

HITACHI
Inspire the Next

Medium Voltage Multi-Level Drive
Range upto 14, 280 kVA (3.3 kV to 11 kV)



**HIVECTOR -
HVI - E Series**



Most Energy Efficient Means of Process Control

About Medium Voltage Multi-Level Drive HIVECTOL-HVI-E

Hitachi Hi-Rel Power Electronics Private Limited, offers HIVECTOL-HVI-E series medium voltage multi level IGBT drives up to 14,280 kVA, voltage range 3.3 kV, 6.6 kV and 11 kV.

Today Hitachi Hi-Rel offers customers the most appropriate digital technology, in AC drives, tailored to their specific application requirements. Sanand, India based its local manufacturing facility ensures long term technical services and spares support. Local manufacturing will help Indian customers to avail the best in class product with long term commitment of Spares and Services. This will also help customers to carry out FAT and train their maintenance engineers in India.

Hardware Overview

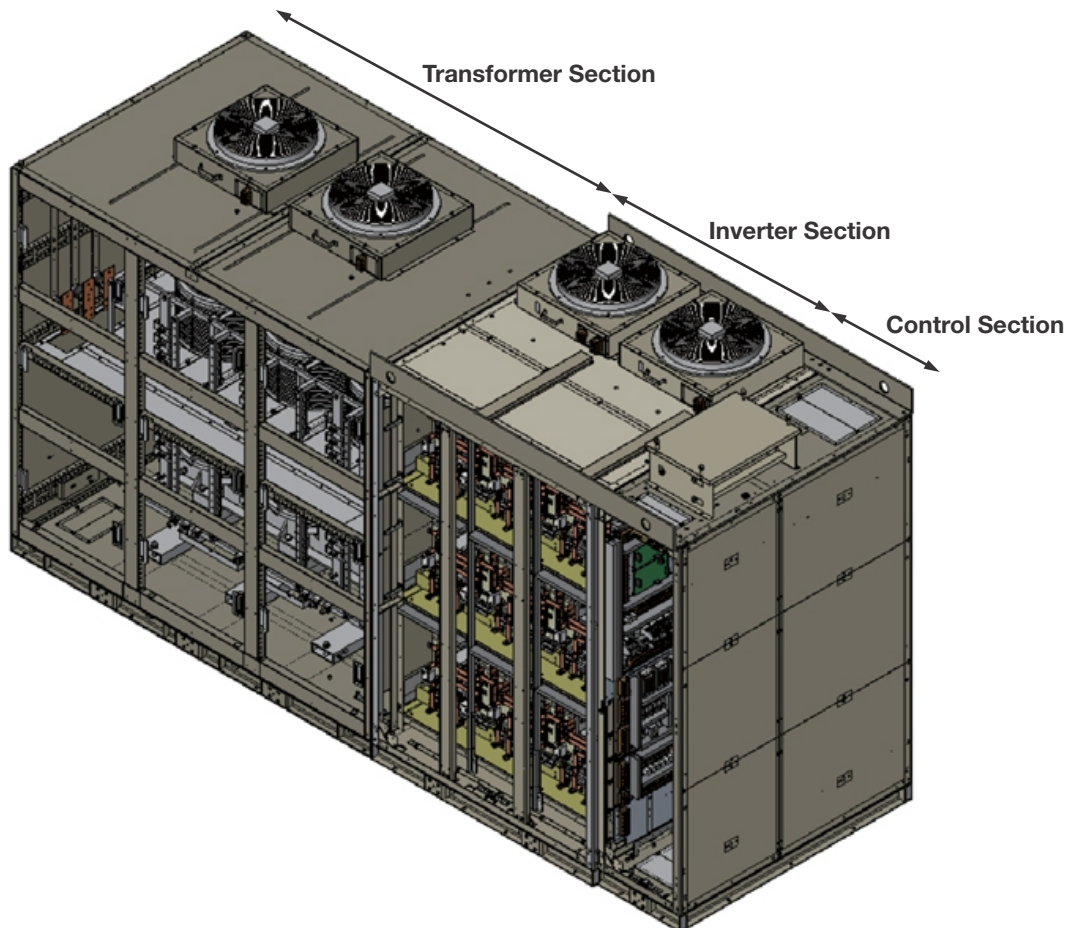
Main components of HIVECTOL-HVI are the "Transformer Section", "Inverter Section" and "Control Section". Inverter Section is composed of a series-connected "Inverter Cell". Isolation a transformer is

