

BUREAU OF INDIAN STANDARDS

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भारतीय मानक मसौदा

**हस्तचालित सार्वभौमिक गियरलेस खींचने और
उठाने वाली मशीनें — विशिष्टि**

(आई एस 5604 का दूसरा पुनरीक्षण)

DRAFT Indian Standard

**Hand-Operated Universal Gearless
Pulling and Lifting Machines — Specification**

(Second Revision of IS 5604)

ICS 53.020

Cranes, Lifting Chains And Related Equipment
Sectional Committee, MED 14

Last date for receipt of comments
is **21st January 2025**

FOREWORD

(The formal clause will be added later)

This standard was originally issued in 1970 and subsequently revised in 1984. This revision has been taken up for incorporating the modifications found necessary as a result of experience gained with the use of this standard. Also, in this revision, the standard has been brought into the latest style and format of Indian Standards, and references wherever applicable have been updated. Amendment 1 has also been incorporated in this revision.

The universal gearless hand-operated pulling and lifting machines are used for the rectilinear pulling of steel wire ropes by gripping and releasing actions of two sets of jaws alternately. Each set consists of a pair of smooth parallel jaws of suitable length that grip the wire rope firmly by closing top and bottom without causing damage to the rope. These jaws work on the self-clamping principle, that is, they are locked by the pulling force of the wire rope itself. The jaws are enclosed in a casing and are connected by rods to forward (or up) and reverse (or down) mechanism, which is operated by a telescopic handle.

The information required by the manufacturer, and instructions for the use of these machines have been given in Annex A and Annex B.

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.

Indian Standard

**HAND-OPERATED UNIVERSAL GEARLESS
PULLING AND LIFTING MACHINES — SPECIFICATION**

(Second Revision)

1 SCOPE

This standard specifies the materials, requirements and testing for the hand-operated gearless pulling and lifting machines of lifting capacities up to 5 tonnes.

2 REFERENCES

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

<i>IS No.</i>	<i>Title</i>
IS 617 : 2024	Aluminium and aluminium alloys ingots for remelting and castings for general engineering purposes — specification (<i>fourth revision</i>)
IS 2004 : 1991	Carbon steel forgings for general engineering purposes — Specification (<i>third revision</i>)
IS 2062 : 2011	Hot rolled medium and high tensile structural steel — Specification (<i>seventh revision</i>)
IS 2266 : 2019	Steel wire ropes for general engineering purpose — Specification (<i>fifth revision</i>)
IS 2611 : 1964	Specification for carbon chromium molybdenum steel forgings for high temperature service
IS 3469 (Part 1 to Part 3) : 1974	Tolerances for closed die steel forgings (<i>first revision</i>)
IS 4367 : 1991	Alloy steel forgings for general industrial use — Specification (<i>first revision</i>)
IS 4454 (Part 1) : 2001	Steel wire for mechanical springs — Specification: Part 1 cold drawn unalloyed steel wire (<i>third revision</i>)
IS 5669 : 2019	Rolling bearings — Radial bearings — Boundary dimensions, general plan (<i>second revision</i>)
IS 5692 : 2024	Rolling Bearings — Radial Bearings — Geometrical Product Specifications (GPS) and Tolerance Values (<i>third revision</i>)
IS 15560 : 2005	Point hooks with shank up to 160 tonne — Specification
IS 2102 (Part 1) : 1993 ISO 2768-1-89	General tolerances : Part 1 tolerances for linear and angular dimensions without individual tolerance indications (<i>third revision</i>)
IS 17894 : 2022 ISO 22081 : 2021	Geometrical product specifications GPS - Geometrical tolerancing - General geometrical specifications and general size — Specifications

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply:

3.1 Hand-Operated Gearless Pulling and Lifting Machine — The machine reeved with a load bearing wire rope and operated by a lever so as to give a mechanical advantage (being operatable in any position horizontal, vertical or inclined and being easily transportable manually).

3.2 Rating — The safe working load in tonnes for the purpose of lifting specified by the manufacturer for the machine. In determining the applied loads, the mass of all individual devices, such as slings and eye-hooks shall be included.

3.3 Factor of Safety — The ratio between ultimate strength of the weakest link of the machine and the rated load fixed for the machine.

3.4 Effort — The pull on the handle required to lift the specified load, the specified load is usually working load limit of the machine.

3.5 Lift per Cycle — The total travel of the wire rope in lifting the rated load per double stroke (forward and backward) of the telescopic lever of the machine.

4 MATERIAL

The different materials for the construction of machine shall conform to the following Indian Standards:

<i>Sl No.</i>	<i>Machine Component</i>	<i>Indian Standards for the Material Conformity</i>
(1)	(2)	(3)
i)	Steel bars, plates and sections	IS 2062
ii)	Steel forgings	IS 2004, IS 2611, IS 4367
iii)	Aluminium and aluminium alloy	IS 617
iv)	Coil springs	IS 4454 (Part 1)
v)	Hooks	IS 15560
vi)	Wire ropes	IS 2266

4.1.1 For other materials used, the manufacturer shall produce evidence satisfactory to those concerned that such materials have the essential qualities of the standard materials.

