


INTER PLANT STANDARD – STEEL INDUSTRY		
 IPSS	SPECIFICATION FOR CABLE REELING DRUM <i>(Second Revision)</i> Corresponding IS does not exist	IPSS : 1-10-017-11
		Formerly : IPSS: 1-10-017-03

0. FOREWORD

- 0.1** This Inter Plant Standard has been prepared by the Standards Committee on Electrical components and equipment, IPSS 1:10 with the active participation of the representatives of the steel plants, major consultancy organizations and established manufacturers of Electric Cables and was adopted in May 2011.
- 0.2** Inter Plant Standards for steel industry primarily aim at achieving rationalization and unification of parts and assemblies used in steel plant equipment and accessories, and provide guidance in indenting stores or equipment (or while placing orders for additional requirements) by individual steel plants. For exercising effective control on inventories, it is advisable to select a fewer number of sizes/types from among those mentioned in this standard, for the purpose of company standards of individual steel plants. It is not desirable to make deviations in technical requirements.

1. SCOPE

- 1.1** This Inter Plant Standard covers the requirements of cable reeling drums used mainly for magnets in overhead cranes, feeder cables for stacker and reclaimer machine, ladle transfer cars etc used in steel plant. Following types of cable reeling drums or spools shall be covered in this standard depending on the drive system :
- a) Reeling drums driven by the rope drum through chain sprocket or gearbox arrangement.
 - b) Spring loaded cable reeling drums.
 - c) Cable reeling drums driven by torque motors.

2. TERMINOLOGY

- 2.1** For the purpose of this standard, the definitions given in IS 1885:1979 “Electro-technical vocabulary” shall apply.

3. SITE CONDITIONS

- 3.1 The equipment shall be suitable for the following site conditions :
- 3.1.1 *Ambient temperature* - The reference ambient temperature shall be 50°C or unless provided by the purchaser.
- 3.1.2 *Altitude* - The altitude shall not exceed 1000m.
- 3.1.3 *Humidity* - The maximum relative humidity shall be 100%. However, both maximum temperature and 100% relative humidity may not occur simultaneously.
- 3.1.4 *Ambient air* - The ambient air may contain fair amount of conductive dust, smoke, steam, corrosive or inflammable gases.

4. DESIGN AND CONSTRUCTION

- 4.1 Reeling drums shall consist of a slipring and a rocker arm assembly to feed power to the cable.
- 4.1.1 The enclosure of the slipring assembly shall conform at least to IP 55 and shall be easily maintainable.
- 4.1.2 The slipring shall be made of brass conforming to IS 6912:1985 'Brass bars, rods and sections suitable for forging (*first revision*)' or phosphor-bronze conforming to IS 7811:1985. It should be assembled type only.
- 4.1.3 The number of sliprings shall be at least 10% or 1 (whichever is more) more than the minimum number of rings required to feed the cable.
- 4.1.4 Each ring shall have minimum two copper graphite spring loaded brush and all the rocker arms shall be mounted on the common assembly to avoid misalignment. The current carrying capacity of the rings shall be minimum 3 times the full load current upto 100 amps and 2 times for higher rating.
- 4.1.5 The insulation of the ring shall be from high impact polycarbonate or epoxy and shall be able to withstand 3 times the full load voltage.
- 4.1.6 The rotating part on which the sliprings assembly or the rocker arm assembly is mounted shall have 2 antifriction bearings.
- 4.2 **Reeling Drum or Spools** – For every long length of bigger diameter cables feeding to stacker and reclaimer machines, big cable reeling drums are used. Sometimes, in older version of cranes also, these drums are used which are suitably driven by the rope drum of the cranes. For smaller length of cable normally spools are used.