This world class manufacturing set up of Hitachi Hi-Rel adopts work culture, design, manufacturing process, component selection, and quality and testing standards that are being followed at Hitachi Japan manufacturing facilities. Multi Cell topology of drive uses low voltage devices. It is user friendly and easy to maintain by customers.

Drive is forced air cooled, and Different voltage ratings, 3.3 kV, 6.6 kV and 11 kV, are available. Intermittent ratings like 3 kV, 4.16 kV, 6 kV are also available.

In house regeneration drive test facility is capable to demonstrate drive characterization during FAT.

phase shifted multi-winding type. Control Unit has functions such as IGBT inverter switching, an interface to external equipment, etc.

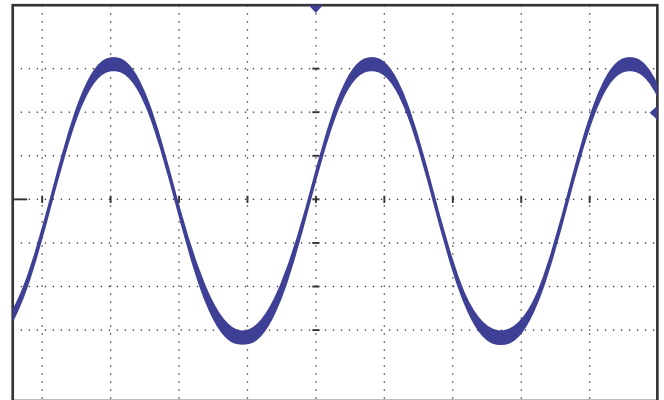


Key Features

Input Harmonics Meets IEEE - 519 - 1992

Multi-pulse rectifier method reduces input side harmonics and conforms better than IEEE 519 - 1992 recommended performance without use of harmonic filters.

No special care needs to be taken in K-rating of the input transformer, cables, switch-gear components, etc.



Line - side current distortion - Meets better than IEEE - 519 Compliance

Output Waveform - Motor Friendly

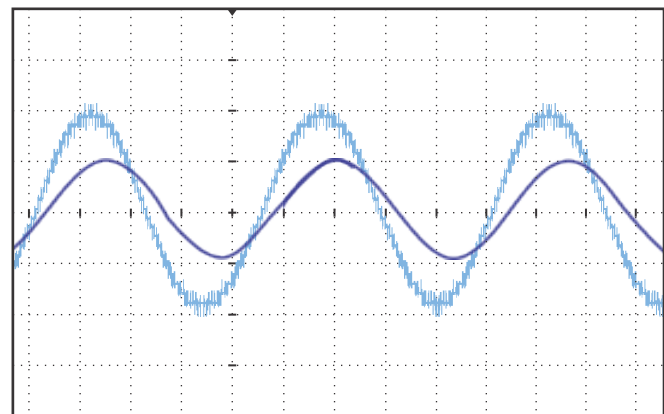
Series connected LV IGBT cell inverter technology gives advantages like:

It controls the output waveform distortion and approximates it to sine waveform. Insignificant over heating due to harmonics is observed in cable and motor.

Voltage spikes observed at the motor winding is limited to less than 1000 V. This performance does not add any stresses on the motor insulation.

Both above features allow use of existing motor whether safe or hazardous operating zone on variable torque load.

Suitable for Induction and Synchronous motor application.



