



MVD1000/MVD2000 Medium Voltage Drives



<http://www.deltaww.com/Products/CategoryListT1.aspx?CID=060103&PID=ALL&hl=en-US>



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Delta built the solar system for the National Stadium holding the 2009 World Games.

Delta Electronics Group

Delta was founded in 1971 and has been the global leader in switching power supply solutions since 2002 and DC brushless fans since 2006.

Delta offers the most energy efficient power products in the industry, including switching power supplies with efficiency over 90%, telecom power with up to 97.5%, and PV inverters with up to 98.8% efficiency. We have also developed the world's first server power supply certified as 80 Plus Titanium with over 96% efficiency. We commonly invest 6% to 7% of our annual sales revenues in R&D and have worldwide R&D facilities in Taiwan, China, Europe, India, Japan, Singapore, Thailand, and the U.S.

Delta is a frequent recipient of international awards and related recognition for innovation, design, and corporate social responsibility. Since 2011, Delta has been selected each year for the prestigious Dow Jones Sustainability™ World Index (DJSI World). In 2015 we were also included in the DJSI Emerging Markets Index and ranked first among 45 leading companies in the Electronic Equipment, Instrument and Component sector.

Delta was also included in to the Climate Disclosure Leadership Index (CDLI) of the 2015 CDP (formerly the Carbon Disclosure Project). Delta continues its dedication to developing technologies and solutions global warming and ensures a sustainable future for mankind.

For more information about Delta Group, please visit: www.deltaww.com

Why Drives Matter

Drives can save more than 40% of the electricity consumption of their motors and reduce related CO₂ emissions. Industry accounts for one-third of the world's electricity consumption and electric motors consume more than 65% of industrial electricity [1]. Power consumption can be reduced significantly if drives are used for the speed regulation of the motors. The impact on the electric grid on the startup current is reduced. The wear of the motor and other machinery are mitigated and the maintenance fee is lowered. A high-performance, reliable drive such as Delta's MVD1000 medium voltage drive can provide an enterprise with substantial energy savings as well as increased productivity of the equipment.

[1] "Energy Efficient Motor Driven Systems," European Copper Institute, Fraunhofer-ISI, KU Leuven and University of Coimbra (April 2004)

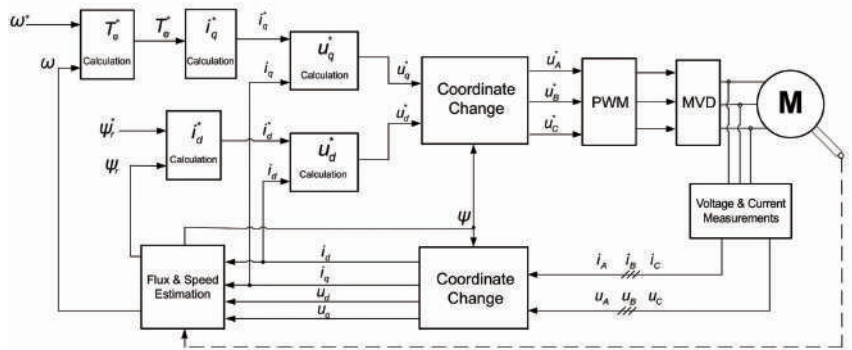
Delta MVD1000/MVD2000 Series

Delta Electronics's medium voltage drive is developed with cutting-edge technologies including power circuits, optimized control methods and advanced vector control algorithm for the motor. The drive is based on the newest IGBT devices to enhance reliability and efficiency. Easy of maintenance, safe operation, easy interface, and various options for communication with the process controller are among the major features offered to customer that reduce operation costs.

The MVD1000 series is a general-purpose drive that provides open-loop V/F motor control. It is a device widely used for motor control that requires high product integration and superior performance. MVD1000 is suitable for square torque applications such as fans, pumps and centrifugal compressors. It provides remarkable speed regulation operation and helps customers to increase productivity, reduce energy consumption and extend equipment operation lifetime.

The MVD2000 series delivers advanced motor vector control, including with and without encoder. It is suitable for constant torque applications such as crushers, extruders and conveyors.

The ability to decoupling motor flux and speed yields fast dynamic response to load fluctuations and high torque at low speeds, including at motor start-up. The drive achieves stable motor operation and accurate speed control so that it can be used for applications with higher requirements.



Vector control structure diagram



System appearance
 More compact and
 economical with easy
 installation and maintenance



Exceptional Performance

Leading technology

- Multi-pulse phase-shifting rectification technology reduces grid current harmonic content effectively and meets IEEE 519- 1992
- Multi-level inverter technology supplies nearly sinusoidal motor voltages, eliminating output filter and making it suitable for long cable applications
- Advanced control functions enhance adaptability against instable grids. Advanced vector control technologies with and without speed sensors are used for higher motor control performance (MVD2000)
- Advanced auto tuning of motor parameters, DC braking, power loss ride through and seamless motor synchronous transfer from drive to grid and vice-versa (MVD2000)
- Coordination and control of multiple drives fulfill different application requirements (MVD2000)

Complete protection features

- Over-current protection
- Over-load protection
- Transformer high-temperature alarm and over-temperature protection
- Power cell over-temperature protection
- Under-voltage and over-voltage protection
- Motor protection via external signals
- Cooling fan abnormal alarm
- Cabinet door open protection
- Cabinet air pressure alarm
- Output short-circuit protection
- Input/output phase loss protection
- Communication failure protection
- Output grounding fault protection

Enhanced Process & Quality Control

- Power loss ride through and flying start features ensure a more uninterrupted operation in spite of temporary power loss
- Easily integrated with customer's upper level control system
- Additional protection against motor stall, reverse rotation direction, over- and under-speed contribute to operation safety (MVD2000)

Control and monitoring features

- Frequency command, operating frequency (Hz) (MVD1000)
- Speed command, operating speed (rpm) (MVD2000)
- Input/output power, current, voltage
- Accumulated running time
- MVD status
- Status of system bypass switches and user upstream switchgear
- Programmable analog I/Os
- Alarms and faults
- Event log

Lower cost of ownership

- System efficiency is higher than 98.5% (excluding phase-shift transformer), which decreases operating costs
- Optimized fan and pump operations ensure energy savings and shorten the investment payback time
- Easy to install, integrate in the user's process and easy to maintain
- Smooth speed control decreases mechanical stress, eliminates pipe-hammer effects and reduces maintenance costs
- Multilevel voltage output and starting current control reduce impacts on the motor
- Seamless motor transfer from MVD output to grid and vice-versa makes it possible to implement soft starter of single and multiple motors

