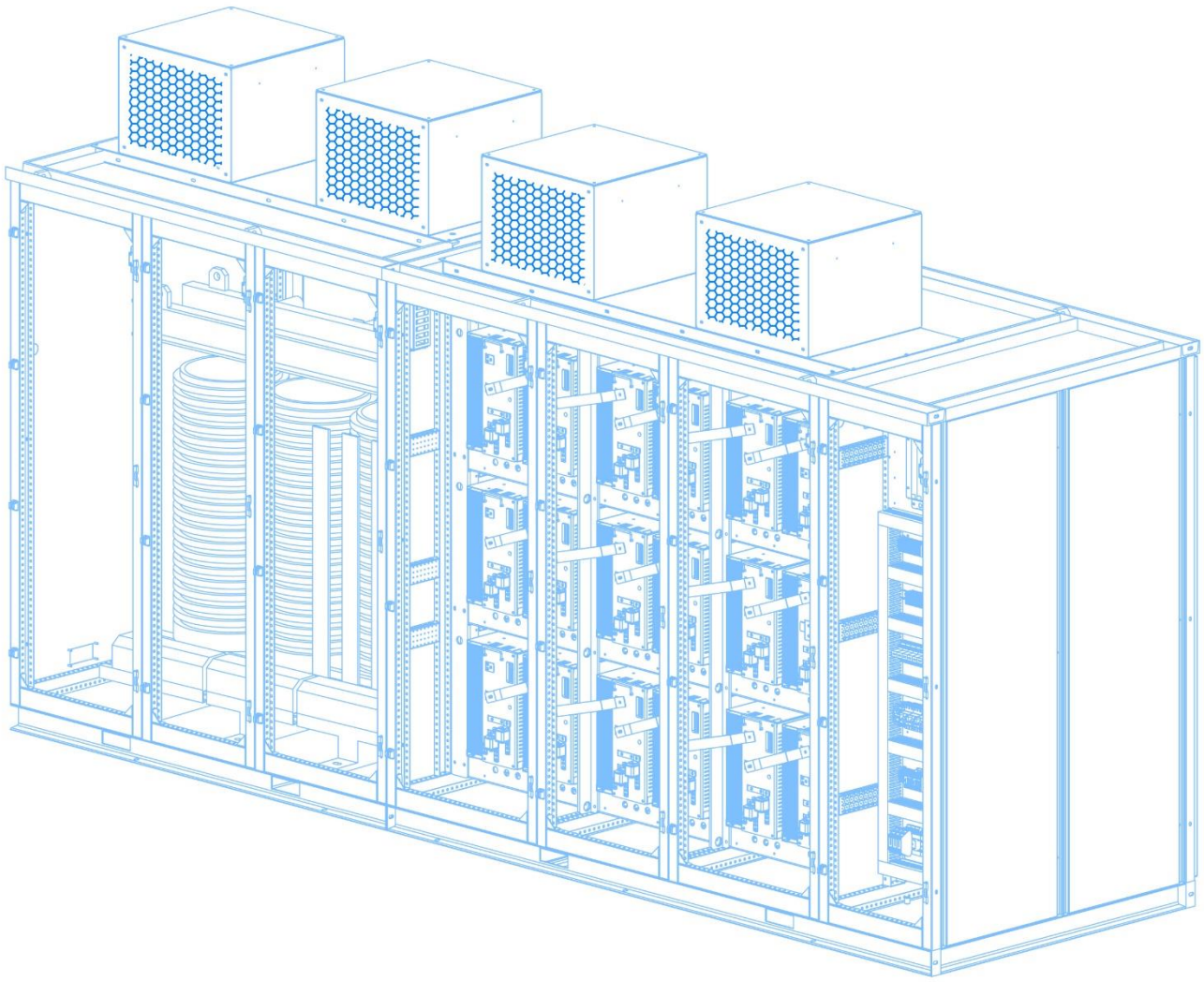
Medium voltage AC drive

HMV 1000, 315kW - 25MW, 3kV – 13.8kV



Drive technology and
power quality

HNC Electric

Content

HMV 1000 - General information

The HMV 1000 can be specified to control asynchronous or synchronous motors whether wound-rotor or permanent magnet.

The HMV 1000 provides speed and/or torque control for motor-driven applications in the medium and high power range from 315kW to 12 MW at motor voltages from 3.0kV to 10kV.

It is available with air cooling in the lower power range and with optional water cooling in the medium to high power range. HMV 1000 drives are also available mounted within a customized container, with self-contained sealed cooling systems, providing the highest IP class ratings for hostile environments as well as providing greater convenience and ease of installation and commissioning.

The HMV 1000 family of drives is thus particularly suitable to retrofit applications as well as applications requiring long cables to the motor. The medium voltage output is achieved directly without the need for an output transformer, particularly important in order to achieve high motor torque at very low speeds.

On the motor side, the drives provide almost perfectly sinusoidal motor current such that there are no concerns regarding overheating in the motor or torque pulsations on the motor shaft. The output voltage waveform is multi-level PWM such that it is close to sinusoidal and compatible with standard motor and cable insulation systems. It also does not induce any significant stray currents in motor bearings which can otherwise cause early motor bearing failure.

This is all achieved without the need for sinusoidal output filters in all but the most exceptional circumstances (extreme cable length).

Solution for a wide range of industries

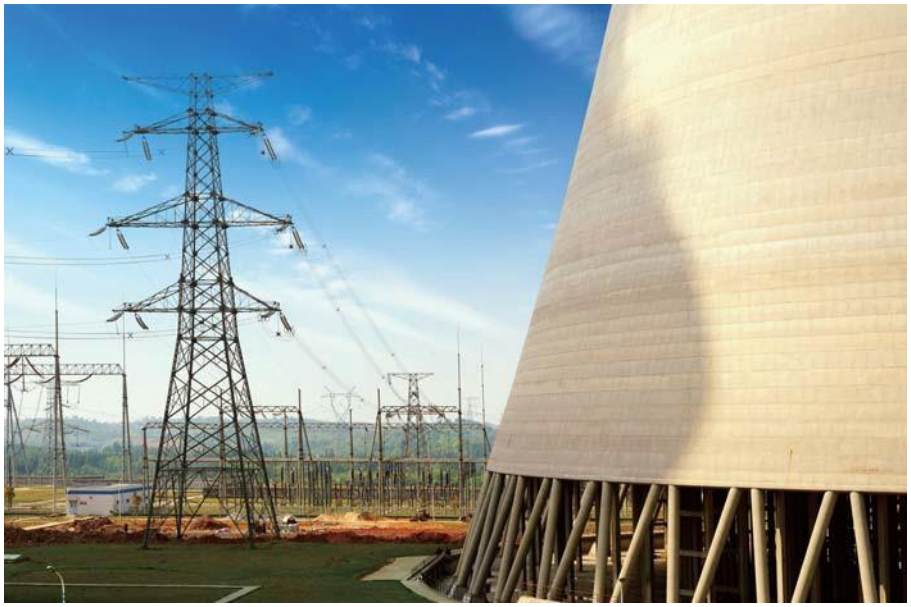
The application of advanced technology variable speed drives to motor control results in significant energy savings over fixed speed in a wide variety of applications.

Since their introduction to the market in 2007, the HMV range of variable frequency drives have provided reliable and highly efficient control of medium voltage AC motors for many applications in a wide range of industries.

The HMV 1000 series is the latest generation optimized for improved performance, reduced size and weight and even greater value for money.

Fields of application

Industries	Applications
Cement, mining and minerals	Grinding mills, conveyors, fans and pumps
Chemical, oil and gas	Compressors, extruders and pumps
Metals	Blast furnace blowers, fans and pumps
Pulp and paper	Fans and pumps
Power generation	Gas turbine starters, ID/FD fans and pumps
Water	Pumps
Renewable energy	Wind turbines, tidal and wave energy generation
Other applications	Test stands and wind tunnels, mine hoist



HMV 1000 - Compact design and high performance

The HMV 1000 is designed for maximum reliability, efficiency and versatility – features that have a direct impact on the customer's cost of ownership.

Clean Power

In the HMV 1000 converter, the medium voltage output is constructed by connecting the outputs of single-phase low-voltage IGBT-based inverters in series, with an equal number per phase. Each individual single-phase inverter power module is powered by an internal rectifier, itself supplied from separate phase-displaced secondary windings of the integrated transformer.

An inherent feature of this technology is that a high pulse number rectifier is created resulting in a significant reduction of input current harmonic distortion. In the example shown below for a 6kV output, the diode rectifier is 30-pulse. The input Power Factor is also high at a minimum of 0.95 regardless of speed and power.

The PWM switching strategy ensures that sinusoidal current is supplied to the motor. The low levels of harmonic current in the motor ensure that both motor heating and shaft torque pulsations transmitted to the coupling and load are minimized.
Use of the multi-level PWM topology also results in a reduced size of voltage steps imposed on to the motor and cable insulation systems compared to 2 or 3-level inverters. The dV/dt is less than 1,000V/uS.

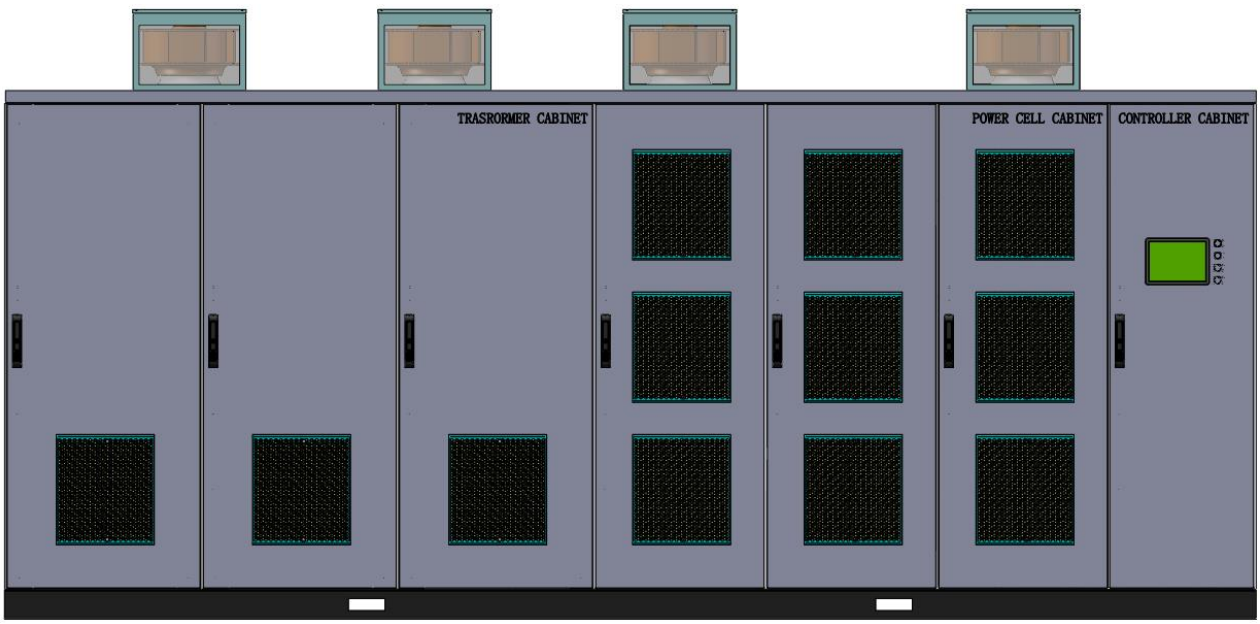
Multi-level features

- Very low levels of input current harmonics with high input power factor.
- Sinusoidal current output to motors – no significant temperature rise in the motor due to current harmonics.