Best for High Starting Torque

Robust Sensor less vector control method provides smooth starting and operation with high torque loads without use of special feedback sensor.

Hence this drive is most suitable for Rubber Mixer, Extruders, Agitators etc in addition to Pump and Fan applications.

Torque Sharing

When two motors are connected to common gear shaft torque sharing control is required, Load like - Rubber extruder, long conveyors. Drive is suitable for similar application.

Auto Restart

If power resumes within 2 secs, no waiting period to restart. It has capability to catch a running motor. The coasting motor can be reaccelerated to the reference speed automatically.

User friendly

Touch screen display Parameter setting through maintenance PC using pass word.

Drive as soft start

Synchronous transfer of load from Drive to Mains and vice versa is possible while starting motor with minimum starting requirement depending on application. This reduces maximum demand of feeder and mechanical jerk of whole system. This is best technical alternative compare to soft starter.

High Efficiency

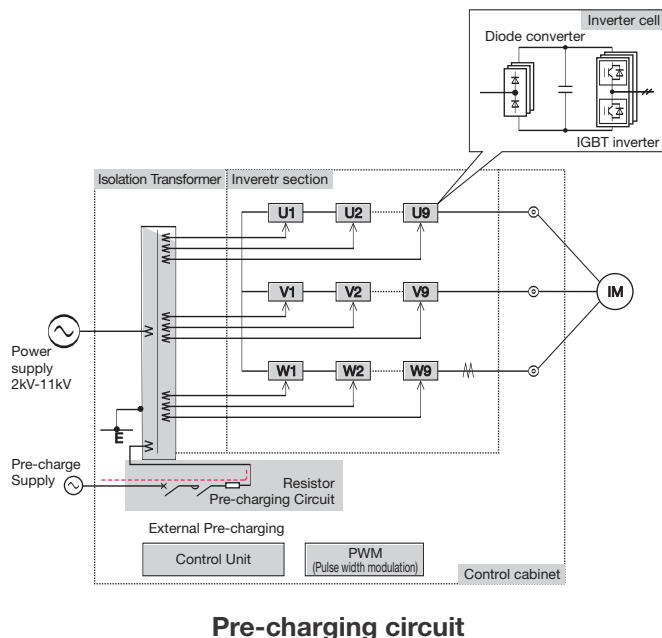
Typical 97% efficiency including input Dry type transformer.

Patented Design - Increases Reliability

Pre-Charging

It reduces charging inrush current of the transformer to less than its rated current. Normal charging method requires large charging current for equivalent rating transformer.

Pre charge of the DC Filter capacitors in each cell is carried out using external pre charge circuit. These components are bypassed from the main power path



Inverter Cell is constructed using standard Diode, IGBT and Capacitors. Each inverter cell is fed from a separate three phase secondary winding of the isolation transformer. These inverter cells are connected in series and are operated in multiplexed mode. This patented design reduces input transformer inrush current to less

Easy to maintain

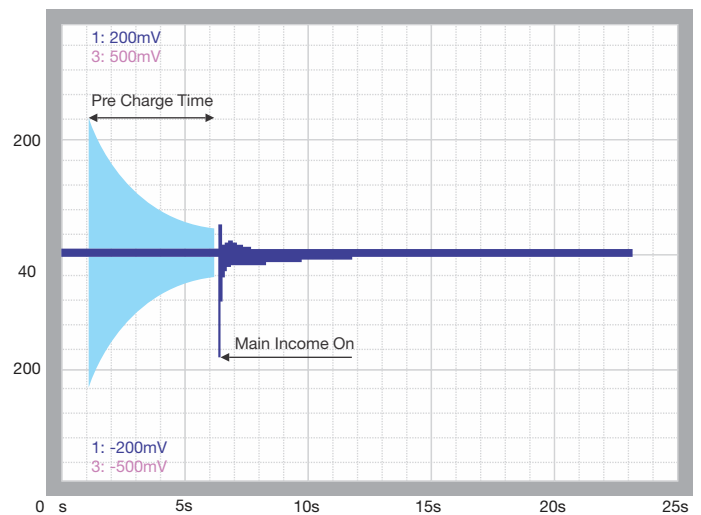
MV drive cells are manufactured in India using standard low voltage Diode, IGBTs and Capacitors. Reliability of the individual cell is greatly enhanced due to high reliability of these devices. User can easily maintain these cells due to very familiar topology and easy availability of main components and training from local manufacturing set up.

