HITACHI
Inspire the Next

HIVECTOL-HVI

Series

Hitachi Medium Voltage Multi-level IGBT Drive

Small capacity type become compact

HIVECTOL-HVI

All-in one structure

For stable operation of user equipment.

Light and Compact

More flexible layout, transportation, and installation.

Efficient in Maintenance and Installation

Smaller height, and easier connection and disconnection

Wide variety of product line

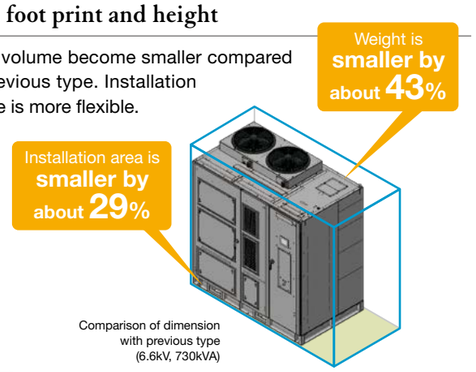
More applicable to various needs of customers

New small capacity type has been added, which is the smallest in class and all in one structure, by leading edge technology of power electronics product design and advanced motor control.

Light and Compact

Less foot print and height

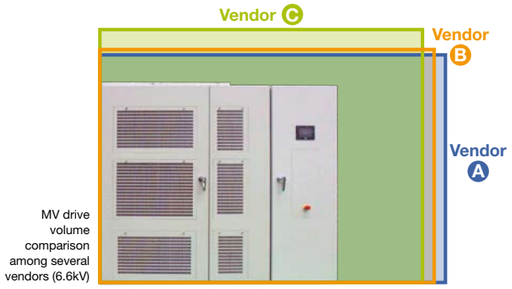
Total volume become smaller compared to previous type. Installation space is more flexible.



Comparison of dimension with previous type (6.6kV, 730kVA)

Smallest in class

Drive volume is the smallest in class.



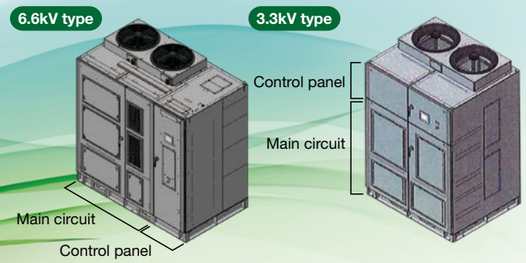
MV drive volume comparison among several vendors (6.6kV)

*As of July, 2016. Source: Hitachi survey. In comparison to various manufacturers' medium-voltage drives with 6.6kV, 570-600kVA.

All in one structure

Integrated main circuit and control panel

All in one structure is realized by adopting optimum parts mounting and cooling design technologies.



Efficient in Maintenance and Installation

Improvement of installation and maintenance efficiency

Due to compactness, working efficiency is improved in transporting, installing, operating, and maintaining.

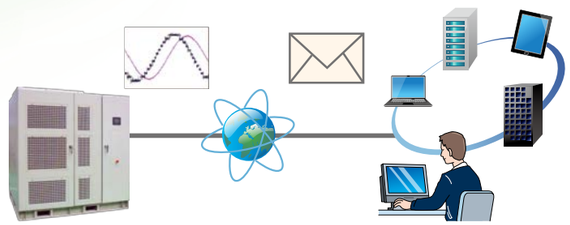
- Wire restoration work is unnecessary after installation
- Transportable by forklift
- Maintenance time is shortened by quick detachable cell unit
- Serviceability is improved by lower height

IoT compatible

Enable to be embedded to IoT system

HIVECTOL-HVI small capacity type is connectable to Internet by Ethernet or Wireless LAN, when optional PLC* is installed. Moreover, this type can be embedded to IoT system.

*PLC: Programmable Logic Controller



IGBT drives are applicable to the following facilities.

