INTERPLANT STANDARD — STEEL INDUSTRY

IP SS	SPECIFICATION FOR MASTER CONTROLLER	IPSS : 1-10-005-81
	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 master controller, 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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1. Scope — This Interplant Standard covers the requirements of reversible air break cam operated master controller (also known as ' desk controller ') used in the operation of heavy duty mobile equipment, overhead cranes, rolling mill drives and similar application, both in indoor and outdoor locations.

1.1 This standard does not cover the requirements of contactless master controllers and duplex type master controllers.

2. Terminology — For the purpose of this standard, the definitions given in the following Indian Standards shall apply:

a) IS : 1885 (Part XVII)-1969 Electrotechnical vocabulary: Part XVII Switchgear and controlgear

b) IS : 6875 (Part I)-1973 Control switches (switching devices for control and auxiliary circuits including contactor relays) for voltages up to and including 1 000 V ac and 1 200 V dc: Part I General requirements and tests

c) IS : 8544 (Part III/Sec 2)-1979 Motor starters for voltages not exceeding 1 000 V : Part III Rheostatic rotor starters, Section 2 Additional requirements for ac rheostatic rotor controllers.

3. 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) *Altitude* — Altitude not exceeding 1 000 metres.

d) Ambient air will contain fair amount of conductive dust.

e) For special applications where steam and corrosive fumes are present, details shall be as agreed to between the manufacturer and the purchaser.

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UDC 621·316·544·1 : 621·873

4. Rating — The master controller shall be rated as follows:

a) *Operation at AC Supply*

1) preferred rated operational voltage = 110 V, 240 V, 415 V at 50 Hz with +6 percent and −10 percent variation in voltage and ±3 percent variation in frequency.

2) rated operational current = 10 A.

3) breaking current at voltages = $\frac{110\text{ V}}{60\text{ A}}$, $\frac{230\text{ V}}{30\text{ A}}$, $\frac{460\text{ V}}{10\text{ A}}$

4) making current = 100 A at 0·4 pf at 500 volts.

b) *Operation at DC Supply*

1) preferred rated operational voltage = 110 V, 230 V, 460 V.

2) rated operational current = 10 A.

3) breaking current (with inductive load and time constant of $\frac{L}{R}$ = 100 milli seconds)

$$= \frac{110\text{ V}}{2{\cdot}2\text{ A}}, \frac{230\text{ V}}{1{\cdot}2\text{ A}}, \frac{460\text{ V}}{0{\cdot}4\text{ A}}.$$

4.1 The controllers shall be rated for 600 operations per hour. It should be capable of 1 200 operations per hour for five minutes as given in IS : 8544 (Part III/Sec 2)-1979.

5. Enclosure — Enclosure type IP-43 for indoor application and IP-55 for outdoor application, according to IS : 2147-1962 ' Degrees of protection provided by enclosures for low-voltage switchgear and controlgear ', shall be provided (unless otherwise specified).

6. General Requirements

6.1 Number of steps of the controllers shall be 6 (maximum) in either direction, that is, 6-0-6 for dc and 5-0-5 for ac duties. All controllers should be such that their mechanical stopper can be adjusted, if necessary, for a six step operation in either direction. The throw of handle shall be limited to 75° in either direction of joy stick handle unless otherwise specified.

6.2 As required by the purchaser, the master controller shall be provided with a crank handle or joy stick handle or with universal joy stick handle for control of two motions through one operating lever.

6.3 The master controller shall be having exact notching in each step position and pronounced notch in neutral position. Master controllers shall be provided with spring return arrangements if 1-0-1 controller is used.

6.4 ' Off ' position mechanical latch shall be provided so that the controller cannot be operated inadvertantly (if required by the purchaser).

7. Construction

7.1 *Housing* — The housing of the controller shall be made from 6 mm cast iron or aluminium casting or 4 mm thick sheet steel with four fixing lugs suitably reinforced to give sufficient rigidity for mounting. It shall be provided with an easily removable bolted cover for keeping dust out and with ample area for easy maintenance. Each controller shall be provided on the sides with one 30 mm dia hole and/or one hole of 50 mm dia at the bottom, for cable entry.

