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HIVECTOL - HVI - E
Medium Voltage Multi-Level Drives
Range upto 14.7 mVA (3.3 kV to 11 kV)

Medium Voltage Multi-Level Drives HIVECTOL - HVI - E

We, Hitachi Hi-Rel Power Electronics Pvt. Ltd., offer HIVECTOL-HVI-E series medium voltage multi level IGBT drives up to 14.7mVA, voltage range 3.3kV, 6.6kV and 11kV.

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

This world class manufacturing set up of Drives 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 customer.

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

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

MAIN FEATURES

- **Suitable for Indian Ambient condition**

  Designed for 50 degree centigrade except few ratings.

- **Input Harmonics Meets IEEE - 519 - 1992**

  Multilpulse 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.

- **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.

  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 the above features allow use of existing motor 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.

- **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 and hence increase the reliability of the overall system.
  - No change in existing electrical system required while going for retrofitting of energy saving application.

  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.

- **High Efficiency**

  Typical 97% efficiency including input Dry type transformer.

- **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.

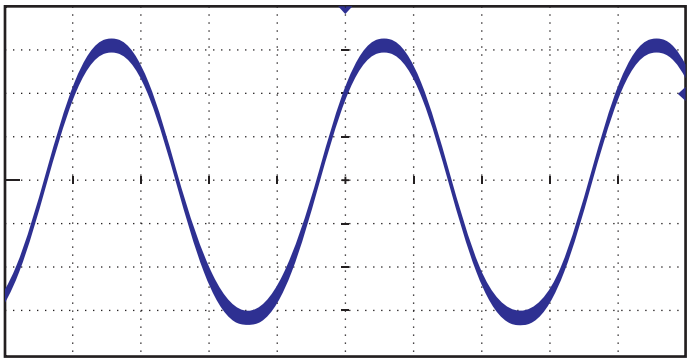
- **User friendly**

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

- **Easy to maintain**

  MV drive cells are manufactured 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.

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

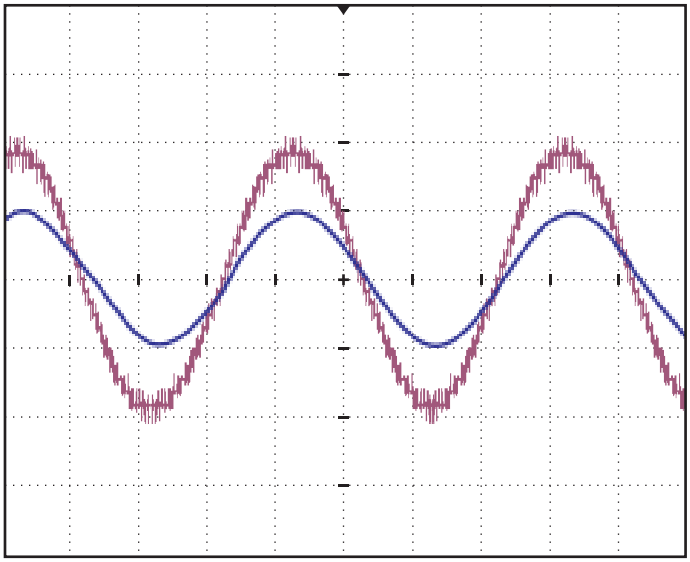


YT		
ID-CH1	40A/div	0A
Horizontal	5ms/div	10MS/s

YT Measure	
out V	3.435kV
input Iu	87.5A
output I	271.0A

The phase shifted multi-winding transformer reduces current harmonics to the power supply well below the levels permitted under IEEE 519-1992 guidelines.

Output Waveform - Motor Friendly



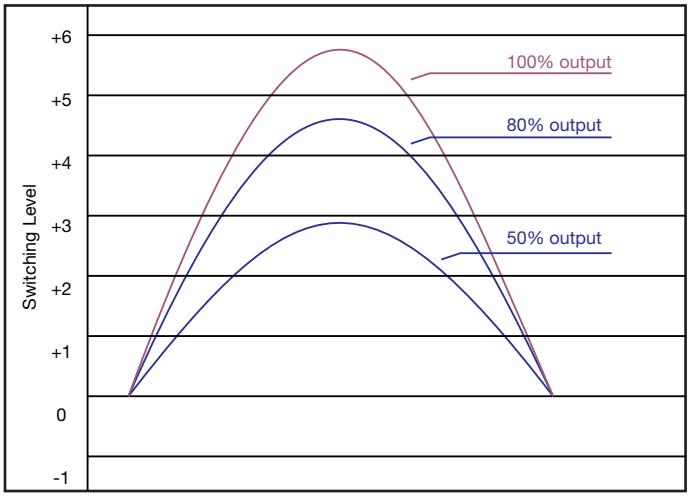
YT		
ID1-CH1	5kV/div	0V
ID2-CH1	100A/div	0A
Horizontal	5ms/div	200kS/s

YT Measure	
O/P VOLT	6.58kV
O/P AMP	66.9A

Output waveform is constructed using 13 / 25 / 37 level (Line to Line) steps in 3.3kV, 6.6kV and 11kV drives respectively.