For energy saving

IGBT drives contribute to energy saving for fan, blower or pump applications. Energy consumption can be reduced by rotating motors at optimal speed corresponding to load.

- **Fan, Blower** Forced draft fan, Induced draft fan for boiler, Dust collector blower, Wind tunnel, etc.
- **Pump** Cooling water recirculation pump, Sea water pump, Boiler feed water pump, etc.
- **Compressor** Screw compressor, etc.

For quality operation

For high torque application, this type drives contribute to improvement in productivity and quality by motor speed control.
Maintainability of DC motor is improved by replacing DC motor with AC motor + IGBT drives.

- **Industry** Rubber mixer, Extruder, Agitator, Kiln, Ball mill, Crusher etc.

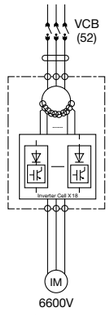
High efficiency and performance

About 97% Efficiency, above 95% Power factor

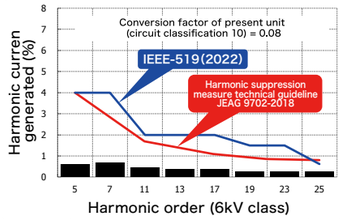
An even more efficient type is available as an option to better meet the needs of customers.

No need of line side harmonic filters

Current harmonics to the power supply is reduced by effect of the phase shifted multi-winding transformer. So, line side harmonic filters are not needed, because both voltage and current approximates sine waveform. Current harmonics are well below the levels admitted under the IEEE-519(2022) guidelines.



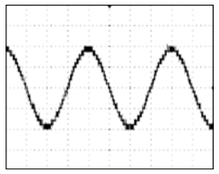
▶Input-side Harmonics (In case of 36-pulse model)



*METI: Ministry of Economy, Trade and Industry. A ministry of the Government of Japan.

Motor friendly - Smooth output

Output waveform is close to sine waveform. HIVECTOL-HVI series is suitable to be applied to existing motor.



AC voltage output wave form
(6kV class)

High reliability

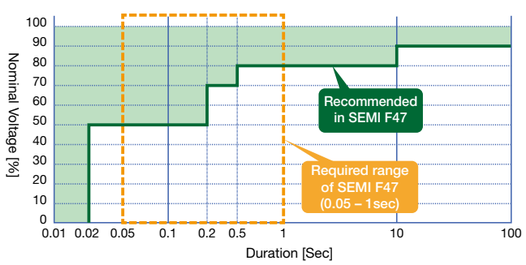
Long lifetime parts

About large capacity type, maintenance cost is reduced by long lifetime design of electrolytic capacitors in main circuit. Otherwise, small capacity type adopts maintenance free film capacitors.

Improved resilience to control power supply fluctuation

Immunity to momentary voltage drop complies SEMI F47 standard. HIVECTOL-HVI series can continue driving without UPS*1, when momentary voltage drop occurs, within the range specified in SEMI F47*2.

*1 200V input only
*2 Continuous drive possible with voltage drop up to 50% for duration of 200ms or more, with voltage drop up to 30% for 500ms or more, and with voltage drop up to 20% for 1000ms or more.



High function

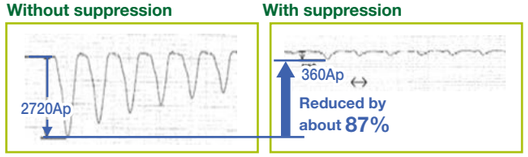
Variety of RAS*1 functions

HIVECTOL-HVI series are maintained easily by wide variety of RAS functions, such as indication of drive record, case of fault, collection of trace back data, and so on.