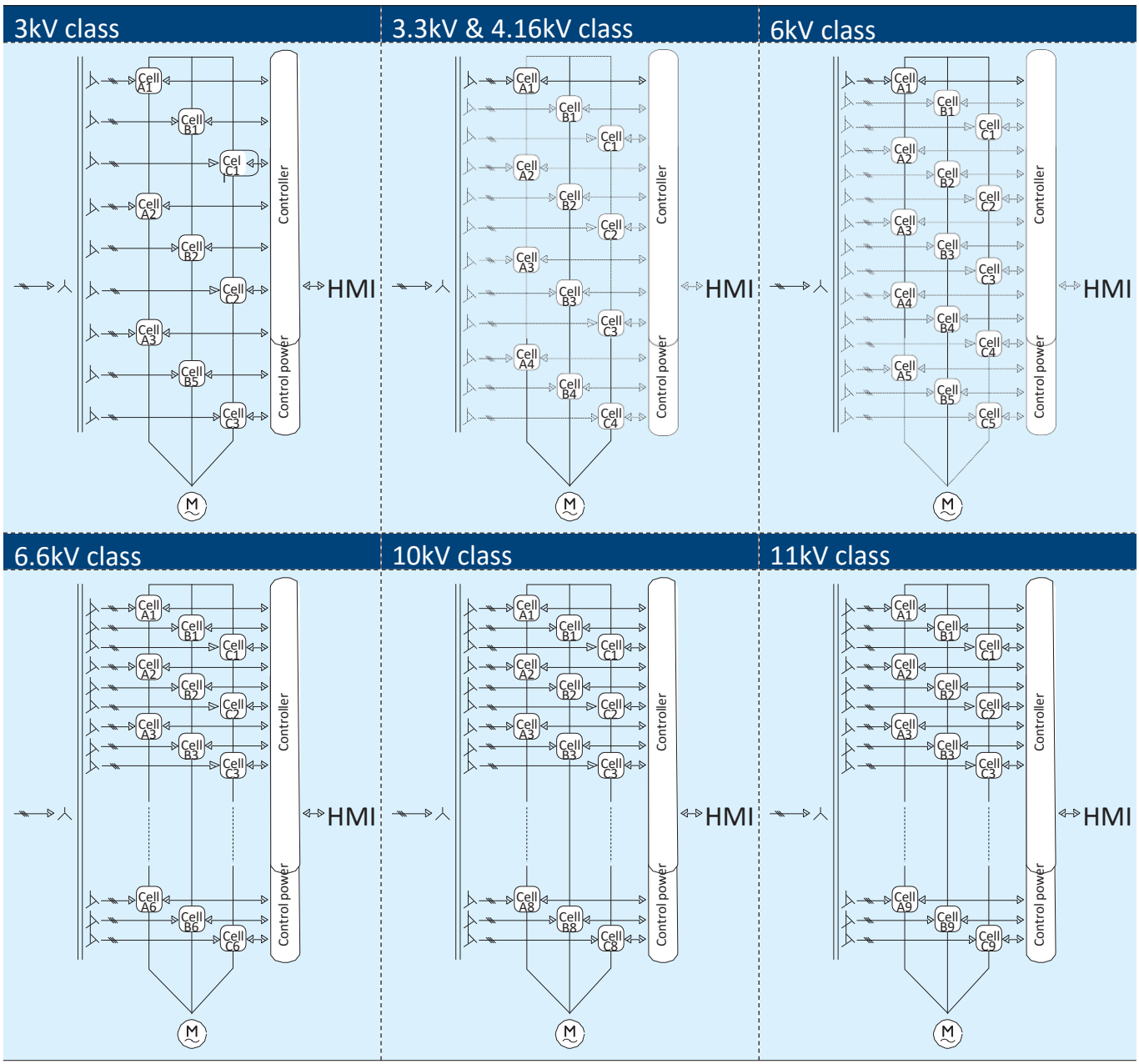
- No significant motor shaft torque pulsations – kind to shaft coupling and mechanical load.
- Lower dV/dt voltage stress imposed on to the motor and cable insulation systems.

- Lower amplitude of PWM switching at the output significantly reduces potential transmission line effects when long output cables are used to the motor.
- Lower amplitude and frequency of PWM switching at the output significantly reduces potential for stray currents through the motor bearings.

- Use of low-voltage IGBTs which are easily obtainable, highly reliable and well-proven.
- Low losses since IGBTs do not need snubber circuits and require little switching power.
- Current can be switched off instantaneously in the event of a fault in the output circuit.
- Modular design.
- Medium voltage output achieved without output transformer



HMV 1000 Multi-level topology



External View

HMV 1000 : 6kV, 1250kVA

Compact design

- Transformer integrated within cabinet
- Modular power module design
- Front access only for easy maintenance and replacement

Fully equipped

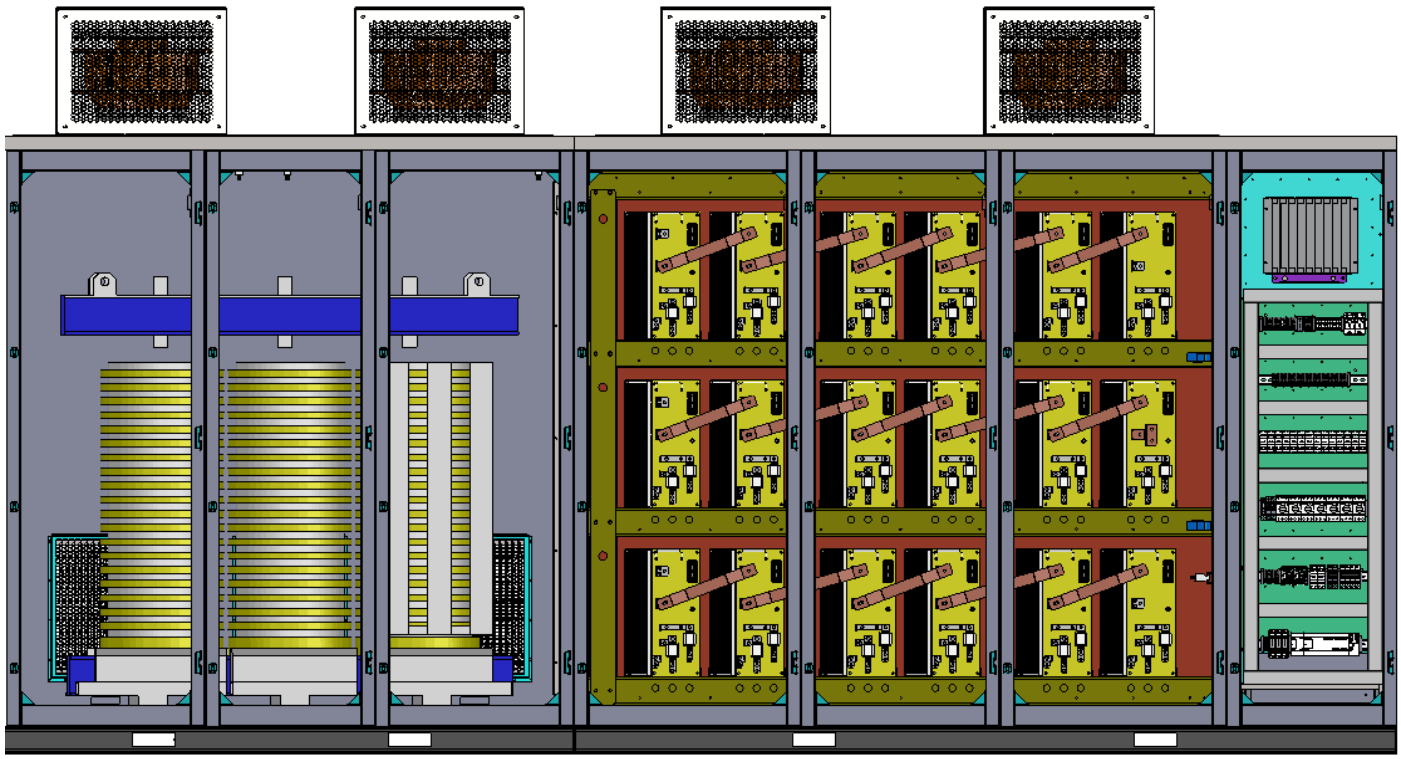
- 10” HMI touch screen for status display6 and local control
- 30 min UPS to maintain control during a short-term power outage
- Internal cabinet lighting
- Visual and audible local alarm

Restricted access to medium voltage area

- Door interlock system prevents unauthorized access
- Special tools required to open doors
- Handle lock provided
- Fiber-optic communications for exchange of status and control between Medium Voltage Cabinets and Low Voltage Control Cabinet

Internal view

HMV 1000: 6.6kV, 3150kVA



Transformer cabinet | Power cell cabinet | Control cabinet

Multi-winding phase-shift transformer

- Multi-winding phase-shift transformer (36 pulse/18 winding) is in place with taps for change in input voltage.
- Reducing power harmonics with multi-pulse filtering in compliance with IEEE standards
- Eliminating need for harmonic filter and power factor-improving condenser

Cell drive module

- Six low-voltage single-phase drives in serial connection per phase, generating 25 level 3 phase output voltage. It is designed to ensure easy cell maintenance.
- Each cell performs PWM switching in distributed control mode and has default built-in cell protection and bypass functions.

Master control module

- Master control module to control multi-level PWM output voltage with a total of 18 unit cells and fiber optic communication link.
- User-centric HMI to support system diagnostics and monitoring

Power cell

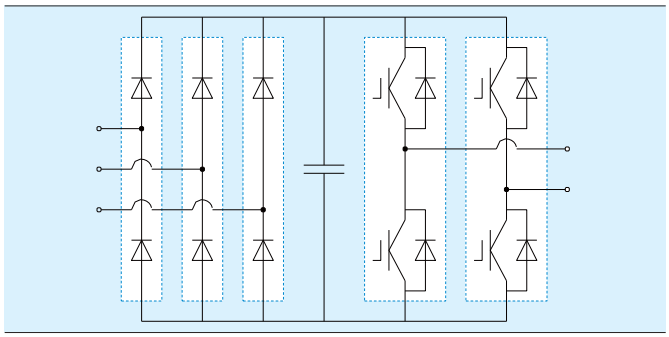
The inverter section within the drive is of a modular design using identical power modules connected in series to create the required medium voltage output. Each power module uses a well-proven low-voltage IGTB-based single-phase H-bridge architecture for added reliability, economy and ease of replacement.