7.2 *Cam Assembly* — The cams shall have long running life with anti-tracking properties. The cams shall be accurately shaped to correspond to the switching sequence for the specified programme. The uncut cams shall have suitable markings to facilitate the purchaser to make required alterations in switching sequence as may be necessary. Cam shaft assembly shall he easily removable without disturbing the wiring and shaft arrangement. The selection of split and non-split cams will be optional to the customer.

7.2.1 The mild steel cam shaft shall be housed in a housing with entifriction/sintered/self lubrication bearings. Each cam shall have an identification mark with respect to its location on the shaft. The cams shall be securely locked on to the shaft.

7.3 *Ratchet Wheel* — Exact switching of the contacts at each step or notch shall be ensured by the provision of a ratchet wheel with pawl-lever arrangement. This arrangement must permit easy

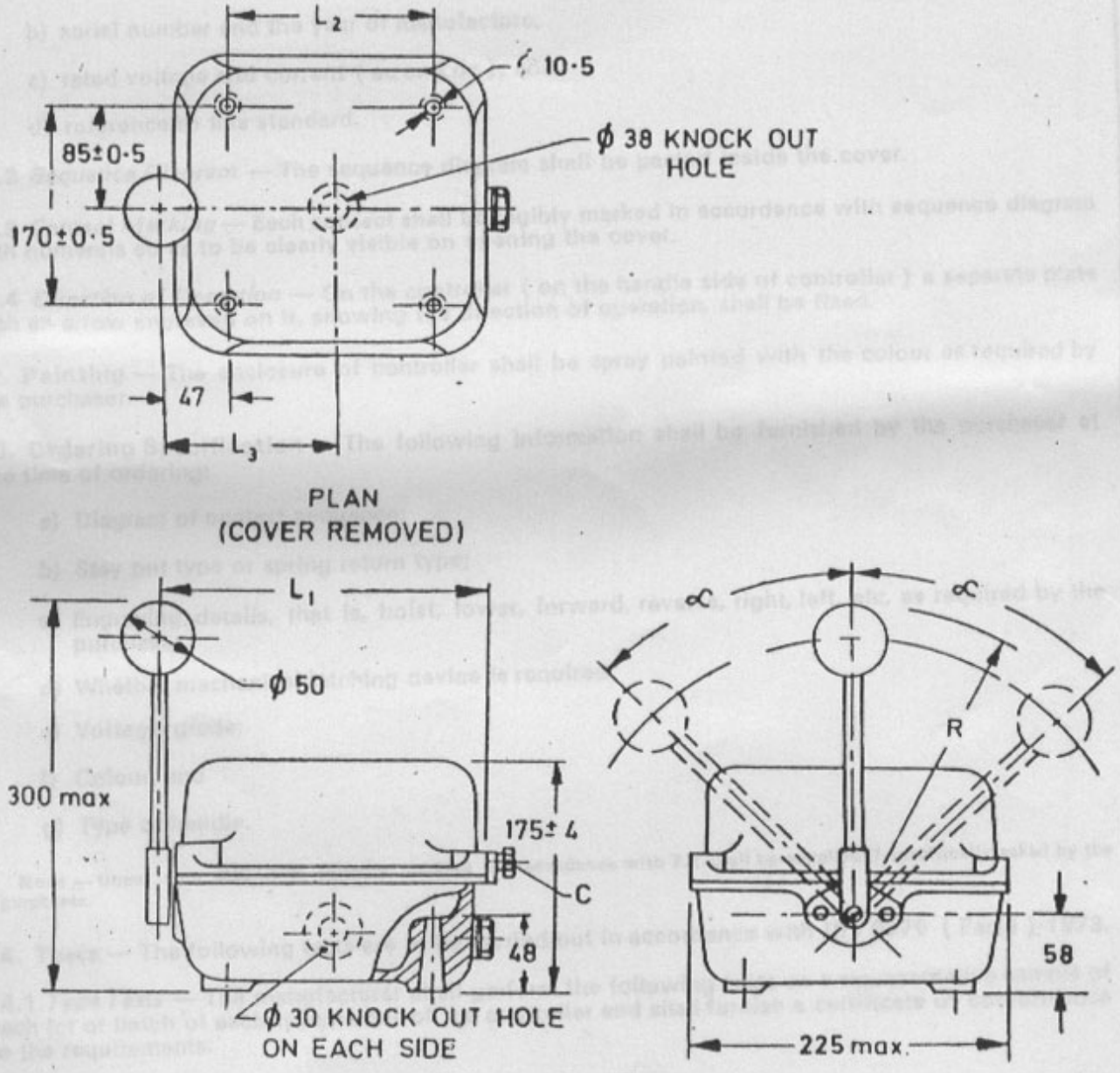
operation of handle while retaining position and exact notching on all steps.

