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Jawaharlal Nehru

“Step Out From the Old to the New”

IS 5604 (1984): Specification for Hand-operated Universal Gearless Pulling and Lifting Machines [MED 14: Cranes, Lifting Chains and Related Equipment]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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Indian Standard
SPECIFICATION FOR
HAND-OPERATED UNIVERSAL GEARLESS
PULLING AND LIFTING MACHINES
(*First Revision*)

UDC 621.861.8 - 871



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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Indian Standard

SPECIFICATION FOR HAND-OPERATED UNIVERSAL GEARLESS PULLING AND LIFTING MACHINES (First Revision)

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Indian Standard
SPECIFICATION FOR
HAND-OPERATED UNIVERSAL GEARLESS
PULLING AND LIFTING MACHINES
(*First Revision*)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 30 March 1984, after the draft finalized by the Lifting Chains and Associated Fittings and Components Sectional Committee had been approved by the Marine, Cargo Movement and Packaging Division Council.

0.2 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 which 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.

0.3 This standard was first published in 1970. Since then the manufacturers have gained sufficient experience and better material and technology have been available. This revision has been necessitated to take into account these technological advances. Moreover, to ensure better safety, the limit for operational test has been raised to 1.5 times the safe working load in this revision.

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

0.5 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 : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Rules for rounding off numerical values (revised).

1. SCOPE

1.1 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. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 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).

2.2 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.

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

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

2.5 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.

3. MATERIAL

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

Steel bars, plates and sections	: IS : 226-1975*, IS : 961-1975†
Steel forgings	: IS : 2004-1978‡, IS : 2611-1964§, IS : 4367-1967
Aluminium and aluminium alloy	: IS : 617-1975¶

*Specification for structural steel (standard quality) (*fifth revision*).

†Specification for structural steel (high tensile) (*second revision*).

‡Specification for carbon steel forgings for general engineering purposes (*second revision*).

§Specification for carbon chromium molybdenum steel forgings for high temperature service.

||Specification for alloy and tool steel forgings for general industrial use.

¶Specification for aluminium and aluminium alloy ingots and castings for general engineering purposes (*second revision*).

Coil springs	: IS : 4454 (Part 1)-1975*
Hooks	: IS : 8610-1977†
Wire ropes	: IS : 2266-1977‡

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

3.2 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:

Tensile strength, <i>Min</i>	900 MN/m ²
Elongation (at gauge length 5.65 A), <i>Min</i>	15 percent
Izod impact value, <i>Min</i>	40 Nm
Hardness, <i>Min</i>	300 BHN

4. CAPACITY

4.1 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.

5. CONSTRUCTION AND WORKMANSHIP

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

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

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

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

*Specification for steel wires for cold formed springs: Part 1 Patented and cold drawn steel wires—unalloyed (*first revision*).

†Specification for point hooks with shank capacity up to 25 tonnes—trapezoidal section.

‡Specification for steel wire ropes for general engineering purposes (*second revision*).

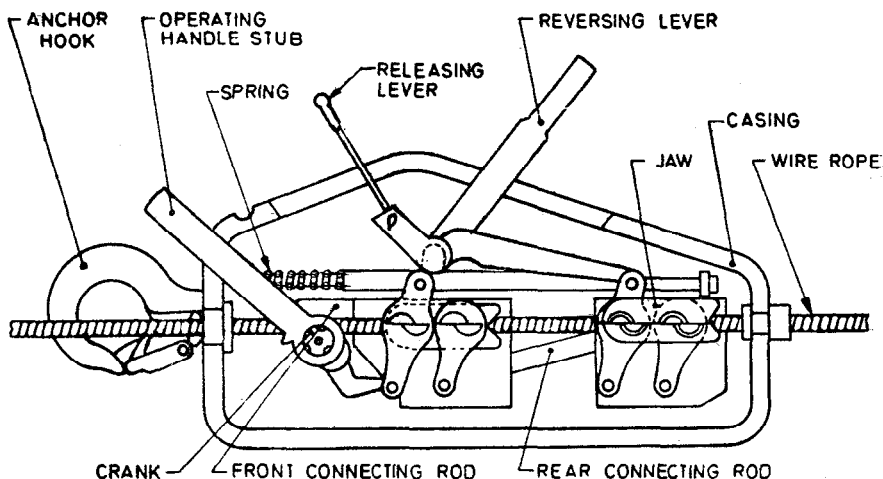


FIG. 1 PULLING AND LIFTING MACHINE

5.4.1 Ball and Roller Bearings — Ball and parallel roller bearings shall comply with the requirements of IS : 5669-1970*, IS : 5692-1970† 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.

5.4.2 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:

	Bronze Bearings kgf/cm ²	Cast Iron Bearings kgf/cm ²
Mild steel shaft ground	180	140
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.

5.5 Wire Ropes — Galvanised 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.

*General plan of boundary dimensions for radial rolling bearings.

†Tolerances for radial rolling bearings.

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

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

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

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

5.8 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.

6. TOLERANCES

6.1 Tolerances on Forgings — Tolerances on forgings shall conform to the requirements of IS : 3469-1974*.

6.2 Machining Tolerances — Machining tolerances shall conform to medium class of IS : 2102-1969†.

7. OPERATION

7.1 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.

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

7.3 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.

7.4 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

*Specification for tolerances for steel drop forgings, upset forgings, press forgings and forged bars.

†Allowable deviations for dimensions without specified tolerances (*first revision*).

a percentage of total lift in one stroke (forward and backward) shall be as follows:

<i>Lifting Capacity of Machine t</i>	<i>Load Applied t</i>	<i>Permissible Back Slip Percent</i>
0.8	0.8	10
1.0	1.0	10
1.6	1.6	10
2.0	2.0	10
3.2	3.2	15
5.0	5.0	15

8. EFFORT

8.1 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.

9. TESTS

9.1 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.

9.2 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.

9.3 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.

9.4 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.

10. INSPECTION, CERTIFICATE OF TEST AND EXAMINATION

10.1 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.

10.2 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.

11. MARKING

11.1 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.

11.1.1 The universal pulling and lifting machine may be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

APPENDIX A

(Clause 0.4)

INFORMATION REQUIRED FROM THE PURCHASER

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

- a) Safe working load (t);
- b) Length of wire rope to be used in process, that is, maximum distance between the load and the machine;

- c) Maximum acceptable effort; and
- d) If break load testing is to be carried out before acceptance.

A P P E N D I X B

(Clause 0.4)

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.