*1 RAS: Reliability, Availability, Serviceability

Inrush current suppression function (option)

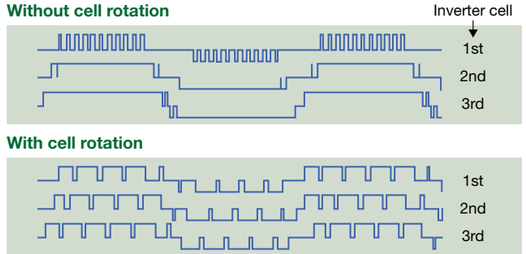
Hitachi' s patented (P2023028253) technology employing the "separated pre-charging circuit method" reduces the flow of magnetizing inrush current to the multi-winding transformer without requiring additional equipment.



In case of Transformer capacity: 1,370kVA Rated primary current: 270Arms

Cell rotation: cell load equalization control

By Hitachi original control method "cell rotation" , cell sequence is rotated cyclically. This ensures equal heating and stress on each inverter cell. This method increases the overall reliability of the drive.



Case of 3 cells/phase

Simple structure

Number of parts is reduced by simplifying circuit of each inverter cell, in addition to separated pre-charging circuit method.

Separated pre-charging circuit method

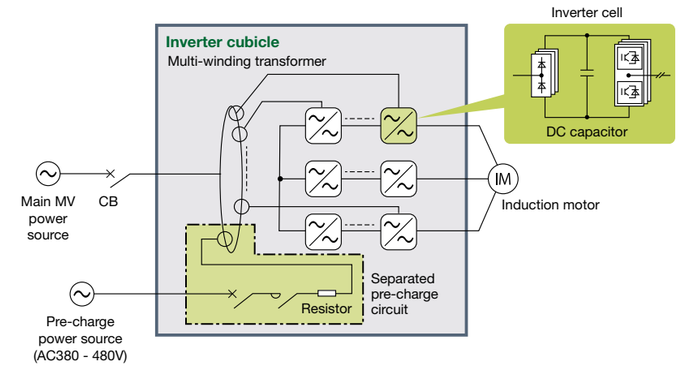
HIVECTOL-HVI uses "Separated pre-charging circuit method", patented by Hitachi, Ltd. (Japanese Patent No.3,535,477).

Separated pre-charging circuit method

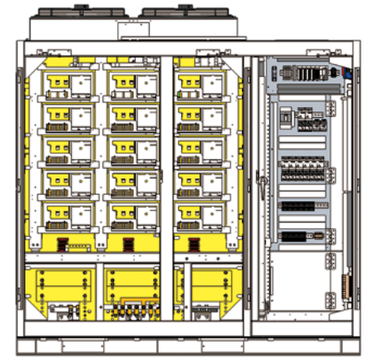
Pre-charging is a type of charging, in order to prevent the inrush current when the medium voltage main power supply turns on. HIVECTOL-HVI uses a separate LV power source for pre-charging. Compared to a pre-charging circuit that uses a thyristor switch in each inverter cell, the arrangement of separated pre-charging circuit is simple and easy to maintain. This design leads to high reliability in inverter operation.

Specifications

Main circuit overview



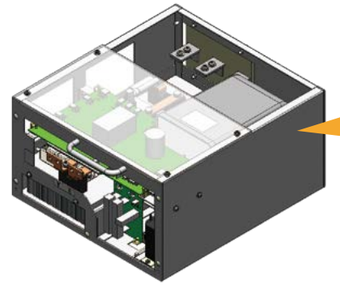
Layout inside cubicle



*In case of rated voltage: 6.6kV, rated capacity: 360-840kVA

Inverter cell

AC output voltage of IGBT drive is generated by combination of multiple inverter cells, which can output small output voltage. Combination of inverter cells makes AC output waveform close to sine waveform, so motor is less stressed.



Easy maintenance
- Small and Light
- Inverter cell could be replaced individually

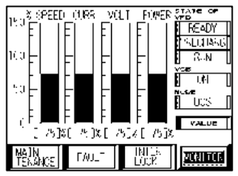
*Rated voltage: 6.6kV
Rated capacity: 360-840kVA
Weight of inverter cell: approximately 14.5kg.

