INTER PLANT STANDARD – STEEL INDUSTRY		
IPSS	**PARTICULAR REQUIREMENTS FOR CONTROL PANELS FOR ac CRANES** (*First Revision*) Based on IS 8623 (Part-1):1993	**IPSS:1-04-042-03** Formerly : IPSS: 1-10-011-84

0. FOREWORD

0.1 This Interplant Standard has been prepared by the Standards Committee on Switchgears and Controlgears, IPSS 1:4 with the active participation of the representatives of the steel plants, concerned organizations and established manufacturers of Cranes; and was adopted in December 2003.

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.

0.3 The requirements of control panels for cranes are being covered in three separate Inter Plant Standards as follows :

a) 1-04-041-03 General requirements for control panels for cranes *(first revision*)

b) 1-04-042-03 Particular requirements for control panels for ac cranes *(first revision*)

c) 1-04-043-03 Particular requirements of control panels for dc cranes *(first revision*)

Consequently these Inter Plant Standards are to be read in conjunction with one another.

0.4 The provisions of the Indian Electricity Rules, 1956 and other statutory regulations of the government of India and the relevant State Govt shall apply in addition to the various requirements specified in the Inter Plant Standards indicated in 0.3.

0.5 This standard is generally based on IS 8623 (Part-1):1993 `Specification for low voltage switchgear & controlgear assemblies – Part 1 Requirements for type tested & partially type tested assemblies (first revision) .

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1. SCOPE

1.1 This Interplant Standard covers the requirements of control panels for ac cranes with rated main circuit voltage up to and including 1100 V ac.

1.2 Control panels for ac shall comply with all the requirements of IPSS:1-04-041-03 `General requirements of control panels for cranes (first revision)', if not otherwise indicated in this standard and shall comply with particular requirements specified in this standard.

1.3 This standard also covers some of the salient features of the control schemes employed for the control panels of ac cranes for the hoist, long travel and cross travel mechanisms; mechanisms like slewing, grab, etc are not included.

1.4 This standard is intended for enclosed type of control panels only. However, this standard may apply for open type control panels also with relevant modifications, to be agreed upon between the manufacturer and the purchaser.

1.5 Individual devices and components incorporated inside the control panel shall conform to the relevant Indian Standard or Interplant Standard for steel industry. Provisions for the same are not covered in this standard.

1.6 This standard does not apply to control panels of ac cranes used in hazardous/explosive atmosphere.

2. TERMINOLOGY

2.1 The provisions of 2 of IPSS:1-04-041-03 shall apply.

3. SERVICE CONDITIONS

3.1 The provisions of 3 of IPSS:1-04-041-03 shall apply.

4. ELECTRICAL CHARACTERISTICS OF CONTROL PANELS

4.1 **Rated voltage of the main circuit** - The rated voltage of the main circuit of the control panel shall be 415 V ac, 3 phase. The tolerance on the voltage shall be + 6% and - 10%.

4.2 **Rated frequency** - The Rated frequency shall be 50 Hz with a tolerance of ± 3%.

4.3 **Rated voltage of the control circuit** - The rated voltage of the control circuit shall be as follows :

a) *For ac control system* : 110 V, 240 V and 415 V; and
b) *For dc control system* : 110 V or 230 V.

The tolerance on the voltage shall be + 6% and - 10%.

4.4 **Rated Thermal Current** - Rated thermal current shall be 30, 70, 100, 200, 300 and 400 A (Max.). Ratings above 400 A shall be in conformity with purchaser's requirements.

4.5 **Rated Short Circuit Current** - Rated short circuit current shall be 35 kA.

5. DESIGN AND CONSTRUCTION

5.1 The provisions of 5 of IPSS:1-04-041-03 shall apply.

5.2 Power disconnection device shall be operable from outside without opening the door, unless otherwise specified.

6. PANEL WIRING

6.1 The provisions of 6 of IPSS:1-04-041-03 shall apply.

7. TERMINATION

7.1 The provisions of 7 of IPSS:1-04-041-03 shall apply.

8. SPECIFICATION OF COMPONENTS

8.1 The provisions of 8 of IPSS:1-04-041-03 shall apply.

9. EARTHING

9.1 The provisions of 9 of IPSS:1-04-041-03 shall apply.

10. INFORMATION TO BE GIVEN WITH MAGNET PANEL

10.1 The provisions of 10 of IPSS:1-04-041-03 shall apply.

11. TESTS

11.1 The provisions of 11 of IPSS:1-04-041-03 shall apply.

12. CONTROL SCHEMES OF ac CRANES WITH ac CONTROL SYSTEM

12.1 General

12.1.1 The control shall be fully magnetic unless otherwise specified.

12.1.2 Control of various motors shall be through cam operated master controllers (IPSS:1-10-005-81) operating over contactors and relays conforming the relevant Inter Plant Standards.