Motor current due to multiplex construction becomes near to sine wave resembling to Utility supply. Due to Large number of steps of small voltage, spikes seen in the motor winding is very small (Less than 1000 V). This feature reduces the additional stresses on the motor winding to insignificantly low level. Due to this fact this drive can be applied on any existing motor in Safe or Hazardous operating area.

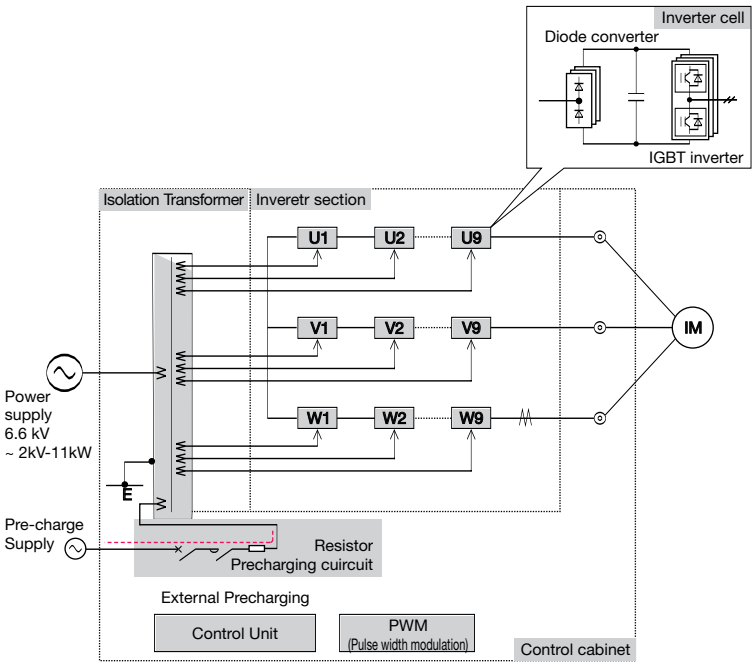
State-of-the-art Technology



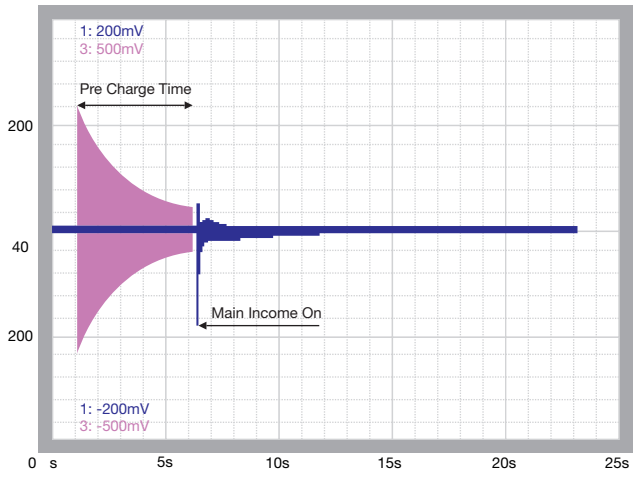
Patented design of cyclic switching rotates the cell sequence. This ensures equal heating and stress on each component of the cell. This method increases the overall reliability of the drive.

Pre Charge - No Stress on Feeder

Inverter Cell is constructed using standard Diode, IGBT and Capacitors. Each inverter cell is fed from a separate 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 than its design value. Normal start up method generates high inrush current. Cell capacitor charging will be taken care by separate circuit and will 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



Pre-charging circuit



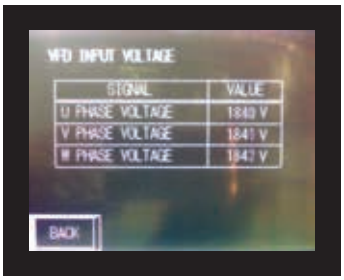
Pre-charging Wave form

User Friendly

Easy analysis diagnostics and maintenance

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

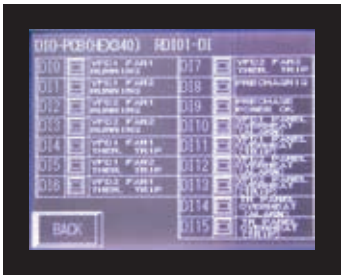
Operator can see various kinds of helpful information such as the operation status and alarm information



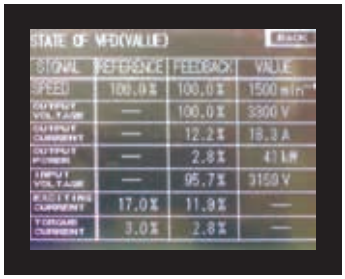
Input Voltage

Output Current

Operation Monitoring (Bar Graph)



I/O Status



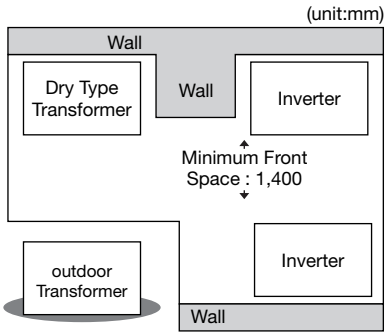
VFD Status

Malfunction

Easy to Install

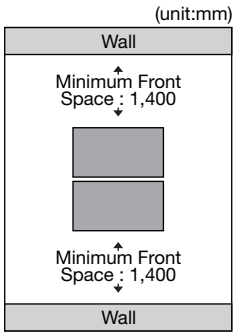
Minimum installation area

- Separated Transformer Installation Outdoor oil-immersed type transformer or indoor dry type transformer is possible to install separately with inverter pannel.