The standard power module for two-quadrant control (bi-directional motor speed control without braking) uses a diode rectifier at the front end. An optional power module is available which uses an IGBT-based rectifier to allow power to be returned to the supply allowing full four-quadrant operation (motoring and braking in both directions). This "Active Front End" is modulated to draw sinusoidal current from the supply and control the input power factor to unity. The AFE version can also be used to continuously return power to the network for renewable energy generation applications such as for wind and tidal turbines.

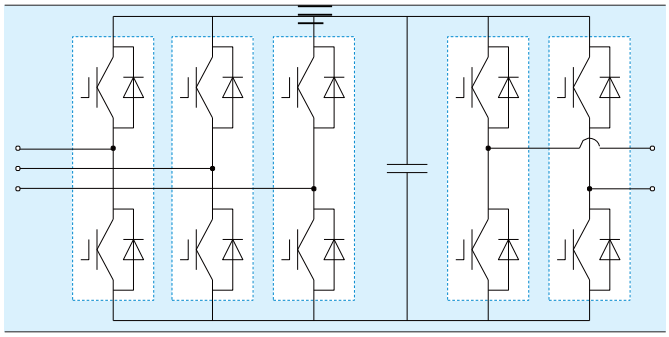
Features

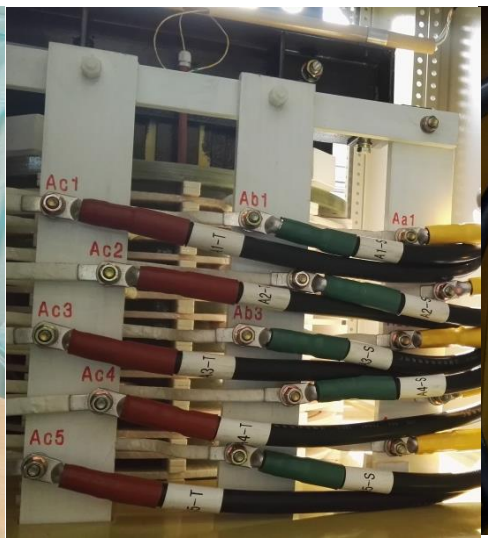
- Front access design for easy maintenance of power modules that can be replaced in just a few minutes.
- Single power cell design for all modules allows reduced spare parts inventory cost.
- 2-Quadrant and 4-Quadrant versions available.
- Fiber-optic interface for safe control and feedback communication with controller.

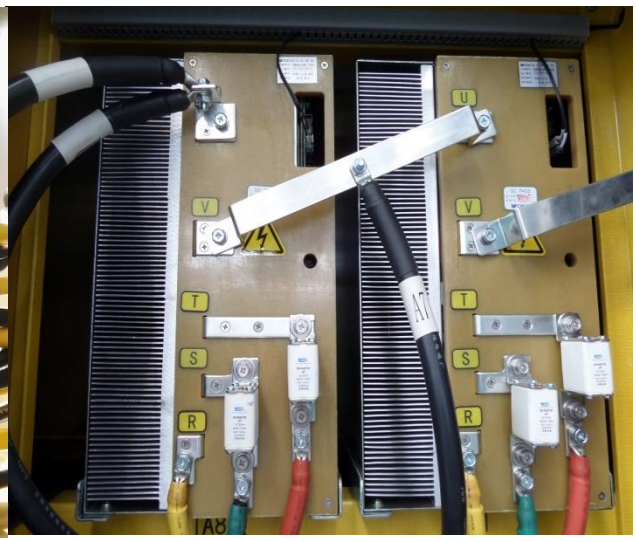
Two quadrant topology



Four quadrant topology







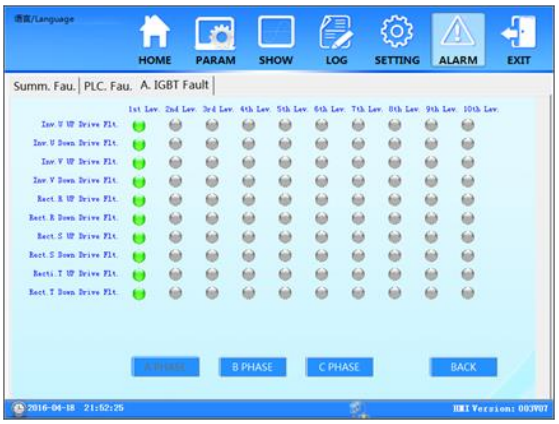
Monitoring(HMI)

- Door-mounted easy-to-use 10-inch color LCD touch-screen
- User-friendly interface with operational data at your fingertips
- Virtual meters display main VFD parameters
- System and status monitoring and manual controls
- Power module status monitoring
- Data logging, trending displays, diagnostic information available
- Multiple languages available
- Parameter adjustment and operation records
- Dedicated multi-level menu to guide user with different access levels for service and commissioning engineers (Operator, Manager and Administrator)

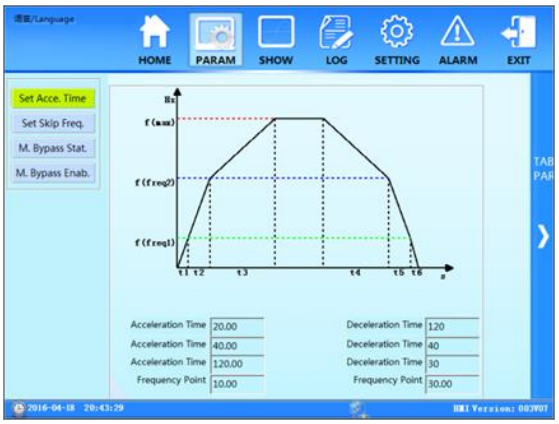
Main panel

Standard HD HMI monitoring maximizes user convenience

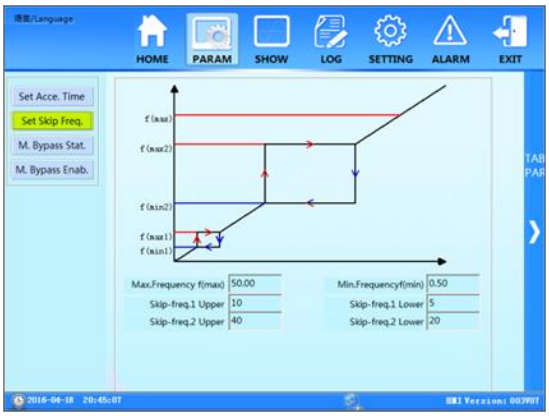
Inverter



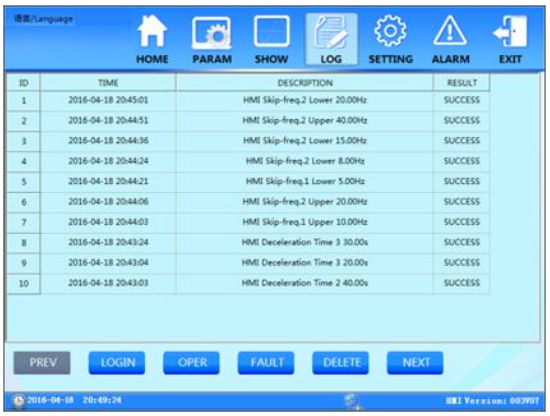
Speed

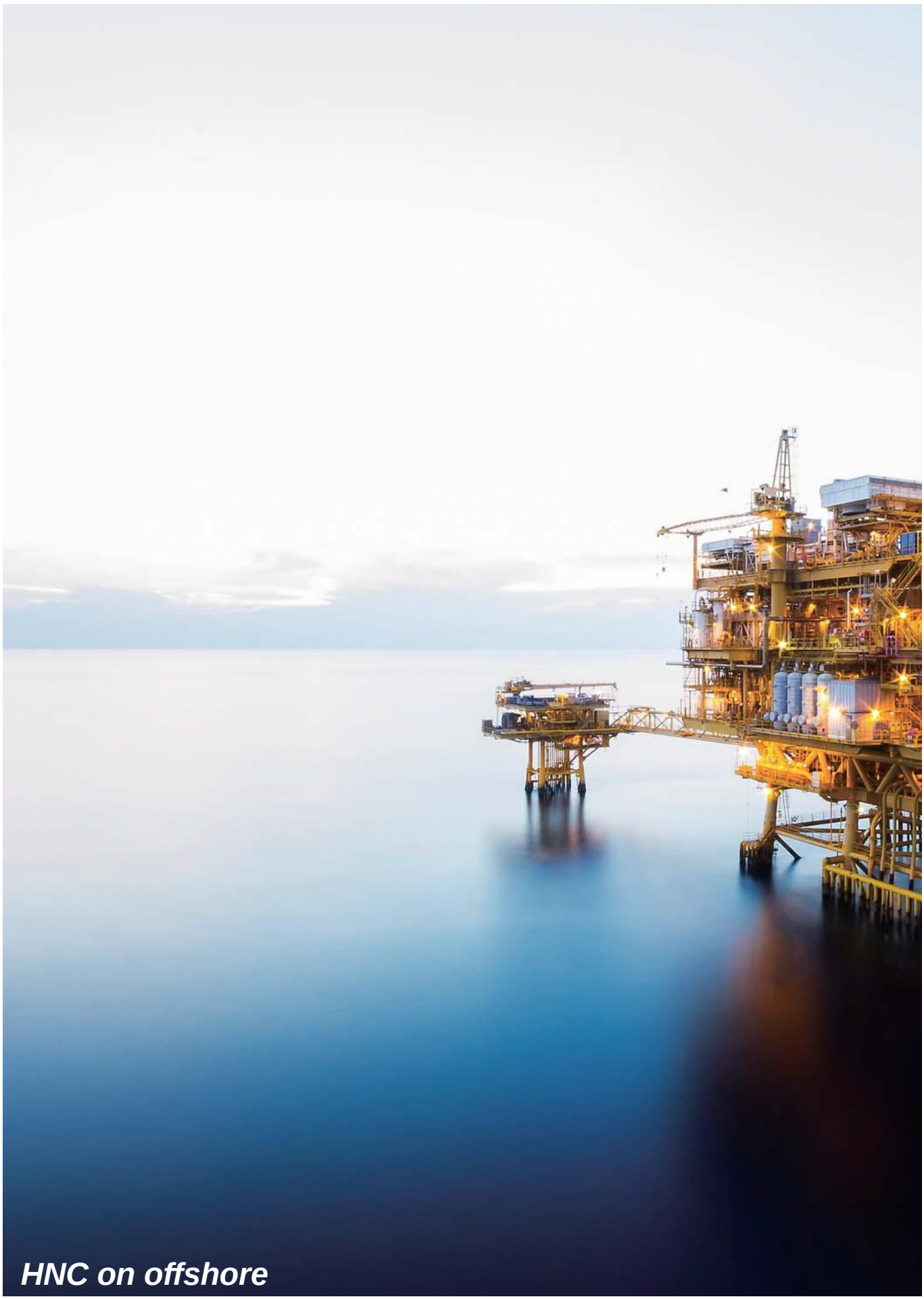


Set



History





HNC on offshore

HNC on offshore

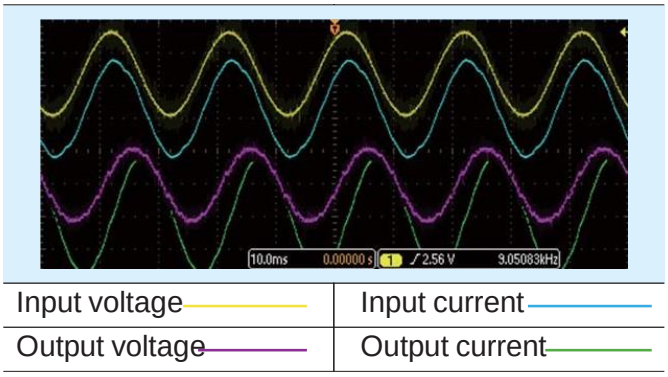
HMV 1000 - Benefits

HMV 1000 is designed to deliver value through reliable process control and low cost of ownership.

