

## CONTACTORS FOR TRACTION APPLICATION

### Electro-Pneumatic

Electro-Pneumatic contactor used to open and close power circuits carrying large current to the traction motors of Diesel Electric Locomotive.

### Electro-Magnetic

Double pole electro-magnetic contactor of the mechanically latched type is used to provide supply to the Light and Fan Circuit of ACEMU.

### Electro-Pneumatic

Electro-pneumatic AC contactor used for switching of the transformer secondary winding of ACEMU, in order to get the required voltage across the motors as per the desired sequence.



## DIVERTER SWITCH OF A ON-LOAD TAP CHANGER

An On-Load Tap Changer (OLTC) is an equipment to regulate the output voltage of a transformer. This is achieved by altering the number of turns in one winding while the transformer is energized and thereby changing the turns ratio of the transformer.

There are two primary OLTC designs:

- ❖ A diverter design, used for higher voltages and power application has separate tap selector and diverter switch.
- ❖ A non-diverter design, used for lower voltage application has only selector switch perform the functions of both diverter switch and tap selector.



## HIGH VOLTAGE DIRECT CURRENT (HVDC) THYRISTOR MODULE

HVDC is preferred over High Voltage Alternating Current (HVAC) for bulk power transmission over long distances due to stability issues and grids operating at different frequencies.

HVDC system comprises a rectifier that converts AC to DC and an inverter that converts back DC to AC. The rectifier and inverter are made up of Thyristor valves and the Thyristor valves are in turn made up of building blocks called Thyristor modules.

Each Thyristor module consists of series connected thyristors along with associated electrical components like snubber circuits and gate electronics. Thyristor modules need to be cooled by non-conducting de-ionized water.



## SOLAR PHOTOVOLTAIC MODULES

Solar cell is the device that convert incident light energy into electrical energy. Solar cells are framed together in assemblies called solar photovoltaic modules and are a source of renewable energy for protecting the environment from pollution and greenhouse effect.

Solar Photovoltaic module is 72/60 cell configuration, high fill factor for optimum energy conversion, high transmission ARC glass, Junction box and three bypass diodes & three layer back-sheet with very low moisture ingress. BHEL Solar PV Module are Potential Induced Degradation free and gives high performance even under subdued lighting conditions and High Salt Mist Corrosion resistant.

BHEL Manufactures a wide range of solar photovoltaic multi crystalline silicon module of 10Wp to 330Wp range for Solar Lanterns to Grid Interactive Solar Power Plants including solar panels for satellite applications.



## SEMICONDUCTOR POWER DIODES & THYRISTORS

The ratings of semiconductor power diode manufactured by BHEL are in the range of 250-2000A / 1400- 4600 V and of phase control thyristor in the range of 150-3300A and 1400-7000V.

These semiconductor power diodes and thyristor are deployed in wide applications such as traction locomotives, variable frequency drives, high-current rectifiers, high-voltage DC transmission stations, static excitations systems, brushless excitors in turbo-generators & alternators and high-frequency inverters.



## VALMET-DNA

Valmet-DNA system is the new generation Distributed Control Systems (DCS) solution for modern Power Plants ranging from simple control system to complex unified automation for power plant of any capacity.

Valmet-DNA application overview:

<b>Power Plant Controls</b>	<b>Electrical System Controls</b>	<b>Industrial Controls</b>
Steam Generator & Turbine Controls	Fossil Fuel Utility Plants	Process Industry
Heat recovery Steam Generator Controls	Simple/ Combine Cycle Power plants	
Balance of Plant Controls	Captive/ Co-generation Power plants	
Switchyard SCADA	Hydro Turbine Governing and Auto-Sequence Control	



## INSULATORS

BHEL manufactures wide range of High Voltage (upto 800kV) Ceramic and Composite insulators:

- Disc insulators
- Solid core post insulators
- Hollow & Station post insulators
- Long rod insulators

These insulators are deployed for varied applications:

- Support & insulation for transmission and distribution lines
- Support & insulation to Busbar isolator & other energized equipment used in Switchyards and Sub-stations
- 25 kV over-head traction line insulation and isolators for railways
- Transformer Bushing and Circuit Breakers



## ENGINE OF A LIGHT AIRCRAFT “SWATI”

SWATI was a two-seat Light Aircraft manufactured by BHEL Haridwar in early 1990s. It was designed and developed by the Research and Development Directorate of the Civil Aviation Department, India for wide range of applications like flying training, sports, touring, surveillance, courier and personal use.

SWATI was designed in compliance with the FAR-23 airworthiness requirements in the utility category for a maximum take-off weight of 700kg and 750kg in the normal category.

Welded chrome-molybdenum steel tube Warren-truss type structure formed the basic fuselage structure covered with Alclad sheets and fabric. The tail unit was metallic.

Non-retractable nose wheel type landing gear was provided in the SWATI. One 116-bhp AVCO-LYCOMING O-235-N2C naturally aspirated, horizontally opposed, four cylinder, updraft carburettor equipped air-cooled engine, driving a fixed-pitch, and matching propeller provided the power to SWATI.





## HIGH PRESSURE VALVES

<b>PARAMETER</b>	<b>QUICK-CLOSING NON-RETURN VALVE</b>	<b>GATE VALVE</b>	<b>CHECK VALVE</b>
Pressure Class	150 TO 900	1500 TO 3500 SPL	1500 TO 3500 SPL
Material	WCB, WC6, WC9	A105, WCC, WC9, C12A, F91, F92	WCC, WC9, C12A
Size	3" TO 36"	2 1/2" TO 24"	
Application	Turbine extraction lines	Steam and Water application	

Scale	1:125
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## **HIGH PRESSURE VALVES**

<b>PARAMETER</b>	<b>SAFETY VALVE</b>		<b>FULL BORE GATE VALVE</b>
Series	7000	7800	-
Pressure Rating	600 TO 5300 psi	300 TO 900 psi	2000, 3000, 5000, 10000, 15000 psi
Material	WCB, WC6, WC9, C12A, F92	WCB, WC6, WC9	Alloy steel, Stainless steel
Size	1½" TO 6"	1¼" TO 6"	1 <sup>13</sup> / <sub>16</sub> ", 2 <sup>1</sup> / <sub>6</sub> ", 2 <sup>9</sup> / <sub>16</sub> ", 3 <sup>1</sup> / <sub>8</sub> ", 4 <sup>1</sup> / <sub>16</sub> ", 5 <sup>1</sup> / <sub>8</sub> "
Application	Steam application		On-shore, Off-shore water, Oil and Gas exploration

