INTER PLANT STANDARD – STEEL INDUSTRY		
IPSS	**HOIST MOTOR CONTROL SCHEME EMPLOYING THYRISTORS FOR ac CRANES** *(Second Revision)*	**IPSS:1-10-018-10**
	Corresponding IS does not exist	Formerly : IPSS: 1-10-018-03

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 ac cranes and was adopted in February 2010.

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 This Inter Plant Standard is to be read in conjuction with IPSS:1-04-041-03 'General requirements for control panels for cranes (with Amendment No.1).

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

0.5 In preparation of this standard, the provisions of IS 8623 (Part 1):1993 'Low voltage switchgear and controlgear assemblies : Part 1 Requirements for type tested and partially type – tested assemblies (first revision)' have been kept in view.

1. SCOPE

1.1 This Inter Plant Standard covers the requirements of hoist motor control scheme employing thyristors for ac cranes.

GULSHAN KUMAR
(MEMBER SECRETARY)

1.2 Control panels employing thyristors for ac cranes shall comply with all the requirements of IPSS: 1-04-041-03, if not otherwise indicated in this standard and shall comply with the requirements specified in this standard.

1.3 Individual devices and components incorporated inside the panels shall conform to the relevant Indian Standard specifications or Inter Plant standards for steel industry.

2. SERVICE CONDITION

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

3. ELECTRICAL CHARACTERISTICS

3.1 **Rated voltage of the main circuit** – The rated voltage of the main circuit shall be 415 V ac, three phase. The tolerance on the voltage shall be +10% and -15%.

3.2 **Rated frequency** – The rated frequency shall be 50Hz with a tolerance of +4%, -6%.

3.3 **Rated short circuit current** – Rated short circuit current shall be 50 kA for one sec.

4. DESIGN AND CONSTRUCTION

4.1 a) The provisions of clause 5 of IPSS: 1-04-041-03 shall apply.

b) All panels shall be provided with anti-vibration pads. Limits of vibration for electronics equipment shall be 10 to 2000 Hz for professional grade and 10 to 500 Hz for consumer grade. Other requirements such as visual inspection, contact resistance and sealing after the completion of the vibration test shall be in accordance with IS 9000 (Part 8):1981 `Basic environmental testing procedures for electronic and electrical items : Part 8 vibration (sinusoidal) test'.

4.2 Thyristor cubicle

4.2.1 The thyristor modules with fuses, gate pulse transformer, etc shall be housed in thyristor cubicle cooled by a separate low noise ventilating fan having dry cleanable filters.

4.2.2 Other components such as ac and dc power packs, regulating and control equipment, shall be located in separate cubicles.

4.2.3 All internal control connections including gate circuits shall be of plug-in-type with extra locking arrangement in plugged-in position.

5. PANEL WIRING

5.1 The provision of clause 6 of IPSS: 1-04-041-03 shall apply.

5.2 For regulating and other electronic circuits, wiring shall be of vibration proof type.

6. TERMINATIONS

6.1 The provision of clause 7 of IPSS: 1-04-041-03shall apply.

6.2 Plug-in type modules shall have connections through plug and receptacle arrangement with additional locking arrangement.

6.3 The connectors shall be made of polycarbonated glass filled nylon with suitable pins for good electrical contact especially with low voltage and weak current signals.

6.4 The connectors shall be mechanically polarized to prevent wrong insertion of the modules.

7. EARTHING

7.1 The provision of clause 9 of IPSS: 1-04-041-03 shall apply.

7.2 The body of each plug-in type module shall be connected through separate terminal of plug to the common earth bus.

Detail of dedicated electronic earthing will be given by Siemens and Rockwell

8. INFORMATION TO BE GIVEN WITH THE CONTROL PANEL

8.1 The provision of clause 10 of IPSS: 1-04-041-03 shall apply.

9. TEST

9.1 The provision of clause 11 of IPSS: 1-04-041-03 shall apply.

9.2 Thyristors and PCB cards shall conform to IEC 146 & IEEE 444.73 tests.

10. CONTROL SCHEME

10.1 The control scheme shall be suitable for phase angle control for stator of hoist motors using thyristors on the stator side.

10.2 For continuous/stepped speed control in a large speed range, combination of step-less adjustments of the stator voltage and rotor resistance control shall be used.

10.3 The control scheme shall be suitable for controlling step-lessly and independent of the load, both, in the hoisting and lowering direction to achieve a speed regulation of 60% in both the directions.

10.4 Beyond 60% step-less and load independent speed range, a further higher speed of the hoist motion shall be achieved at final notch of the master controller at which the motor shall be short circuited with a small slip resistance in the rotor and full voltage shall be applied on the stator to achieve the final speed. During lowering one super-synchronous speeds shall be achieved at master controller position IV lowering by resistance steps.

10.5 Set value input/command signal shall be obtained through 4 step master controller and the speeds shall be in the following range :

Position	Hoist	Lower
I	10-15	10-15
II	25-35	25-35
III	40-60	40-60
Iv	95	105

Further speeds at different notches and number of notches may be mutually agreed upon between the purchaser and the supplier.

10.6 The thyristor control shall be of 4 quadrant operation.

10.7 For reversing the drive, thyristor reversal shall be utilized.

10.8 The variable voltage shall be obtained through adequately rated thyristors connected in anti parallel on the primary side of the motor.

10.9 Thyristors shall be controlled by phase angle control which opens the thyristors at a certain phase angle after the ac voltage has crossed over zero. By variation of the angle from 0-180 deg, the motor voltage shall be decreased from 100% to zero.

10.10 Actual speed detection shall be either through the tacho-generator/ Digital Encoder. However, if the tacho-generator is employed, it shall be of dc permanent magnet field type.

11. COMPLETE PACKAGE

11.1 The complete package shall comprise of the following in addition to the main functional blocks as specified by the purchaser :

i) Thyristors connected in anti parallel arrangement adequately rated for the motor,

ii) Rotor resistance

iii) Rotor contactors and brake contactors,

iv) Master controller and tacho-generator

v) All other safety features such as anti drop, braking in O-position, torque failure, protection equipment and surge suppression networks,

vi) All necessary modules for feedback, regulation and control for achieving phase angle control of stator,

vii) Annunciation facility,

viii) For twin drives control of hoist, load sharing between motors is to be provided.

ix) Alphanumeric drive programming unit with display

Note: Motors selected as per IPSS:1-03-003-08 are to be derated by 15% for thyristor application.

Back