Major Applications

Thermal power generation	Coal mill, induced draft fan, forced draft fan, primary air fan, desulfurization booster fan, condensation pump, feed water pump, circulation water pump
Metallurgy	Conveyor belt (with brake), gas compressor, dust removal fan, blast furnace blower, centrifugal feed pump, volumetric pump, phosphorus removal pump, boiler feed water pump
Mining	Crusher, grinding mill, conveyor belt (with brake), volumetric pump, ventilation fan, feed pump, drain pump
Petrochemical & gas	Compressor, volumetric pump, centrifugal pump, feed water pump, induced draft fan, main channel pump, oil pump, kiln head exhaust fan, submersible pump head/tail exhaust fan, dust removal fan, rotary kiln
Cement & building materials	Crusher, grinding mill, blender, extruder, drying furnace fan, hot temperature fan, raw mill fan, kiln head/tail exhaust fan, dust removal fan, rotary kiln
Sugar and ethanol	Cane sugar mill, water pump, induced draft fan
Rubber	Burner blower, feed water pump, dust collector, banbury mixer, extruder, conveyor belt (with brake)
Municipal engineering	Chiller, cooling tower, water supply pump, water intake pump, sewage pump, heat circulation pump, clean-up pump, aeration pump, clean water pump, air compressor

Energy Saving Case Study

Application: MVD retrofit for induced draft fan

Motor specifications		Fan specifications	
Rated power	710 kW	Shaft power	631 kW
Rated voltage	6600 V	Rated flow	144817 m ³ /hr
Rated frequency	60 Hz		
Pole number	6 pole		
Rated current	77.6 A		
Rated speed	1185 rpm		

	Damper air flow control	MVD air flow control
Air flow (m ³ /hr)	96,554	96,544
Motor speed (rpm)	1,185	592
Operating frequency (Hz)	60	35
Grid-side current (A)	44	20
Hourly power consumption (kW/hr)	402	183
Hourly energy saving (kW/hr)		219
Annual energy saving rate (%)		54%



MVD1000/MVD2000 Advantages

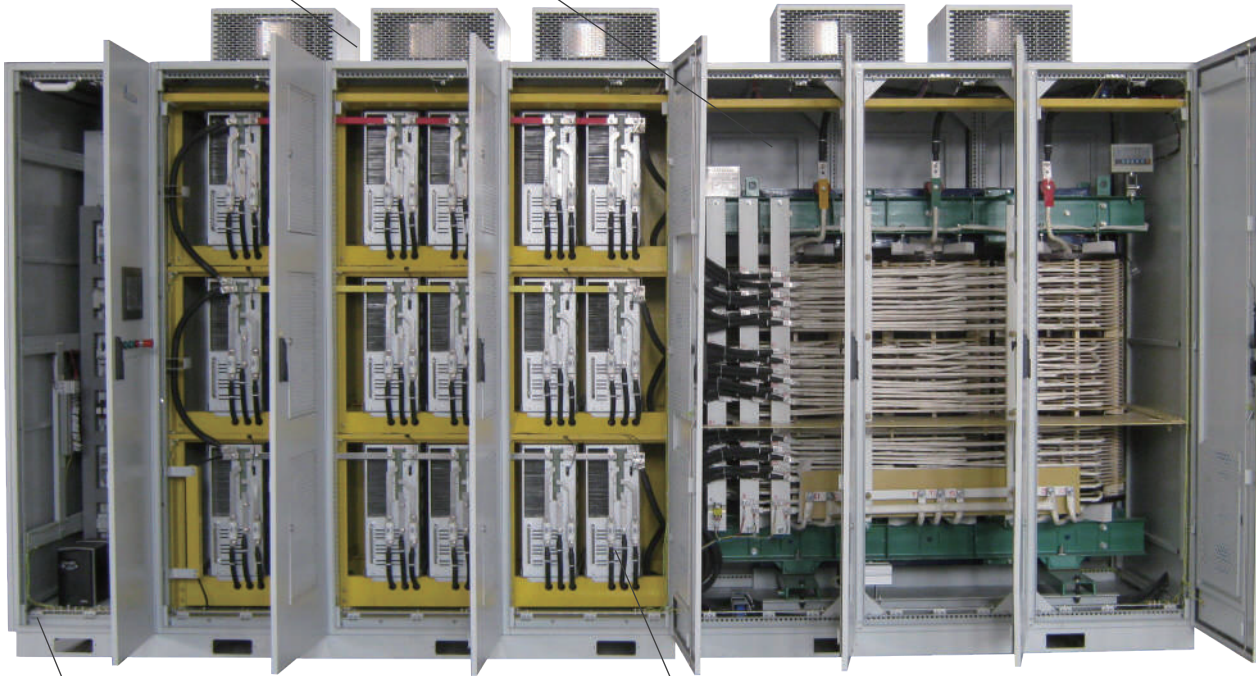
The MVD1000/MVD2000 series of medium voltage drives are convenient to operate and easy to maintain. It supports numerous communication interfaces commonly used by industry that can be easily integrated with peripheral control systems.

System cooling fans

- Effective air-cooling design
- Easy maintenance

Transformer cabinet

- The transformer secondary windings provide isolated phase-shifted power for improved input current waveforms and lower grid current harmonic distortion



Controller cabinet

- Touch screen display for system monitoring and parameter setting
- High performance DSP for reliable control
- Analog and digital signal I/Os for different types of applications
- UPS

Power cell cabinet

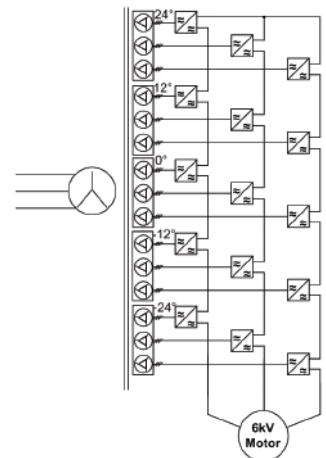
- Modular power cell allows easy replacement and maintenance
- Optical fiber between low voltage and high voltage sections

MVD1000/MVD2000 Topology

- Modular and flexible series-connected power cells achieve different multilevel working motor voltages
- Extremely low harmonic contents of motor and grid currents
- Fast transient response and a wide range of motor power
- N+1 power cell redundancy configuration (optional)

Drive series	Cells/Phase	Input rectification pulse
3.3 kV	3/4	18/24
4.16 kV	4/5	24/30
6 kV	5/6	30/36
6.6 kV	5/6	30/36
10 kV	8/9	48/54
11 kV	9/10	54/60

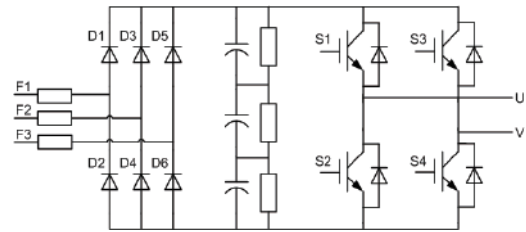
* Refer to the system model name description for other voltage levels.



Power Cell Topology

The power cell inputs are connected to 3-phase low voltage transformer secondary windings, while the outputs are connected in series to build up the required motor working voltage. A three-phase diode rectifier charges the DC link capacitor, which supplies the H-bridge single phase inverter circuit formed by four IGBTs.

The power cells receive the control signal through optical fiber to control the on/off states of IGBTs S1~S4 via PWM regulation. The resulting output of each power cell is a single phase pulse modulated waveform.



