



# Delta MVD 1000 Series

Medium Voltage Drive



[www.deltaww.com/mvd](http://www.deltaww.com/mvd)



# Table of Content

Delta Group	01
Why Drives Matter	01
Delta MVD1000 Series	02
Advanced Features & Benefits	03
Major Applications	04
Reduced Energy Consumption & CO <sub>2</sub> Emissions	04
Typical MVD System	05
MVD 1000 Advantages	05
System Architecture	06
Power Cell Topology	06
High Input / Output Power Quality	06
Product Dimensions	07
Product Selection	08
Reliability & Certification	12
Delta MVD1000 Specifications	13
Compliance & Standards	14
Delta MVD1000 Success Application	15
Global Operations	17
System Model Names	17
Global Sales & Service	





Delta's solar energy system covers the 2009 World Games Stadium.

## Delta Group

Delta Group, founded by Mr. Bruce C.H. Cheng in 1971, is the global leader in power and thermal management solutions. Our mission statement, "To provide innovative, clean and energy-efficient solutions for a better tomorrow" focuses on our role in addressing key environmental issues such as global climate change. With our concern for the environment, we continue to develop innovative energy efficient products and solutions. Our businesses encompass power electronics, energy management, and smart green life.

Delta is devoted to innovation and systematically developing new products and technologies, particularly those that are high-efficiency and energy-saving. We invest 5% to 6% of our group's annual sales revenues in R&D and have worldwide R&D facilities in Taiwan, China, Thailand, Japan, the U.S., and Europe. Our national honors for innovation include the Taiwan National Industry Innovation Award (2008 and 2012) and the Thailand Prime Minister's Industry Award (1995, 2010, 2011, and 2012).

Throughout Delta Group's history we have received many global awards and recognitions for our business, technology, and corporate social responsibility. In 2012, for the second consecutive year, Delta was selected for two of the prestigious Dow Jones Sustainability Indexes -- the DJSI World Index and the DJSI Asia / Pacific Index. Delta was also ranked first among the 29 leading companies in the Electronic Equipment sector and named as "Sector Leader." Since 2010, Delta has received 47 internationally recognized design awards including iF, Reddot, CES Innovation, Computex Best Choice, and Taiwan Excellence Award.

Delta will continue its dedication to developing technologies and solutions that aim to reduce global warming and ensure a sustainable future for mankind.

For more information about Delta Group, please visit: [www.deltaww.com](http://www.deltaww.com).

## Why Drives Matter

Drives can save an average of 40% of the electricity a motor uses as well as reduce related CO2 emissions. Since industry accounts for one-third of the world's electricity consumption and electric motors consume 65% of industrial electricity in regions such as the EU, the potential global energy savings from a wider use of drives would be substantial. For an industrial enterprise drives can reduce energy costs, minimize wear on motors and other equipment, and reduce maintenance costs. A reliable, high-performance drive such as Delta's MVD1000 medium voltage drive can provide an enterprise with greater energy-savings as well as increased productivity.

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



# Delta MVD1000 Series



Delta medium voltage drive is a high-efficiency, compact, high reliable and energy-saving solution. According to demand of different motors and loads, Delta provides general type and vector control type MVDs, which have a broad range of applications in segments such as power generation, oil & gas, mining, metals, cement, and public facilities. MVD is used to drive medium voltage motors loaded for instance by fans, pumps, compressors, mills, crushers, mixers, and extruders. MVD provides process control, so it can increase production efficiency, reduce energy loss, improve equipment protection, and reduce maintenance cost. Delta provides customers complete solutions with easily operated variable frequency drives.



## Advanced Features & Benefits

### Leading Technology

- Multi-pulse input rectification reduces input current harmonic distortion, meeting IEEE 519-1992
- Advanced drive concept provides multilevel output voltages and enhanced motor operation
- Advanced control functions enhance adaptability against instable grid

### Protection Features

- Over current
- Over load
- Transformer over temperature
- MVD over temperature
- Under voltage / over voltage
- Motor overload (external)
- Blower fault
- High voltage cabinet door open
- Cabinet air pressure abnormal
- Output short circuit
- Input / output phase loss
- Communication fault
- Output fault to ground

### Enhanced Process & Quality Control

- Built-in proportional integral differential (PID) controller enhances control of process variables such as flow and pressure
- Ride through and flying start features ensure a more continuous process in spite of input voltage dips
- Friendly user interface provide easy-to-use system integration