Improved power quality

- Almost sinusoidal input current eliminates the need for additional harmonic filters or active filters on the input side
- Compatible with older design of motors allowing retrofit to existing system designs.
- Minimal impact of voltage reflection, allowing longer cable length between motor and drive.
- Multi-level medium voltage drives minimise stress on motor windings, eliminating the need for additional sine wave filters

Input and output current and voltage waveform



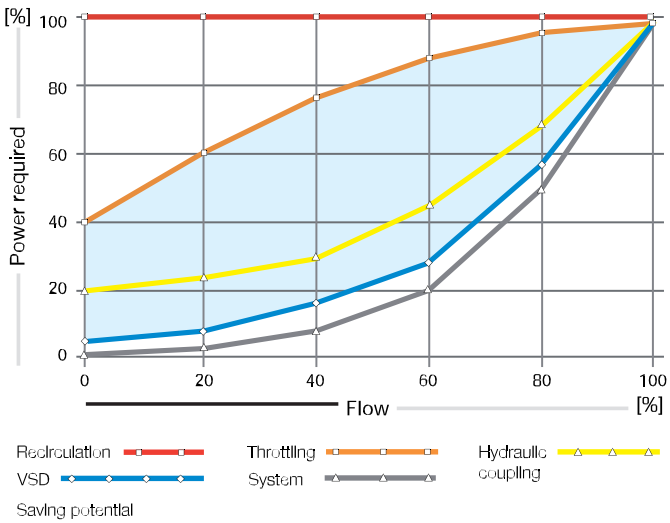
Energy saving

Fans, pumps and compressors have load characteristics whereby the power consumed increases as a cubic law with speed. The optimum way to save energy with this type of load is to control the motor speed with a VFD. This is far more effective as it avoids the waste of energy when fluid flow rate is controlled using a valve or damper.

Process control is improved by the use of more accurate, prompt and flexible control of the motor speed.

- The inherent soft starting ability of a VFD reduces the impact on the network (voltage dips) caused by high starting currents. Substantially greater starting torques can be achieved with a VFD than with a soft starter and with much lower starting current, reducing stress on the motor windings and saving energy.
- The controlled start-up acceleration rate also reduces the mechanical stress on the load equipment.
- The VFD operates at a higher input power factor than a directly connected asynchronous motor.
- The losses in the VFD converter are low, only 1.5% excluding the transformer.

Power consumption for various pump control methods



High Reliability and Easy Maintenance

HNC drive technologies, such as the use of a modular multi-level topology design and use of IGBT power semiconductors, provide a low parts count, which extends the Mean Time Between Failures (MTBF) and increases reliability.

Front access

The HMV 1000 is designed to allow easy front access to the drives components thereby providing high availability.

Long lifetime

The DC bus capacitors provide an energy store and
de-coupling buffer between the supply network and the load side converter. The high value of the capacitors almost eliminates the voltage ripple and stabilizes the DC bus voltage, suppressing disturbances caused by fluctuations
of the load and supply side harmonics and switching transients.

Traditionally, the capacitors used for the DC bus have been of aluminium electrolytic type as the technology is mature and relatively low cost and also achieves a high energy density.

Disadvantages of electrolytic capacitors

However, electrolytic capacitors suffer from some disadvantages:

- Limited ability to handle large ripple current.
- Limited voltage rating and ability to handle voltage surges. It is necessary to connect capacitors in series and use voltage-sharing resistors, increasing system design complexity and reducing overall reliability.
- Limited lifetime.
- Unsuitability for long-term storage as spare parts.
- Failure modes may result in collateral damage to other components.

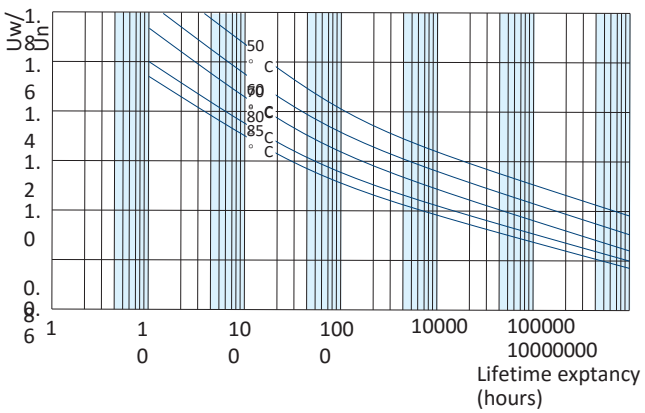
Advantages of metalized film capacitors

The HMV 1000 uses metalized film capacitors which have the following advantages, despite having a lower power density:

- Ability to handle high ripple current.
- Self-healing with longer natural life.
- Improved performance at low temperatures.
- Higher voltage capability such that it is not necessary to mount in series and also non-polarised - both these factors simplify bus bar and system design with reduced effects of stray parameters and improved resultant reliability.
- Lower internal losses and stray than electrolytic capacitors.
- Generally fail to open-circuit without causing collateral

Can be stored for long periods without the need for re-forming.

Lifetime expectancy vs Uw/Un



HMV 1000 - Functions

HMV 1000 offer highly reliable optimum solutions by providing spinning start, power cell bypass, sensorless vector control and many more functions.

Torque limiting function

The torque limit function is used to accurately control and limit the torque in order to prevent overload of the motor, electricity supply system or VFD itself. This prevents damage to the motor when stationary, for example, with a locked rotor, when starting with high inertia or high initial friction load.

The torque limit function can also be used to prevent or limit the return of power from the motor to the VFD in the event of an over-hauling load causing the motor speed to exceed the commanded speed.

Spinning start (Flying start)

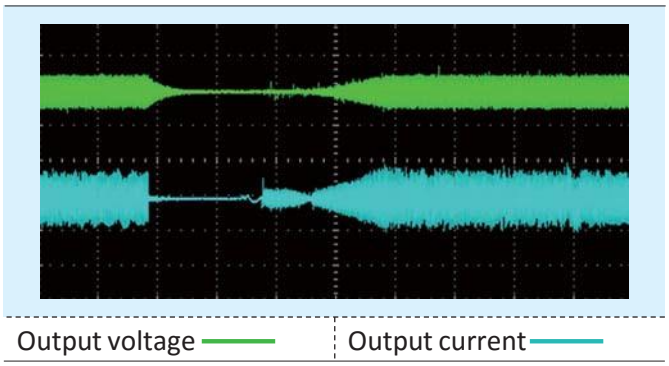
The HMV 1000 can automatically identify that the motor is already spinning at the moment of the start request and institute a controlled sequence to enable the drive to pick up the spinning motor without the need to stop the motor or the risk of a system trip. The sequence requires an initial estimate of the spinning motor speed by scanning the motor voltage while changing the output frequency. Steps are taken to reduce the time needed to estimate the motor speed.

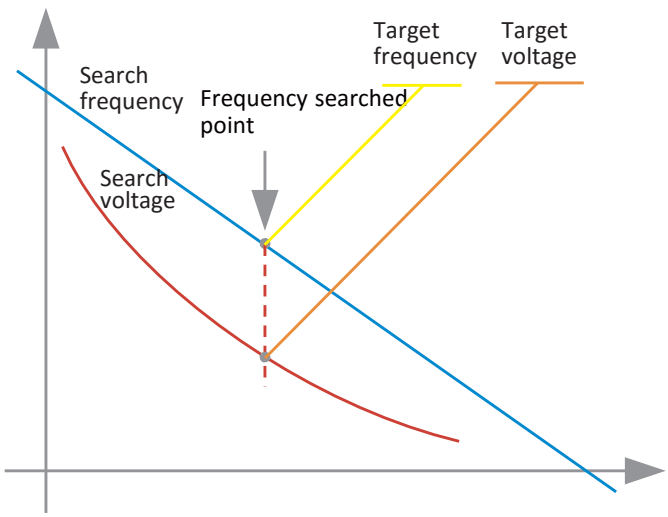
- The mechanical load causes the motor to be spinning, even though no electric power is applied to the motor.
- Manual reset after trip
- Automatic restart after a shutdown.
- Restart after Low-Voltage Ride-Through (temporary loss of supply power).
- Restart after an automatic Power Cell Bypass.

Rapid Speed Estimation

- Reduce speed estimation time by controlling the drive output frequency scanning rate
- Reduce estimation time by reducing output frequency
- Reducing estimation time by controlling voltage response

Spinning start waveform





Automatic power cell bypass option

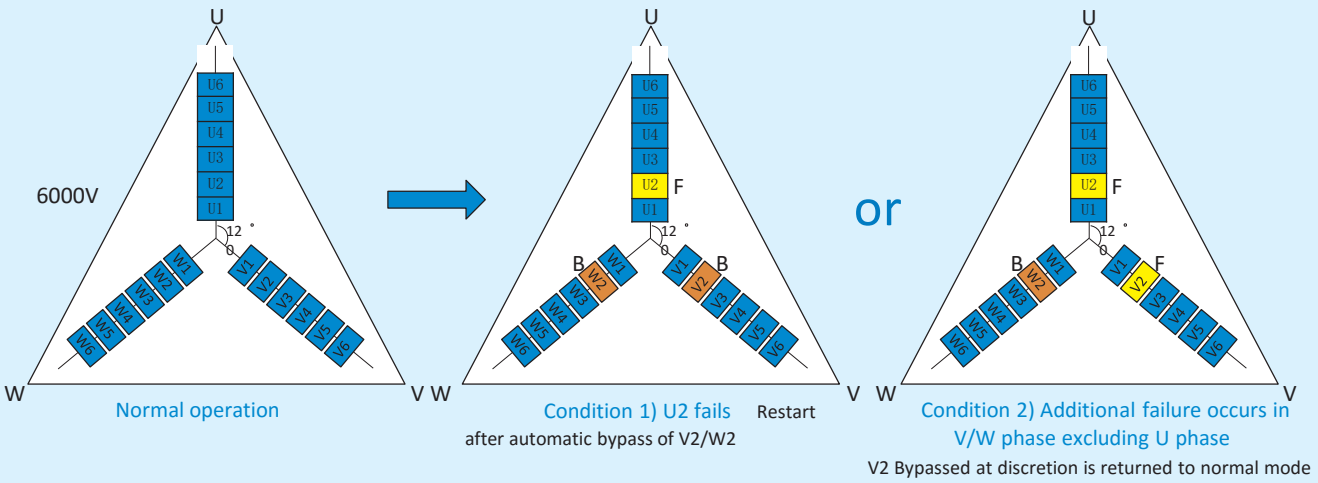
When a fault in a power module is detected, the HMV 1000 shuts off current to the motor, bypasses the identified faulty power module, bypasses the equivalent power module in the other phases in order to maintain voltage balance, and automatically restarts current to the motor. This allows operation to continue without intervention of the operator.