Power Cell Characteristics

- Optional power cell bypass ensures that any failed power cell can be bypassed to keep the system in operation until maintenance can be schedule. This function increases the system availability effectively and reduces downtime.
- Modular design for effective reduction of installation and maintenance time.



Enhanced Input/Output Power Quality

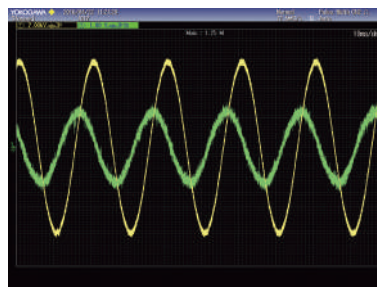
Meets IEEE-519 for input and output voltages and currents.

Input

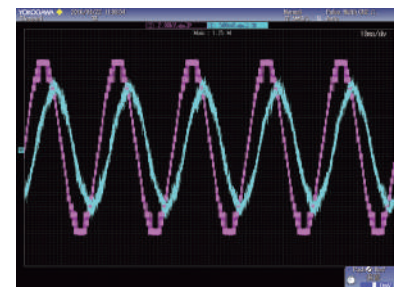
- The transformer efficiency is increased
- The grid voltage quality is not affected
- No extra input filter required

Output

- No extra output filter required
- No need for motor derating operation
- Low dv/dt interference, avoids damaging insulation of the motor and cables
- No torque ripple resulting from harmonics
- Suitable for long cable applications



Line input voltage (yellow) and current (green)



Output voltage (purple) and current (blue)