Suitable for Indian Ambient condition

Designed for 50 degree centigrade except few ratings.

and hence increase the reliability of the overall system.

No change in existing electrical system required while going for retrofitting of energy saving application.

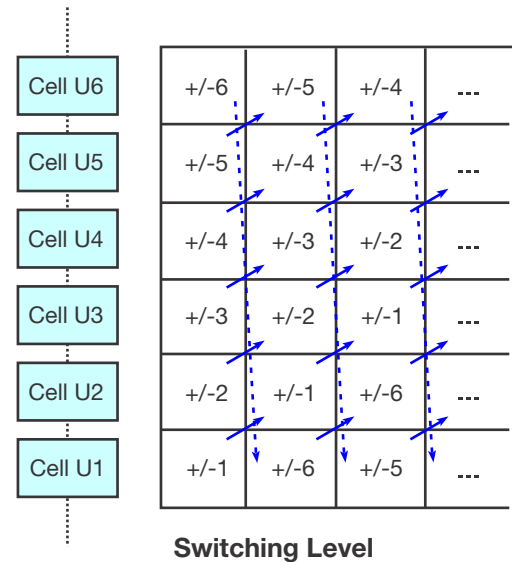
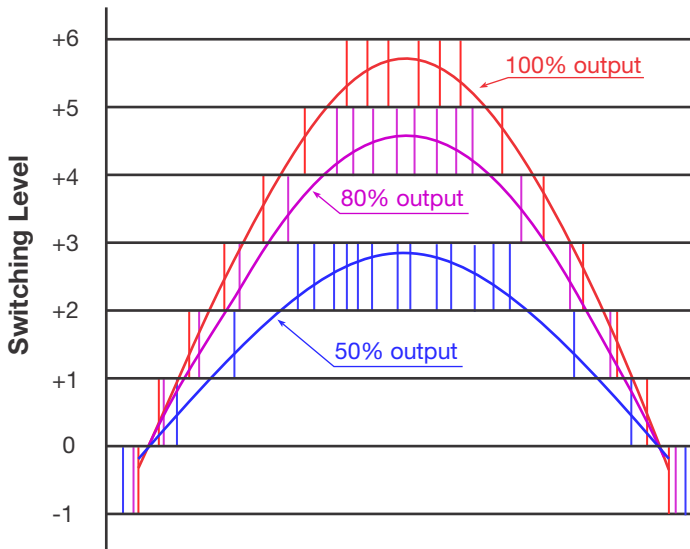


than its design value. Normal start up method generates high inrush current since full primary voltage is applied rather than in step. Cell capacitor charging will be taken care by separate circuit and may not be in use once its function is over. It increases reliability of drive as well as does not ask for any special input switch gears

Cyclic Switching of the Cells

- Cyclic switching achieves equal utilization of each cell at any operating speed. It ensures even heating

and stresses on each component. It increases the reliability of the drive.