### Control & Monitoring Features

- Frequency reference (Hz)
- Actual frequency (Hz)
- Input / output power / current / voltage
- Cumulative operating hours
- Drive status
- Status of system bypass switches and MCB
- Analog inputs / outputs monitoring
- Fault / Alert messages
- Fault diagnosis function
- Ride-through and flying start functions

### Lower Cost of Ownership

- System efficiency is more than 98.5% (without phase-shifted transformer)
- Optimized pump and fan operation ensure significant energy savings and short return on investment
- Integrated transformer enables a three-cable-in-three-cable-out installation concept using considerably less engineering effort
- Reduced mechanical stresses eliminate hammer effect in pipelines and vent ducts, and lowers maintenance cost
- Multilevel voltages and motor soft start minimize stresses

# Major Applications

Power Generation	Forced draft fan, induced draft fan, boiler feed-water pump, cooling water pump, compressor, circulation water pump, compressor, condensator pump
Oil & Gas	Gas compressor, electrical submersible pump, pipeline pump, brine pump, feed-water pump
Mining	Ventilation fan, baghouse fan, slurry pump, feed pump, gas compressor, blast furnace fan
Metallurgy	Forced draft fan (FDF), induced draft fan (IDF), baghouse fan, descaling pump, feed-water pump, booster pump, coiler blast, furnace fan, gas compressor
Cement	Kiln IDF, baghouse fan, separator fan, raw mill IDF
Public Facilities	FDF, IDF, raw sewage pump, freshwater pump, feed-water pump



## Reduced Energy Consumption & CO<sub>2</sub> Emissions

For many applications the MVD1000 can provide significant reductions in energy consumption and CO<sub>2</sub> emissions. The example below shows the benefits of using the MVD1000 for two forced draft fans in one of the worlds leading steel companies.

### Application: Two Forced Draft Fans (FDF) in one Chinese steel company using Delta MVDs

Specifications	FDF 1 / FDF 2
Rated fan power	4300 KW
Total hours 2010	7105 Hrs
Rated speed	890 RPM
Rated voltage	10000V
Rated motor power	4400KW
Rated current	305A
CO <sub>2</sub> emissions	0.637CO <sub>2</sub> eq/kWhr

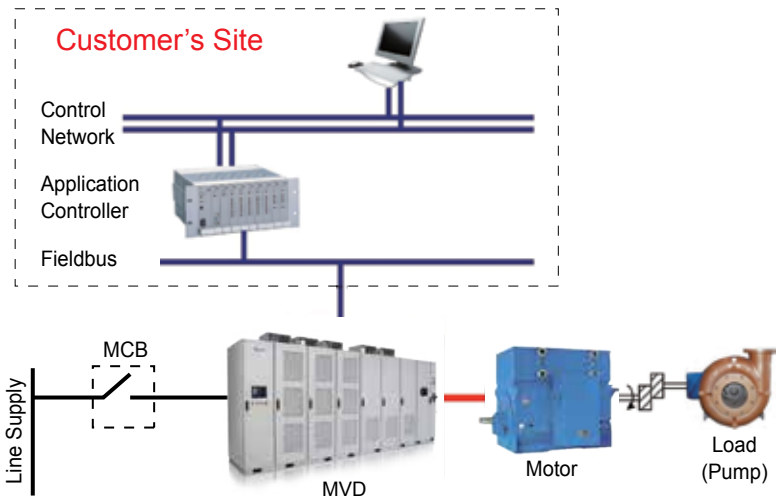
### Energy Savings Comparison (MVD vs. Damper)

Motor	FDF 1	FDF 2
Energy usage (Damper)	2311kW/yr	2350kW/yr
	16,560,255kWhr/yr	16,700,073kWhr/yr
Energy usage (MVD)	893kW/yr	968kW/yr
	6,343,167kWhr/yr	6,880,787kWhr/yr
Energy Savings	62%	59%
Savings Amount (per year)	US\$686,222	US\$659,504

### CO<sub>2</sub> Emissions Comparison (MVD vs. Damper)

Motor	FDF 1	FDF 2
Damper	10,549 tons/yr	10,638 tons/yr
MVD	4,041 tons/yr	4,383 tons/yr
Reduction	6,508 tons/yr	6,255 tons/yr
	62%	59%

# Typical MVD System



## Delta MVD1000 Advantages

Delta MVD1000 is easy to operate and maintain, and offers special features for integration into a broad range of applications.

