INTERPLANT STANDARD — STEEL INDUSTRY

IP SS	SPECIFICATION FOR DRUM/CAM CONTROLLER	IPSS : 1-10-006-81
	CORRESPONDING INDIAN STANDARD NOT AVAILABLE	

0. Foreword

0.1 Interplant standardization activity in steel industry is being pursued under the aegis of the Indian Standards Institution (ISI) and the Steel Authority of India Limited (SAIL). This Interplant Standard, prepared by the Subcommittee on Electric Crane Controlgears and Components, IPSS 1 : 10, with the active participation of the representatives of all the steel plants and established manufacturers of electrical control equipment, was adopted by the Approval Committee on Consumable Stores and General Equipment, IPSS 1, on 6 November 1981.

0.2 Interplant Standards for steel industry primarily aim at achieving rationalization and unification of parts and sub-assemblies used in steel plant equipment and accessories, and provide guidance in indenting stores or equipment for existing or new installations by individual steel plants. For exercising effective control on inventories, it is advisable to select a fewer number of sizes (or types) from among the products mentioned in this standard for the purpose of company standards of individual steel plants. It is not desirable to make deviations in technical requirements.

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(D. BANDYOPADHYAY)
Sr. Dir. & Ex-officio IPSS

1. Scope — This Interplant Standard covers the requirements of reversible airbreak drum/cam controller used in cranes, mobile equipment or similar apparatus in steel plants.

Note — Here-in-after wherever ' controller ' is mentioned in this standard, it shall mean drum/cam controller, unless otherwise stated.

2. Rating — The rating of controllers shall be as given in Table 1.

TABLE 1 RATING OF CONTROLLERS

Supply Voltage	Motor Rating in kW		Current in Amperes	Number of Steps	Number of Operations per Hour
	Above	Up to and Including			
230/460 V dc	—	22	63	5	300
415 V ac	—	11	40	4	300
415 V ac	11	25	63	6	300
415 V ac	25	40	90	7	300
415 V ac	40	63	160	7	300

3. Dimensions — The outside dimensions of controller shall be as given in Table 2 read with Fig. 1. In addition, the dimensions 1, 2 and 3 (shown in Fig. 1) shall be supplied by the manufacturer.

Amendments Issued (*to be filled up by the user department*):

No.	Date of Issue	No.	Date of Issue
1		3	
2		4	

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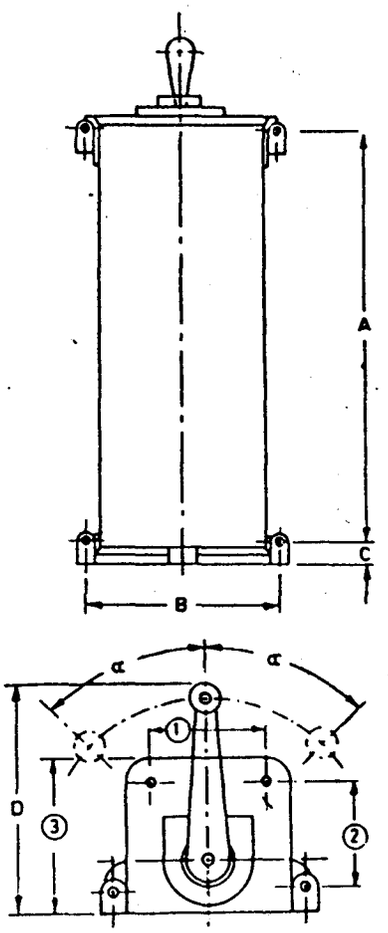
TABLE 2 OUTSIDE DIMENSIONS OF CONTROLLERS

(*Clause* 3)

Rating of Controller	*D* *Max* mm	*A* mm	*B* mm	*C* mm	Mounting Holes	
					Number	Dia in mm
230 V, 11 kW dc 460 V, 22 kW dc 415 V, 11 kW ac	380	500	300	50	8	13·0
415 V, 25 kW ac 415 V, 40 kW ac 460 V, 63 kW dc	380	610	300	50	8	13·0



Note — The manufacturer shall supply the dimensions 1, 2 and 3 at the time of submitting the tender.

FIG. 1 SCHEMATIC DIAGRAM OF A CONTROLLER

4. Site Conditions — The following shall constitute the normal site conditions:

a) *Ambient Temperature* — The reference ambient temperature shall be 40°C.

b) *Relative Humidity* — The relative humidity can be up to the maximum of 100 percent. Maximum temperature and 100 percent relative humidity may not occur simultaneously.

c) *Composition of Ambient Air* — The ambient air may contain fair amount of conducting dust.

d) *Altitude* — Altitude shall not exceed 1 000 metres.