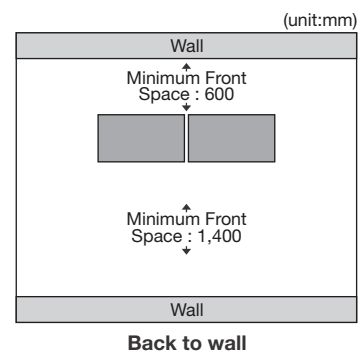
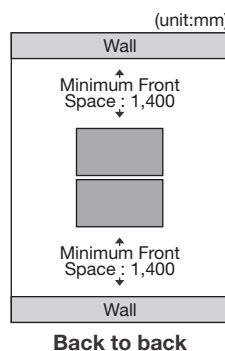
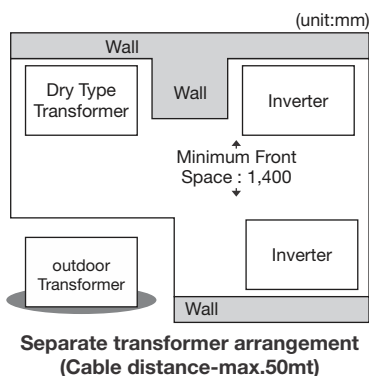
VFD is mainly used for operating motor at lower than base speed maintaining V/F ratio. The lower cells energizes for longer period of time compare to top cells. Top cell energizes very rarely when motor is operated near to base speed. This results in more stress and heat generation in lower cell components due to more conduction losses compare to other cells.

Hitachi VFD periodically rotates switching level of each cell so that stresses of all cells are leveled. This feature ensures all cell components have equal stress and heat generation. It increases over all reliability of VFD.

Advantages

Easy to Install - Minimum installation area

- Separated Transformer Installation Outdoor oil immersed type transformer or indoor dry type transformer is possible to install separately with inverter panel.
- Line-up Arrangement back to wall installation and back to back installation is possible.
- Front Access Maintenance reduced front maintenance space as minimum 1,400 mm.
- Back side Access Minimum - 600 mm



User Friendly - Easy analysis diagnostics and maintenance

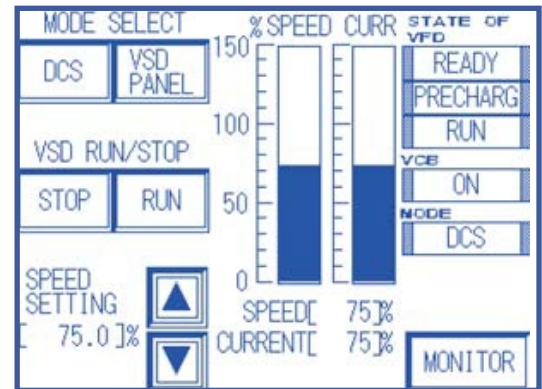
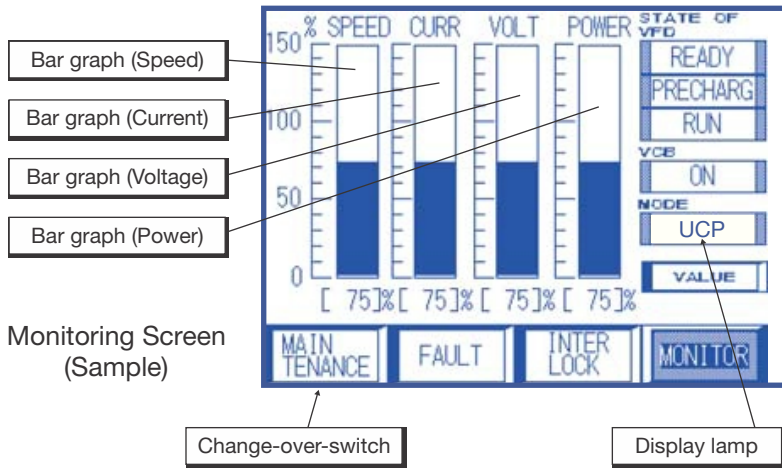
The operator touch-screen panel with a large LCD is easy to view and operate. Operator can see

various kinds of helpful information such as the operation status and alarm information



