REFRIGERATION TYPE HYDROGEN DRIER
(WITH NON-CFC COMPRESSOR)

1.0 SCOPE

This standard specifies the requirements of Refrigeration type hydrogen drier, with non-CFC compressor, for eliminating the moisture from hydrogen / air / CO_2 or their mixture present in the Turbogenerator casing.

2.0 DESIGNATION

2.1 On drawing and indents (computerised):

a)	Material Specification Column	:	TG 60327
b)	Description Column	:	Hydrogen drier
c)	Material code column	:	W90414903463

2.2 On Indents (Manual)
Hydrogen drier to Product Standard No. TG 60327

2.3 On Enquiries and Purchase Orders:
In addition to incorporating the above details a copy of this standard shall be enclosed alongwith the enquiry.

3.0 TECHNICAL REQUIREMENTS:

3.1 Working Principle:
The moist hydrogen gas is first passed through the gas to gas heat exchanger. The hot moist gas on the primary side is cooled in advance through the dried cold gas on the secondary side. The condensation of water vapours and oil vapours if any starts in the heat exchanger.

				नाम NAME	दिनांक एवं हस्ताक्षर SIGN. & DATE
TSX	AK CHATURVEDI	24-2-06	अनुवादक TRANSLATED BY		
PSC Member	L. CHAND		निर्माणकर्ता WORKED BY	S.B. JAYANT	30/1/06
QAX	S S Chauhan	17/2	जांचकर्ता CHECKED BY	A.K.MALHOTRA	30
सहमत विभाग AGREED DEPTT.	नाम NAME	दिनांक एवं हस्ताक्षर DATE & SIGNATURE	पर्यवेक्षणकर्ता SUPERVISED BY	K.R. GUPTA	

हस्ताक्षर एवं दिनांक SIGN & DATE 29/2/06

सामग्री सूची संख्या INVENTORY NO. P. 5734

स्वीकृति : APPROVED : DEVRAJ (AGM/EME) 30/1/06

GP.NO. 4-70

REV. NO. 05

DATED 01.03.11

निर्माण PREPARED: EME, HEEP, HWR

जारी ISSUED: TSX, HEEP, HWR

दिनांक : DATE: 24-2-06

After the pre-cooling, the compressed gas passes through evaporator in which deep cooling taken place on the pressure dew point up to 3-5^{0}C. The evaporator is spiral/brazed type. This has the action of cyclone separator. In this way, water and oil drops are separated. After this, the gas is passed through a separator system. From the separator system, the condensate flows to the drain chamber. The gas again passes through heat exchanger and is heated to about 8-10^{0}C below the inlet temperature.

The cooling machine with complete hermetically sealed non – CFC compressor produces the required cooling power (Refer Fig.1)

3.2 The drier shall consist of the following major components.

i) Pre-cooler, shall and tube type, all welds seams 100% rediographed.
ii) Evaporator, shall and tube type with tubes of copper and 100% rediographed weld seams.
iii) Drain collector
iv) Hermetically sealed non-CFC compressor of reputed make.
v) Fin and tube type air cooled condenser along with suitable fan driven by explosion proof motor.
vi) Temperature controllers and pressure switches for controls.
vii) Thermometers and pressure gauges for hydrogen gas temperature & pressure measurement.
viii) Rectangular steel cabinet with all the instruments mounted on the front panel.
ix) All other components necessary for the unit.

NOTE :
In place of item (i) &(ii) , a single brazed plate type heat exchanger, suitable to work as a pre-Cooler & Evaporator of a reputed make like Alfa Laval / GEA/ or equivalent is acceptable.

3.3 <u>Technical Parameters:</u>

i)	Compressor rating	:	3225K.cal/Hr.
ii)	Gas flow rate	:	40M^3 / Hr.
iii)	Inlet temperature	:	60^{0}C Max.
iv)	Inlet pressure	:	5Kg/cm^2 (g)
v)	Design pressure	:	10Kg/cm^2 (g)
vi)	Flange connections	:	NB50, NP10
vii)	Dew point	:	3-5^{0}C
viii)	Utility available	:	415V, 3phase, 50Hz
ix)	Dimension of the drier unit (tentative)	:	Height: 1300mm ,Width: 800mm, depth:800mm
x)	Max. Ambient temp.	:	50^{0}C

4.0 TESTING

Following tests shall be carried out.

4.1 Hydraulic test of evaporator unit and Pre-cooler unit (shall & tube type) / Single brazed plate Heat Exchanger, shall be carried out separately at 15 Kg/cm^2 for 30 minutes.

