INTER PLANT STANDARD - STEEL INDUSTRY		
IPSS	**THYRISTOR CONVERTORS FOR ARMATURE AND FIELD OF MAIN DRIVE MOTORS** *(FIRST REVISION)*	**IPSS: 1-10-038-15**
	Corresponding IS does not exist	

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 manufactures of Thyristor Convertors for Armature and Field control of Main drive motors and was adopted in September 2015.

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 While formulating this standard assistance has been drawn from the following publications:

i) IEC 146-1-1 (1991-04)
ii) IEEE Standard 444 (Part-I) 1973

1 SCOPE

1.1 This Interplant Standard covers the requirement of Digital dc Variable Speed Thyristor Convertor Drives for Armature and Field supply to main motors in steel plants.

1.2 This IPSS Standard is applicable to Single and 4 Quadrant operation of the Drives in simple stand alone applications as well as in high performance group drive systems with distributed control systems.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions in IS 1885 (Part17) : 1979 “Electrotechnical Vocabulary “ Part 17 Switchgear and Controlgear (First Revision)' shall apply.

3. SITE CONDITIONS

3.1 The following shall constitute the normal site conditions for the purpose of this standard :

3.1.1 *Ambient Temperature* - The reference ambient temperature shall be 50°C Maximum ambient temperature shall be 55°C.

3.1.2 *Ambient Air* -The ambient air may contain large amount of conductive dust.

3.1.3 *Altitude*- The altitude shall not exceed 1000 m above sea level.

3.1.4 *Relative Humidity*- The maximum relative humidity shall be 100%. However, the maximum temperature and maximum relative humidity may not occur simultaneously.

4. ENCLOSURE

4.1 The operating cubicles shall have IP42 degree of protection for assemblies with cooling fans. Assemblies shall be provided with dry cleanable filters.

5. POWER SUPPLY SYSTEM

5.1 The Drive unit shall be suitable for operation from the following power supply system :

a) Voltage : (i) 3.3/6.6/11 KV (ii) 415 V 3 phase 3/4 wire AC supply system, voltage variation +10% to -15%
b) Frequency : 50 Hz , variation +4%, -6%.

5.2 To suit the motor requirement, suitable rectifier, transformers/chokes shall be provided.

6. RATINGS

6.1 The convertor shall always be rated for continuous duty. The convertor shall also be designed as per the Peak voltage and current of the drive motor.

6.2 The convertors should be rated for 50°C. Derating factors above 50°C ambient temperature should be applicable.

6.3 The preferred nominal dc output voltage shall be :

a) 220 V
b) 460 V
c) 500 V
d) 700 V
e) 700 V and upto 1000 V L.T.
f) Above 1000 V for H.T.

7. EQUIPMENT DETAILS

7.1 Basic Features required are :

7.1.1 The convertors shall be of two types catering to I Quadrant non-regenerative and IV Quadrant regenerative operations.

7.1.2 One fully controlled 3 phase thyristor bridge rectifier capable of supplying the peak armature current for continuous duty cycle shall be there for single Quadrant convertor and 2 such bridges connected anti-parallel shall be there for 4 Quadrant convertors. The field supply can be derived from 3ph ac supply using full controlled bridge rectifiers.

7.1.2.1 The class of protection for thyristor convertor shall be as IEEE 444 (Part-1) : 1973

7.1.2.2 Unless otherwise specified the over load capacity of the thyristor convertor shall meet the requirement of duty class IV of IEC 146-1-1 (1991-04).

7.1.2.3 The convertor shall have surge suppressor circuit at the input side for transient/surge suppression.

7.1.2.4 The convertor shall have RC snubber circuit across each thyristor, semiconductor fuse and fuse monitoring. The heat sink shall also be monitored wherever applicable.

7.1.2.5 The control supply shall have EMI filters and transient suppressors and should be so arranged that the control scheme and the pulse triggering can be checked without applying mains power to the thyristors.

7.1.3 The thyristor convertor for the motor field control should be 3 phase fully controlled Bridge rectifier capable of supplying maximum field current continuously and must have provision for field discharge.