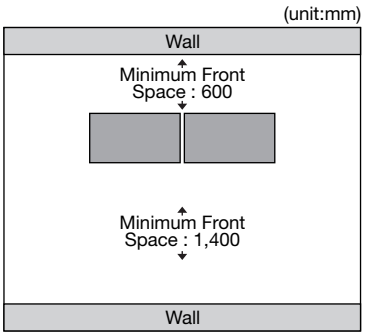
Separate transformer arrangement

- Front Access Maintenance reduced front maintenance space as minimum 1,400 mm.



Back to back

- Line-up Arrangement back to wall installation and back to back installation is possible.



Back to wall

RATING

Continuous current	kVA			
	3.3kV	4.16kV	6.6kV	11kV
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	840	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
772	4400	5560	8800	14700

(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.

TECHNICAL SPECIFICATIONS

No	Item	Explanation	Output Voltage [v]	Specifications
1	Power supply	Input voltage		Ac, 3,000V / 3,300V / 4,160V / 6,000V / 6,600V / 10,000V / 11,000V
2		Input frequency		50 / 60 [Hz]
3		Power supply for control		Ac100 / 110 / 200 / 220V 1phase (Standard) or DC 100 / 110V (Option)
4		Pre-charge power supply		Ac400 / 440V (Standard) AC200 / 220V or other low voltage (Option) 3 phase
5		Input PF		Better than 0.95
6		Voltage fluctuation		Within ± 10%
7		Frequency fluctuation		Within ± 5%
8		Ambient temperature		50°C
9	Structure	Cubicle		Panel with in-built Dry Type Transformer
10		Protection Class		IP21 (Higher degrees upto IP 42 option)
11	Control	Type		Medium voltage multi - level IGBT inverter
12		Control method		Sensor less vector control / vector control with sensor (Option)
13		Driving method		2 quadrant operation
14		Deceleration		Natural deceleration
15		Carrier frequency		3.3kHz
16		Speed control range		Type 10%~100% speed
17		Input voltage of cell unit		700V
18		DC voltage of cell unit		945V
19		Accuracy		± 0.5% at 100% speed without sensor, ± 0.1% at 100% speed with sensor (Option)
20		Overload		110% over load for 60 secs every 10 minute
21		Efficiency		Typical 97% (Including transformer)
22		Interface		Analog : 0 ~ ±10V 4~20mA (Option: Field network, DeviceNet / communication BUS on request.)
23	Protection	Momentary over current		Detected output AC side
24		Over voltage of DC circuit		Detected DC over voltage of each cell
25		Power drop for driver board		Detected power drop of each cell
26		PT CT failure		Comparing drive frequency with voltage / current feed back
27		Ground fault		Detected current flow into earthing resistor
28		Power failure		Detected at quaternary voltage of multiplex winding transformer
29		Abnormal cooling fan		Detected by thermal and MCCB trip
30	Indication	Cell Capacitor Charging level		Indicate until minimum DC voltage to 50V
31		Speed / Current / etc.		Indication bar chart on graphic panel
32		Fault		Indication on graphic panel
33		Trace back data		Read out to the maintenance tool
34	Other	Cable entrance		Upper or Bottom
35		Output cable length		300 mt. - more on request
36		Restart after instantaneous power failure		Option (Need UPS power supply)
37		Restart while the motor is running or coasting		Option
38		Remote monitoring on Network		Option
39	Standards			IEC / JIS / JEC / JEM

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

KEY APPLICATIONS

Industry	Applications
Power	Pumps, Compressors, fans, Conveyors, Centrifuges, turbines, extruders and mixers etc.
Steel & Metal	Pumps, Fan / Exhausters, Steel mills, Winders etc.
Cement	Pumps, Fan / Exhausters, Conveyors, Cement kilns etc.
Oil & Gas	Pumps, Fan / Exhausters, Compressors, Mixers/ Agitators etc
Mining	Pumps, Fan / Exhausters, Conveyors etc.
Sugar	Pumps, Induced draft fans, Forced draft fans, Centrifugal applications like Sugar refining & Mining tandem etc.
Pulp & Paper	Pumps, Fans, Exhausters, Compressors, Mixers / Agitators Etc
Water & Waste Water	Pumps
Rubber	Banburys applications, Extruders

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