### System Cooling fans

- Effective air-cooling design.
- Easy maintenance.

### Transformer Cabinet

- The transformer secondary windings provide isolated phase-shifted power for improved current waveforms and lower grid harmonic distortion.
- Cooling fans specifically mounted for transformer.



### Controller Cabinet

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

### Power Cell Cabinet

- Modular design of power cell allows easy interchange and maintenance.
- Optical interface with main controller cabinet.

### Bypass Cabinet

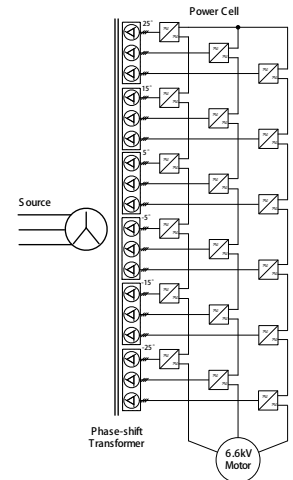
Manual or synchronous transfer bypass cabinets.



## System Architecture

- IGBT-based power cells connected in series to achieve working voltage using modular design for high flexibility and reliability
- Extremely low motor and AC line current harmonics
- Fast transient response and wide motor frequency range
- N+1 redundant power cells (option)

System voltage	Cells/Phase	Phase-shift transformer(pulses)
3.3kV	3/4	18/24
4.16kV	4/5	24/30
6kV	5/6	30/36
6.6kV	5/6	30/36
10kV	8/9	48/54
11kV	9/10	54/60



## Power Cell Topology

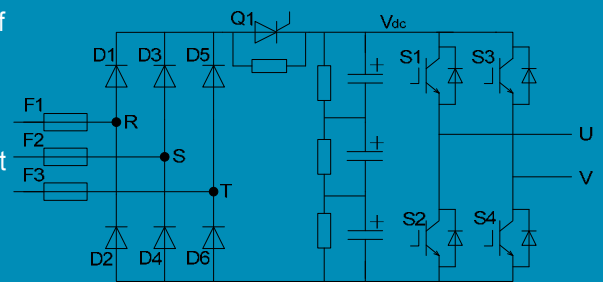
The power cell inputs are connected with the 3-phase low voltage outputs of the transformer secondary windings. A three-phase diode rectifier charges the DC link capacitor, which supplies the H-bridge single phase inverter circuit formed by 4 IGBTs. The power cells receive the PWM signal through optical fiber to control the on/off states of IGBTs S1~S4. The resulting output of each power cell is a single-phase pulse width modulated waveform.

### Power cell components

- Three phase diode rectifying circuit
- DC capacitor for energy storage
- IGBT inverting circuit
- Gate drives, control board, and auxiliary power supply

### Advantages

- Compact size
- Simple
- Easy installation and maintenance



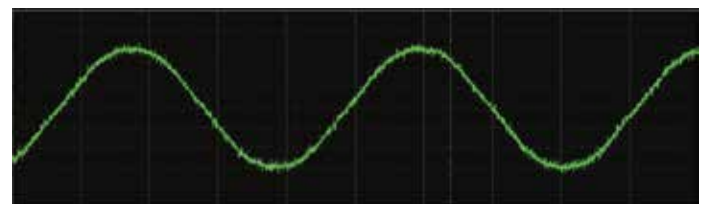
## High Input / Output Power Quality

### Low Input / Output Harmonics (6kV)

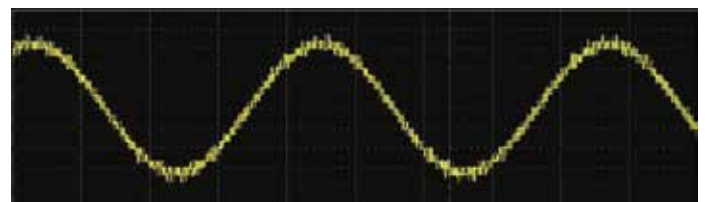
- 1.5% Output current distortion
- 0.25% Output voltage distortion
- 1.8% Input current distortion at rated load

### Almost Sine Wave Output

- No extra output filter required
- Applicable to induction or synchronous motors
- No need for motor derating operation
- Low dv/dt, avoid damaging insulation of motor and cables
- No torque ripple resulting from output harmonics
- Cable length limited by voltage drop