4.2 Pneumatic test of evaporator unit and Pre-cooler unit (shall & tube type) / Single brazed plate Heat Exchanger, shall be carried out separately at 10 Kg/cm^2 for 8 hours.

4.3 Hydraulic test of complete H_2 circuit at 10 Kg/cm^2 for 30 minutes.

4.4 Pneumatic test of complete H_2 circuit at 10 Kg/cm^2 for 8 hours.

4.5 Hydraulic test of freon circuit bypassing compressor at 15 Kg/cm^2 for 30 minutes.

4.6 100% radiography of pre-cooler, evaporator unit and any welding in the H_2 circuit.

4.7 High Voltage & Insulation resistance test of control panel.

4.8 Performance test shall be demonstrated by the supplier at their works covering the following.

4.8.1 Proper functioning of the Refrigeration system:

Checking for proper functioning is to be carried by supplying air through the drier. The thermostats of the gas drier should switch off the compressor as soon as 3^{0}C temperature achieved in the evaporator and when the temperature again reaches 5-6^{0}C, the compressor / cooling should start.

During functional test, operation of instrument shall also be checked.

4.9 Test & Inspection - Inspection shall be carried out by BHEL / its customer / authorised inspection agency as per approved quality plan. Minimum of 15 days notice shall be given. No equipment shall be dispatched without inspection and clearance.

5.0 Test certificate – 3 copies of the following test certificates shall be furnished.

- NDT reports
- Hydraulic / Pneumatic test report
- Performance test report
- Manufacture's test certificates for major items i.e compressor, motor, fan, solenoid valves, etc.
- Material test certificates for tubes, tubes plate, flanges, nozzles, plates of heat exchanger, etc.

5.0 GUARANTEE:

The drier along with its accessories shall be guaranteed for satisfactory operation for 18 months from the date of commissioning or 24 month from the date of dispatch whichever is earlier. Any defect during the guarantee period shall be rectified by supplier at no obligation.

6.0 PAINTING:

The Drier shall be cleaned before painting. Drier shall be painted with two coats of light grey white epoxy paint from outside after applying suitable epoxy primer. The total thickness of paint (including primer, intermediate and finish paint) shall be 200 microns. Inside of the drier shall be also be painted suitably.

7.0 PACKING AND DESPATCH:

7.1 All the openings shall be blanked during transport.
7.2 All the instruments likely to be damage during transit shall be packed in a separate small packing box and that box shall be kept in the main packing box.

8.0 DOCUMENTS TO BE SUPPLIED ALONG WITH OFFER:

8.1 General view of the gas drier unit along with overall dimensions including cross section & material details.
8.2 The drawing/ catalogues of the bought-out components giving complete description.
8.3 Data sheets of all the items/ components.
8.4 Description and operation & maintenance manual.
8.5 Quality plan on BHEL format for major items including the tests/ checks being carried out during material induction stage, in process, final assembly and testing stage along with reference documents shall be submitted for BHEL review and approval.

9.0 DOCUMENTS TO BE SUPPLIED AFTER ORDER PLACEMENT

9.1 20 copies of O & M Manual per drier.
9.2 3 copies of the Test & guarantee Certificate as per clause 4.0.

10.0 SPARES INCLUDED IN EVERY SET OF REFRIGERATION TYPE GAS DRIERS:

10.1. Refrigerant Gas Cylinder (1 NO. of 13 Kg.)
10.2. Capillary (1 NO.)
10.3. Contactor (1 NO.)
10.4. Solenoid Valves (1 Set)
10.5. Freon drier / receiver (1 NO.)