4.2 The jaws shall be made from the alloy steel containing at least 0.90 percent chromium to ensure resistance to abrasion. The alloy steel after suitable heat treatment (hardening and tempering) shall have the following properties:

<i>Sl No.</i>	<i>Properties</i>	<i>Specifies Requirement</i>
(1)	(2)	(3)
i)	Tensile strength, <i>Min</i>	900 MN/m ²
ii)	Elongation (at gauge length 5.65 A), <i>Min</i>	15 percent
iii)	Izod impact value, <i>Min</i>	40 Nm
iv)	Hardness, <i>Min</i>	300 BHN

5 CAPACITY

The machines shall be manufactured with the following lifting capacities:

0.8, 1.0, 1.6, 2, 3.2 and 5 tonnes.

The corresponding pulling capacity shall be specified by the manufacturer.

6 CONSTRUCTION AND WORKMANSHIP

6.1 All parts of the machine shall be constructed with a minimum factor of safety of 5.

6.2 For the purpose of guidance, the various components of machine are shown in Fig. 1.

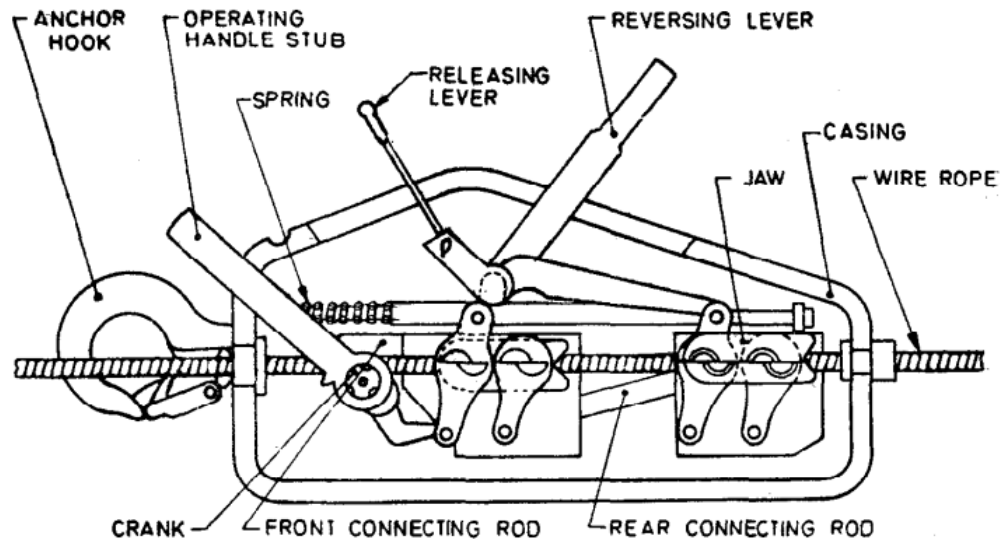


FIG. 1 PULLING AND LIFTING MACHINE

6.3 Casing

The casing of the machine either cast or fabricated shall maintain alignment under all expected conditions of service.

6.4 Bearings

The crank shall be supported by suitable rolling bearing or plain bush bearing.

6.4.1 Ball and Roller Bearings

Ball and parallel roller bearings shall comply with the requirements of IS 5669, IS 5692 with the provision that needle roller bearings are permitted. The load life rating and grade of diametric clearance for all types of anti-friction bearings shall be as recommended by the bearing manufacturer for the particular service required.

6.4.2 Plain Bearings

When plain bearings are used facility for proper lubrication shall be provided and their maximum bearing pressure shall not exceed the following values:

Sl No.		Bronze Bearings kgf/ cm ²	Cast Iron Bearings kgf/ cm ²
(1)	(2)	(3)	
i)	Mild steel shaft ground	180	140
ii)	Mild steel shaft not ground	140	100

For plain bearings made of material other than bronze or cast iron, the load/ life rating and the maximum allowable bearing pressure shall be as recommended by the bearing manufacturers.

6.5 Wire Ropes

Galvanized steel core wire ropes of 6 × 19 construction up to 12 mm diameter and 6 × 36 or 6 × 37 construction above 12 mm diameter shall be used.

A galvanized wire rope with fiber steel mixed core may also be used if agreed to between the manufacturer and the purchaser.

6.5.1 The tolerance on wire rope diameter shall be + 4, - 2 percent.

6.6 Heat Treatment

All components shall be normalized or hardened and tempered, wherever necessary. Fabricated load bearing components shall be stress-relieved.

6.7 All steel components of the pulling and lifting machines shall be treated for rust prevention.

6.8 Weight

The machine shall be portable and the weight shall, therefore, be such that the machine can be lifted and carried easily by two persons.