Output current waveform



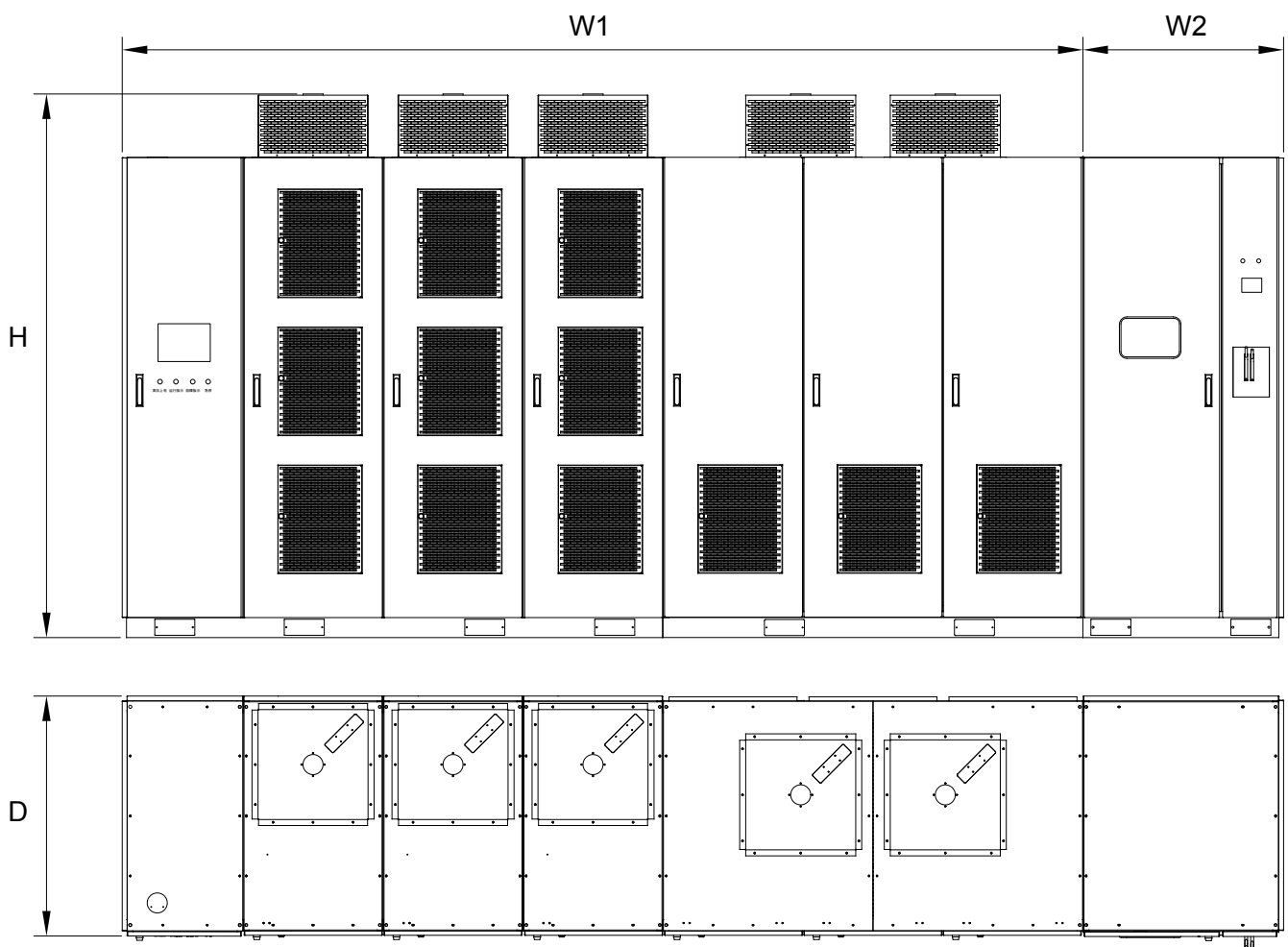
Output voltage waveform





# Production Dimensions & Selection

## MVD1000 Outline Drawings for Combination Cabinet



### MVD1000 - Combination Cabinet Selection

Rated Voltage	Motor power	MVD Model Name	H	W1	D	Weight	Bypass cabinet ( optional )	
							W2	Weight
kV	kW		mm	mm	mm	kg	mm	kg
3.3	160	MVD1□A035A□□	2480	3200	1200	1500	980	800
	200	MVD1□A045A□□	2480	3200	1200	1500	980	800
	250	MVD1□A055A□□	2480	3200	1200	1800	980	800
	315	MVD1□A070A□□	2480	3200	1200	1800	980	800
	355	MVD1□A080A□□	2480	3200	1200	2600	980	800
	400	MVD1□A090A□□	2480	3200	1200	2600	980	800
	450	MVD1□A100A□□	2480	3200	1200	2600	980	800
	500	MVD1□A110A□□	2480	3200	1200	2600	980	800
	530	MVD1□A120A□□	2480	3200	1200	3300	980	800
	630	MVD1□A140A□□	2850	3700	1400	3300	980	800
	710	MVD1□A160A□□	2850	3700	1400	3300	980	800
	800	MVD1□A175A□□	2850	3700	1400	3300	980	800
	900	MVD1□A200A□□	2850	3700	1400	4000	980	800
	1000	MVD1□A220A□□	2850	3700	1400	4000	980	800
	1120	MVD1□A245A□□	2850	3700	1400	4000	980	800
	1250	MVD1□A275A□□	2850	3700	1400	4800	980	800
	1350	MVD1□A300A□□	2850	3700	1400	4800	980	800
	1500	MVD1□A330A□□	2850	3700	1400	4800	980	800
	1800	MVD1□A375A□□	2850	4850	1400	9500	980	800
	2000	MVD1□A420A□□	2850	4850	1400	9500	980	800
