2.1 A hydraulic impulse tool shall be tested for rated torque at an air pressure of $6 \text{ bar} \pm 0.5 \text{ bar}$.

Note — $1 \text{ bar} = 10^5 \text{ Pa}$

9.2.2 The test shall consist of operating the hydraulic impulse tool on a load cell or on a screwing joint simulator connected to digital display showing the value of torque delivered by the tool.

9.2.3 The load test shall be carried out on one percent of the total ordered quantity, the minimum being one for an order of 50 or more. The load shall be applied on a hydraulic impulse tool under test after preliminary run of not less than 5 to 10 s.

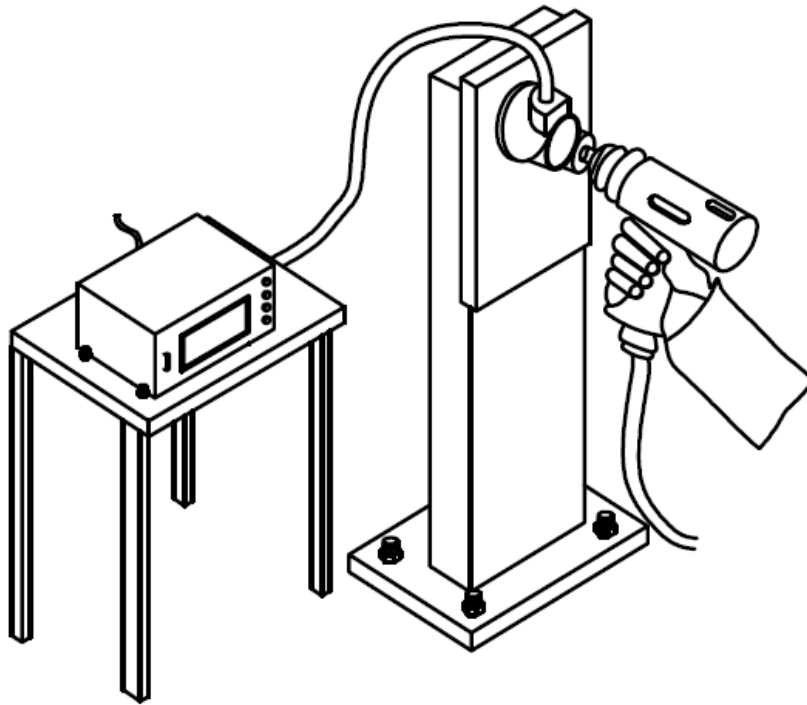


FIG. 8 PERFORMANCE TEST

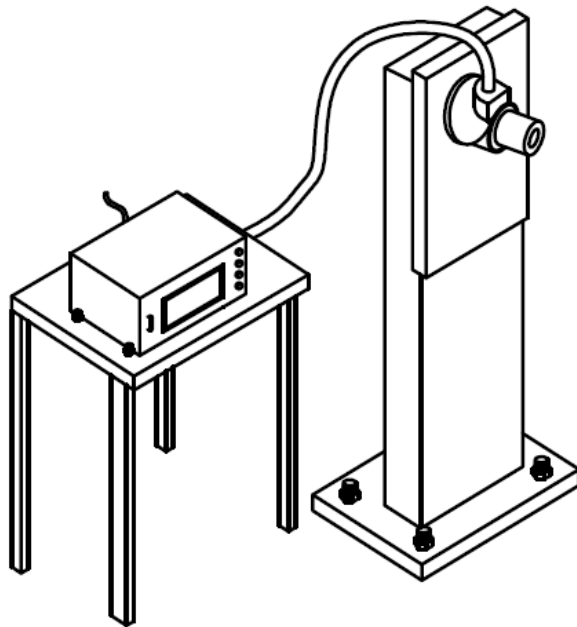


FIG. 9 LOAD CELL

9.3 Operational Test

Every tool shall be tested for easy starting and stopping for at least 50 times (on-off cycles) in each forward and reverse direction. It shall also be tested for easy fitment and removal of the impact socket/tool bit shank on the hexagon drive. During testing, there shall be no abnormal noise or excessive temperature rise. The machine shall show no flaws developed during testing.

9.4 Endurance Test

9.4.1 For Type Approval

Each sample shall be put on extensive run down on automatic testing machine for 500,000 cycles.

After completion of the cycles, the tool shall be dismantled and all parts examined. No part shall either break during field use or shall be found, cracked, deformed or show signs of excessive wear on examination. The quality of pulse unit oil needs to be verified.

9.4.2 The test as per **9.4.1** shall be carried out by the manufacturer before a new product is marketed or any changes are made in design or materials in the existing product. A type approval certificate shall be supplied by the manufacturer to the purchaser, if asked for.

10 PACKAGING AND MARKING

10.1 Packaging

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. Packing shall be done in accordance with IS : 11609.

10.2 Marking

10.2.1 The tool shall be marked at a suitable place so that during normal use the markings shall not get damaged. It shall be marked with following information:

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

10.2.2 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.