If a power module in another phase were to fail, the system automatically re-organises the bypass to achieve the highest working voltage possible.

Note: This function is optional.

Operate cell bypass function (in auto setup)

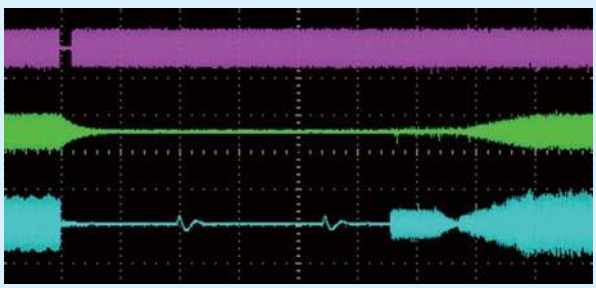
- F: Bypass following cell failure
- B : Auto bypass



Low voltage ride-through (LVRT)

In the event of a short-term dip in supply voltage, the vector control system maintains correct motor flux while allowing the motor to coast. If the supply voltage recovers within the stipulated period (e.g. up to 5 cycles of the supply power), normal speed and torque control are restored automatically. During the supply dip mechanical energy of the load may be regenerated in order to maintain the DC Link voltage, maintain control power and maintain control of the motor flux. The VFD is then able to ride through the under-voltage event and automatically continue normal operation without operator intervention. If the supply dip exceeds the stipulated period, the VFD will trip and a normal re-start is undertaken.

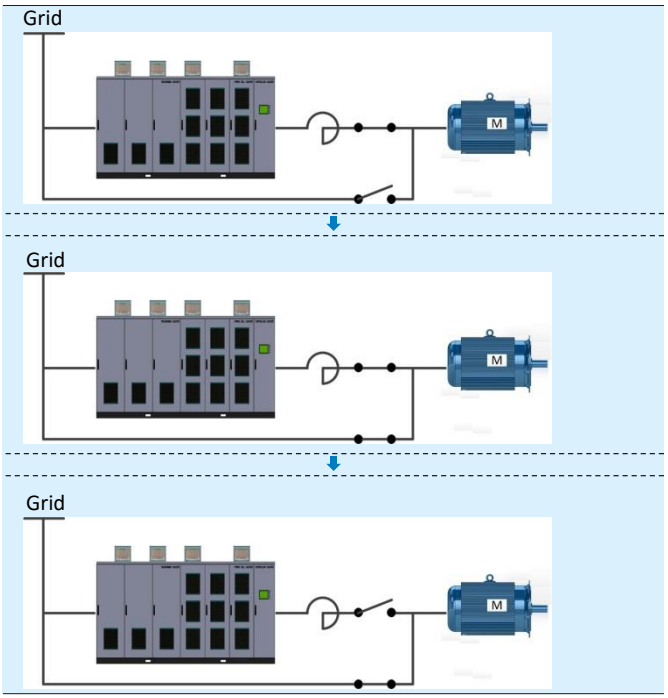
LVRT waveform



Synchronous transfer

- Seamless switching of the source of motor power from the VFD to the local supply network (Synchronous Transfer to Bypass mode) or vice versa (switch to VFD mode).
- Synchronous transfer function synchronises the VFD output frequency, voltage and phase with the local supply network before operating the Bypass circuit breaker, enabling power transfer without over-current or motor torque disturbance.
- For transfer back to VFD mode, the VFD output is first synchronised to the supply network before opening the Bypass circuit breaker and assuming VFD control of motor torque and speed.
- Multi-motor operation: Synchronous transfer can be arranged for a single VFD to be used as a starter for several motors that do not need variable speed operation. Once the transfer of a motor onto the supply network has been completed, the VFD is then available to start another motor. The final motor to be started can remain on the VFD if variable speed is required.

Drive mode to grid mode



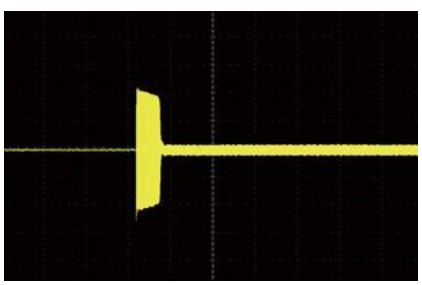
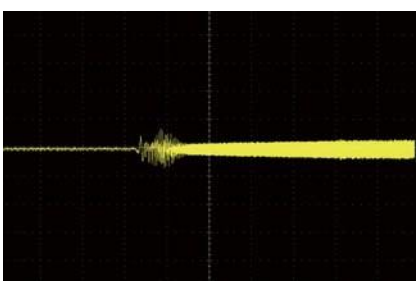
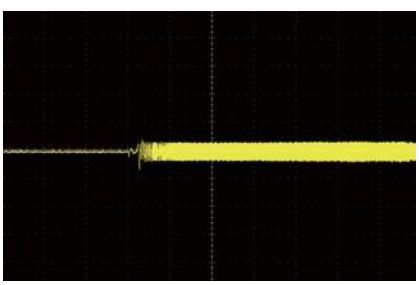
Sensorless vector control

A speed sensor can be a source of potential unreliability so is avoided if possible. Traditionally, the only alternative to closed-loop speed control with a speed sensor was to use V/f control with subsequent loss of accuracy, loss of ability to control and limit torque and inability to control at close to zero speed.

Advantage

Sensorless Vector Control (Open-loop control) now provides improved starting torque and accurate control of speed and torque at low speed. Low-speed performance now approaches that of closed-loop control without the need for a sensor with the attendant maintenance cost.

Starting current in different control mode

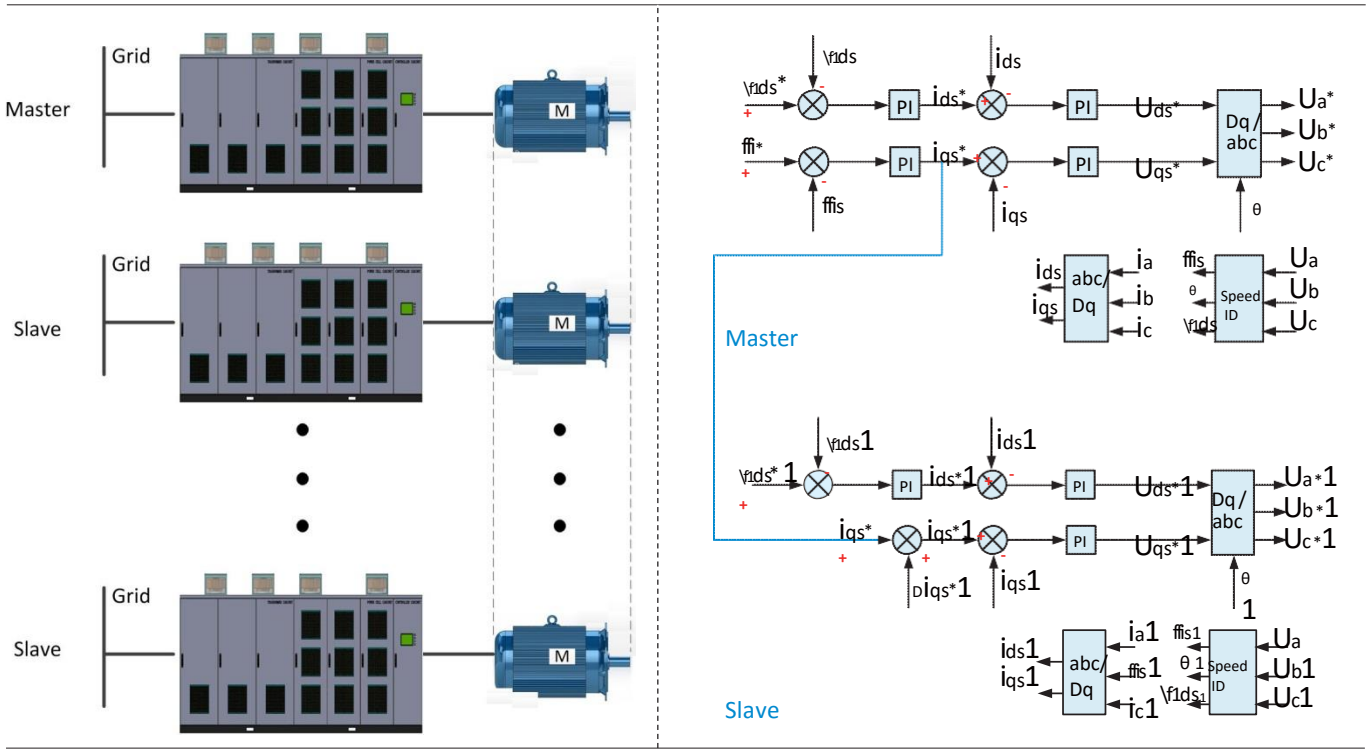
DOL	V/F control	Sensorless vector control
		

Master-Slave control

Some applications require that the load is driven by two or more motors that are mechanically coupled together. It is inherent that the motors run at the same speed but it is essential that they share the mechanical load equally or in a defined and stable manner. Even if each motor is driven from a separate VFD, only one speed regulator is required and steps must be taken to ensure that each motor takes the correct share of the mechanical load torque.

This requirement is satisfied by the Master-Slave system. VFD must be in Vector Control mode. One VFD is arbitrarily designated the Master and the Torque Command produced by the Speed Regulator in this Master VFD is transmitted to the other VFDs designated as Slaves. The Slave VFDs follow the Torque Command from the Master while their own Speed regulators are disabled. In the event that the Master VFD becomes unavailable, the system automatically re-assigns one of the former Slave VFDs to become the new Master. The medium used to transmit the Torque Command signal between the VFDs is either high-speed hard-wired analogue or via a high-speed digital network.

Vector logic drawing



Automatic parameter identification (Auto-tune)

The HMV 1000 can automatically identify the required motor parameters allowing accurate control of the motor at low speed without the need for a sensor (Open-loop Control).