2560	MVD1□A535A□□	2850	5450	1400	10500	980	800	
3110	MVD1□A650A□□	2850	6200	1400	11500	980	800	
3840	MVD1□A750A□□	2850	6200	1400	12000	980	800	
4.16	160	MVD1□B030A□□	2480	3500	1200	1600	980	800
	200	MVD1□B035A□□	2480	3500	1200	1600	980	800
	250	MVD1□B045A□□	2480	3500	1200	1600	980	800
	315	MVD1□B055A□□	2480	3500	1200	1900	980	800
	355	MVD1□B065A□□	2480	3500	1200	1900	980	800
	400	MVD1□B070A□□	2480	3500	1200	1900	980	800
	450	MVD1□B080A□□	2480	3500	1200	3000	980	800
	500	MVD1□B090A□□	2480	3500	1200	3000	980	800
	560	MVD1□B100A□□	2480	3500	1200	3000	980	800
	630	MVD1□B110A□□	2480	3500	1200	3000	980	800
	710	MVD1□B125A□□	2850	4200	1400	3800	980	800
	800	MVD1□B140A□□	2850	4200	1400	3800	980	800
	900	MVD1□B160A□□	2850	4200	1400	3800	980	800
	1000	MVD1□B165A□□	2850	4200	1400	3800	980	800
	1120	MVD1□B195A□□	2850	4200	1400	4300	980	800
	1250	MVD1□B220A□□	2850	4200	1400	4300	980	800
	1350	MVD1□B235A□□	2850	4200	1400	4300	980	800
	1500	MVD1□B260A□□	2850	4200	1400	5100	980	800
	1800	MVD1□B300A□□	2850	4200	1400	5100	980	800
	2000	MVD1□B330A□□	2850	4200	1400	5100	980	800
2400	MVD1□B400A□□	2850	5400	1400	9500	980	800	
2520	MVD1□B420A□□	2850	5400	1400	9500	980	800	
3230	MVD1□B535A□□	2850	6000	1400	10400	980	800	
3920	MVD1□B650A□□	2850	6900	1400	11600	980	800	
4840	MVD1□B750A□□	2850	6900	1400	13500	980	800	