MVD1000/MVD2000 Series

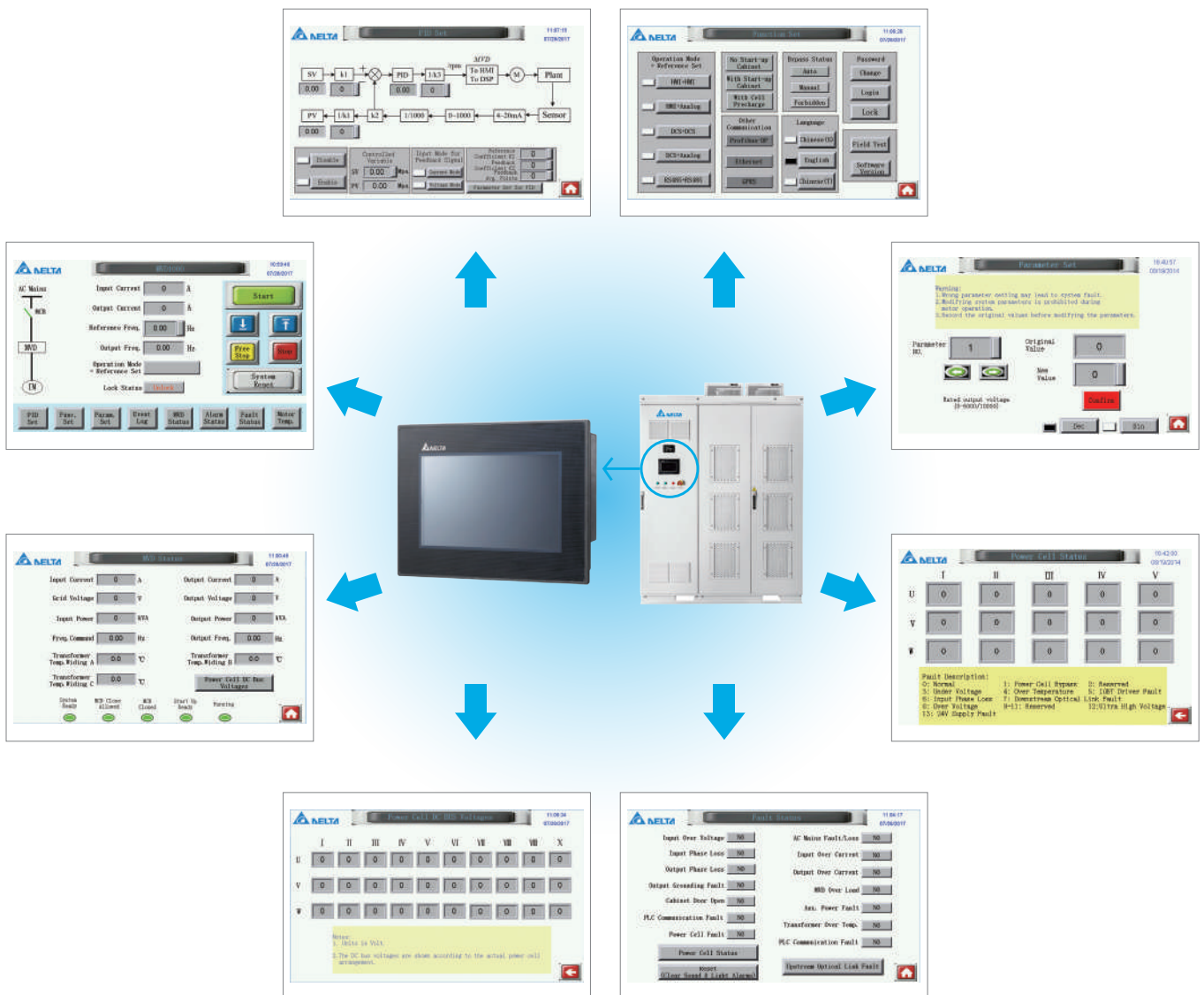
Specifications & Parameters

	MVD1000	MVD2000
Input frequency	50 Hz / 60 Hz (-5% ~ 5%)	
Control power	Single phase AC220 V; power capacity 5 kVA (Design upon customer request)	
Input current harmonics	<<5% (rated)	
Input voltage harmonics	<5% (rated)	
Input power factor	>0.96 (rated)	
System efficiency	>98.5% (rated, excluding transformer)	
Output voltage range	3.3 kV~11 kV (Refer to the system model name for other voltage levels.)	
Output frequency range	0~75 Hz	
Frequency resolution	0.01 Hz	
Overload capacity	120% for 1 min every 10 min; 150% stop immediately (Please contact Delta for other overload capacity requirements)	
Starting torque	Rated torque (torque boost function can be configured to increase starting torque)	Above 120% rated torque
Control methods	V/F open-loop control	Vector control with speed sensor; vector control without speed sensor
Speed control range	Not defined (open loop)	1%~100% (with speed sensor); 5%~100% (without speed sensor)
Speed control resolution (stable state)	N/A	±0.01% (with speed sensor, depending on speed sensor accuracy); ±0.5% (without speed sensor)
Speed response bandwidth	N/A	60 rad/s (with speed sensor); 20 rad/s (without speed sensor)
Current response bandwidth	N/A	600 rad/s
PID function	Built-in PID regulator available with programmable parameters	
Modulation method	SPWM/SVPWM	
Acceleration & deceleration time	0~3000 s (programmable)	
Alarms	Power cell under-voltage, analog signals loss, cooling fan over-temperature, cooling fan power supply failure, air flow over-pressure, air flow under-pressure, control power loss, transformer high-temperature, HMI communication failure, input under-voltage, UPS failure, PLC communication failure, flying start failure	
Protections	Over-current, over-load, short-circuit, over-voltage, phase loss, high-voltage input, output grounding fault, transformer over-temperature, power cell communication failure, high-voltage cabinet door open, control power fault, external fault, motor stall protection. Additional protection for MVD2000 include over-speed protection, under-speed protection, reverse rotation protection	
Control functions	Torque boost, multi-point V/F control, automatic output voltage regulation, frequency skipping, flying start, power loss ride through, automatic restart, soft stall, power cell bypass (optional), system bypass (optional), synchronous transfer switch (optional), fan redundancy (optional)	Speed skipping, flying start, power loss ride through, automatic restart, DC braking, jogging, S-curve acceleration and deceleration, auto tuning of motor parameters, power cell bypass (optional), system bypass (optional), synchronous transfer switch (optional), master-slave control (optional), fan redundancy (optional)
Analog inputs	0~10 V / 4~20 mA, 2 sets (expandable)	
Analog outputs	0~10 V / 4~20 mA, 4 sets (expandable)	
Digital I/Os	10 sets input, 8 sets output (expandable), dry contact type	
Human machine interface	7 inch Chinese/English touch-screen; larger sizes available	
Communication (optional)	Modbus RTU/ASCII (RS485), Modbus TCP/IP (Ethernet), Profibus-DP, DeviceNet, CANopen, GPRS	
Ambient temperature	-5 °C~40 °C (normal operation); 40 °C~50 °C (continuous running at derating speed)	
Storage/transportation temperature	-40 °C~70 °C	

Ambient humidity	5%~95%, no condensation
Altitude	< 1000 m, normal operation; 1000-2000 m, derating operation; > 2000 m, special design upon request
Cooling	Forced air cooling
Optional configuration	Space heater, surge arrester, fan redundancy, temperature module, input power meter
System bypass (optional)	Manual bypass, automatic bypass, synchronous transfer
Protection level	IP30 standard; IP42 optional
Standards and certifications	IEC, IEEE, GB, CE, GOST
Color	RAL7035 (Design upon customer request)

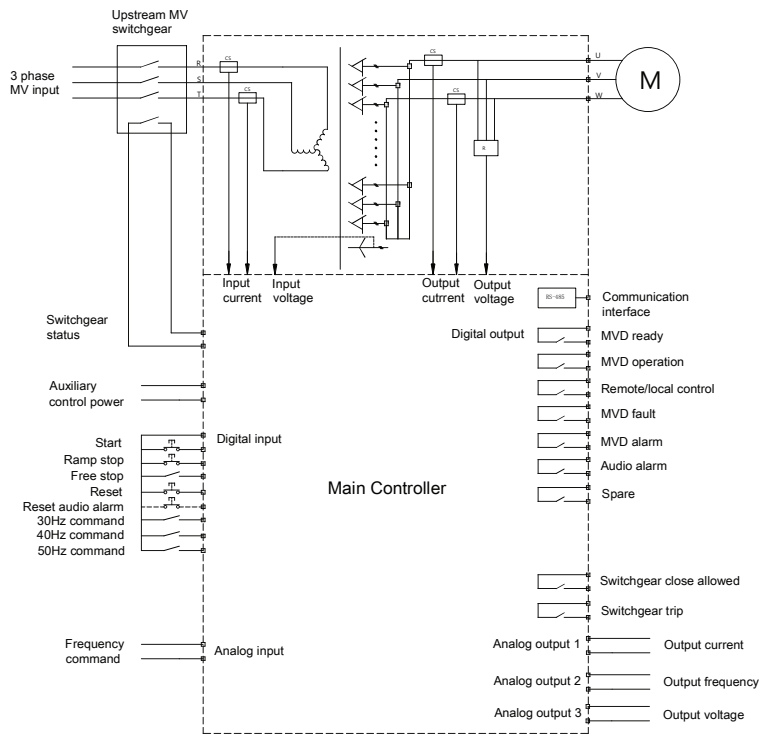
Human-Machine Interface

The HMI (Human-Machine Interface) is installed with a high resolution touch screen and is easy to operate. It can communicate through PLC to complete function parameter settings, display and record system status, operating status, error and so on. There is a password lock function in the user interface, which is only accessible to the authorized operator to ensure operation security.



Wiring Diagram

MVD I/O can be set according to customer request. The standard interface is as below:




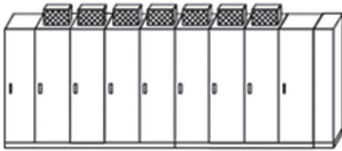

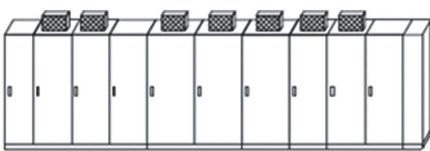
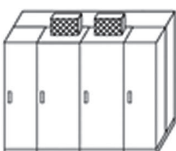

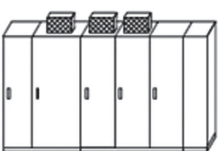

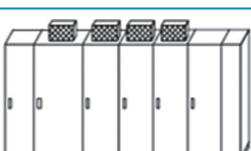
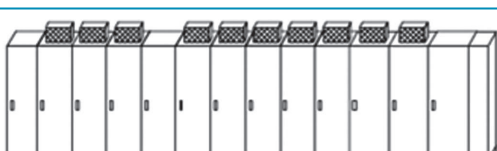
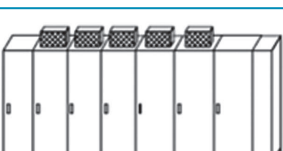
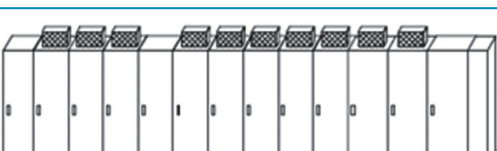
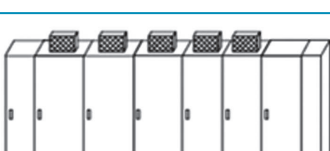
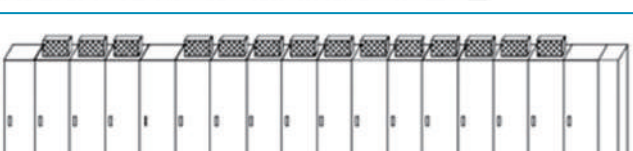
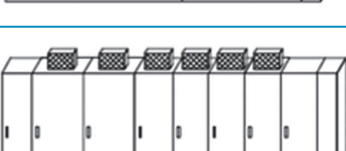
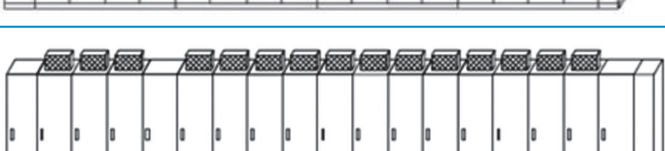
System Bypass Diagram

