Project Engineering
Management

Bharat Heavy Electricals Limited
(A Govt. Of India Undertaking)

2 X 660 MW IB TPP BANHARPALLI UNITS 3 & 4- GENERATOR CIRCUIT BREAKER

REF NO. : PE/PG/OP1/E-4773/14 **DATE: 14.05.2015**

TECHNICAL CLARIFICATION

Tender Enquiry no.: PE/PG/OP1/E-4773/14 DTD. 15.04.14
2 X 660 MW IB TPP BANHARPALLI UNITS 3 & 4
GENERATOR CIRCUIT BREAKER

EXTENDED DUE DATE
29.05.2015
02.00 PM (IST)

With ref to clarification received from vendors, following may please be noted for subject tender.

1. REFERENCE Clause No.1.01.02 Sec C of Tech Spec :

   CLARIFICATION : ONE SET OF CB OPERATION ANALYSER IS REQUIRED FOR TWO GCBs. IN CASE TWO SETS ARE REQUIRED BY THE BIDDER TO MEET THEIR SYSTEM REQUIREMENT , THEY SHOULD SUPPLY TWO SETS ACCORDINGLY. HOWEVER, THE SAME NEED NOT BE MODIFIED IN UNPRICED SCHEDULE OF SPECIFICATION.

2. REFERENCE Clause No.4.03.03 Sec C of Tech Spec :

   CLARIFICATION : BREAKER CONTACT NEED NOT BE EASILY REPLACEABLE.

3. REFERENCE Clause No.4.15.00 Sec C of Tech Spec :
   CLARIFICATION : OPERATIONAL ANALYSER MAY OR MAY NOT HAVE FACILITY FOR MEASURENT OF SYNCHRONISATION OF CONTACTS.

4. REFERENCE Sl No. 13.00 Mandatory Spares of unpriced Spec:

   CLARIFICATION : Item description is "Circuit Breaker complete operating mechanism".

5. Generator typical data sheet & excel sheet containing relevant system details, required for GCB calculation is also attached.

With Regards,
For & on behalf of BHEL

Haseen Ahmed
DY.MANAGER/PG-II-1

Please reply to:
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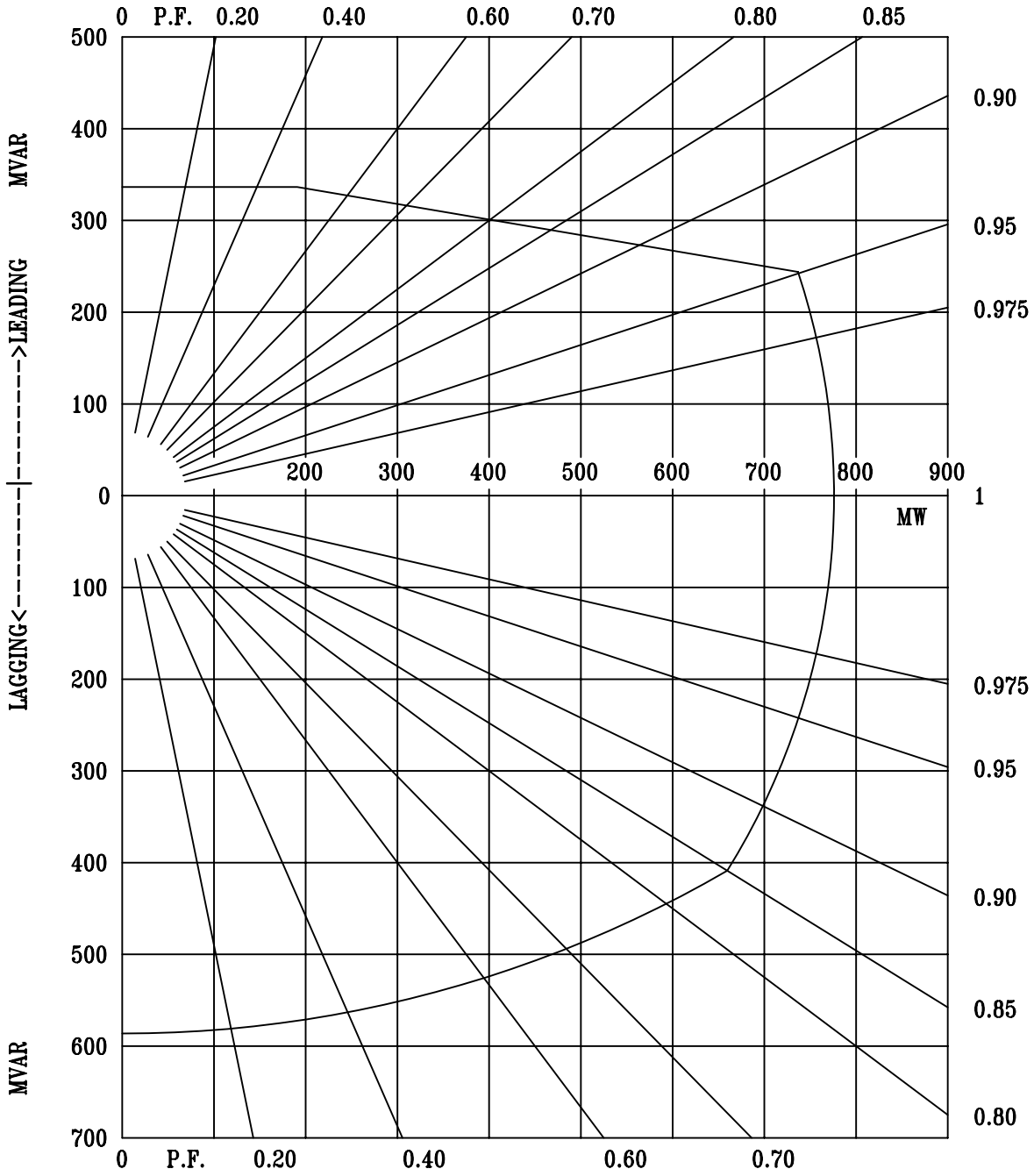
CAPABILITY DIAGRAM

