

BUREAU OF INDIAN STANDARDS

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**भारतीय मानक मसौदा
मॉड्यूलर निचले अंग ऑर्थोटिक घटकों के लिए विशिष्टता
भाग 4 संयुक्त इकाई, टखना**

[IS 9471 (भाग 4) का पहला पुनरीक्षण]

Draft Indian Standard

**Specification for Modular Lower Limb Orthotic Components
Part 4 Joint Unit, Ankle**

[First Revision of IS 9471 (Part 4)]

ICS 11.180.01

Artificial Limbs, Rehabilitation Appliances and
Assistive Products for Persons with Disabilities
Sectional Committee, MHD 09

Last date for comments:
20 November 2023

FOREWORD

(Formal clause will be added later)

This standard was originally published in 1980. The first revision of this standard has been brought out to align the cross references to the latest standards to incorporate the updated designation of steel and the currently used methods of performance and corrosion resistance.

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 same as that of the specified value in this standard.

1 SCOPE

Covers requirement of joint unit ankle for modular lower limb braces.

2 REFERENCES

The standards given below 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 agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of these standards.

<i>IS No.</i>	<i>Title</i>
6761 : 2023	Fasteners Hexagon Socket Countersunk Head Screws with Reduced Loadability Third Revision of IS 6761
1570 (Part 5) : 1985	Schedules for Wrought Steels: Part 5 Stainless and Heat - Resisting Steels (<i>Second Revision</i>)
9550 : 2001	Bright steel bars - Specification (<i>First Revision</i>)
2898 (Part 1) : 2019	Rolling bearings - Balls: Part 1 Steel balls (<i>Second Revision</i>)
4454 (Part 1) : 2001	Steel wire for mechanical springs - Specification: Part 1 cold drawn unalloyed steel wire (<i>Third Revision</i>)
4454 (Part 4) : 2001	Steel wires for mechanical springs: Part 4 stainless steel wire (<i>Second Revision</i>)
1068 : 1993	Electroplated coatings of nickel plus chromium and copper plus nickel plus chromium - Specification (<i>Third Revision</i>)

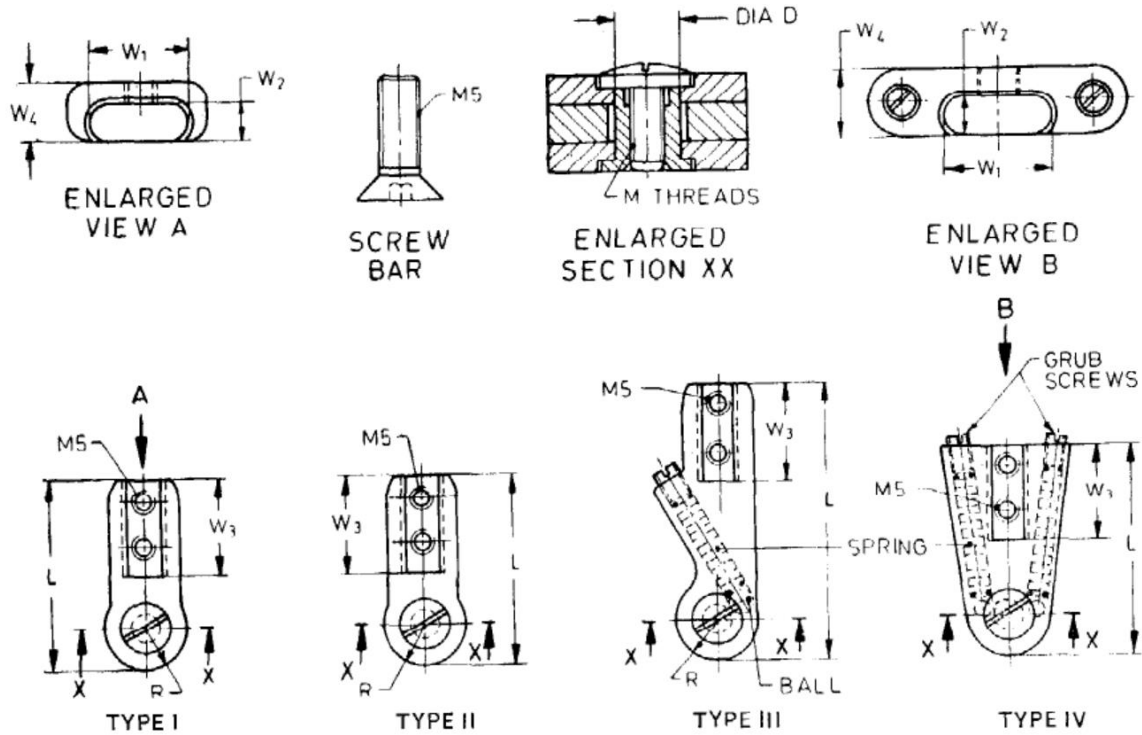
3 TYPE

Four types of joint unit ankle shall be as given below:

- Type I – Free motion
- Type II – Limited motion
- Type III – Foot drop
- Type IV – Double action

4 SHAPE AND DIMENSIONS

4.1 The typical shape of joints is shown in Fig. 1. The joint unit ankle of all types shall be in three sizes to suit the corresponding size of stirrups/stirrups split.



