

**I. TURBINE**

Inlet Steam Pressure	40 Bar G (580 psig)
Inlet Steam Temperature	500°C (932°F)
Exhaust Pressure	0.11 Bar A (26.7" Hg)
Power Rating	9190 kW MER; 10100 kW CMR
Normal Turbine Speed	6983 rev/min
Normal Generator Speed	1500 rev/min
Turbine Critical Speed Band	2000-4000 rpm
Turbine Rotation	Anti-clock viewed on S.E.
Turbine Staging	11 Impulse
Turbine Nozzle Grouping	No. 1 arc = 22 Nozzles No. 2 arc = 4 Nozzles No. 3 arc = 4 Nozzles

**II. OIL SYSTEM**

Reservoir Capacity	3200 litres (700 lgall)
Lubricating Oil Pressure	1.4-2.1 Bar G (20-30 lb/in <sup>2</sup> g)
Lubricating Oil Quantity	545 litres/min (120 lgpm)
Control Oil Pressure	13.8 Bar G (200 lb/in <sup>2</sup> g)
Stable Control Oil Quantity	68 litres/min (15 lgpm)

**Main Oil Pump (Shaft Driven)**

Maker	Rickmeier
Model No	R65/400
Speed	1500 rev/min
Capacity	593 litres/min (131 lgpm)
Driver	Low Speed Gear through Spur Gear Drive

**Auxiliary Oil Pump (Motor Driven)**

Maker	David Brown
Model No.	Roloid 3H Tank Top Mounted
Speed	1440 rev/min
Capacity	545 litres/min (120 lgpm)
Driver	11 kW 415v/3 ph/50 Hz Motor

**Main Control Oil Pump**

Maker	Plenty Mirrlees
Model No.	T32-3 STD
Speed	2890 rpm
Capacity	73 litres/min (16 lgpm)
Driver	4 kW 415v/3 ph/50 Hz Motor

**Auxiliary Control Oil Pump (As Main Control Oil Pump)****Emergency Oil Pump**

Maker	David Brown
Model No.	Roloid 5H Tank Top Mounted
Speed	1600 rev/min
Capacity	159 litres/min (35 lgpm) at 25 psig
Drive	2.0 kW 110v D.C. Motor

**Lubricating Oil Filter**

Maker	Vokes
Type	Duplex
Model No.	ED41
Capacity	545 litres/min (120 lgpm)
Filtration	10-15 Microns

**Control Oil Filter**

Maker	Pall
Type	Simplex
Model No.	HH8600 C16
Capacity	10-15 Microns
Filtration	90 litres/min (20 lgpm)

**Pressure Regulating and Relief Valves**

Function	Serial No.
Auxiliary Oil Pump Relief	2 off 1" 26315/2 Zwicky Ltd.
Emergency Oil Pump Relief	1" 26315/1 Zwicky Ltd.
Control Oil Pressure Regulating	2 off 1/2" 9930.0916 Hopkinsons Ltd.
Lubricating Oil Pressure Regulating	3/4" 26314/1 Zwicky Ltd.
Alternator Bearing Pressure Reducing	1/2" 25322/1 Press. Reducing, Zwicky Ltd.

**Hydraulic Accumulator**

Maker	Fawcett Engineering
Type	Rubber Bladder
Model No.	AL26-8-1-16.6
Capacity	27 litre (6.0 Imp. gal.)
Pre-Charge Pressure	12.4 Bar G (180 lb/in <sup>2</sup> g) Nitrogen

**Oil Cooler**

Maker	Alfa-Laval
Model Ref. No.	M6-FM
Type	Duplex Water Cooled Plate, Heat Exchangers
Oil Capacity	654 litres/min (120 lgpm)
Cooling Water	708 litres/min (156 lgpm) at 24°C max

**Thermostatic Oil Temperature Controller**

Maker	Amot
Type	Wax Element Non Adjustable
Model No.	2 1/2 B
Set Range	35-46°C (41°C mean)

**III. GOVERNING SYSTEM (SPEED/LOAD SHARING CONTROL)****Controller**

Maker	Woodward Governor Co.
Type	505A Load Sharing and Speed Control
Part No.	8238-011
Action	Forward Acting (Direct Acting)
Power Supply	24v D.C. from 240v/1 ph/50 Hz

**Actuator**

Maker	Woodward Governor Co.
Type	TG-17E
Actuator Action	Forward Acting (Direct Acting)
Oil Supply	Turbine Lubricating Oil at 12.4 Bar G (200 psig)

**Magnetic Pick-up**

Maker	Woodward Governor Co.
Part No. (MPU)	1680-649

**IV. ALARM AND TRIP SETTINGS (ELECTRICAL)**

The following levels are Brotherhood recommendations but, except where specified, they can be varied slightly at customers discretion:

Function	Alarm Level	Trip Level
Overspeed	N/A	7611 rpm
Journal Bearing Temperatures High	80°C	85°C
Thrust Bearing Temperatures High	135°C	140°C
Lubricating Oil Supply to Bearing High	55°C	60°C
Alternator Journal Bearing Temperatures High	75°C	85°C
Alternator Winding Temperature High	1345°C	155°C
Turbine Rotor Shaft Vibration Excessive (Steam End)	2.5 mils	3.0 mils
Turbine Rotor Shaft Vibration Excessive (Exhaust End)	3.0 mils	4.0 mils
Gearbox Vibration Excessive (Pinion)	1.3 mils	1.8 mils
Gearbox Vibration Excessive (Gearwheel Shaft)	2.0 mils	2.5 mils
Turbine Axial Displacement Excessive	5.0 mils	10.0 mils
Gearbox Pinion Temperature High	110°C	115°C
Gearbox Gearwheel Shaft High	85°C	90°C
Generator Cooling Air (Outlet)	45°C	55°C