12.1.3 Specifications of various components are not covered in this standard.

12.1.4 Unless otherwise specified the sequence of operation shall be automatic with time delay relays. The secondary resistances and time relays shall be so adjusted that the peak accelerating or decelerating transient torque is limited to 180 percent of the full load motor torque.

12.1.5 If an accelerating contactor or relay fails in service the next accelerating step shall be automatically locked out.

12.1.6 All directional contactors shall be electrically and mechanically interlocked to prevent simultaneous closing to both.

12.1.7 Unless otherwise specified the control shall be through 4/5 notches in each direction of the controller.

12.1.8 “OFF” position of master controller shall be interlocked to feed the control supply through a control contactor so that in the event of any fault the controller is brought to OFF position to restart the motion.

12.1.9 Normally closed contacts of the over-load relay shall be interlocked with the respective control contactors.

12.1.10 The contactor closing sequence diagram and the master controller control diagram shall be represented in the individual circuits.

12.1.11 All time delay circuitry shall be designed to suit only “ON” delay timers.

12.1.12 A common circuit breaker incorporating short circuit and over-load protection and under-voltage coil shall be provided for the entire crane. Individual drives shall not be provided with circuit breakers. The circuit breaker shall be mounted either in the operator’s cabin or any other

position convenient to the operator. Provision shall be made in undervoltage coil of circuit breaker to prevent closing the circuit breaker in case any of the contactors is welded in any circuit.

12.1.13 An off-load isolator is to be replaced ahead of the circuit breaker. Additionally each panel shall have its own isolator. The main off-load isolator is to be located on the crane bridge above the girder where protective panel is placed.

12.1.14 To avoid light flicker due to successive switching of high capacity inductor motor, the lighting connection is necessarily to be taken from main protective panel over amply rated double winding lighting transformer having sufficient reactance. It is desirable to provide a lighting transformer having a nominal secondary lighting voltage of 240 V, 50 Hz with its mid point suitably tapped and solidly earthed to reduce the shock voltage to 120 V only for maintenance and operational personnel.

12.1.15 ac supply for magnet shall be tapped from incoming of main CB after the main isolator in case of magnet cranes.

12.2 Control Scheme for Hoist

12.2.1 General requirements

12.2.1.1 For hoist motions the circuit shall enable any load up to test load to be lowered with safety and the motor shall remain stable with the controller in all positions.

12.2.1.2 Hoisting shall take place only when the master controller is in hoisting position and similarly lowering all loads up to rated load shall take place when the master controller is in the lowering position.

12.2.1.3 Hoist control shall be so designed that the hoist brake shall arrest positively whenever motor power fails due to any reason.

12.2.1.4 If directional contactor drops out in operation, the electro-mechanical braking shall be instantly applied to hold the load from over speeding and to bring the motor to a rapid standstill.

12.2.1.5 All hoists shall be provided with `Anti drop' features in order to prevent the load from moving away when the controller is brought to OFF position. Unless otherwise specified, this shall be achieved by a switching combination of an auxiliary contactor and a time delay relay providing automatic plugging control when the controller is brought to OFF position from lowering positions. Similarly when moved from

hoisting or counter torque positions to OFF position the hoist contactor shall remain energized for the set time by the above relay.

12.2.1.6 All hoists shall be provided with counter torque braking feature. When the controller is moved rapidly from the lowering load, a time delay relay shall prevent the rotor contactors from being enerized. The motor shall initially be braked with full rotor resistance in circuit and after pre-determined period of time the first rotor contactor shall pick up. If the starting of the motion is not desired in the hoisting direction the operator can bring the controller to OFF position.

12.2.2 Classification of hoists

12.2.2.1 The hoist mechanism of various cranes in iron and steel works can be broadly classified as follows :

a) Hot metal ladle cranes, rolling mill erection cranes, etc where special creep speed control with flat characteristics is necessary;

b) Tongs cranes such as stripper, mould yard, soaker cranes, etc where the weight of tongs constitute a base load of about 50 per cent.

c) Grab hoist cranes; and

d) All other general handling cranes including magnet hoists.

12.2.2.2 The special requirements of control schemes for operations like stripping, tongs closing, slewing, luffing and tipping shall be specified by the purchaser.

12.2.2.3 When twin motor drive is used in hoists as in ladle cranes, provisions shall be made to operate with a single motor with full load. Control scheme for two motors shall be similar to the one for single motor excepting the provisions of additional selector switches and control contactors.

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