660 MW TURBOGENERATOR

GENERATOR-TYPE: THDF 115/67

			RATED	
GENERATOR OUTPUT	S	=	776.000	MVA
ARMATURE VOLTAGE	U	=	21.000	kV
ARMATURE CURRENT	I	=	21.334	kA
FREQUENCY	F	=	50.0	Hz
POWER FACTOR	P.F.	=	0.850	
RATED H2-PRESSURE	P_E	=	5.00	bar
COLD GAS TEMPERATURE	T_K	=	45.00	Cel



ELECTRICAL MACHINES ENGINEERING

BHEL , HARDWAR

SDN		02.05.07
NAME	SIGN.	DATE

TG - THDF 115/67 - 010

KVUICR/RE0100/KVU/BHEL VER 7.92/4.93 (GRAPHICS INTF. I.C.RAD)DATE: 1- 5-2007 TIME: 954
FILE NAMES: INPUT:UNKNOWN OUTPUT:OLDDC GRAPHIC:OLSCR

B. GENERATOR AND ACCESSORIES

1.00.00	**General**	
1.01.00	Make	: BHEL / Siemens
1.02.00	Type	: THDF 115/67
1.03.00	Reference Standard	: IEC 60034
1.04.00	Enclosure and degree of protection	: Generator:IP54
1.05.00	**Type of cooling**	
	a) Stator winding	: Primary water
	b) Stator core	: Hydrogen
	c) Rotor	: Hydrogen
1.06.00	Rated coolant pressure Hydrogen, Bar	: 5 bar (g)
1.07.00	Rated speed, RPM	: 3000
2.00.00	**Main Ratings**	
2.01.00	Rated output, MW	: 660
	MVA	: 776
2.02.00	Maximum continuous rating (M.C.R.), MW	: 693
	MVA	: 816
2.03.00	Rated power factor	: 0.85 (lag)
2.04.00	Rated terminal voltage, KV	: 21
2.05.00	Rated stator current, Amps.	: 21362
2.06.00	Phase, Nos.	: 3
2.07.00	Rated frequency, Hz.	: 50
2.08.00	Excitation at rated output and power factor	
2.08.01	Voltage, Volts	: 463
2.08.02	Current, Amps.	: 5710
2.09.01	Short circuit ratio (S.C.R) at rated output	: 0.52
2.09.02	Permissible (±) Tolerance in S.C.R.	: ±15%