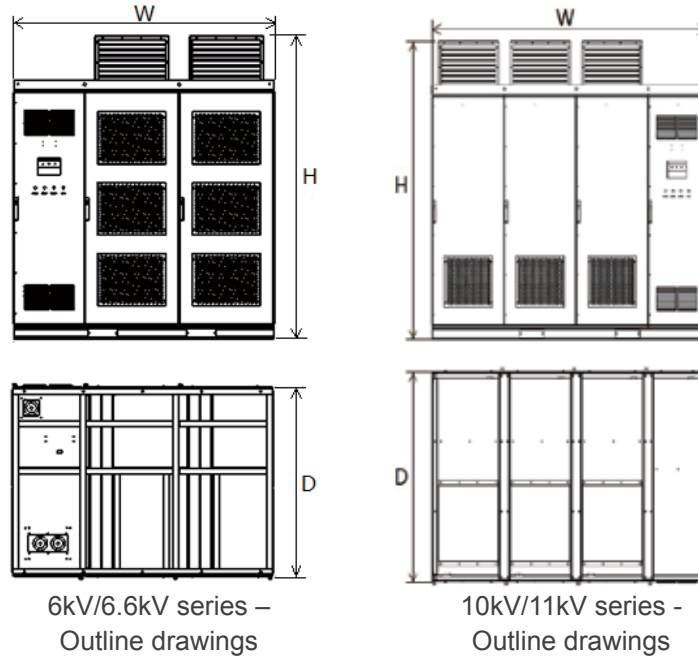
Rated Voltage	Motor power	MVD Model Name	H	W1	D	Weight	Bypass cabinet ( optional )	
							W2	Weight
kV	kW		mm	mm	mm	kg	mm	kg
6	280	MVD1□C035A□□	2480	3800	1200	2500	980	800
	315	MVD1□C040A□□	2480	3800	1200	2500	980	800
	355	MVD1□C045A□□	2480	3800	1200	2500	980	800
	400	MVD1□C050A□□	2480	3800	1200	3100	980	800
	450	MVD1□C055A□□	2480	3800	1200	3100	980	800
	500	MVD1□C060A□□	2480	3800	1200	3100	980	800
	560	MVD1□C070A□□	2480	3800	1200	3100	980	800
	630	MVD1□C075A□□	2480	3800	1200	3800	980	800
	710	MVD1□C085A□□	2480	3800	1200	3800	980	800
	800	MVD1□C100A□□	2480	3800	1200	4600	980	800
	900	MVD1□C110A□□	2480	3800	1200	4600	980	800
	1000	MVD1□C120A□□	2480	3800	1200	4600	980	800
	1120	MVD1□C135A□□	2850	4700	1400	4600	980	800
	1250	MVD1□C150A□□	2850	4700	1400	5900	980	800
	1400	MVD1□C170A□□	2850	4700	1400	5900	980	800
	1600	MVD1□C185A□□	2850	4700	1400	7400	980	800
	1800	MVD1□C210A□□	2850	5000	1400	7400	980	800
	2000	MVD1□C230A□□	2850	5000	1400	7400	980	800
	2240	MVD1□C260A□□	2850	5000	1400	7800	980	800
	2500	MVD1□C290A□□	2850	5000	1400	7800	980	800
	2800	MVD1□C320A□□	2850	5000	1400	7800	980	800
3150	MVD1□C360A□□	2850	7180	1400	10500	980	800	
3550	MVD1□C410A□□	2850	7180	1400	10500	980	800	
3640	MVD1□C420A□□	2850	7180	1400	10500	980	800	
4660	MVD1□C535A□□	2850	8000	1400	12000	980	800	
5650	MVD1□C650A□□	2850	8000	1400	13200	980	800	
6980	MVD1□C750A□□	2850	8000	1400	14000	980	800	
6.6	250	MVD1□D030A□□	2480	3800	1200	3200	980	800
	315	MVD1□D035A□□	2480	3800	1200	3200	980	800
	355	MVD1□D040A□□	2480	3800	1200	3200	980	800
	400	MVD1□D045A□□	2480	3800	1200	3200	980	800
	450	MVD1□D050A□□	2480	3800	1200	3200	980	800
	500	MVD1□D055A□□	2480	3800	1200	3800	980	800
	560	MVD1□D065A□□	2480	3800	1200	3800	980	800
	630	MVD1□D070A□□	2480	3800	1200	3800	980	800
	710	MVD1□D080A□□	2480	3800	1200	5700	980	800
	800	MVD1□D090A□□	2480	3800	1200	5700	980	800
	900	MVD1□D100A□□	2480	3800	1200	5700	980	800
	1000	MVD1□D110A□□	2480	3800	1200	5700	980	800
	1120	MVD1□D125A□□	2850	4700	1400	6800	980	800
	1250	MVD1□D140A□□	2850	4700	1400	6800	980	800
	1350	MVD1□D150A□□	2850	4700	1400	6800	980	800
	1500	MVD1□D165A□□	2850	4700	1400	6800	980	800
	1800	MVD1□D190A□□	2850	4700	1400	6800	980	800
	2000	MVD1□D210A□□	2850	5000	1400	8300	980	800
	2240	MVD1□D235A□□	2850	5000	1400	8300	980	800
	2400	MVD1□D250A□□	2850	5000	1400	8300	980	800
	2500	MVD1□D265A□□	2850	5000	1400	9400	980	800
2900	MVD1□D305A□□	2850	5000	1400	9400	980	800	
3150	MVD1□D330A□□	2850	5000	1400	9400	980	800	
3340	MVD1□D350A□□	2850	6600	1400	9800	980	800	
4000	MVD1□D420A□□	2850	6600	1400	9800	980	800	
5120	MVD1□D535A□□	2850	7800	1400	10700	980	800	
6220	MVD1□D650A□□	2850	7800	1400	11300	980	800	
7680	MVD1□D750A□□	2850	7800	1400	12500	980	800	