HMV 1000 - Technical Data

Technical specification

Items	Parameters
Power supply	
Input voltage	3 phase, AC, 3kV -13.8KV
Input voltage fluctuation tolerance	±10%
Control voltage	3 phase, AC 380V/400V/415V/480V
Output	
Voltage	0 ~13.8KV
Current	0 ~ rated current
Frequency	0.5 ~ 120Hz
Maximum length of cable permitted	1000m
Performance	
Input waveform	Current THD < 4%, input filter is not necessary
Output waveform	dv / dt < 1000V / us, output filter is not necessary
Effciency	> 97% (including transformer)
Power factor	>0.96, (20%～100% Speed) power factor compensator is not necessary
Ambient	
Installation	Indoor, no explosive and corrosive gas
Temperature	5 ~ 40 ℃
Humidity	< 95%, no condensation
Above sea level	Less than 1000m (customized)
Storage / transportation temperature	-25 ℃ ~ +55 ℃
Control	
Control mode	Standard Control(V/Hz), Sensorless Vector Control, Field-oriented Vector Control (FOC)
Load type	Synchronous or asynchronous motor (slip ring motor)
PID function	Programmable
Control features	Duplicate supply, fault diagnostic, torque and current limit, low voltage ride-through, synchronous-transfer and drive bypass, power module bypass (option), flying start, master-slave control, skip frequencies, motor parameter estimation
Frequency resolution	0.01Hz
Communication	RS485, Modbus-RTU / Profibus-DP, TCP/IP (optional:devicenet, profinet, ethernet)
HMI operation	Touch screen
HMI language	English / Chinese/Russian (developing)
Alarm annunciation	Audio visual
Noise level	<80dB
Protection	Over current, earth fault, over voltage, under voltage, phase loss, over temperature, fan failure, communication failure
Torque response time	5ms
Enclosure	
Cooled mode	Air cooled (optional: water cooled)
Ingress protection	IP30 (optional: IP31 IP33)
Reference standard	GB/T12668.4,GB12668.3,GB2423etc.


HNC in South America

HMV 1000 - How to chose

Model Definitions

HMV-1 □□□ - □□ / □□□

Product Series
HNC MV Drive 1000 series

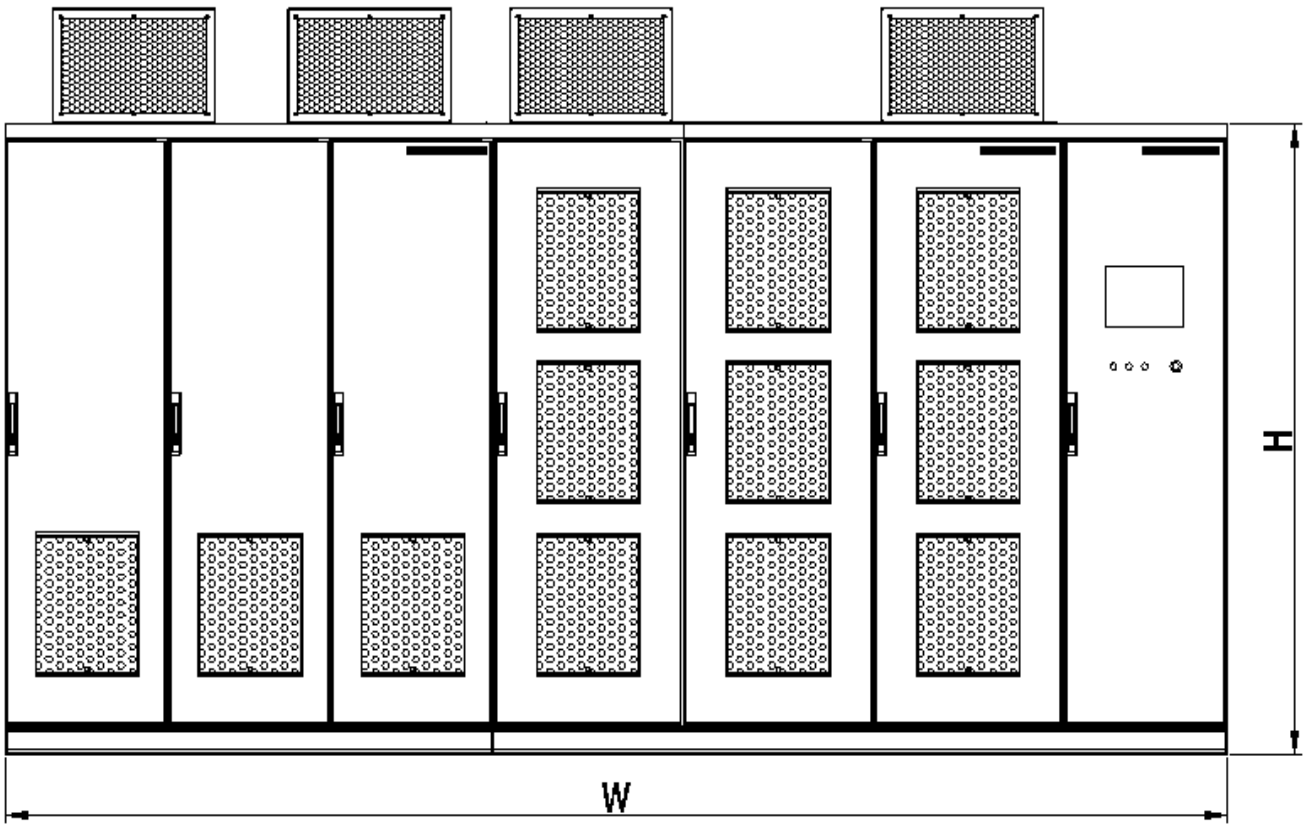
Series No.
- 1200: Two-quadrant
- 1400: Four-quadrant

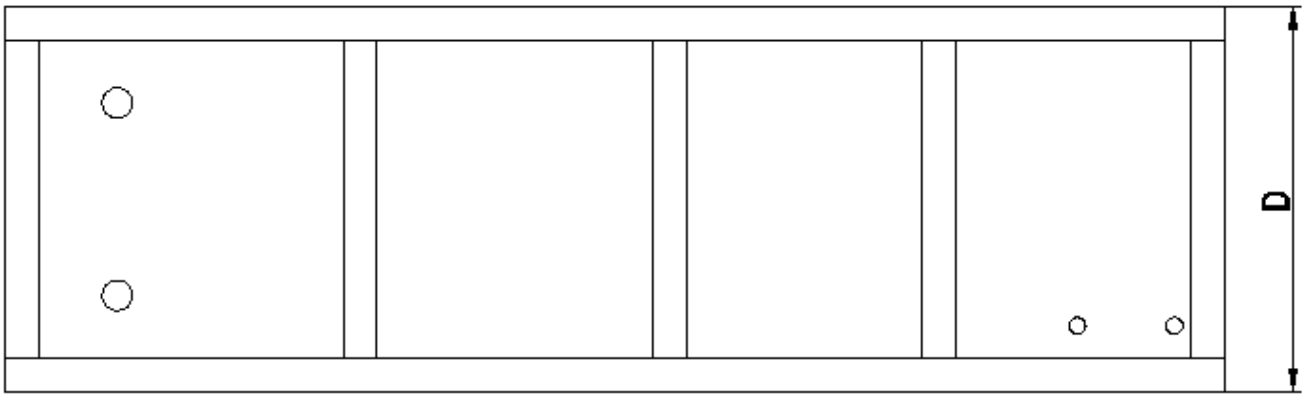
Rated output voltage
- 06 – 6kV
- 10 – 10kV

Output current
015-15A
……
600 – 600A
……

Example
HMV 1200 - 10 / 280
HMV 1200 = HNC medium voltage drive 1000 series Two-quadrant
10 = input voltage 10kV,
280 = output current 280A

Standard dimension drawing



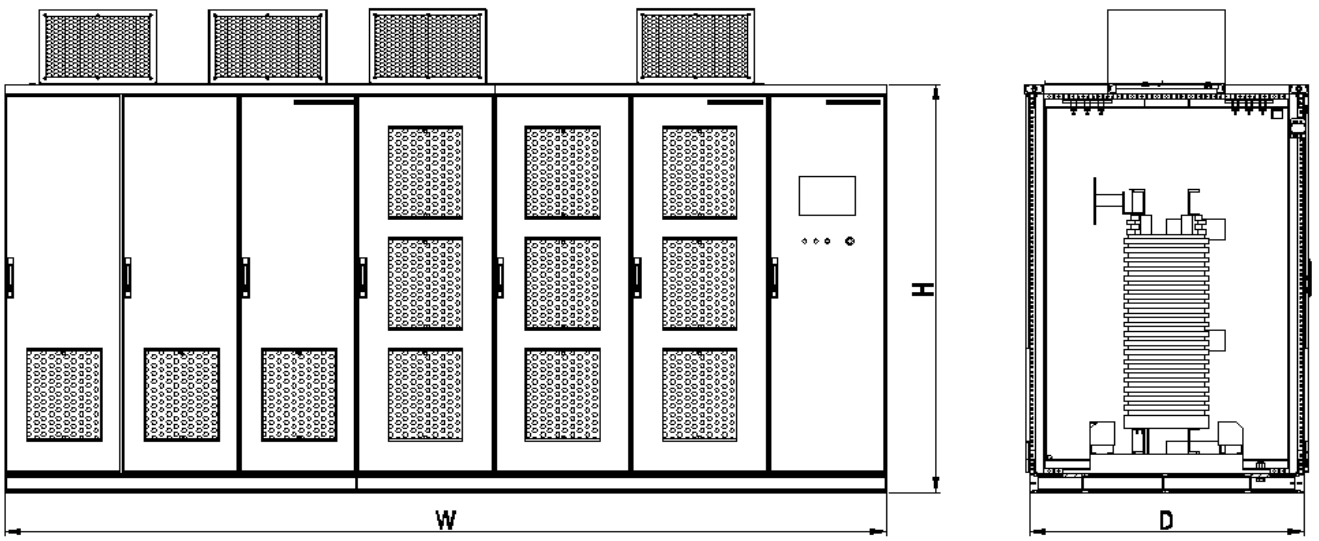


6kV 1200Series specification

Motor data			HMV drive	HMV drive data	
Voltage	Current	Power	Type mode	Width*Depth*Height	Weight
kV	A	kW	Standard	mm*mm*mm	kg
6	40	315	HMV1200-06/040	3900*1400*2660	4500
6	45	355	HMV1200-06/045	4000*1400*2660	4700
6	50	400	HMV1200-06/050	4000*1400*2660	4700
6	55	450	HMV1200-06/055	4000*1400*2660	4700
6	60	500	HMV1200-06/060	4000*1400*2660	4700
6	70	560	HMV1200-06/070	4000*1400*2660	4700
6	75	630	HMV1200-06/075	4000*1400*2660	4700
6	90	710	HMV1200-06/090	5200*1400*2660	5900
6	100	800	HMV1200-06/100	5200*1400*2660	5900
6	110	900	HMV1200-06/110	5200*1400*2660	5900
6	120	1000	HMV1200-06/120	5200*1400*2660	5900
6	135	1120	HMV1200-06/135	5200*1400*2660	5900
6	150	1250	HMV1200-06/150	5200*1400*2660	5900
6	170	1400	HMV1200-06/170	5200*1400*2660	6300
6	200	1600	HMV1200-06/200	5200*1400*2660	6300
6	225	1800	HMV1200-06/225	5200*1400*2660	6300
6	250	2000	HMV1200-06/250	5200*1400*2860	7380
6	280	2240	HMV1200-06/280	5200*1400*2860	7380
6	300	2500	HMV1200-06/300	5200*1400*2860	7380
6	330	2800	HMV1200-06/330	6800*1400*3100	10000
6	360	3150	HMV1200-06/360	6800*1400*3100	10000
6	410	3550	HMV1200-06/410	6800*1400*3100	10000
6	450	4000	HMV1200-06/450	6800*1400*3100	10000
6	550	4500	HMV1200-06/550	6800*1600*3500	15000
6	600	5000	HMV1200-06/600	6800*1600*3500	15000

Note:

1) Please contact HNC for other combinations of input and output voltage.
2) For higher drive capacity please contact HNC.
3) The specification is only suitable for 6kV standard air cooling drive, for water cooling system please contact HNC.
4) The above chart and picture only contain the main drive unit, no by-pass cabinet and optional parts are included.
5) Product dimensions, weights and other data listed here are for reference only, the actual data shall subject to the final design drawings.