4.1 For application in special locations where steam and/or corrosive fumes are present, the details of site conditions shall be as agreed to between the purchaser and the manufacturer.

5. Construction — The controller shall be drum type or cam type as specified by the purchaser.

5.1 *Casing or Enclosure* — The main frame shall be made of welded mild steel plates of thickness not less than 3 mm. The top and the bottom plates which house the bearings of the main shaft shall be made of cast iron and shall be bolted on to the main frame to facilitate accurate alignment of shaft and easy withdrawal of the drum/cam without disturbing the finger bars or arc shield. The bearings shall be of sintered type. A close fitting removable type front cover made of steel sheet of nominal thickness of 2 mm shall be secured to the frame by quick release latches. The cover shall be provided with a fire repellent insulating lining inside. The controller shall be suitable for both wall and floor mounting and shall be provided with 4 bolting lugs for either type of mounting. In case of the dc controller, the back wall shall be provided with suitable insulation.

5.2 *Drum/Cam Assemblies*

5.2.1 The drum of the drum type controller shall consist of an insulated steel shaft, square in section on which cast iron drum segments are clamped rightly to its axis. Air brake sliding contact segments of hard-drawn electrolytic copper shall be fixed on to these drum segments by means of countersunk set-screws. Insulation spacers shall be provided between every two drum segments. Mica as insulator is not preferred.

5.2.2 The cam type controller shall also consist of a similar insulated steel shaft, square in section on which cams made of phenol-formaldehyde are clamped rightly to its axis. Air brake sliding contact segments of hard-drawn electrolytic copper shall be fixed on to these cams by means of countersunk set-screws.

5.3 *Finger Contact Assemblies* — Finger contacts shall be connected to the external power circuit of motors by cables. These shall be of hinged type, securely clamped to an insulated bar with fixed ends. Each finger shall be a rigid stamping fitted with a renewable contact tip of half round section, engaging with the rotating sliding contacts under heavy spring pressure. Laminated copper shunts or copper braids carrying current from the finger tips to the terminal shall be provided. The contact tips shall be renewable and shall be rated adequately for the corresponding currents mentioned in Table 1. Provision shall be made to adjust the spring pressure on the drum or cam segments and also the ' wipe ' of the finger contact tips to the desired extent. Both these adjustments are to be independent to each other. In the case of renewal contact tip being of round section with a renewal threaded hole, the contact finger may be provided with two fixing holes at 45°C angle. This will facilitate to use a worn-out round tip by rotating it through 45° and securing it to the finger.

5.4 *Arc Shields* — Substantial heat and fire resistant and non-hygroscopic arc shields shall be fitted on these controllers. Provision shall be made for swinging of arc shields clear of contacts after the front cover is removed, thus providing easy access for inspection and replacement of contacts whenever needed. Powerful magnetic blow-out coils are to be fitted in case of dc controllers.

5.5 *Ratchet Wheel* — Exact location of the contacts at each step/notch shall be ensured by provision or a ratchet wheel engaging an adjustable spring loaded pawl lever fitted with the rollers; this arrangement shall permit easy operation of handle while retaining positive and exact notching on all steps.

5.6 *Adjustable Bottom Bearing* — Provision shall be made for adjusting the height of the drum or the cam assemblies to align the segments and the finger contacts by raising and lowering of the bottom bearing and also for locking it in position securely in operation.

5.7 *Handle* — Robust crank handle shall be provided. The handle grip shall be made of insulation material with a mechanical interlock with finger tip or a hand operated release mechanism or locking in OFF position so that the controller cannot be operated inadvertantly. The direction of the operation of the controller handle shall be marked in the form of arrow or with brief letters like FORWARD, REVERSE, HOIST, LOWER, etc, as specified by the purchaser. The individual notches and steps shall also be marked on the controller.

5.8 *General Contact Provision*

5.8.1 A normally closed electrical contact in the OFF position of the handle shall be provided in the controller to act as an interlock in the external circuit for undervoltage release.

5.8.2 Additional contacts for connecting shunt limit switches shall be provided in such a way that in case of tripping through limit switch in particular direction, the operation in other direction is possible.

5.9 *Cabling Arrangement* — Ample space shall be provided for connecting aluminium or copper cables to the various finger terminals. The smallest terminal for power circuit shall accommodate 25 mm aluminium cable. Plain holes/bushed entries shall be provided in the bottom or back frame of controller as specified by the purchaser. Screwed conduit flanged or the standard form of cable glands may also be provided.

5.10 *Lubrication* — Suitable provision shall be made for lubricating the bottom and top bearings and also the pawl lever and roller mechanisms. The operating power required by hand shall be less than 5 kg.