7 TOLERANCES

7.1 Tolerances on Forgings

Tolerances on forgings shall conform to the requirements of IS 3469.

7.2 Machining Tolerances

Machining tolerances medium class of IS 2102 (Part 1) : 1993/ISO 2768-1-89 and IS 17894 : 2022/ISO 22081 : 2021 as applicable.

8 OPERATION

8.1 The load shall be moved by the operation of a lever and the direction of movement shall be determined by selecting one of the two separate levers provided for the purpose.

8.2 It shall be possible to change the direction of movement of the wire rope without releasing the load.

8.3 Suitable release lever shall be provided to allow the operator to move the slack wire rope quickly to its required position when the hoist is not underload.

8.4 Back Slippage

When a load is being lifted, some back slippage of the load is bound to occur. Permissible back slippage of the load as a percentage of total lift in one stroke (forward and backward) shall be as follows:

<i>Sl No.</i>	<i>Lifting Capacity of Machine t</i>	<i>Load Applied t</i>	<i>Permissible back Slip Percent</i>
(1)	(2)	(3)	(4)
i)	0.8	0.8	10
ii)	1.0	1.0	10
iii)	1.6	1.6	10
iv)	2.0	2.0	10
v)	3.2	3.2	15
vi)	5.0	5.0	15

9 EFFORT

9.1 When requested by the user, the manufacturer shall declare the operating effort on the lever required to raise the safe working load together with the effective radius of the handle of the hoist.

10 TESTS

10.1 Proof Loading

Each pulling and lifting machine shall be subjected to a proof load of twice the safe working load for a period of 30 seconds. The machine shall withstand the proof load without permanent deformation of any component part.

10.2 Operational Test

After proof loading the lifting and pulling machine shall be made to lift 1.5 times the safe working load through a distance of 30 cm in such a manner as to ensure that every part of mechanism comes under load. During the test, there shall be no deformation of any component part.

10.3 Break Load Testing

If desired by the purchaser, a sample of pulling and lifting machine shall be subjected to a gradually increasing load of at least 5 times the safe working load without breakage of material or such distortion as could result in the release of the load. After this test, all parts shall be defaced to make them unusable.

10.4 Examination

After proof loading and the operational test, the machine shall be thoroughly examined by a competent person. It shall be deemed to comply with the requirement of this standard only if it is found free from deformation, cracks, flaws or other defects.

11 INSPECTION, CERTIFICATE OF TEST AND EXAMINATION

11.1 Inspection

The representative of the purchaser shall have access to the works of the manufacturer at all reasonable times for the purpose of witnessing the specified test and inspecting the testing machine and methods of examination.

11.2 Certificate of Test and Examination

Certificate of test and examination shall be issued with every consignment of pulling and lifting machines giving following information for each machine:

- a) Distinguishing mark;
- b) Description;
- c) Wire rope size and type;
- d) Number tested;
- e) Proof load applied;
- f) Operational test load applied;
- g) Rating; and
- h) Back-slippage of load per stroke.

12 MARKING

12.1 The following details shall be permanently and legibly marked on a universal pulling and lifting machine at a suitable place on the casing after the machine has passed the proof loading test:

- a) Manufacturer's name or trade-mark, if any;
- b) Safe working load (t); and
- c) Maximum diameter (mm) of the wire rope for which it is used.

12.1.1 The universal pulling and lifting machine may be marked with the BIS Certification Mark.

12.2 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 Standard Act, 2016* and the Rules and Regulations framed there under, and the product(s) may be marked with the Standard Mark.

ANNEX A

(Foreword)

INFORMATION REQUIRED FROM THE PURCHASER

A-1 The enquiry and order should give the following details:

- i) Safe working load (t);
- ii) Length of wire rope to be used in process: that is, maximum distance between the load and the machine;
- iii) Maximum acceptable effort; and
- iv) If break load testing is to be carried out before acceptance.

ANNEX B

(Foreword)

**CARE AND SAFE USE OF UNIVERSAL GEARLESS HAND.
OPERATED PULLING AND LIFTING MACHINES**

B-1 Never lift the load in excess of the safe lifting load on the machine. The machine has been tested at more than this load but it has been done in carefully controlled conditions. Use of the machine at any load greater than the safe working load may result in damage.

B-2 Before use, examine the wire rope to ensure that the same is in good condition and is free from kinks. If in doubt, the diameter should be measured. It should be remembered that the wire rope is a component of the machine.

B-3 Lubrication should be carried out at regular intervals to ensure that all the rope gripping mechanisms are working freely. The wire rope should also be lubricated to keep it free from rust and in good condition.

B-4 A periodic inspection to check the excess wear on the jaws should be carried out every three or six months, depending on the use of the machine. The inspection procedure is provided by the manufacturer.

B-5 Never lift with the point of the hook. All machines should be registered and at periodic intervals should be thoroughly cleaned, inspected and lubricated.