STATE OF VFD(VALUE)			
SIGNAL	REFERENCE	FEEDBACK	VALUE
SPEED	75.0%	75.0%	1200 min ⁻¹
OUTPUT VOLTAGE	—	75.0%	1200 V
OUTPUT CURRENT	—	75.0%	123.4 A
OUTPUT POWER	—	75.0%	1200 kW
INPUT VOLTAGE	—	75.0%	1200 V
EXCITING CURRENT	75.0%	75.0%	—
TORQUE CURRENT	75.0%	75.0%	—

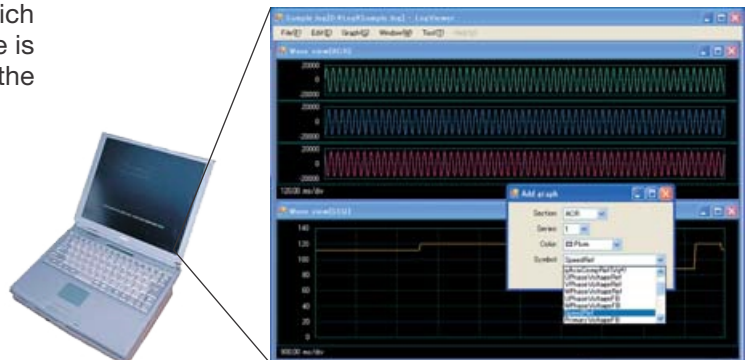
Condition Number Display (Sample)



Easy Maintenance

Hitachi provides a maintenance software tool which helps maintain the drive system easier. The software is designed for Windows' PC. The major functions of the maintenance tool are as follows:

- Memory Read/Write Function
- Display Diagnostic Message and Trend Data
- Selection of Analog Output Signal
- File Read/Write Function
- Bar Graph Display Function



Maintenance Software

Rating

Continuous current	kVA			
	3.3 kV	4.16 kV	6.6 kV	11 kV
32	180	240	360	600
42	240	300	480	800
53	300	380	600	1000
64	365	460	730	1210
74	420	530	840	1410
85	485	600	970	1620
95	545	690	1090	1820
106	600	760	1200	2000
127	725	920	1450	2420
147	820	1060	1640	2800
159	900	1145	1800	3025
169	975	1220	1950	3225
191	1100	1375	2200	3625
222*	1270	1600	2540	4230
233	1325	1675	2650	4400
254	1450	1830	2900	4850
275	1575	1980	3150	5250
296	1700	2140	3400	5650
318	1820	2290	3640	6050
344	1965	2475	3930	6550
370	2120	2670	4240	7060
397*	2270	2860	4540	7565
415*	2370	2990	4740	7900
450	2570	3140	5140	8575
476	2725	3430	5450	9075
503	2875	3625	5750	9580
515	2945	3725	5890	9810
529	3025	3800	6050	10080
609	3475	4385	6950	11600
662	3780	4770	7560	12600
714	4085	5150	8170	13600
750	4280	5320	8750	14280
Model No.	Hivectol HVI-E-33 - (kVA)	Hivectol HVI-E-41 - (kVA)	Hivectol HVI-E-66 - (kVA)	Hivectol HVI-E-11 - (kVA)

(1) Continuous operation without de-rating up to 50°C. Over load rating of 110% for one minute.

(2) *Continuous operation limited to 40°C. De-rating of 1%/°C is applied between 40°C to 50°C.

(3) Select drive considering motor FLA rather than kW rating.