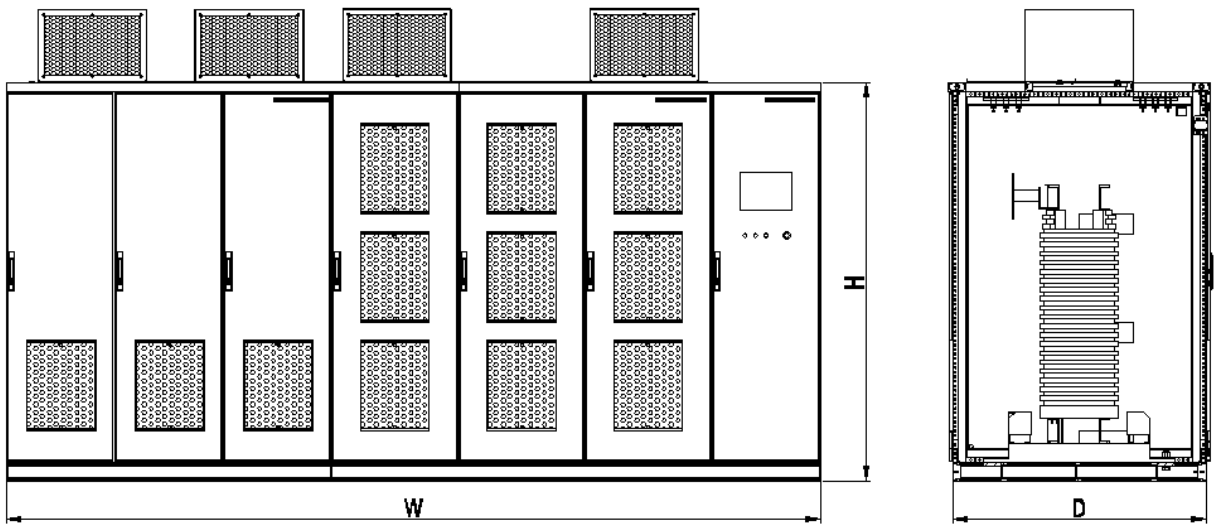


Motor data			HMV drive	HMV drive data	
Voltage	Current	Power	Type mode	Width*Depth*Height	Weight
kV	A	kW	Standard	mm*mm*mm	kg
10	40	500	HMV1200-10/040	4200*1400*2660	4900
10	45	560	HMV1200-10/045	4000*1400*2700	5900
10	50	630	HMV1200-10/050	4000*1400*2700	5900
10	55	710	HMV1200-10/055	4000*1400*2700	6200
10	60	800	HMV1200-10/060	4000*1400*2700	6400
10	70	900	HMV1200-10/070	4000*1400*2700	7000
10	75	1000	HMV1200-10/075	4400*1400*2660	6300
10	90	1120	HMV1200-10/090	4600*1600*2900	8000
10	100	1250	HMV1200-10/100	4600*1600*2900	8000
10	110	1400	HMV1200-10/110	6300*1400*2660	10800
10	120	1600	HMV1200-10/120	6300*1400*2660	10800
10	135	1800	HMV1200-10/135	6300*1400*2660	10800
10	150	2000	HMV1200-10/150	6300*1400*2660	10800
10	170	2240	HMV1200-10/170	6600*1400*2660	12000
10	200	2500	HMV1200-10/200	6600*1400*2660	12000
10	225	2800	HMV1200-10/225	6600*1400*2660	12000
10	250	3150	HMV1200-10/250	6700*1400*2900	18000
10	280	3550	HMV1200-10/280	6700*1400*2900	18000
10	300	4000	HMV1200-10/300	6700*1400*2900	18000
10	330	4500	HMV1200-10/330	9000*1600*2900	21500
10	360	5000	HMV1200-10/360	9000*1600*2900	21500
10	410	5600	HMV1200-10/410	9000*1600*2900	21500
10	450	6300	HMV1200-10/450	9000*1600*2900	20000
10	550	7100	HMV1200-10/550	9500*1600*3500	26500
10	600	8000	HMV1200-10/600	9500*1600*3500	28500

10kV 1200Series specification

Note:

1) Please contact HNC for other combinations of input and output voltage.
2) For higher drive capacity please contact HNC.
3) The specification is only suitable for 10kV standard air cooling drive, for water cooling system please contact HNC.
4) The above chart and picture only contain the main drive unit, no by-pass cabinet and optional parts are included.
5) Product dimensions, weights and other data listed here are for reference only, the actual data shall subject to the final design drawings.

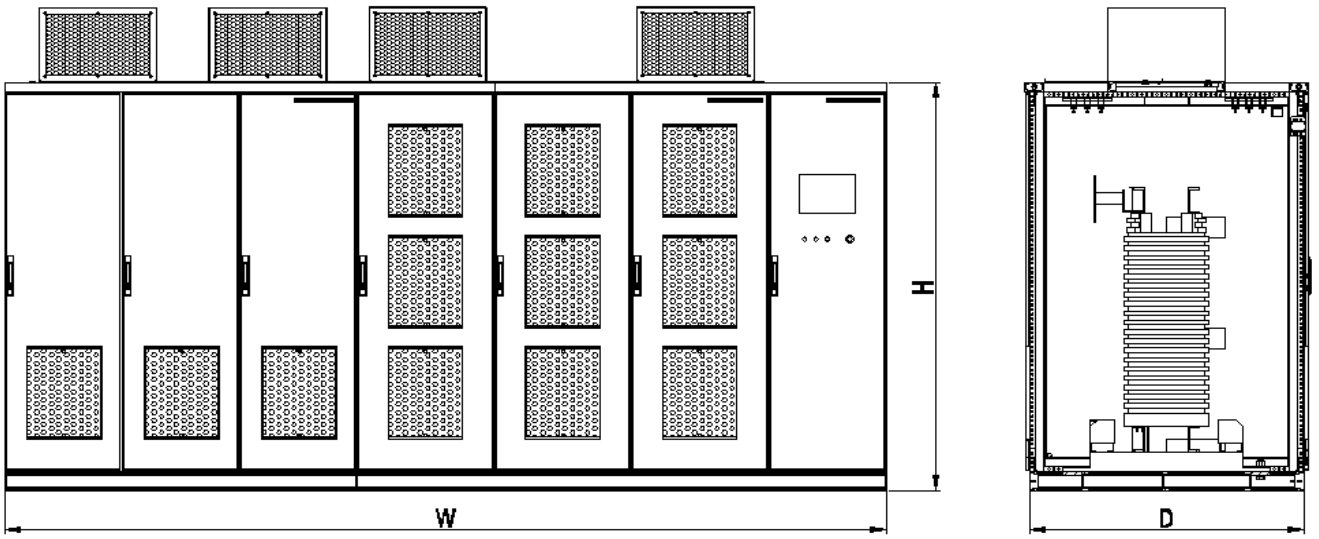


6kV 1400Series specification

Motor data			HMV drive	HMV drive data	
Voltage	Current	Power	Type mode	Width*Depth*Height	Weight
kV	A	kW	Standard	mm*mm*mm	kg
6	40	315	HMV1400-06/40	4000*1400*2500	4800
6	45	355	HMV1400-06/45	4000*1400*2500	4800
6	50	400	HMV1400-06/50	4000*1400*2500	4800
6	55	450	HMV1400-06/55	4000*1400*2500	4800
6	60	500	HMV1400-06/60	4000*1400*2500	5200
6	70	560	HMV1400-06/70	4000*1400*2500	5200
6	75	630	HMV1400-06/75	4000*1400*2500	5200
6	90	710	HMV1400-06/90	4500*1600*2700	5700
6	100	800	HMV1400-06/100	4500*1600*2700	5700
6	110	900	HMV1400-06/110	4500*1600*2700	6000
6	120	1000	HMV1400-06/120	4500*1600*2700	6000
6	135	1120	HMV1400-06/135	4500*1600*2700	6500
6	150	1250	HMV1400-06/150	4500*1600*2700	8500
6	170	1400	HMV1400-06/170	5400*1400*2900	8700
6	200	1600	HMV1400-06/200	5400*1400*2900	9200
6	225	1800	HMV1400-06/225	5400*1400*2900	9700
6	250	2000	HMV1400-06/250	5400*1400*2900	10100
6	280	2240	HMV1400-06/280	5400*1400*2900	13100
6	300	2500	HMV1400-06/300	5400*1400*2900	13100
6	330	2800	HMV1400-06/330	7900*1600*3100	13500
6	360	3150	HMV1400-06/360	7900*1600*3100	14000
6	410	3550	HMV1400-06/410	7900*1600*3100	14500
6	450	4000	HMV1400-06/450	7900*1600*3100	15000
6	550	4500	HMV1400-06/550	7900*1600*3100	17500
6	600	5000	HMV1400-06/600	7900*1600*3100	18500

Note:

1) Please contact HNC for other combinations of input and output voltage.
2) For higher drive capacity please contact HNC.
3) The specification is only suitable for 6kV standard air cooling drive, for water cooling system please contact HNC.
4) The above chart and picture only contain the main drive unit, no by-pass cabinet and optional parts are included.
5) Product dimensions, weights and other data listed here are for reference only, the actual data shall subject to the final design drawings.