3.00.00	**Performance**	
3.01.00	**Efficiency at**	
3.01.01	100% load, %	: 98.75
3.01.02	75% load, %	: 98.83
3.01.03	50% load, %	: 98.80
3.01.04	25% load, %	: 98.29
3.02.00	**Regulation at rated output, speed and voltage**	
3.02.01	0.85 power factor lag, %	: Later
3.02.02	Unit power factor, %	: Later
3.02.03	0.85 power factor lead, %	: Later
3.03.00	**At generator rated output, rated speed and power factor, the permissible variation range in**	
3.03.01	Terminal voltage, %	: ± 5%
3.03.02	Frequency, %	: -5 to +3 %
3.03.03	Absolute sum of combined voltage and frequency variation	: 5 %
3.04.00	**Voltage rise during sudden rejection of full load at rated power factor**	
	a) With A.V.R., %	: 19
	b) Without A.V.R., %	: 38.4
3.05.00	**Generator reactive capability**	
3.05.01	Maximum inductive loading (zero lag), MVAR	: 586
3.05.02	Maximum capacitive loading (zero lead), MVAR	: 336
3.05.03	Capacitive loading at rated load and voltage, MVAR	: Later
3.06.00	**Permissible unbalanced loading subject to current not exceeding the rated current in any phase**	
3.06.01	Maximum continuous negative sequence current-I_2, %	: 8
3.06.02	Maximum value of I^2_2t for transient operation under system fault (I_2 in p.u. and t in secs.)	: 8

3.07.00	**Generator asynchronous operation**	
3.07.01	Permissible load, % f.l	: Later
3.07.02	Duration, Min.	: Later
3.08.00	**Short circuit withstand**	
3.08.01	**3-phase terminal fault**	
	a) Current, KA	: 32.06
	b) Duration, Secs.	: 3
3.08.02	**Stator ground fault**	
	a) Current, KA	: Later
	b) Duration, Sec.	: Later
3.09.00	**Overload performance**	
3.09.01	Stator current, % f.l.	: acc. IEC 60034
3.09.02	Time, Sec.	: acc. IEC 60034
3.10.00	Generator pull out power at rated voltage	: --
3.11.00	Maximum continuous generator capability under one H_2 cooler out of operation	: 2/3 of rated load
3.12.00	Generator capability on variation of coolant pressure	: Const. H2 press.
3.13.00	Minimum H_2 gas pressure & corresponding MW; Bar, MW	: 5 bar(g) at rated load (660MW)
4.00.00	**Temperatures**	
4.01.00	**Ambient temperature**	
4.01.01	Cooling water at inlet to heat exchanger, Deg. C	: 39
4.01.02	Ambient air, Deg.C	: -
4.02.00	**Coolant temperatures**	
4.02.01	Cooled H_2 gas, Deg.C	: 44
4.02.02	Hot H_2 gas, Deg.C	: 85
4.02.03	Stator Water inlet, Deg.C	: 49

4.02.04	Stator Water outlet, Deg.C	: acc. IEC 60034
4.03.00	**Guaranteed temperature rise over specified ambient**	
4.03.01	Stator winding, Deg.C	: acc. IEC 60034
4.03.02	**Stator core**	
	a) In contact with insulated winding, Deg.C	: acc. IEC 60034
	b) Not in contact with insulated winding, Deg.C	: acc. IEC 60034
4.03.03	Rotor winding, Deg.C	: acc. IEC 60034
4.03.04	Collector rings if any, Deg.C	: N.A.
5.00.00	**Miscellaneous Parameters**	
5.01.00	Saturation constant	: Later
5.02.00	Wave form factor	: Later
5.03.00	**Stored energy constant (H)**	
5.03.01	Generator + exciter, KW Sec./KVA	: 0.7
5.03.02	Complete turbo-generator, KW Sec./KVA	: Later
5.04.00	**Fly wheel effect (GD^2)**	
5.04.01	a) Generator + exciter, Kg/Sq.m	: approx. 11500
	b) Turbine, Kg/Sq.m	:Later
	c) Complete TG unit	:Later
5.05.00	Acceleration time (Ti), Sec.	:Later
5.06.00	Critical Speed, r.p.m	:
	a) 1st r.p.m	: 720
	b) 2nd r.p.m	: 1980
	c) 3rd r.p.m	: 3360
6.00.00	**Reactances etc. (in % at rated MVA and KV) Saturated/Unsaturated**	
6.01.00	**Direct axis reactances**	**Saturated/Unsaturated**
6.01.01	Synchronous - xd, %	: --- / 244.13