(4) For more than 110% over load requirement please contact factory

Technical Specifications

Item	Explanation	Output Voltage [v]	Specifications
Power Supply	Input Voltage		AC, 3,000 V / 3,300 V / 4,160 V / 6,000 V / 6,600 V / 10,000 V / 11,000 V
	Input Frequency		50 / 60 [Hz]
	Power Supply for Control		AC 100 / 110 / 200 / 220 V 1phase (Standard) or DC 100 / 110 V (Option)
	Pre-charge Power Supply		AC 400 / 440 V (Standard) AC 200 / 220 V or other low voltage (Option) 3 phase
	Input PF		Better than 0.95
	Voltage Fluctuation		Within $\pm 10\%$
	Frequency Fluctuation		Within $\pm 5\%$
	Ambient Temperature		50°C
Structure	Cubicle		Panel with in-built Dry Type Transformer
	Protection Class		IP21 (Higher degrees upto IP 42 option)
Control	Type		Medium voltage multi - level IGBT inverter
	Control Method		Sensor less vector control / vector control with sensor (Option)
	Driving Method		2 quadrant operation
	Deceleration		Natural deceleration
	Carrier Frequency		3.3 kHz
	Speed Control Range		Type 10%~100% speed
	Input Voltage of Cell Unit		700 V
	DC Voltage of Cell Unit		945 V
	Accuracy		$\pm 0.5\%$ at 100% speed without sensor, $\pm 0.1\%$ at 100% speed with sensor (Option)
	Overload		110% over load for 60 secs every 10 minute
	Efficiency		Typical 97% (Including transformer)
	Interface		Analog : 0 ~ ± 10 V & 4~20 mA (Option: Field network, DeviceNet / communication BUS on request.)
Protection	Momentary Over Current		Detected output AC side
	Over Voltage of DC Circuit		Detected DC over voltage of each cell
	Power Drop for Driver Board		Detected power drop of each cell
	PT CT Failure		Comparing drive frequency with voltage / current feed back
	Ground Fault		Detected current flow into earthing resistor
	Power Failure		Detected at quaternary voltage of multiplex winding transformer
	Abnormal Cooling Fan		Detected by thermal and MCCB trip
Indication	Cell Capacitor Charging Level		Indicate until minimum DC voltage to 50 V
	Speed / Current / etc.		Indication bar chart on graphic panel
	Fault		Indication on graphic panel
	Trace Back Data		Read out to the maintenance tool
Other	Cable Entrance		Upper or Bottom
	Output Cable Length		300 mt. - more on request
	Restart After Instantaneous Power Failure		Option (Need UPS power supply)
	Restart While the Motor is Running or Coasting		Option
	Remote Monitoring on Network		Option
Standards			IEC / JIS / JEC / JEM

- (1) This specification is designed four-pole standard motors.
- (2) Input transformer protection relay shall be provided at incomer ACB Panel along with surge suppressor.
- (3) Consult factory for redundant cooling fan requirement and VFD bypass arrangement.
- (4) 30/36 pulse options available in 6.6 kV

Serving Entire Gamut of Industries

We have rich experience in supplying power electronics products for mission critical applications

in various industries for critical data processing applications and back-up technology for demanding applications.



Oil & Gas

- Pump
- Fan / Exhausters
- Compressor
- Mixers / Agitators



Water & Waste Water

- pump



Cement

- Cement Kilns
- Conveyors
- Raw Mill Fan
- Pre-Heater Fan
- Mill Fan
- Mill Classifier Fan
- Bag House Fan
- Cooler Fan



Power

- Pumps
- Compressors
- Fans
- Conveyors
- Centrifuges
- Turbines
- Extruders and mixers



Steel & Metal

- Steel mills
- Long Conveyors
- Fan / Exhauster



Mining

- Pumps
- Fan / Exhausters
- Conveyors



Sugar

- Pumps
- Induced Draft Fans
- Forced Draft Fans
- Sugar Refining
- Crusher
- Mill
- Conveyor



Pulp & Pape

- Pump
- Fans
- Exhausters
- Compressors
- Mixers / Agitators



Rubber

- Banburys Applications
- Extruders

and many more...

Customer Support

“Have peace of mind with flexible and nimble footed, 24 X 7 service”

Our Service program includes:

On Site Installation supervision and commissioning

- Provides Comprehensive check at user site to ensure trouble free installation of product
- Our technical experts give recommendations to the site engineer or electrical contractor and supervise for our supplied products (LV-VFD, MVD, I-dip, UMPS & Steel Automation VFD) installation before load power-up
- Offers commissioning services along with site acceptance test report & PG test.