• Optional features: manual bypass, automatic bypass and synchronous transfer

System bypass category	Diagram
Manual bypass system	
Automatic bypass system	
Synchronous transfer system	



Standard Product Selection Table

Appearance No.	Appearance diagram	Appearance No.	Appearance diagram
I		IX	
II		X	
III		XI	
IV		XII	
V		XIII	
VI		XIV	
VII		XV	
VIII		XVI	

Voltage	Motor power	MVD model	Width	Depth	Height	Weight	Appearance	Voltage	Motor power	MVD model	Width	Depth	Height	Weight	Appearance				
kV	kW		mm	mm	mm	kg	No.	kV	kW		mm	mm	mm	kg	No.				
3.3	164	MVD□□□A036NN	2010	1400	2100	2200	I	4.16	630	MVD□□□B109NN	2110	1400	2100	3200	I				
	205	MVD□□□A045NN	2010	1400	2100	2300			690	MVD□□□B120NN	2110	1400	2100	3300					
	228	MVD□□□A050NN	2010	1400	2100	2300			778	MVD□□□B135NN	2110	1400	2100	3400					
	250	MVD□□□A055NN	2010	1400	2100	2400			864	MVD□□□B150NN	2110	1400	2100	3500					
	320	MVD□□□A070NN	2010	1400	2100	2500			900	MVD□□□B156NN	4310	1400	2400	4000					
	355	MVD□□□A077NN	2010	1400	2100	2500			1000	MVD□□□B173NN	4310	1400	2400	4200					
	411	MVD□□□A090NN	2010	1400	2100	2600			1037	MVD□□□B180NN	4610	1400	2400	4500					
	450	MVD□□□A098NN	2010	1400	2100	2700			1095	MVD□□□B190NN	4610	1400	2400	4600					
	500	MVD□□□A109NN	2010	1400	2100	2800			1250	MVD□□□B217NN	4610	1400	2400	5200					
	548	MVD□□□A120NN	2010	1400	2100	2900			1296	MVD□□□B225NN	4610	1400	2400	5300					
	617	MVD□□□A135NN	2010	1400	2100	3000	1350		MVD□□□B234NN	4610	1400	2400	5300						
	685	MVD□□□A150NN	2010	1400	2100	3000	1440		MVD□□□B250NN	4610	1400	2400	5400						
	710	MVD□□□A155NN	3810	1400	2400	3200	1500		MVD□□□B260NN	4610	1400	2400	5500						
	800	MVD□□□A175NN	3810	1400	2400	3300	1556		MVD□□□B270NN	4610	1400	2400	5600						
	823	MVD□□□A180NN	3810	1400	2400	3500	1800		MVD□□□B297NN	4610	1400	2400	5900						
	868	MVD□□□A190NN	3810	1400	2400	3600	1845		MVD□□□B305NN	4610	1400	2400	6100						
	900	MVD□□□A197NN	3810	1400	2400	3700	2000		MVD□□□B330NN	4610	1400	2400	6500						
	1000	MVD□□□A219NN	3810	1400	2400	4200	2118		MVD□□□B350NN	4610	1400	2400	6600						
	1028	MVD□□□A225NN	4110	1400	2400	4300	2400		MVD□□□B396NN	6210	1400	2400	8000						
	1120	MVD□□□A245NN	4110	1400	2400	4500	2650		MVD□□□B438NN	6210	1400	2400	8400						
	1143	MVD□□□A250NN	4110	1400	2400	4600	3150		MVD□□□B520NN	6210	1400	2400	9200						
	1234	MVD□□□A270NN	4110	1400	2400	4700	3389		MVD□□□B560NN	6610	1400	2400	9800						
	1350	MVD□□□A295NN	4110	1400	2400	4800	3550		MVD□□□B586NN	6610	1400	2400	10000						
	1394	MVD□□□A305NN	4110	1400	2400	4900	4000		MVD□□□B661NN	6610	1400	2400	10600						
1500	MVD□□□A328NN	4110	1400	2400	5000	4115	MVD□□□B680NN	6610	1400	2400	11000								
1680	MVD□□□A350NN	4110	1400	2400	5100	IV	6	280	MVD□□□C033NN	2210	1500	2100	2500	VIII					
1800	MVD□□□A375NN	5210	1400	2400	6300			300	MVD□□□C036NN	2210	1500	2100	2600						
2000	MVD□□□A416NN	5210	1400	2400	6900			355	MVD□□□C042NN	2210	1500	2100	2800						
2102	MVD□□□A438NN	5210	1400	2400	7000			400	MVD□□□C048NN	2210	1500	2100	2900						
2240	MVD□□□A466NN	5210	1400	2400	7100			415	MVD□□□C050NN	2210	1500	2100	3000						
2400	MVD□□□A500NN	5510	1400	2400	7400			450	MVD□□□C054NN	2210	1600	2100	3200						
2688	MVD□□□A560NN	5510	1400	2400	7900			500	MVD□□□C060NN	2210	1600	2100	3300						
2900	MVD□□□A604NN	5510	1400	2400	8200			560	MVD□□□C067NN	2210	1600	2100	3400						
3150	MVD□□□A656NN	5510	1400	2400	8600			580	MVD□□□C070NN	2210	1600	2100	3500						
3260	MVD□□□A680NN	5910	1400	2400	9000			630	MVD□□□C075NN	2410	1600	2100	3600						
4.16	160	MVD□□□B028NN	2110	1400	2100	2300		VI	710	MVD□□□C085NN	2410	1600	2100	3600	II				
	207	MVD□□□B036NN	2110	1400	2100	2500			745	MVD□□□C090NN	2410	1600	2100	3800					
	259	MVD□□□B045NN	2110	1400	2100	2600			800	MVD□□□C096NN	2410	1600	2100	3900					
	288	MVD□□□B050NN	2110	1400	2100	2700			900	MVD□□□C108NN	2410	1600	2100	3900					
	315	MVD□□□B055NN	2110	1400	2100	2800			1000	MVD□□□C120NN	2410	1600	2100	4000					
	355	MVD□□□B062NN	2110	1400	2100	2900			1120	MVD□□□C135NN	4860	1400	2400	4900					
	403	MVD□□□B070NN	2110	1400	2100	3000			1250	MVD□□□C150NN	4860	1400	2400	5000					
	450	MVD□□□B078NN	2110	1400	2100	3100			1400	MVD□□□C168NN	4860	1400	2400	5200					
	518	MVD□□□B090NN	2110	1400	2100	3100			1495	MVD□□□C180NN	4860	1400	2400	5300					
	560	MVD□□□B097NN	2110	1400	2100	3200			1600	MVD□□□C183NN	4860	1400	2400	5300					
	4.16	160	MVD□□□B028NN	2110	1400	2100			2300	VIII	6	280	MVD□□□C033NN	2210		1500	2100	2500	III
		207	MVD□□□B036NN	2110	1400	2100			2500			300	MVD□□□C036NN	2210		1500	2100	2600	
259		MVD□□□B045NN	2110	1400	2100	2600		355	MVD□□□C042NN			2210	1500	2100	2800				
288		MVD□□□B050NN	2110	1400	2100	2700		400	MVD□□□C048NN			2210	1500	2100	2900				
315		MVD□□□B055NN	2110	1400	2100	2800	415	MVD□□□C050NN	2210			1500	2100	3000					
355		MVD□□□B062NN	2110	1400	2100	2900	450	MVD□□□C054NN	2210			1600	2100	3200					
403		MVD□□□B070NN	2110	1400	2100	3000	500	MVD□□□C060NN	2210			1600	2100	3300					
450		MVD□□□B078NN	2110	1400	2100	3100	560	MVD□□□C067NN	2210			1600	2100	3400					
518		MVD□□□B090NN	2110	1400	2100	3100	580	MVD□□□C070NN	2210			1600	2100	3500					
560		MVD□□□B097NN	2110	1400	2100	3200	630	MVD□□□C075NN	2410			1600	2100	3600					
4.16		160	MVD□□□B028NN	2110	1400	2100	2300	I	710			MVD□□□C085NN	2410	1600	2100	3600	V		
		207	MVD□□□B036NN	2110	1400	2100	2500		745			MVD□□□C090NN	2410	1600	2100	3800			
	259	MVD□□□B045NN	2110	1400	2100	2600	800		MVD□□□C096NN	2410	1600	2100	3900						
	288	MVD□□□B050NN	2110	1400	2100	2700	900		MVD□□□C108NN	2410	1600	2100	3900						
	315	MVD□□□B055NN	2110	1400	2100	2800	1000		MVD□□□C120NN	2410	1600	2100	4000						
	355	MVD□□□B062NN	2110	1400	2100	2900	1120		MVD□□□C135NN	4860	1400	2400	4900						
	403	MVD□□□B070NN	2110	1400	2100	3000	1250		MVD□□□C150NN	4860	1400	2400	5000						
	450	MVD□□□B078NN	2110	1400	2100	3100	1400		MVD□□□C168NN	4860	1400	2400	5200						
	518	MVD□□□B090NN	2110	1400	2100	3100	1495		MVD□□□C180NN	4860	1400	2400	5300						
	560	MVD□□□B097NN	2110	1400	2100	3200	1600		MVD□□□C183NN	4860	1400	2400	5300						