7.4 *Terminals* — The terminals shall be in accordance with IS : 6875 (Part I)-1973.

7.5 *Contact Assembly* — The moving and fixed contact shall be of single/double break type for ac system and double break type for dc system of supply. The contact tips shall be of silver alloy with anti-weld properties. The moving contact shall operate in the closing direction by the springs and in the opening direction by the cams. Contacts shall be easily removable without disturbing the contact assembly.

7.5.1 Adequate facilities shall be available for changing the fixed and moving contacts together or independently.

7.6 *Dimensions* — The dimensions of the master controller shall be as given in Fig. 1.



All dimensions in millimetres.

Circuits	α	L_1 Max	L_2	L_3
8 Circuits	75°	250 *Max*	130	116·5
16 Circuits*	75°	400 *Max*	220	148·5

*17 Circuits shall also be supplied if required by the purchaser within the same dimensions.

FIG. 1 MOUNTING DIMENSIONS OF MASTER CONTROLLER

8. Earthing — Provision for earthing shall be as given in 4.4 of IS : 6875 (Part 1)-1973.

9. Clearance and Creepage Distance — This shall be as given in Appendix B of IS : 4237-1967 ' General requirements for switchgear and controlgear for voltages not exceeding 1000 V '.

10. Material — All the parts in assembly and sub-assembly shall be made in accordance with relevant Indian Standards wherever applicable.

11. Marking

11.1 *Name Plate* — Every controller shall have a name plate affixed to its body giving:

a) the name of manufacturer,

b) serial number and the year of manufacture,

c) rated voltage and current (ac and dc), and

d) reference to this standard.

11.2 *Sequence Diagram* — The sequence diagram shall be pasted inside the cover.

11.3 *Contact Marking* — Each contact shall be legibly marked in accordance with sequence diagram with numerals so as to be clearly visible on opening the cover.

11.4 *Direction of Operation* — On the controller (on the handle side of controller) a separate plate with an arrow engraved on it, showing the direction of operation, shall be fixed.

12. Painting — The enclosure of controller shall be spray painted with the colour as required by the purchaser.

13. Ordering Specification — The following information shall be furnished by the purchaser at the time of ordering:

a) Diagram of contact sequence;

b) Stay put type or spring return type;

c) Engraving details, that is, hoist, lower, forward, reverse, right, left, etc, as required by the purchaser;

d) Whether mechanical latching device is required;

e) Voltage grade;

f) Colour; and

g) Type of handle.

Note — Uncut cam disc with suitable marking in accordance with 7.2 shall be supplied if specifically asked by the purchaser.

14. Tests — The following tests are to be carried out in accordance with IS : 6875 (Part I)-1973.

14.1 *Type Tests* — The manufacturer shall perform the following tests on a representative sample of each lot or batch of each type/model of the controller and shall furnish a certificate of conformance to the requirements:

a) General mechanical inspection.

b) *Temperature-rise test* — The copper contact fingers or flexible connections, wherever applicable, and cable conductor at terminals shall be capable of carrying the rated full load current continuously without exceeding limits mentioned below:

1) Maximum temperature-rise of 45°C at the main copper contact tip/finger, and

2) Maximum temperature-rise of 35°C at terminals of the cable conductors. Such tests shall be carried out for dc models, with convenient dc voltage and for ac models, with convenient ac voltage at 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 the rated currents.

c) Test for making and breaking capacities.

d) *High voltage test* — An ac voltage of 2 500 V — rms at 50 Hz shall be applied between the body and circuit and between fixed and moving contacts for one minute and shall withstand the test. There shall be no breakdown/deterioration of 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 not be less than 5 MΩ.

e Load operation test.

f) *Mechanical endurance test* — The controller shall be able to withstand one million make-break operations without passing current through the contacts at the rate of 600 operations per hour.

14.2 *Routine Tests* — The manufacturer shall perform the following tests on each controller before despatch and shall furnish a certificate of conformance to the requirements:

a) General mechanical inspection, and

b) High voltage test [*see* 14.1 (d) above].