6.01.02	Transient - xd', %	: 30.2 / 33.47
6.01.03	Sub-transient -xd", %	: 20.2 / 24.95
6.02.00	**Quadrature axis reactances**	
6.02.01	Synchronous - Xq, %	: --- / 231.92
6.02.02	Transient - Xq', %	: 70.15 / 86.61
6.02.03	Sub-transient - Xq", %	: 22.22 / 27.45
6.03.00	Negative sequence reactance - X_2	: 20.27 / 25.03
6.04.00	Zero sequence reactance-Xo, %	: 10.62
6.05.00	Potier reactance, Xp	: 27.4
6.06.00	Permissible tolerance in all guaranteed reactance values, %	: ± 15%
6.07.00	**Effective winding capacitance to earth**	
6.07.01	Per phase, mfd	: 0.377
6.07.02	All phase connected to earth, mfd	: --
6.08.00	Effective surge impedance to neutral per phase, ohm	: --
6.09.00	**Armature resistance per phase at**	
6.09.01	25 Deg. C, Ohm.	: 0.000916(at 20˚C)
6.09.02	75 Deg.C, Ohm.	: --
6.10.00	**Field resistance per phase at**	
6.10.01	25 Deg. C, Ohm.	: 0.064016 (at 20˚C)
6.10.02	75 Deg. C, Ohm.	: --
7.00.00	**Time Constants**	
7.01.00	**Direct axis transient**	
7.01.01	Open circuit time constant Td'o, Sec.	: 7.94
7.01.01	Short circuit time constant Td', Sec.	: 0.855
7.02.00	**Direct axis sub-transient**	
7.02.01	Open circuit time constant Td"o, Sec	: 0.0412

7.02.02	Short circuit time constant Td", Sec.	: 0.0291
7.03.00	**Quadrature axis transient**	
7.03.01	Open circuit time constant Tq'o, Sec.	: 2.5
7.03.02	Short circuit time constant Tq', Sec.	: 0.836
7.04.00	**Quadrature axis sub-transient**	
7.04.01	Open circuit time constant Tq"o, Sec.	:0.2
7.04.02	Short circuit time constant Tq", Sec.	:0.07
7.05.00	Armature short circuit time constant Ta, Sec.	:0.326
8.00.00	**Short Circuit Current (in p.u.)**	
8.01.00	**Sub-transient current**	
8.01.01	3-phase short circuit	: -
8.01.02	2-phase short circuit	: -
8.01.03	1-phase to neutral short circuit	: -
8.02.00	**Transient current**	
8.02.01	3-phase short circuit	: 302.58 kA (initial)
8.02.02	2-phase short circuit	: 255.65 kA (initial)
8.02.03	1-phase to neutral short circuit	: -
8.03.00	**Steady state current**	
8.03.01	3-phase short circuit	:32.06
8.03.02	2-phase short circuit	:50.38
8.03.03	1-phase to neutral short circuit	: -
9.00.00	**Design and Construction**	
9.01.00	**Stator core**	
9.01.01	Type of mounting	:flat spring mounting
9.01.02	**Grade of steel**	
	a) Thickness, mm	: later
	b) Loss figure	:later

9.01.03	Generator air gap, mm	:105
9.02.00	**Stator winding**	
9.02.01	Is winding transposed ? Yes/No	:yes
9.02.02	Phase connections	:YY
9.02.03	**Insulation**	
	a) Class	:F
	b) Type	:Micalastic
	c) Corona protection	:semiconducting varnish
9.02.04	Dielectric test voltage, KV	:43
9.02.05	Impulse voltage strength, KVp	:89
9.02.06	**Insulation Class**	
	a) Slot	:F
	b) End Coil	:F
9.03.00	**Terminals**	
9.03.01	**No. of terminals brought out**	
	a) Phase	:3
	b) Neutral	:3
9.03.02	Type of terminal bushings	:Epoxy type
9.03.03	Net space available for mounting bushing current transformers	: --
9.03.04	Bushing CT furnished ? Yes/No	:No
9.03.05	If yes state no. and specification of bushing CT.	: --
9.03.06	Dielectric test voltage, KV	: later
9.04.00	**Rotor**	
9.04.01	**Material for**	
	a) Rotor forging.	:26NiCrMoV145