Voltage	Motor power	MVD model	Width	Depth	Height	Weight	Appearance	Voltage	Motor power	MVD model	Width	Depth	Height	Weight	Appearance		
kV	kW		mm	mm	mm	kg	No.	kV	kW		mm	mm	mm	kg	No.		
6	1655	MVD□□□C190NN	4860	1400	2400	5400	V	6.6	3150	MVD□□□D328NN	5160	400	2400	8800	V		
	1800	MVD□□□C206NN	4860	1400	2400	6200			3360	MVD□□□D350NN	5560	1400	2400	9300	VI		
	1960	MVD□□□C225NN	4860	1400	2400	6700			3550	MVD□□□D370NN	7310	1400	2400	11500	XI		
	2000	MVD□□□C229NN	4860	1400	2400	6800			4205	MVD□□□D438NN	7310	1400	2400	12500			
	2180	MVD□□□C250NN	4860	1400	2400	6900			5000	MVD□□□D521NN	7310	1400	2400	14000			
	2240	MVD□□□C256NN	4860	1400	2400	7000			5377	MVD□□□D560NN	7310	1400	2400	14500			
	2355	MVD□□□C270NN	5160	1400	2400	7300			6530	MVD□□□D680NN	9710	1400	2400	17500	XIII		
	2500	MVD□□□C286NN	5160	1400	2400	7500			XI	10	280	MVD□□□E020NN	2910	1500	2100	3000	III
	2660	MVD□□□C305NN	5160	1400	2400	7700					315	MVD□□□E022NN	2910	1500	2100	3100	
	2800	MVD□□□C320NN	5160	1400	2400	8000					355	MVD□□□E025NN	2910	1500	2100	3200	
	3055	MVD□□□C350NN	5160	1400	2400	8400					400	MVD□□□E029NN	2910	1500	2100	3300	
	3150	MVD□□□C360NN	7310	1400	2400	10000					450	MVD□□□E032NN	2910	1500	2100	3400	
	3550	MVD□□□C406NN	7310	1400	2400	10600					500	MVD□□□E036NN	2910	1500	2100	3500	
	3820	MVD□□□C438NN	7310	1400	2400	11000					560	MVD□□□E040NN	2910	1500	2100	3700	
	4000	MVD□□□C458NN	7310	1400	2400	11300					630	MVD□□□E045NN	2910	1500	2100	3800	
	4500	MVD□□□C515NN	7310	1400	2400	11800					690	MVD□□□E050NN	2910	1500	2100	4000	
4885	MVD□□□C560NN	7310	1400	2400	12500	800	MVD□□□E058NN	2860			1800	2100	4600				
5935	MVD□□□C680NN	9710	1400	2400	16000	XIII	900	MVD□□□E065NN			2860	1800	2100	4800			
6.6	250	MVD□□□D027NN	2210	1500	2100	2500	II	970			MVD□□□E070NN	2860	1800	2100	5000	VII	
	329	MVD□□□D036NN	2210	1500	2100	2600		1120			MVD□□□E081NN	5310	1200	2100	5100		
	355	MVD□□□D039NN	2210	1500	2100	2700		1250			MVD□□□E090NN	5310	1200	2100	5200		
	411	MVD□□□D045NN	2210	1500	2100	2800		1400			MVD□□□E101NN	5310	1200	2100	5400		
	457	MVD□□□D050NN	2210	1500	2100	3000		1600			MVD□□□E110NN	5310	1200	2100	5500		
	500	MVD□□□D055NN	2210	1600	2100	3200		1745	MVD□□□E120NN	5310	1200	2100	5700				
	560	MVD□□□D061NN	2210	1600	2100	3300		1800	MVD□□□E124NN	5860	1400	2400	6500				
	640	MVD□□□D070NN	2210	1600	2100	3500		1960	MVD□□□E135NN	5860	1400	2400	7000				
	710	MVD□□□D077NN	2410	1600	2100	3600		2180	MVD□□□E150NN	5860	1400	2400	7200				
	800	MVD□□□D087NN	2410	1600	2100	3800		2240	MVD□□□E154NN	6160	1400	2400	7300				
	823	MVD□□□D090NN	2410	1600	2100	3800		2500	MVD□□□E172NN	6160	1400	2400	7800				
	900	MVD□□□D098NN	2410	1600	2100	4000		2615	MVD□□□E180NN	6160	1400	2400	8000				
	1000	MVD□□□D109NN	2410	1600	2100	4300		2760	MVD□□□E190NN	6160	1400	2400	8200				
	1097	MVD□□□D120NN	2410	1600	2100	4500		3150	MVD□□□E216NN	6560	1400	2400	9600				
	1234	MVD□□□D135NN	4860	1400	2400	5200		3270	MVD□□□E225NN	6560	1400	2400	10000				
	1371	MVD□□□D150NN	4860	1400	2400	5400		3550	MVD□□□E244NN	6560	1400	2400	10300				
	1500	MVD□□□D164NN	4860	1400	2400	5500		3635	MVD□□□E250NN	6560	1400	2400	10400				
	1728	MVD□□□D180NN	4860	1400	2400	5700		3925	MVD□□□E270NN	6560	1400	2400	10900				
	1824	MVD□□□D190NN	4860	1400	2400	6000		4000	MVD□□□E275NN	6560	1400	2400	11000				
	2000	MVD□□□D208NN	4860	1400	2400	7100		4435	MVD□□□E305NN	6560	1400	2400	11600				
2160	MVD□□□D225NN	4860	1400	2400	7200	5000	MVD□□□E344NN	6560	1400	2400	12500						
2240	MVD□□□D233NN	4860	1400	2400	7300	5090	MVD□□□E350NN	6560	1400	2400	14200						
2400	MVD□□□D250NN	5160	1400	2400	7600	6370	MVD□□□E438NN	12210	1400	2400	19000						
2500	MVD□□□D260NN	5160	1400	2400	7800	8145	MVD□□□E560NN	12210	1400	2400	21500						
2592	MVD□□□D270NN	5160	1400	2400	8000	9890	MVD□□□E680NN	12210	1400	2400	24000						
2928	MVD□□□D305NN	5160	1400	2400	8500	III	V	VIII	XV								