5.11 *Earthing Terminal* — Earthing terminals of minimum 10 mm dia shall be provided in accordance with **5.4** of IS : 8544 (Part I)-1977 ' Specification for motor starters for voltages not exceeding 1 000 V: Part I Direct-on-line ac starters '.

6. Marking — A plate marked indelibly with the following shall be fixed on each controller:

a) Manufacturer's name and trade-mark;

b) Manufacturer's serial number and year of manufacture;

c) Type, that is, whether drum type or cam type;

d) Voltage of the system;

e) Rating of the motor in kW;

f) Current rating of the controller; and

g) Reference to this standard.

6.1 The sequence diagram shall be engraved on a metallic plate which shall be fixed on the inside of the cover.

7. Limits of Temperature-Rise — The copper contacts, fingers, flexible connections and terminals for external insulated connections shall be capable of carrying the rated full load current continuously without exceeding limits mentioned below:

a) Maximum temperature-rise of sliding contacts, copper contact tips, fingers and copper braid	45°C
b) Maximum temperature-rise of terminals for external insulated connections	70°C
c) Maximum temperature-rise of series blow-out coil	65°C

8. Tests

8.1 *Type Tests* — All the tests mentioned at **8.1.1** to **8.1.5** shall constitute the type tests and these shall be conducted on a representative sample of each lot or batch of each type/model by the manufacturer and he shall supply a certificate of conformity in this connection.

8.1.1 *General examination and construction* — This shall be carried to see that the model conforms to the stipulations at **8.2.1** of this standard.

8.1.2 *Temperature-rise test* — The main current carrying parts shall be tested for compliance with **7** of this standard. This test shall be carried out for dc models, with direct current at convenient voltage and for ac models with alternating current at any convenient voltage and at a frequency of 50 Hz. The test shall be continued until the temperature has remained constant within ±1°C for one hour. Connecting conductors shall be of normal size for rated current. During temperature-rise test all current carrying parts (except those used for shorting resistance steps) shall be in circuit.

8.1.3 *Test for breaking capacity* — This test shall be carried out to ascertain that the model is capable of breaking without damage a current of 300 percent of rated full load current of controller after 6 consecutive operations at 10 seconds interval for dc application, 50 operations at 10 seconds interval for ac application.

8.1.4 *High voltage test* — An ac voltage of 2 500 V — rms at 50 Hz shall be applied for one minute between the body and insulated electrical contact on the drum and finger. There shall be no breakdown/deterioration of the insulation during/after the test. The insulation resistance value when measured using a 1 000 V direct reading portable insulation resistance tester before and after the test shall be not less than 5 MΩ.

8.1.5 *Mechanical endurance test* — The model shall be operated for 300 000 times by its own operating mechanism at a speed of 300 operations per hour without current through the main contacts. A record shall be kept of all mechanical adjustments during the test. At the end of the test, all parts of the model shall be in order and shall be without permanent distortion or undue wear.

8.2 *Routine Test* — Each drum controller before despatch to the purchaser shall be subjected to the test described in **8.2.1** and **8.2.2** by the manufacturer and he shall supply a certificate of conformity in this connection.

8.2.1 *General inspection and visual check* — This is to be carried out to ensure that the controller conforms to the specification and is free from any apparent defect in operating mechanism.

8.2.2 *High voltage test* — For details please *see* **8.1.4**.

9. Electric Wiring Diagram — The manufacturer shall supply an electric wiring diagram with each controller showing clearly the programme of contacts.

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Alterations

(5.2.1 and 5.2.2) - Substitute the following for the existing clauses:

5.2.1 The drum of the drum controller shall consist of an insulated steel shaft, square in section, on which there shall be mica based insulation held by glass epoxy. On this, drum of bronze or cast iron shall be clamped. Segmental and electrolytic copper contact shall be screwed on to this drum. Spring loaded fingers holding the screwed-on copper contacts shall be fixed on an insulated parellel steel shaft, so that the segmental contacts slide freely under the finger contacts with sufficient contact pressure to ensure that the contact temperature rise does not exceed 65 deg C. Insulation spacers shall be provided between every two drum segments. Mica as insulator is not preferred.

5.2.2 The cam type controller shall consist of a central square shaped steel spindle on which cams made of fabric based phenol formaldehyde or any other tougher material are screwed on. Alternatively, in case the metallic cams are used, insulated contact finger assembly shall be used. The moving and fixed contact assemblies along with spring loaded replaceable electrolytic copper tips shall be assembled on a parellel square steel spindle, insulated in the same manner as decribed in 5.2.1. The contact fingers shall be normally closed and shall have steel rollers. When the cams slide under them, the fingers shall open the contacts to interrupt the load current.