	b) Retaining ring	:X8CrMnN1818K
	c) Rotor wedge	:CuNi2Si
9.05.00	**Rotor winding**	
9.05.01	**Insulation**	
	a) Class	:F
	b) Type	:Glass fibre fabric, Nomex
9.05.02	Turns per pole	:later
9.05.03	Dielectric test voltage, KV	:4.63
9.06.00	**Bearing**	
9.06.01	Type	:sleeve bearing
9.06.02	Oil quantity per bearing, Cu.M/hr	:later
9.06.03	Oil pressure, Kg/Sq.cm	:later
10.00.00	**Seal Oil System**	
10.01.00	No. of streams	:single flow
10.02.00	**Seal oil pumps**	
10.02.01	Number	:2x100%
10.02.02	Capacity, Cu.M/hr.	:later
10.02.03	Discharge pressure, Kg/Sq.cm (g)	:later
10.03.00	**Pump motor**	
10.03.01	KW rating	:15
10.03.02	Voltage rating	:415
10.04.00	**Vapour Extraction Unit**	
10.04.01	Type	:later
10.04.02	Capacity, Cu M/hr.	:later
10.04.03	Motor size, KW/V	:later
10.05.00	**Oil/Water Cooler (if applicable)**	
10.05.01	No. x Capacity	:2x100%
10.05.02	**Material of Construction**	

	(Specify Standard/Code & grade if required)	
	a) Tube	:plate type / later
	b) Tube plate	:plate type / later
	c) Water box	:plate type / later
10.05.03	Quantity of Cooling water per cooler, Cu. M/hr.	:approx 60
10.05.04	Pressure drop across cooler on water side, m.w.c	:approx. 0.5 bar
10.05.05	Designed heat load, KW	:204
10.05.06	Heat transfer area, Sq.m	:later
10.05.07	**Cooling water temperature**	
	a) Inlet, Deg. C	:39
	b) Outlet, Deg. C	:approx. 42
10.05.08	Maximum cooling water pressure allowable, Kg/Sq.cm (g)	:later
10.05.09	Cooler water side hydrostatic test pressure, Kg/Sq.cm (g)	:later
11.00.00	**Gas System**	
11.01.00	Volume of H_2 space in generator, Cu.M	:85
11.02.00	Cooling gas flow, Cu.M/hr.	:24
11.03.00	**Purity of H_2 required**	
11.03.01	Normal, %	:>99.9
11.03.02	Minimum, %	:>99.9
11.04.00	H_2 Leakage per day at rated pressure, (Specify Unit)	:18 Cu. M
11.05.00	**Volume at NTP required for**	
11.05.01	H_2 to displace CO_2 to bring the casing to rated pressure, Cu M	:638
11.05.02	CO_2 to displace H_2, Cu.M	:213
11.05.03	Air to displace CO_2, Cu. M	:255
11.05.04	CO_2 to displace Air, Cu. M	:170
11.06.00	**No. x Capacity of Cylinders furnished**	

11.06.01	H_2	:120
11.06.02	CO_2	:40
11.07.00	**H_2 Gas/Water Cooler**	
11.07.01	No. x Capacity	:2 x (2 x 25%)
11.07.02	**Material of Construction (Specify Standard/Code & grade)**	
	a) Tube	:later
	b) Tube plate	:later
	c) Water box	:later
11.07.03	Quantity of cooling water per cooler, Cu.M/hr.	:approx. 600
11.07.04	Pressure drop across cooler on water side, m.w.c.	:approx. 0.5 bar
11.07.05	Designed heat load, KW	:approx. 5800
11.07.06	Heat transfer area, Sq.M	:later
11.07.07	Overall Heat transfer co-efficient, KCal/Sq.m.Hr.Deg.C	:later
11.07.08	**Cooling water temprature**	
	a) Inlet (maximum), Deg. C	:39
	b) Outlet, Deg. C	:approx. 48
11.08.00	Maximum cooling water pressure allowable, Kg/Sq.cm (g)	:later
11.09.00	Cooler water side hydrostatic pressure, Kg/Sq.cm (g)	:later
12.00.00	**Excitation System**	
12.01.00	**Nominal exciter response ratio**	
12.01.01	With generator at no load	:EDN
12.01.02	With generator at rated load	:
12.02.00	Excitation System Voltage response time, Sec.	:
12.03.00	Ceiling current, Amp.	:
12.04.00	Ceiling voltage, Volts	:
12.05.00	Ceiling duty duration, Sec.	:
12.06.00	"Rapid defluxing" time and the technique used, Sec.	:

12.07.00	Type of de-excitation system	:
12.08.00	Field reversal capability	:
12.09.00	Excitation system time constant	:
12.10.00	Auxiliary power requirement	:
12.11.00	Forced Cooling System requirement	:
12.12.00	Base field voltage	:
12.13.00	Natural frequency of T.G. torsional oscillations	:
12.14.00	Space requirement including clearance	:
12.15.00	Shelf life of the solid state spares	:
12.16.00	Time for which spare parts (including solid state) will be kept available.	:
13.00.00	**Automatic Voltage Regulator**	
13.01.00	Make	:
13.02.00	Type	:
13.03.00	Power Supply to regulator, Volts	:
13.04.00	**Range of voltage adjustments**	
13.04.01	Auto	:
13.04.02	Manual	:
13.05.00	**Range of operation**	
13.05.01	Frequency, Hz	:
13.05.02	Temperature, Deg C	:
13.06.00	Accuracy	:
13.07.00	Dead Band	:
13.08.00	Response time to apply field forcing voltage with a 5%drop	:
14.00.00	**Brushless Excitation**	
14.01.00	**Pilot Exciter**	
14.01.01	Make	:BHEL / Siemens

14.01.02	Type	:ELP 50/42-30/16
14.01.03	Reference Standard	:IEC 60034
14.01.04	Type of drive	:Direct
14.01.05	Rated output, KVA	:65
14.01.06	Rated power factor	:later
14.01.07	Rated voltage, Volts	:220
14.01.08	Rated current, Amps	:195
14.01.09	Rated speed, r.p.m.	:3000
14.01.10	Phase and frequency, No.x Hz	:400 Hz
14.01.11	Insulation class and type	:later
14.01.12	Stator winding resistance per phase at 25 Deg.C Ohm	:later
14.02.00	**Main Exciter**	
14.02.01	Make	:BHEL / Siemens
14.02.02	Type	:ELR 70/90-30/6-20N
14.02.03	Reference Standard	:IEC 60034
14.02.04	Type of drive	:Direct
14.02.05	Rated output, KVA	:4500
14.02.06	No. of phase and frequency, Nos. x Hz	: ---
14.02.07	Rated power factor	: ----
14.02.08	Rated voltage at generator rated output and power factor, Volts	: 463
14.02.09	Rated current at generator rated output and power factor, Amps.	:5710
14.02.10	Field current at generator rated output and power factor, Amps	:later
14.02.11	**Exciter rectified field voltage with manual control**	
	a) Maximum, Volts	:later
	b) Minimum, Volts	:later

14.02.12	No. of poles	:6
14.02.13	**Winding resistance at 25 Deg.C**	
	a) Armature, (per phase), Ohm	:later
	b) Field, Ohm	:0.423 (at 20˚C)
14.02.14	**Class and type of insulation**	
	a) Armature	:F
	b) Field	:F
14.02.15	Nominal exciter response ratio	:≥ 2.0 per sec
14.02.16	Type of cooling	:Air
14.03.00	**Rotating rectifier assembly**	
14.03.01	Make	:BHEL / Siemens
14.03.02	Type	: -
14.03.03	Reference Standard	: -
14.03.04	Type of connection	:later
14.03.05	No. of bridge arms	:later
14.03.06	No. of parallel paths per bridge arm	:later
14.03.07	No. of rectifier cells in series in each parallel path	:later
14.03.08	Minimum nos. of parallel paths per bridge arm required for rated output	:later
14.03.09	Spare capacity of rectifier on the basis of guaranteed full load, %	:later
14.03.10	**Diode rating**	
	a) Rated average forward current, Amps	:later
	b) Maximum repetitive peak inverse voltage, Volts	:later
14.03.11	**Fuses**	
	a) Total no. of fuses	:later
	b) Type of connection	:later

	c) Rating of each fuse	:later
	d) Type of fuse failure indicator	:later
14.03.12	**Overload rating of the rectifier cell**	
	a) Current, Amps	:later
	b) Duration, Sec.	:later
14.03.12	Maximum junction temperature of the rectifier cell	:later
14.03.13	Method of over voltage protection	:later
14.03.14	Make and type of cooling fans	:later
14.04.00	**Air/Water Cooler**	
14.04.01	No. x capacity	:2x50%
14.04.02	**Material of Construction** (Specify Standard/Code & Grade)	
	a) Type	:later
	b) Tube plate	:later
	c) Water box	:later
14.04.03	Quantity of cooling water per cooler, Cu.M/hr.	:approx. 110
14.04.04	Pressure drop across cooler on water side, m.w.c.	:approx. 0.5 bar
14.04.05	Designed heat load, KW	:approx. 500KW
14.04.06	Heat transfer area, Sq. M	:later
14.04.07	**Cooling water temperature**	
	a) Inlet (maxm.), Deg. C	:39
	b) Outlet, Deg. C	:approx. 43
14.05.00	Maximum cooling water pressure allowable, Kg/Sq.cm (g)	:later
14.06.00	Cooling water side hydrostatic pressure, Kg/Sq.cm (g)	:later
15.00.00	**Generator Losses**	
15.01.00	**Iron Loss**	