Function	Alarm Level	Trip Level
Control Oil Pressure Low	12.5 Bar G	N/A
Lubricating Oil Pressure Low	1.35 Bar G	0.7 Bar G
Oil Tank Level High/Low	Fixed	N/A
Exhaust Pressure High	0.7 Bar A	0.8 Bar A
Lub Filter Differential Pressure High	1.0 Bar rising	N/A
Inlet Steam Pressure Low	38.5 Bar G	N/A
Inlet Steam Temperature Low	450°C	350°C
Condensate Level Low	30% falling	70% rising

**V. GEARBOX AND BARRING GEAR****Gearbox**

Manufacturer	GEC-Alsthom Gears Ltd.
Size	HSG 560H
Type	Side x Side, Single Reduction, Double Helical
Ratio	4.655:1

**Barring Gear**

Manufacturer	Flender Power Transmissions Ltd.
Type	120 CFW Worm Reduction
Ratio	10.67:1
Clutch	SSS 36T
Drive Motor	Brook Crompton Parkinson 11 kW
Supply	415v/3 ph/50 Hz
Speed	1460 rpm

**VI. THRUST AND JOURNAL BEARINGS****(a) Turbine Thrust Bearing**

Maker	Michell
Type	Tilting Pad
Model No.	Omega 08040

**(b) Turbine Journal Bearings (Steam End/Exhaust End)**

Maker	Glacier Metal Co.
Type	Offset Halves
Size	5"x2"/6"x2"

**VII. COUPLINGS****(a) High Speed Coupling – Turbine to Pinion**

Maker	Euroflex Transmissions
Type	Laminated Flexible Elements with Spacer
Model No.	G-Flex 6GH-220S/2A

**(b) Low Speed Coupling – Gearwheel to Generator**

Maker	Holsett
Type	Flexible Rubber Blocks
Model No.	PM 130 with limited end float

**VIII. TRIPS (MECHANICAL)**

The following trips are provided:

**Overspeed**

Maker	Peter Brotherhood Limited
Type	Eccentric Spring Loaded Oil Dump Valve in Turbine Shaft Extension operating Master Oil Trip
Set Point	7680-8030 rev/min

**Low Vacuum**

Maker	Peter Brotherhood Limited
Type	Spring Loaded Bellows Operated Plunger combined with Master Oil Trip
Set Point	0.61 to 0.51 Bar G (12-15 in Hg)

**Low Lubricating Oil Pressure**

Maker	Peter Brotherhood Limited
Type	Spring Loaded Spool Valve combined with Master Oil Trip
Set Point	0.55 to 0.83 Bar G (8-12 lb/in <sup>2</sup> g) (non adjustable)

**Local Hand Trip**

Maker	Peter Brotherhood Limited
Type	Two Position Dump Valve on Steam End Pedestal operating Master Oil Trip

**Solenoid Trip**

Maker	Maxseal
Type	Solenoid Dump Valve 1/2" NB type 581
Operating Mode	De-Energise to Trip
Electrical Supply	110v D.C.
Activation	Deliberate by remote pushbutton. Automatic by various electric trip devices and signals

**IX. CONDENSER**

Maker	Peter Brotherhood Limited
Type	2 Pass – Divided water boxes Integral with turbine baseplate
Surface Area	467m <sup>2</sup> (5032 ft <sup>2</sup> )
C.W. Quantity	1485m <sup>3</sup> /hr (5500 Igpm)
C.W. Temp. & Pressure	24°C @ 2.0 Bar G
Vacuum with Design Steam Quantity	0.098 Bar A (27.1" Hg)
Steam Quantity (Design)	34092 kg/hr

**X. AUTOMATIC GLAND STEAM SEALING REGULATOR**

Manufacturer	Leslie
Type	Pressure Reducing Valve
Model No.	1/2" Type GPS
Steam Requirements	64-200 kg/hr at 20 Bar G 315°C

**XI. CONDENSATE LEVEL TRANSMITTER**

Maker	Magnetrol
Type	Electronic transmitter
Ref. No.	E65-2P3A-EZA
Output	4-20 mA
Supply Voltage	24v D.C.

**XII. EXTRACTION PUMPS**

Manufacturer	Worthington Simpson
Type	D-Line, close coupled
Ref. No.	65WR200
Capacity	16.89 kg/sec
Driver	15 kW TE Motor
Speed	2900 rpm
Motor Electrics	415v/3ph/50 Hz

**XIII. VACUUM PUMPS**

Manufacturer	Nash Engineering
Type	2-Stage Liquid Ring Pumps
Ref. No.	MT74
Driver	4 kW TEFV Motor, Frame Size 112 MD
Speed	1460 rpm
Motor Electrics	415v/3ph/50 Hz

**XIV. ALTERNATOR**

Manufacturer	GEC-Alsthom Large Machines Ltd.
Type	Unipak, Salient Pole, Brushless, A.C.
Enclosure	CACW
Duty Output	10,000 kW @ 0.799 pf
Supply	13316v/3ph/50 Hz
Speed	1500 rpm

**XV. TURBINE GENERATOR PERFORMANCE**

Duty Point	Load (kW)	Inlet Steam Consumption (kg/S)	Flow to De-aerator (kg/S)
1	5140	6.04	0.54
2	8350	9.38	0.85
3A	8920	10.18	0.92
3B	9190	10.40	0.94
4	10100	11.43	0.99