Training

- On Site Training for safe & efficient operation of equipment
- Training at Factory (Optional)
 - Course-1 : Operation, system principle, hands on training, predictive and preventive maintenance – 3 days training
 - Course-2 : Predictive and preventive Maintenance, Hardware, Settings, System panel & restoration services – 5 days training



Preventive Maintenance Services (AMC, CMAC & Extended warranty)

- Ensures safe and reliable operation
- Contracts includes cleaning, measurements of various parameters, calibrations, functional tests, event log and parameter validation, hardware and software upgrades supported by Field Service Report.
- Maintenance Plan is one of the most cost-effective actions that can preserve initial investment and ensures business continuity.
- Ensure optimal performance and to protect critical application from potential downtime.
- PM is mandatory to avoid down time and process losses.



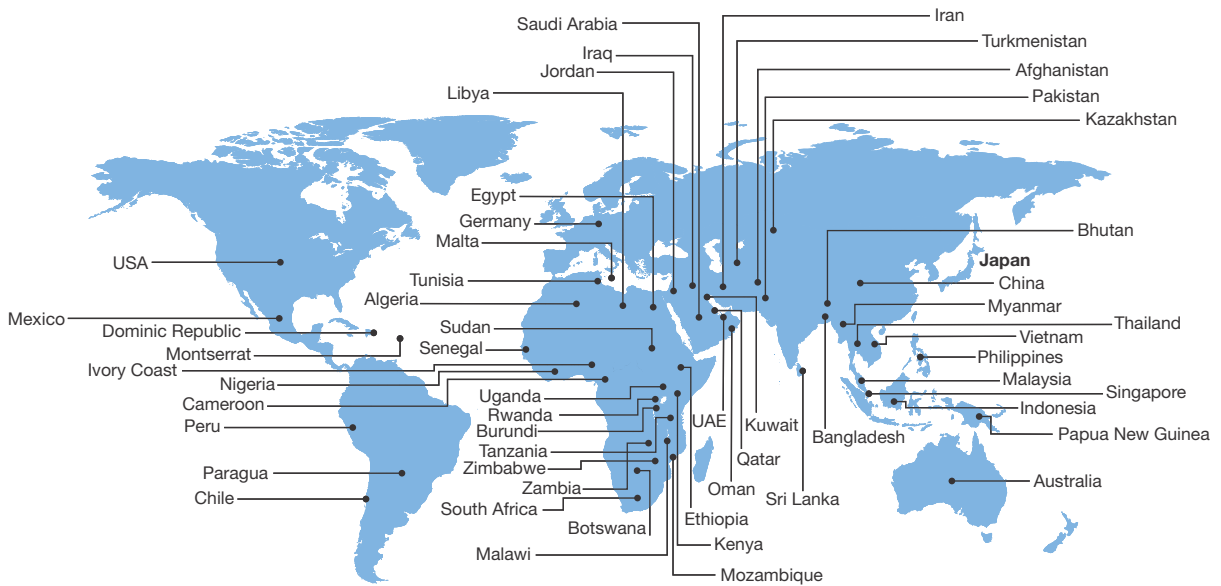
Break Down Maintenance & EMERGENCY CALL

- In the event of an emergency call, our service expert, located as close to your site as possible, guarantees a quick intervention time with the help of 24x7-365 days.
- With the help of powerful diagnostics software, quick troubleshooting is possible by a service expert, which guarantees a short MTTR (Mean Time to Repair).
- Corrective actions are performed (Part replacement, adjustments and upgrades of software's etc.)
- Timely technology enhancement inputs to customer for optimum performances.
- Helpline Number for Service Support - (080) 6112 0800



*Service program are separate from equipment supply and subject to applicable terms and conditions.

Worldwide Presence



Pan India Presence




Contact us

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