REV. 05

उत्पाद मानक

PRODUCT STANDARD

TURBOGENERATOR ENGINEERING

TG60327

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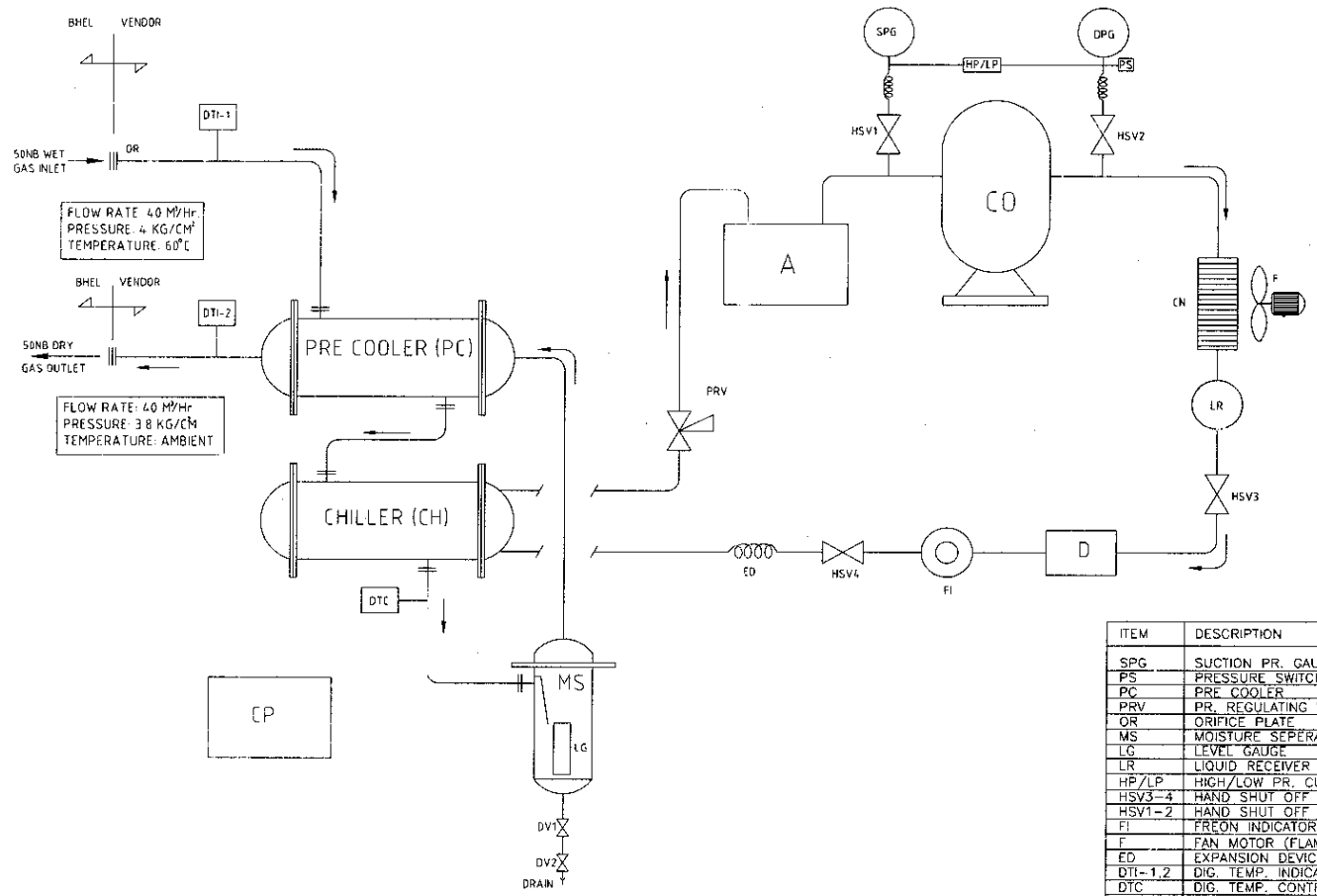

REFRIGERATION TYPE HYDROGEN GAS DRIER

FIG.1

(FOR REFERENCE ONLY)

ITEM	DESCRIPTION
SPG	SUCTION PR. GAUGE
PS	PRESSURE SWITCH
PC	PRE COOLER
PRV	PR. REGULATING VALVE
OR	ORIFICE PLATE
MS	MOISTURE SEPERATOR
LG	LEVEL GAUGE
LR	LIQUID RECEIVER
HP/LP	HIGH/LOW PR. CUT OUT
HSV3-4	HAND SHUT OFF VALVE
HSV1-2	HAND SHUT OFF VALVE
FI	FREON INDICATOR
F	FAN MOTOR (FLAME PROOF)
ED	EXPANSION DEVICE
DTI-1,2	DIG. TEMP. INDICATOR
DTC	DIG. TEMP. CONTROLLER
DPG	DISCHARGE PR. GAUGE
DV1-2	DRAIN VALVE
D	FREON DRYER
CN	CONDENSER
CH	FREON CHILLER
CP	CONTROL PANEL
CO	COMPRESSOR
A	ACCUMULATOR

तैयारकर्ता Worked by	SBJ	30/01/06
जांचकर्ता Checked by	AKM	30/1/06