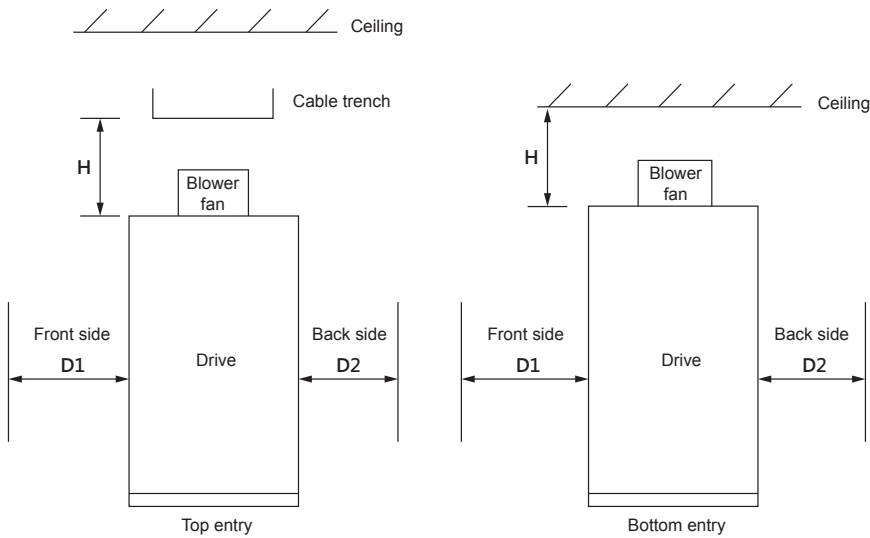
Voltage kV	Motor power kW	MVD model	Width mm	Depth mm	Height mm	Weight kg	Appearance No.	Voltage kV	Motor power kW	MVD model	Width mm	Depth mm	Height mm	Weight kg	Appearance No.	
11	315	MVD□□□F020NN	2910	1500	2100	3000	III	11	2400	MVD□□□F150NN	6410	1400	2400	8100	VII	
	355	MVD□□□F023NN	2910	1500	2100	3200			2800	MVD□□□F175NN	6410	1400	2400	8900		
	450	MVD□□□F029NN	2910	1500	2100	3300			2880	MVD□□□F180NN	6410	1400	2400	9100		
	500	MVD□□□F033NN	2910	1500	2100	3400			3040	MVD□□□F190NN	6410	1400	2400	9200	VIII	
	548	MVD□□□F036NN	2910	1500	2100	3500			3150	MVD□□□F197NN	6810	1400	2400	10600		
	630	MVD□□□F041NN	2910	1500	2100	3600			3400	MVD□□□F212NN	6810	1400	2400	10800		
	685	MVD□□□F045NN	2910	1500	2100	3800			3600	MVD□□□F225NN	6810	1400	2400	11200		
	762	MVD□□□F050NN	2910	1500	2100	4000			3800	MVD□□□F237NN	6810	1400	2400	11300		
	800	MVD□□□F052NN	2860	1800	2100	4400			4000	MVD□□□F250NN	6810	1400	2400	11800		
	900	MVD□□□F059NN	2860	1800	2100	4600			4200	MVD□□□F262NN	6810	1400	2400	12000		
	1000	MVD□□□F065NN	2860	1800	2100	4800			4320	MVD□□□F270NN	6810	1400	2400	12200		
	1066	MVD□□□F070NN	2860	1800	2100	5000			4600	MVD□□□F287NN	6810	1400	2400	12500		
	1120	MVD□□□F073NN	5510	1200	2100	5400			4880	MVD□□□F305NN	6810	1400	2400	13000		
	1250	MVD□□□F082NN	5510	1200	2100	5600			5000	MVD□□□F312NN	6810	1400	2400	13200		
	1371	MVD□□□F090NN	5510	1200	2100	5800			5600	MVD□□□F350NN	8810	1400	2400	15800		X
	1500	MVD□□□F098NN	5510	1200	2100	5900			6000	MVD□□□F375NN	12510	1400	2400	19500		XV
	1800	MVD□□□F112NN	5510	1200	2100	6300			6500	MVD□□□F406NN	12510	1400	2400	20000		
	1920	MVD□□□F120NN	5510	1200	2100	6800			7009	MVD□□□F438NN	12510	1400	2400	21000		XVI
2000	MVD□□□F125NN	6110	1400	2400	7700	7500	MVD□□□F468NN	12910	1400	2400	22000					
2160	MVD□□□F135NN	6110	1400	2400	7800	8960	MVD□□□F560NN	12910	1400	2400	24000					

Note: For motor power under 1600 kW, PF x Efficiency = 0.80, otherwise PF x Efficiency = 0.84.