User friendly operator touch screen panel

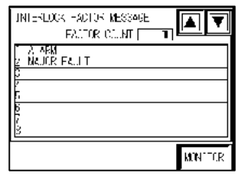
The operator touch-screen panel with a large LCD* is easy to see and easy to operate.
Operator can see various kinds of helpful information such as the operation status and alarm information.

*LCD: Liquid-Crystal Display

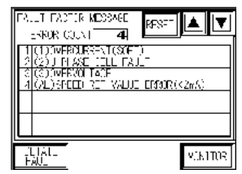
*Emergency stop button is optional.



Operation display (Bar graph)



Interlock display

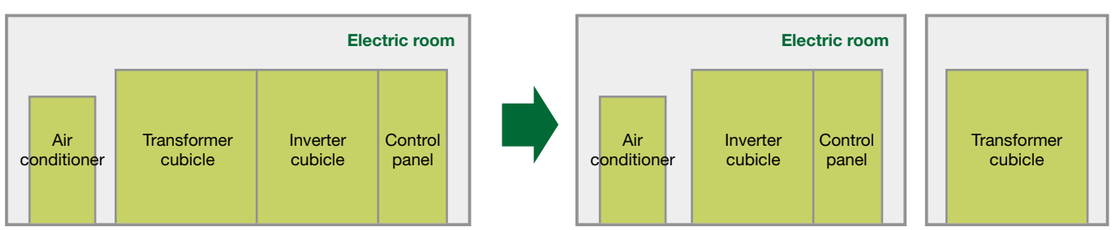


Error display

*Display is different by type.

Separate installation of transformer cubicle (option)

Transformer cubicle and inverter cubicle can be installed separately. This option make equipment layout more flexible, and reduce required cooling capacity for electric room.



Specifications

Item		Specifications	
		Small capacity type	Large capacity type
Appearance			
Power supply	Input voltage	AC 2.4kV, 3.0kV, 3.3kV, 4.16kV, 6.0kV, 6.6kV	AC 2.4kV, 3.0kV, 3.3kV, 4.16kV, 6.0kV, 6.6kV, 10kV, 11kV, 13.8kV
	Input frequency	50 / 60Hz	
	Power supply for control	AC 100 - 240V 1 phase (default) DC100 / 110V (option)	
	Pre-charge power supply	AC 380 - 480V 3 phase (default), or AC 200 - 220V (option)	
	Voltage fluctuation	Within +/- 10% (Working without fault although the output power become lower) Within +/- 5% (Guarantee output power)	
	Frequency fluctuation	Within +/- 5%	
Structure	Cubicle	Forced air cooled self-standing cubicle type	
	Transformer	In-built dry type	In-build dry type (Oil-immersed transformer as option)
	Protection	IP20 (Higher degrees protection as option)	
Control	Type	Medium Voltage Multi-level IGBT drive	
	Control method	Sensor less vector control (default) Vector control with sensor (option)	
	Driving method	2 quadrant operation	
	Deceleration	Natural deceleration	
	Speed Control Range	1% - 100% speed	
	Accuracy	+/- 0.5% at 100% speed without sensor, +/- 0.05% at 100% speed with sensor	
	Maximum output frequency	50 / 60Hz (max, 75Hz)	
	Overload	110% 60sec	125% 60sec
	Efficiency	Maximum 97% (including Transformer)	
	Power factor	Above about 95% (at rated load operation)	
	Interface	Analog (4-20mA) + DI/O, fieldbus (Modbus-RTU) Other fieldbus (DeviceNet, Profibus, CAN, CANopen, Ethernet) (option)	Analog (4-20mA) + DI/O (default)
Protection		Pre-charge not completed, Momentary over current, Output over voltage, Control power abnormal, Over load, Ground fault, Input power failure, Cooling fan abnormal, Over heat inside of the panel, Door open	
Others	Indication	Operational status, speed, current, fault, etc.	
	Trace back data	Read out to the maintenance tool	
	Cable entrance	Bottom (default) / Upper (option)	
	Restart after instantaneous power failure	Option (Need UPS power supply)	
	Restart while the motor rotating	Option	
	Options	Redundant fan, Pre-charge / Control power supply method, Cooling type, Signal interface, External equipments, Commercial bypass, Door interlock, CT phase number, Cable type, Coating, IP code, Control function, Protection function, Speed sensor, Language, External transformer, Mirror layout (Large capacity type only)	
Standards		IEC, JIS, JEC, JEM, etc.	