4.2.1 Reeling drums driven by rope drum

- a) These are used to feed power to the magnet and other drives in overhead cranes. These drums are driven by a heavy duty chain sprocket arrangement or by a suitable gear box driven by the rope drum.
- a-1) *For Magnet Cable* – The cable reeling drum shall be suitable for minimum 16 sq mm, 2 core, 1.1 kV grade flexible copper conductor cable, EPR insulated CSP sheathed with general purpose elastomer (rubber) insulation and general service sheath.
- a-2) *Reeling drums driven by rope drum and gear* - Reeling drums driven by rope drum & gear. Clutch mechanism provided to disengage. For maintenance of sliprings opening cover is to be provided and the cover is to be fixed with counter shank allen bolts.
- b) **Size and Construction**
- b-1) Dia – The belly diameter (ID) of the drum shall be selected preferably from 600, 750 and 900 mm. However, linear speed of the magnet cable shall match with the linear speed of the rope and ID of the drum shall be at least 16 times of OD for LT cables and 25 times OD for HT cables.
- b-2) Length – The drum shall be of such length that at least 2 full turns of cable shall be available on the drum when the magnet is in lowest position.
- b-3) The drum shall be flanged at both ends and when the cable is fully wound on the drum, the flange shall project a minimum distance of 50 mm. No sharp edges shall be allowed so that cable damage is avoided.
- b-4) There shall be a provision for clamping the cable at the entrance to the drum with suitable tapped holes.
- c) **Material of the Drum and the pedestal** – Drum shall be of fabricated construction or of cast steel :

Drum body	Cast steel IS 1030 Gr.II or Structural IS 2062 :2006
Drum hut	Steel C-45 as per IS 1570(Part-2):1979
Drum shaft	Steel C-35 as per IS 1570(Part-2):1979
Pedestal	Structural steel as per IS 2062 (Gr.A):2006

4.2.2 Spring Loaded Cable Reeling Drum

- a) Barrel dia of the drum shall not be less than 360 mm. The flange diameters (OD) of drums used for cable reeling shall be 600, 750 or 900 mm. Pay-off directions of cable to be specified by the purchaser viewing from slipping end.
- a-1) *Construction* – Drums shall be constructed with heavy welded steel sections to withstand high ambient temperature, vibration and other adverse operating conditions (from IS 2062, Gr.A structural material). These shall be designed to store 30% extra length of cable. The mounting pedestal shall be constructed from structural steel conforming to IS 2062, Gr.A.
- b) **Spring Cassettes** – If required, two or more spring cassettes may be connected in parallel through a suitable gearing arrangement. Spring cassettes should be covered with inspection slots.
- b-1) *Special features (Optional)* – The spring assembly shall be of such design that easy tension may be given by suitably rotating a bar or screw and a digital centre shall be attached to it to display the tension position. The coupling of the drum shall be through a key and slot at the end of the shaft so that drum may be slid out easily (keyed jack-shaft arrangement) or spring motor cassettes should be easily detachable from the cable reel shaft, but securely fixed through key and slot, while in service.
- b-2) The spring shall be made out of clock type spring steel conforming to Grade 1 of IS 3431:1982 'Steel for the manufacture of volute, helical and laminated springs for automotive suspension (*Second Revision*)'.
- b-3) The spring shall wind only 80% of the total fully coiled turns when full length of cable is unwound for the drum and shall be easily replaceable.

4.2.3 Reeling Drum Driven by Stalled Torque Motor

4.2.3.1 The drive system will comprise of the following equipment :

- 4.2.3.1.a **Motor** – The drum shall be driven by one or more continuously rated stalled torque slipping motors with suitable braking arrangement suitable for 415 V, 3 phase, 50 Hz ac supply system, IP 55 class of protection, class F insulation. For light duty application, squirrel cage stalled torque motor may be used.
- 4.2.3.1.b **Cable reeling drum** – The cable reeling drum shall be heavy duty, robust design and rugged construction fitted with antifriction bearing for reeling and unreeling duty. The drum will be monospiral type for small length of cable, semispiral for medium length of cable and

barrel type for long length of cable. The drum shall be suitable for accommodating variation of cable overall dia upto 10%.

4.2.3.1.c **Slipring Housing** – The slipring housing shall be robust duty in dust, vermin and weather proof enclosure conforming to IP 55 class of protection complete with power sliprings (nos as per clause 4.1.3) and brush gear suitably rated. Adequate clearance and creepage distance between the sliprings and between slipring and earth shall be maintained.

4.2.3.1.d **Limit Switches** – One No. Rotary geared limit switch shall be provided for dead turn, forward and reverse direction and centre by pass.

One No. pendulam limit switch will be provided for direction sensing and tension regulation without gear.

Two Nos. Track limit switches shall be provided for sensing over tension in both direction of track.

4.2.3.1.e **Chain, Sprocket and Gear Box** – The gear box shall be of heavy duty type having helical gear and antifriction bearings. While designing the centre distance between two sprockets should be so chosen that the arc of contact on the smaller sprocket is, in no case less than 120°. Provision for mounting an encoder to the CRD motor shaft to be kept. This encoder is to be used to measure the travel distance and the direction of rotation. The encoder is to be hooked up with the end user's PLC system.