System Structure

It is recommended to reserve minimum space for MVD maintenance:

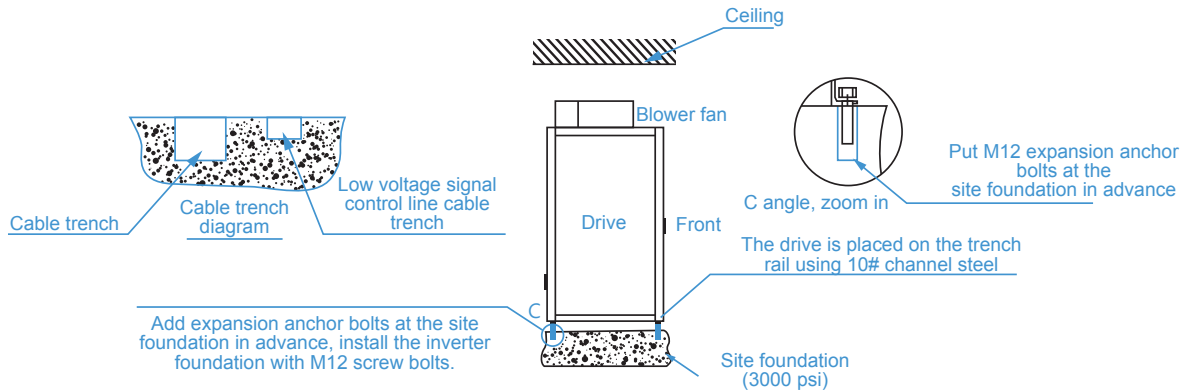


Appearance No.I~III:
 $D1 \geq 1200$, $D2 \geq 1200$, $H \geq 1000$

Appearance No.IV~XVI: Front access for maintenance only
 $D1 \geq 1500$, $D2 \geq 50$, $H \geq 1000$

(Unit: mm)

Installation Diagram



Installation Diagram

For wiring safety and convenience, it is recommended to install the MVD cabinet on a cable trench. It is not allowed to install on a flammable surface.

Detailed requirements :

1. It is recommended to set the minimum length of the cable trench as the total MVD length, adding 1 m to the left and right for easy cabling and maintenance.
2. The MVD is placed on the trench rail using 10# channel steel (use 16# channel steel if the MVD power is higher than 1600 kW and use 18# I beam steel when higher than 4000 kW).

Reliability and Certification

MVD1000/MVD2000 high reliability and quality programs are ensured through intense inspection and testing. To guarantee that the motor drive operates as predicted during commissioning, Delta Electronics has built an advanced and multi-megawatt testing facility for full load testing capability.

Advanced test equipment



PCB assembly station



MVD system test area



Power cell function test area



Central control room

International certification (factory)



ISO 9001:2015



TL9000-H/R5.5/R5.0



ISO 14001:2004



OHSAS 18001:2007



IECQ QC 080000:2012

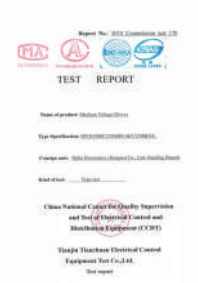
International certification (frequency converter)



GOST



CE



GB



UL

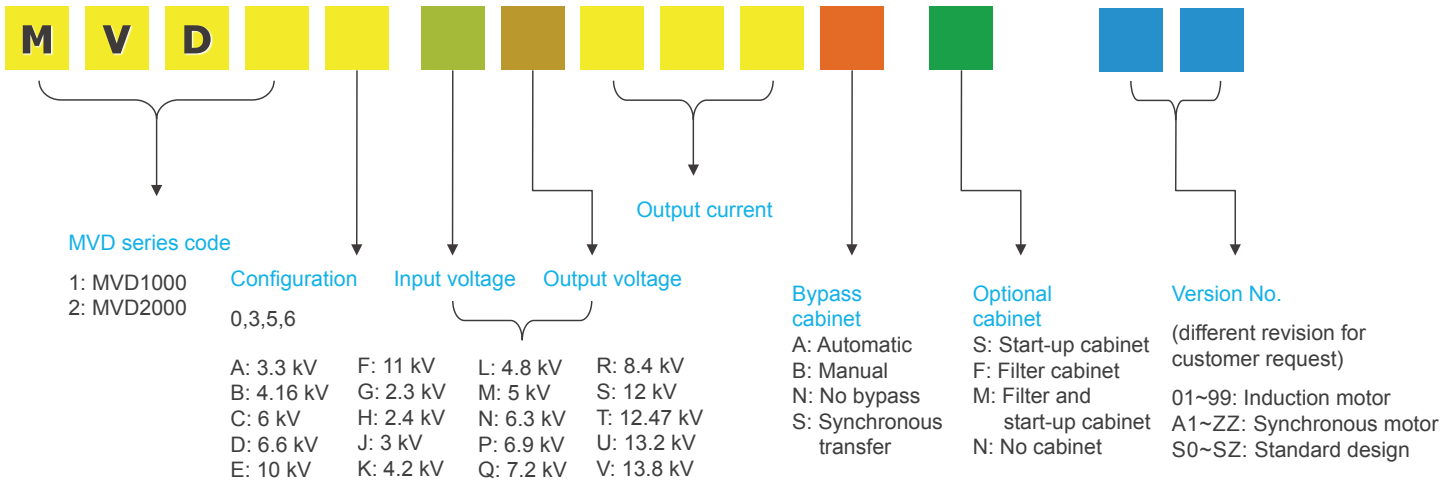
Standards

Standard	Name
IEC 60038:2009/AS 60038-2012	IEC standard voltages
IEC 60071:2014	Insulation co-ordination
IEC 60076/AS 60076/IS 2026	Power transformers - Parts 1, 3, 5, 10, 11, and 12
IEC 60146-2:1999/AS 60146.2-2001 (R2013)	Semiconductor converters - Part 2: Self-commutated semiconductor converters including direct d.c. converters
IEC 60270:2000/AS 60270-2001 (R2015)	High-voltage test techniques - Partial discharge measurements
IEC 60332-3-10:2000	Tests on electric and optical fiber cables under fire conditions - Part 3-10: Test for vertical flame spread of vertically-mounted bunched wires or cables - Apparatus
IEC 60529:2013/AS 60529-2004	Degrees of protection provided by enclosures (IP Code)
IEC 60721-3-1:1997	Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities - Section 1: Storage
IEC 60721-3-2:1997	Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities - Section 2: Transportation
IEC 60721-3-3:1996	Classification of environmental conditions - Part 3-3: Classification of groups of environmental parameters and their severities - Stationary use at weather protected locations
IEC 61000-2-4:2002/AS/NZS 61000.2.4:2009	Electromagnetic compatibility (EMC) - Part 2-4: Environment - Compatibility levels in industrial plants for low-frequency conducted disturbances
IEC 61800-3:2004/AS 61800.3-2005	Adjustable speed electrical power drive systems - Part 3: EMC requirements and specific test methods
IEC 61800-4:2002/AS 61800.4-2007	Adjustable speed electrical power drive systems - Part 4: General requirements - Rating specifications for a.c. power drive systems above 1000 V a.c. and not exceeding 35 kV
IEC 61800-5-1:2007/AS IEC 61800.5.1-2013	Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy
IEC 62271-202:2006/AS 62271.200-2005	High-voltage switchgear and controlgear - Part 202: High-voltage/low voltage prefabricated substation
IEEE 519:2014	IEEE Recommended Practice and Requirements for Harmonic Control in Electric Power Systems
IPC-6012	Qualification and Performance Specification for Rigid Printed Boards
IPC-4101	Specification for Base Materials for Rigid and Multilayer Printed Boards
IPC-TM-650	Test Methods Manual
ISO/TS 16949:2009	Quality management systems -- Particular requirements for the application of ISO 9001:2008 for automotive production and relevant service part organizations

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<http://www.deltaww.com/Products/CategoryListT1.aspx?CID=060103&PID=ALL&hl=en-US>