7.2 Protection to be provided :

a. Instantaneous over current of motor
b. Over Voltage protection when field weakening is used.
c. Over speed
d. Tacho Failure
e. Field Loss
f. Input power phase failure
g. Input phase sequence
h. Transient over voltage
i. Transient under voltage
j. Earth leakage /earth fault
k. Synchronizing supply failure
l. Convertor short circuit
m. HSCB.

7.3 Alarm annunciation on main panel :

- Main power On/Off
- Control supply On
- Earth fault
- dc current overload
- Thyristor fuse failure
- Thyristor failure
- Cooling fan failure (pre-trip alarm)
- Tacho failure
- Over speed
- Field loss
- Over current
- Instanstaneous trip
- Thyristor over temperature
- Phase fail/reversal of Main power

7.4 Operating Status Display

1. Direction of rotation
2. Readiness for operation
3. Normal running
4. Inching
5. Power supply presence at Converter Input
6. Waiting for Thyristor Check Completion
7. dc contactor close
8. Field excitation current
9. Parameter Listing
10. Fault listing
11. Emergency stop
12. Drive parameter
13. Status of input sources signals
14. Display pulse encoder signal
15. Display for Digital and Analog Tacho inputs.
16. Display of Ramp time
17. Armature current.

8. OPERATION

8.1 The convertor shall have Manual and Auto modes of operation for Local and Remote control of the system;

8.1.1 ***Manual Mode***: In this mode the drive is tested and tuned from the Panel. Provision should be there to check the thyristor pulses and control ranges without giving mains power to the devices.

8.1.2 ***Auto Mode*** : In this mode the drive should be able to be run from remote station either singly in a stand-alone mode in conjunction with other drives in the system. The drive must have provision to do all parameters settings, limit set point setting and tuning remotely through serial links and suitable interfaces.

8.1.3 The convertor must have Window based programming Software, provision for digital and analog signal inputs.

9 TERMINATION

9.1 Clause 6.0 of IPSS: 1-04-041-03 General requirements for control panels for cranes (First Revision) shall apply.

9.2 Plug-in type electronic cards shall have connections through plug and receptacle arrangement.

9.3 The connection shall be ploy carbonated glass grilled nylon with gold plated pins for good electrical contacts especially with low voltage and weak current signals.

9.4 The connectors shall be mechanically polarized to prevent wrong insertion of the modules/cards.

9.5 The electronic cards shall be provided with identification plates, test point brought out for checking input/output parameters, signals monitoring at critical points along with suitable handle for drawing out the cards.

9.6 The cards shall be housed in regular bins which shall be metal rack with hinged swiveling arrangement conforming to the dimension as given in IEC 50297-1(1986-09). The electronic cards shall be provided with self- locking screws to secure them firmly in the bins with sufficient space between them for electrical isolation and proper cooling.

10 EARTHING

10.1 Provision of clause 9 of IPSS: 1-04-041-03 General requirements for control panels for cranes (First Revision) shall apply.

10.2 The body of each plug-in module shall be connected on separate terminal of plug to common earth bus.

11 DOCUMENTATION

11.1 The supplier along with the equipment shall furnish the following documents, in duplicates :

i) Test reports /certificates of tests carried out at the manufacturer's premises and must include compliance certificates to relevant national and international standards.

ii) Operation and maintenance manuals in duplicate. The manuals shall include Trouble shooting and fault finding Diagnostics for easy and speedy maintenance.

iii) Detailed schematic and wiring diagram of the panels and equipment supplied

iv) Wherever deviations are there due to omission or inclusion of optional or additional equipment the supplier shall hand-over one set of As Built corrected drawings after commissioning.

. v) Softcopy of all Hardware and Software details such as user program, operating program, PC based interfacing programs shall be supplied in CDs.

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12 INFORMATION TO BE FURNISHED

12.1 The provision of clause 10 of IPSS :1-04-041-03 "General requirements for control panels for cranes (First Revision)" shall apply