15.01.01	At no load, KW	:719
15.01.02	At full load, KW	:719
15.02.00	Stator copper loss, KW	:1518
15.03.00	**Rotor copper loss**	
15.03.01	At no load, KW	:-
15.03.02	At full load, KW	:2552
15.04.00	Stray load loss, KW	:2206
15.05.00	Friction and windage loss, KW	:1025
15.06.00	**Excitation losses**	
15.06.01	Exciter loss, KW	:361
15..06.02	Rotary rectifier loss, KW	:incl. in exciter loss
15..06.03	Collector-brush contact loss, KW	: --
16.00.00	**Main Weights**	
16.01.00	Weight of the Generator Stator, Tonnes	:316 (shipping wt.)
16.02.00	Weight of the Generator Rotor, Tonnes	:75
16.03.00	Weight of the Complete Generator (Stator plus Rotor), Tonnes	:524
17.00.00	**Generator Performance Curves**	
17.01.00	Generator capability curves at different hydrogen pressure with and without AVR	:TG-THDF115/67-010
17.02.00	Permissible loading at rated power factor during voltage and frequency variation	: TG-THDF115/67-015
17.03.00	Negative sequence current characteristics	: TG-THDF115/67-013
17.04.00	Field winding resistance and impedance vs. temperature	:Later
17.05.00	Unloading schedule due to high temperature of inlet water to gas coolers	: ---
17.06.00	Load excitation curves and estimated `V' curves	: TG-THDF115/67-012
17.07.00	Open and short circuit characteristics	: TG-THDF115/67-011

17.08.00	Heat load curves for hydrogen and seal oil	: ---	
18.00.00	**Drawings**		
18.01.00	Turbine and Generator General arrangement drawing enclosed with full dimension, also showing	:	
18.01.01	Condenser, CW inlet and outlet	:	
18.01.02	**Generator rotor withdrawal space**		
	a) Straight	:19.5m (from cetreline)	
	b) Skewed	:	
18.01.03	**Generator terminal boxes**		
	a) Phase	:	
	b) Neutral	:	
19.00.00	**Additional Data**		
19.01.00	Furnish details of generator protection (Attach additional sheets, if necessary)	:	
19.02.01	Is it necessary to provide any surge capacitor ?	:	
19.02.02	If so, state the reasons and requirement	:	
19.03.00	Furnish the description of standard practice in coordinating connection of isolated phase bus duct to generator main leads	:	
19.04.00	Furnish detailed literature for the excitation system along with AVR	:	
20.00.00	**All shop tests to be carried out as specified ?**	:	Yes/No

Generator Data

Identification (Refer to Single Line Diagram)	.....	--
Type of Generator:	mark as appropriate	
- [ ] Turbo Generator		
- [ ] Salient-Pole Generator		
Rated Power		MVA
Rated Frequency		Hz
Rated Voltage		kV
Minimum Service Voltage		kV
Maximum Service Voltage		kV
Rated Power Factor		--
Reactance Values (**Saturated**):		
- Synchronuos Reactance, Direct Axis		pu
- Transient Reactance, Direct Axis		pu
- Subtransient Reactance, Direct Axis		pu
- Synchronuos Reactance, Quadrature Axis		pu
- Transient Reactance, Quadrature Axis		pu
- Subtransient Reactance, Quadrature Axis		pu
- Negative Sequence Reactance		pu
- Zero Sequence Reactance		pu
Resistance Values:		
- Stator Resistance		pu
Time Constants (**Saturated**):		
- Transient Short-Circuit Time Constant, Direct Axis		s
- Subtransient Short-Circuit Time Constant, Direct Axis		s
- Transient Short-Circuit Time Constant, Quadrature Axis		s
- Subtransient Short-Circuit Time Constant, Quadrature Axis		s
- Armature Time Constant		s
Exciter:		
- Field Current which produces the Rated Voltage on the Air Gap Line		A
Mechanical Data:		
- Speed	3000	rpm
- Moment of Inertia of Turbine/Generator/Exciter	.....	kgm2
Method of Grounding of Generator Star Point:	mark as appropriate	
- [ ] Generator Star Point Ungrounded		
- [ ] Generator Star Point Grounded via Resistance		
- [ ] Generator Star Point Grounded via Restistance Connected to Secondary of Transformer or Voltage Transformer		
- Generator Star Point Grounding Resistance	.....	Ohm
- Grounding Transformer/Voltage Transformer:		
- Voltage on HV-Side	.....	kV
- Voltage on LV-Side	.....	kV