* The output rated voltage shall be guaranteed within the above mentioned voltage fluctuation.
* All specifications are subject to change without notice.
* DeviceNet is trademark of Open DeviceNet Vendor Association (ODVA), Inc.
* Profibus is a registered trademark of Profibus Nutzerorganisation e. V.
* Modbus is a registered trademark of AEG Schneider Automation Inc.
* Ethernet is a registered trademark of Fuji Xerox Co., Ltd.
* HIVECTOL is a registered trademark of Hitachi, Ltd.
* Applicable standards differ according to the technical specifications of the product. Contact your Hitachi representative for details.

Wide variety of product rating choice

Wide variety of product rating choice helps propose service and system optimal for each customer.

Capacity line-up list:

Voltage (kV)	Type	kVA	Dimensions (mm)				Weight (kg)
			Width (W)	Depth (D)	Height (H)	Cubicle height (Hc)*	
3.3	Small capacity type	180	1,500	1,230	2,250	2,020	2,010
		240					2,240
		300					2,360
		360					2,470
		420					2,510
		480	1,900	1,430			2,880
		540					3,040
		600					3,070
		720					3,270
		840					3,500
		900	2,600	1,630			4,080
		960					4,310
		1,090					4,360
		1,260					4,540
	Large capacity type	1,460	4,100	1,200	2,710	2,400	5,760
		2,200	4,500	1,500			7,700
		2,930	5,000	1,700			9,300
		4,400	6,900	1,730	2,920	2,440	14,150
6.6	Small capacity type	360	2,200	1,230	2,250	2,020	2,760
		480					2,880
		600					3,250
		730					3,360
		840					3,440
		970	2,600	1,430			3,860
		1,080					4,090
		1,210					4,320
		1,450					4,910
		1,680					5,370
		1,810	3,200	1,630			6,240
		1,930					6,470
		2,180					7,050
		2,530					7,280
	Large capacity type	2,930	5,800	1,200	2,710	2,400	8,900
		4,400	6,400	1,500		2,440	9,500
		5,870	7,200	1,700			14,650
		8,800	14,600	1,730	2,920		30,600

*excluding fan height

Enriched after service

24 hours on-call response (option)

Responding any failures in 24 hours.

Predictive Analysis (IoT) (option)

We offer predictive analysis and parts replacement using IoT. Your drive is constantly monitored via Internet, and any predictor of a failure, as well as a timing of replacing parts are notified automatically by Email. It also allows prompt analysis in case of a failure.

Long Maintenance Package (option)

15 years maintenance available when your installation environment meets specified conditions. This package includes yearly inspection and free replacement of consumable parts (cooling fans, and AVR). Operation stability can be enhanced by replacing components with a fixed service life at appropriate inspection intervals.

Retrofitting service (option)

This service is intended for equipment that has reached the end of its anticipated service life. It aims to maintain the internal apparatus in a like-new state and extend the anticipated service life of the equipment through appropriate replacement of components. This can reduce the work period associated with upgrading equipment. Hitachi can also propose flexible partial upgrade options.

-The pictures in this catalog are inland composite images.
-Contents of this document may be changed without notice for product improvement.
-Descriptions of patents in this document are as of September, 2016.

https://www.hitachi-ip.com/products/direct_inverter

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