Dimensions (1)	Size 1				Size 2				Size 3			
	(2) Type	(3) Type	(4) Type	(5) Type	(6) Type	(7) Type	(8) Type	(9) Type	(11) Type	(12) Type	(13) Type	(14) Type
	I	II	III	IV	I	II	III	IV	I	II	III	IV
$L (\pm 0.5)$	47	42.5	70	51	52	48.5	80	57	57	52	90	63
$R (\pm 0.25)$	10.0				12.0				15.0			
$Dia, D (H 8)$	7				9				9			
$M Thread$	M5				M6				M6			
$W_1 \pm 0.25$	12.0				16.0				20.0			
$W_2 \pm 0.25$	5.0				6.0				6.0			
$W_3 \pm 0.25$	25				25				25			
$W_4 \pm 0.25$	8.0				9.0				9.0			
Compressibility of spring, <i>Min</i>	8				11				11			

**All dimensions in millimetres.
FIG. 1 JOINT UNIT, ANKLE**

4.2 Overall Dimensions

The overall dimensions of the joint unit shall be as given in Fig. 1.

4.3 In the case of free motion, limited motion and foot drop ankle joint unit, the inside (medical) joints shall be contoured to $15 \pm 1^\circ$, as shown in Fig. 2 and the outside (lateral) joints shall be straight.

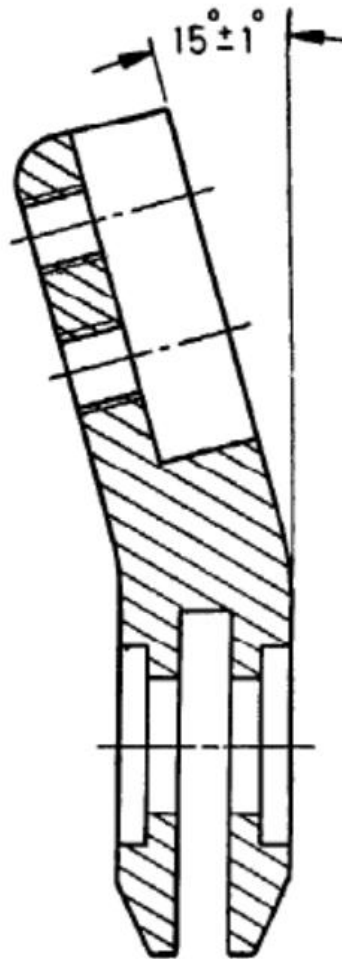


FIG. 2 INSIDE JOINT, FOR KNEE JOINT UNIT

4.4 Depth of Slot

Depth of slot shall be arrived at by the manufacturers depending on their individual designs to match with their stirrups and shall be subject to the following performance considerations.

4.4.1 Free Motion (Type 1)

The joint shall provide an unrestricted movement of at least 45° in both planter flexion and dorsi flexion when assembled with stirrups free motion.

4.4.2 Limited Motion (Type 2)

The joint shall provide no movement when fitted with limited motion stirrup. In case movement is required in planter or/and dorsi flexion, shaping of stirrups should be done at the time of fittings.

4.4.3 Foot Drop (Type 3)

The joint shall provide the maximum dorsi flexion of 15° when assembled with, stirrup-foot drop.

4.4.4 Double action (Type 4)

The joint shall provide equal planter flexion and dorsi flexion of 25° to 30° when assembled with stirrups double action.

4.5 Screw shall conform to designation M5 × 10 of IS 6761.

4.6 A rivet of minimum 4 mm diameter shall be used.

5 MATERIAL

5.1 The male and female parts of the joint unit shall be manufactured from high strength heat treatable stainless steel conforming to designation 30Cr13 or 04Cr17Ni12Mo2 of IS 1570 (Part 5).

5.2 The screws shall be manufactured from cold rolled bright steel annealed bars conforming to IS 9550.

5.3 The nut shall be made from cold rolled bright steel annealed bars conforming to IS 9550.

5.4 The steel ball shall conform to IS 2898.

5.5 The spring shall be made from spring steel wire conforming to IS 4454 (Part I) or IS 4454 (Part IV) for a spring rate of 13 ± 2 N/mm.

5.6 The rivet shall be manufactured from a suitable aluminium alloy.

6 WORKMANSHIP AND FINISH

6.1 The joints shall be accurately machined and the joint faces shall be finished clean and free from tool marks. Fabrication by welding or brazing shall not be allowed. The outside surfaces of the joint shall be free from casting defects. All sharp edges and corners shall be rounded. The component shall be free from surface flaws and cracks. The joint shall be electro-polished after hardening and sand blasting.

6.2 The spring shall be capable of 1 million cycles of operation and shall be supplied in blackened/ phosphated finish.

6.3 The joint nut, screw and grub screws shall be supplied in dull nickel plated finish conforming to Grade 1 of IS 1068.

6.4 The screw bar shall be supplied in blackened/ phosphated finish.

7 HEAT TREATMENT

The male and female parts of the joint unit and the nut shall be hardened and tempered to 240 to 300 *HV*.

8 MARKING

8.1 Shall be marked with the manufacturer's name, initials or recognized trade-mark and with proper identification of the type, size and material.

8.2 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.

9 PACKING

The joints shall be packed in polyethylene bags and the ends shall be heat-sealed. They may also be packed as agreed to between the manufacturer and the purchaser.