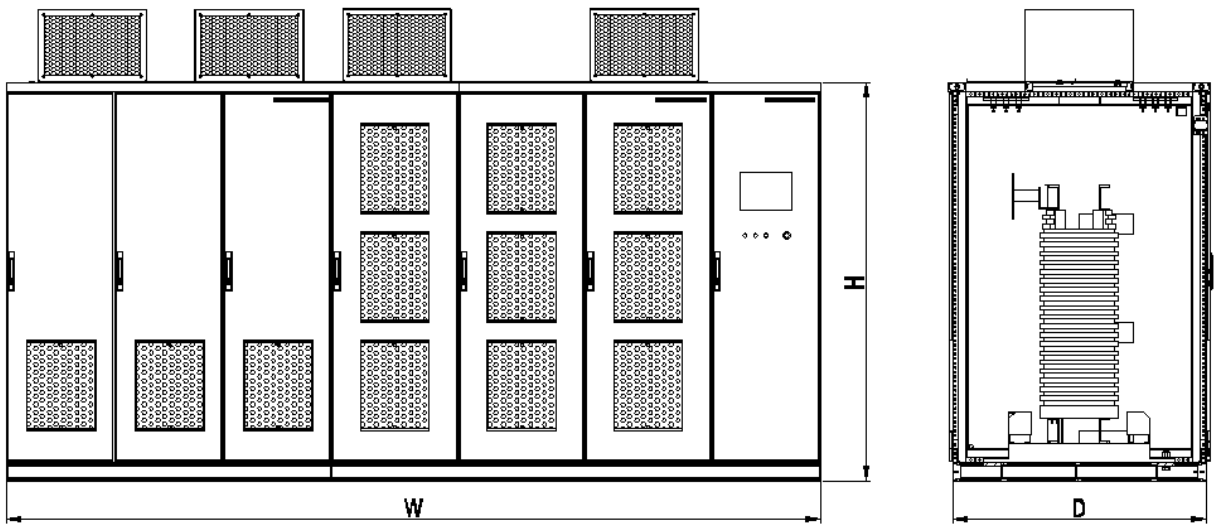


10kV 1400Series specification

Motor data			HMV drive	HMV drive data	
Voltage	Current	Power	Type mode	Width*Depth*Height	Weight
kV	A	kW	Standard	mm*mm*mm	kg
10	40	500	HMV1400-10/40	4600*1400*2700	6200
10	45	560	HMV1400-10/45	4600*1400*2700	6400
10	50	630	HMV1400-10/50	4600*1400*2700	6400
10	55	710	HMV1400-10/55	4600*1400*2700	6700
10	60	800	HMV1400-10/60	4600*1400*2700	6900
10	70	900	HMV1400-10/70	4600*1400*2700	7500
10	75	1000	HMV1400-10/75	4600*1400*2700	7500
10	90	1120	HMV1400-10/90	5200*1600*2900	8500
10	100	1250	HMV1400-10/100	5200*1600*2900	8500
10	110	1400	HMV1400-10/110	5200*1600*2900	8900
10	120	1600	HMV1400-10/120	5200*1600*2900	9300
10	135	1800	HMV1400-10/135	5200*1600*2900	9500
10	150	2000	HMV1400-10/150	5200*1600*2900	10900
10	170	2240	HMV1400-10/170	6800*1600*2900	11500
10	200	2500	HMV1400-10/200	6800*1600*2900	11500
10	225	2800	HMV1400-10/225	6800*1600*2900	11600
10	250	3150	HMV1400-10/250	6800*1600*2900	19000
10	280	3550	HMV1400-10/280	6800*1600*2900	19800
10	300	4000	HMV1400-10/300	6800*1600*2900	20400
10	330	4500	HMV1400-10/330	13000*1600*3100	22000
10	360	5000	HMV1400-10/360	13000*1600*3100	22000
10	410	5600	HMV1400-10/410	13000*1600*3100	22000
10	450	6300	HMV1400-10/450	13000*1600*3100	23000
10	550	7100	HMV1400-10/550	13000*1600*3100	27000
10	600	8000	HMV1400-10/600	13000*1600*3100	29000

Note:

1) Please contact HNC for other combinations of input and output voltage.
2) For higher drive capacity please contact HNC.
3) The specification is only suitable for 10kV standard air cooling drive, for water cooling system please contact HNC.
4) The above chart and picture only contain the main drive unit, no by-pass cabinet and optional parts are included.
5) Product dimensions, weights and other data listed here are for reference only, the actual data shall subject to the final design drawings.



HMV 1000 - Installation

In order to ensure stable and reliable operation over the entire long lifetime of the VFD, attention should be paid to maintaining the correct environmental conditions.

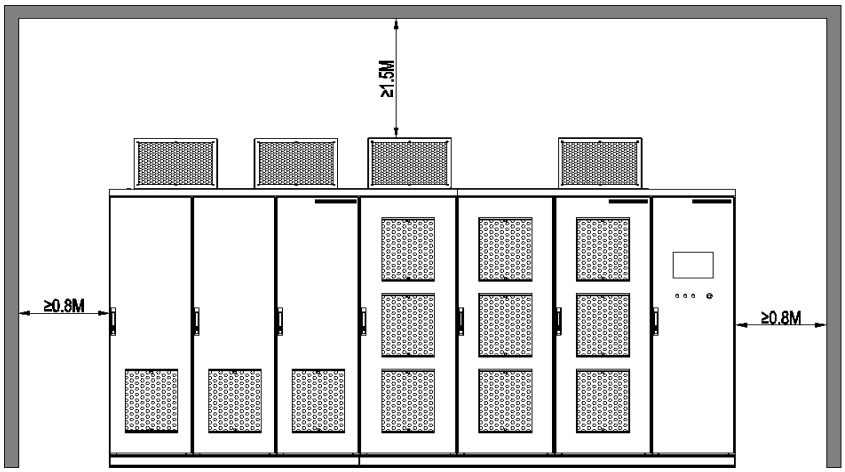
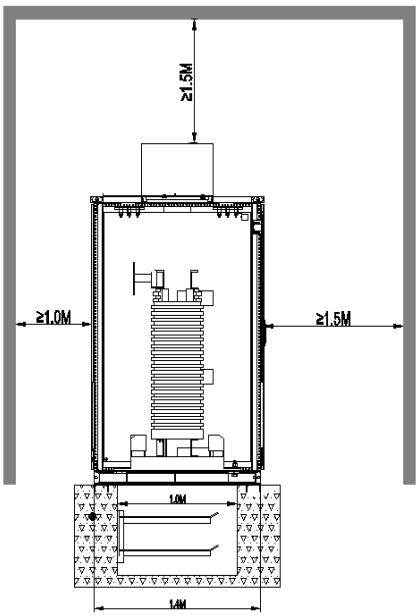
Environmental conditions

- Ambient temperature: 5~40°C
- Transportation / Storage temperature: -25°C~55°C
- Relative humidity: less than 95%, no condensation
- Free of corrosive gas or liquids
- Air supply free of dust and metallic dust
- Low levels of electric and magnetic field strength and of radiation
- Low levels of vibration

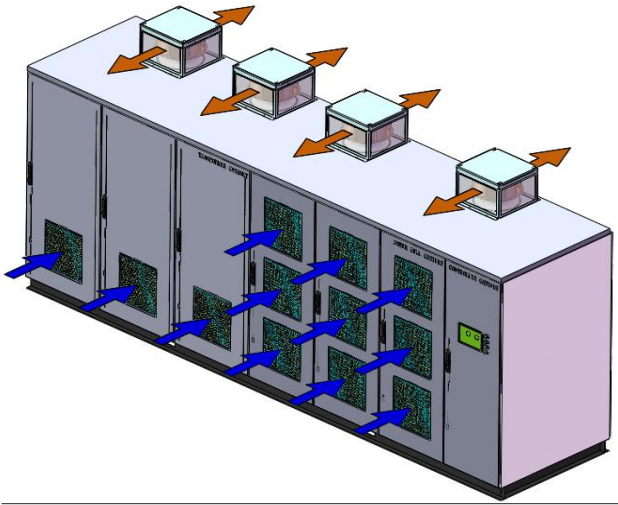
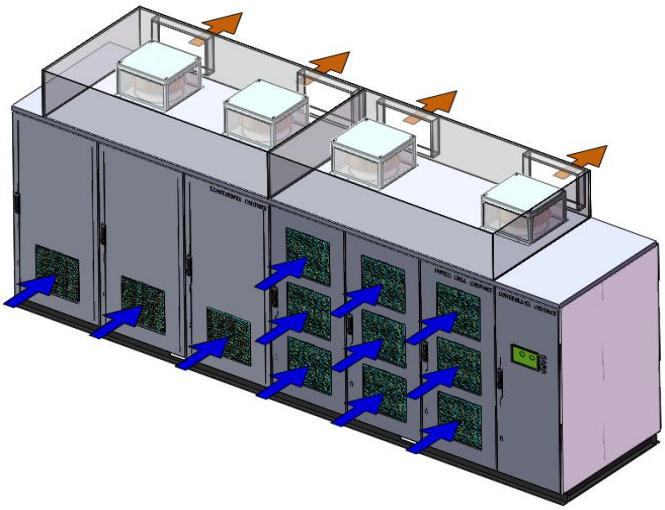
Installation space

It is important to allow sufficient space around the VFD for heat dissipation, air circulation and convenient routine maintenance.
Please ensure that the following clearances are maintained as a strict minimum:

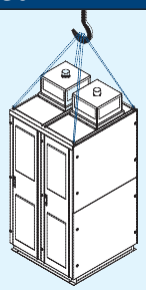
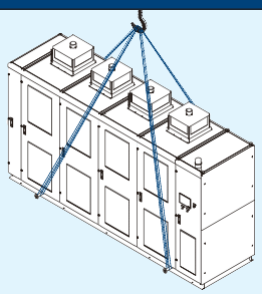
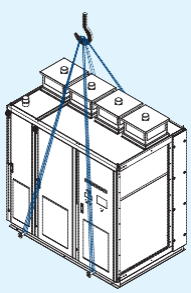
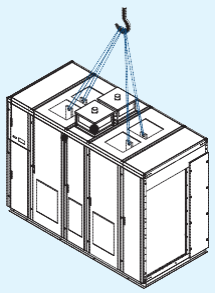
Diagram showing the installation space requirement.

View from front	View from side
	
• Top of the cabinets to the ceiling 1.5m • Space behind all of the cabinets to the rear wall 1.0m • Space between cabinet sides and adjacent walls 0.8m • Space in front of drive cabinets is at least 1.5m	

Construction of duct for extracted air (optional)

Sketch of standard ventilation method	Sketch of optional duct for extracted air
	

Lifting methods

Lifting methods	Power and control cabinet	Lifting methods	Transformer
The width of the power cabinet and control cabinet sections for lifting must not exceed 900mm.		Here, the width of power cabinet and control cabinet section exceeds 900mm and is not allowed without a “spreader bar”.	
Where the size of transformer does not exceed 3500kVA, the cabinet may be lifted normally.		Where the size of transformer exceeds 3500kVA, use should be made of lifting rings which are fixed directly to the transformer and accessible by removing the access covers provided in the roof of the cabinet.	

HMV 1000 - Note

Standard MV drive-HMV1000

Specialized MV drive-HMV2000

Super Power MV Drive-HMV3000

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Drive technology and
power quality

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