REFER ATTACHED GENERATOR DATASHEET

Step-up Transformer Data

Two-Winding Transformer

Identification (Refer to Single Line Diagram)	.....	--
Group Connection		--
Voltage Regulation:	mark as appropriate	
- [ ] No Voltage Regulation		
- [ ] Voltage Regulation on HV-Side:		
- [ ] On-Load Tap Changer	NOT APPLICABLE	
- [ ] Off-Load Tap Changer	Off-Load Tap Changer	
Rated Power	810	MVA
Reference Power *)	270	MVA
Rated Frequency	50	Hz
Rated Voltage on HV-Side	420	kV
Nominal Voltage on HV-Side (Nominal Tap)	-	kV
Maximum Voltage on HV-Side (Maximum Tap)	-	kV
Minimum Voltage on HV-Side (Minimum Tap)	-	kV
Rated Voltage on LV-Side	21	kV
*) power on which pu values are based		
Losses:		
- Short-Circuit Losses (Referred to the Reference Power)		kW
Impedance Values:		
- Short-Circuit Impedance:		
- Nominal Tap	0.16	pu
- Maximum Tap	.....	pu
- Minimum Tap	.....	pu
Resistance Values:		
- Ohmic Voltage Drop:		
- Nominal Tap	.....	pu
- Maximum Tap	.....	pu
- Minimum Tap	.....	pu

Unit Transformer Data

Two-Winding Transformer

Identification (Refer to Single Line Diagram)	.....	--
Group Connection		--
Voltage Regulation:	mark as appropriate	
- [ ] No Voltage Regulation		
- [ ] Voltage Regulation on HV-Side:		
- [ ] On-Load Tap Changer	On-Load Tap Changer	
- [ ] Off-Load Tap Changer	NOT APPLICABLE	
Rated Power	50	MVA
Reference Power *)	50	MVA
Rated Frequency	50	Hz
Rated Voltage on HV-Side	21	kV
Nominal Voltage on HV-Side (Nominal Tap)	11.5	kV
Maximum Voltage on HV-Side (Maximum Tap)	.....	kV
Minimum Voltage on HV-Side (Minimum Tap)	.....	kV
Rated Voltage on LV-Side	11.5	kV
*) power on which pu values are based		
Losses:		
- Short-Circuit Losses (Referred to the Reference Power)		kW
Impedance Values:		
- Short-Circuit Impedance:		
- Nominal Tap	0.115	pu
- Maximum Tap	.....	pu
- Minimum Tap	.....	pu
Resistance Values:		
- Ohmic Voltage Drop:		
- Nominal Tap	.....	pu
- Maximum Tap	.....	pu
- Minimum Tap	.....	pu
Motor Load Connected to Secondary Side:		
- Rated Voltage of Motor Connected to Secondary Side	**21**	kV
- Total Motor Load	**18**	MVA APPROX
- Ratio of Starting Current to Rated Current	**6**	--
- X/R-Ratio	**9**	--

HV-System Data

Rated Voltage of HV-System	400	kV
Maximum Service Voltage of HV-System	420	kV
Minimum Service Voltage of HV-System	380	kV
Rated Frequency	50	Hz

Method of Neutral-Point Connection of HV-System:	mark as appropriate	
- [ ] Isolated Neutral-Point		
- [ ] Neutral-Point Grounded via Arc-Suppression Coil		
- [ ] Neutral-Point Grounded via Resistance	.....	Ohm
- [ ] Neutral Point Grounded via Reactance	.....	Ohm
- [X] Solidly Grounded Neutral-Point		

Total Short-Circuit Current at HV-Substation (with Contribution of All Generators and All Outgoing Lines):		
- Maximum Three-Phase Short-Circuit Power		GVA
- Maximum Three-Phase Short-Circuit Current	**50**	kA
- X1/R1-Ratio	14	--
- X0/X1-Ratio	.....	--
- R0/R1-Ratio	.....	--