4.2.3.1.f **Cable Guide** – Cable guide system shall be of sturdy constructions. Cable guide system shall be fitted with anti-friction bearing mounted on moveable saddles and with anti-friction mounting roller of suitable size and number. Rollers shall be lubricated for life to guide the cable frictionlessly from vertical to horizontal during winding and un-winding. Cable guide system shall be suitable to maintain minimum bending radius of cable. The limit switches for over-tension shall preferably be in-built with cable guide.

4.2.3.1.g **CRD Control Panel**

a-7-1) *Power feeder* shall be provided with adequately rated T.P. switch-fuse unit stator contactor. Thermal over-load relay with inbuilt single phasing prevention feature. Power feeder shall be provided with adequately rated T.P. fuse switch unit / MPCB /MCCB stator contactor. Thermal / Electronic overload relay with in-built single phasing protection.

a-7-2) *Control feeder* shall be provided with adequately rated D.P. ON/OFF selector switch, control transformer, control fuses, timers, auxiliary contactor, door interlock limit switch etc.

a-8) **Rotor Resistance** – Punched steel resistance box suitably selected for continuous duty and suitable tappings shall be provided as per IPSS:1-10-002-82 `Resistance boxes for power circuits (*with amendment 1*). For current less than 25 amp, stainless steel wire grid resistance may be used.

4.2.4 Reeling Drum Driven by Squirrel Cage Motors with Torque Regulators- The drum shall be driven by an ac squirrel cage induction motor with torque regulator. The squirrel cage motors shall conform to IPSS:1-10-001-06 `General purpose squirrel cage induction motors (fourth revision)`.

4.2.4.1 The torque regulator mechanism employs the power transmission through adjustable friction drive with friction lining. The material for the friction lining shall be able to sustain a temperature of 125° and shall have a co-efficient of friction 0.35100.4. The liners shall be easily replaceable at site and shall be of standard dimension (manufactured by the abrasive material manufacturer). The various other components of the torque regulator such as the adjusting screws, tension spring, etc, shall conform to relevant IS.

Adjusting screw steel C-40 as per IS 1875:1992

Spring steel 55 size 2 mm 90 as per IS 3431:1982

4.2.4.2 The manufacturer shall provide the necessary circuitry along with the torque regulated mechanism for the reversal of the direction of the drum.

4.2.4.3 Torque regulated type reels may be driven by any constant speed squirrel cage motor of standard frame sizes – 90, 100, 112, 132 depending upon requirement of speed and torque.

4.2.4.4 The power unit shall drive the reel through an irreversible worm and wheel transmission which shall be totally enclosed and lubricated for life. The reduction ratio of the gear box shall be fixed and rotational speed of the output shaft shall be selected by fitting appropriate speed motor units.

4.2.4.5 In all cases, rotational speed of output shaft shall be in excess of that required for cable reeling which ensures correct cable retrieval under all operational conditions. The energy dissipation capability of the torque regulation unit shall be greater than the energy permissible through out the gear box thus ensuring adequate safety margins which are applied to torque regulation unit.

- 4.2.4.6** The cable compartment shall be directly mounted on the torque regulator which is easily adjustable to suit the various combinations of cable size and length to be reeled. Torque regulation unit can be with single face/double face and of fixed torque and shall be mounted on gear box. Drive unit shall have drive motor which shall energize for reeling of cable only and it shall de-energize when cable is laid out.

5. MARKING

- 5.1** Following information shall be marked distinctly and indelibly on the name plate :

- a) Manufacturer's name,
- b) Serial No. and Year of manufacture,
- c) Maximum length and size of cables which can be used
- d) Size of the drum (dimension sheet to be given)
- e) Rated voltage of sliprings
- f) Rated current of sliprings
- g) Type and grade of the brush
- h) Motor rating and frame size.

In case torque motor arrangement has been made separate, name plate shall be provided on motors as per relevant standard.

- 5.2** A separate technical leaflet shall be supplied with each cable reeling drum. This leaflet shall cover technical features, operational and maintenance requirements of machine. Overhauling, dismantling and assembly instructions shall also be furnished. Schematic diagram of cable reeling drum shall be provided.