Rated Voltage	Motor power	MVD Model Name	H	W1	D	Weight	Bypass cabinet ( optional )	
							W2	Weight
kV	kW		mm	mm	mm	kg	mm	kg
10	280	MVD1□E020A□□	2480	4800	1200	3800	980	800
	315	MVD1□E022A□□	2480	4800	1200	3800	980	800
	355	MVD1□E025A□□	2480	4800	1200	3800	980	800
	400	MVD1□E030A□□	2480	4800	1200	3800	980	800
	450	MVD1□E035A□□	2480	4800	1200	3800	980	800
	560	MVD1□E040A□□	2480	4800	1200	3800	980	800
	630	MVD1□E045A□□	2480	4800	1200	3800	980	800
	710	MVD1□E055A□□	2480	4800	1200	5100	980	800
	800	MVD1□E060A□□	2480	4800	1200	5100	980	800
	900	MVD1□E065A□□	2480	4800	1200	5100	980	800
	1000	MVD1□E075A□□	2480	4800	1200	5900	980	800
	1120	MVD1□E080A□□	2480	4800	1200	5900	980	800
	1250	MVD1□E090A□□	2480	4800	1200	5900	980	800
	1400	MVD1□E105A□□	2480	4800	1200	6500	980	800
	1600	MVD1□E115A□□	2480	4800	1200	6500	980	800
	1800	MVD1□E130A□□	2850	6000	1400	6500	980	800
	2000	MVD1□E140A□□	2850	6000	1400	8200	980	800
	2240	MVD1□E155A□□	2850	6000	1400	8200	980	800
	2500	MVD1□E175A□□	2850	6000	1400	8200	980	800
	2800	MVD1□E195A□□	2850	6400	1400	9700	980	800
	3150	MVD1□E220A□□	2850	6400	1400	9700	980	800
	3550	MVD1□E250A□□	2850	6400	1400	10800	980	800
	4000	MVD1□E275A□□	2850	6400	1400	10800	980	800
	4500	MVD1□E310A□□	2850	6400	1400	10800	980	800
5000	MVD1□E350A□□	2850	6400	1400	10800	980	800	
6070	MVD1□E420A□□	2850	9280	1400	13500	980	800	
7760	MVD1□E535A□□	2850	10400	1400	14000	980	800	
9420	MVD1□E650A□□	2850	11400	1400	15600	980	800	
11640	MVD1□E750A□□	2850	11400	1400	17300	980	800	
11	315	MVD1□F020A□□	2480	5100	1200	5000	980	800
	355	MVD1□F025A□□	2480	5100	1200	5000	980	800
	450	MVD1□F030A□□	2480	5100	1200	5000	980	800
	530	MVD1□F035A□□	2480	5100	1200	5000	980	800
	560	MVD1□F040A□□	2480	5100	1200	5000	980	800
	630	MVD1□F045A□□	2480	5100	1200	5000	980	800
	710	MVD1□F050A□□	2480	5100	1200	6100	980	800
	800	MVD1□F055A□□	2480	5100	1200	6100	980	800
	900	MVD1□F060A□□	2480	5100	1200	6100	980	800
	1000	MVD1□F065A□□	2480	5100	1200	6100	980	800
	1120	MVD1□F075A□□	2480	5100	1200	7500	980	800
	1250	MVD1□F085A□□	2480	5100	1200	7500	980	800
	1350	MVD1□F090A□□	2480	5100	1200	7500	980	800
	1500	MVD1□F100A□□	2480	5100	1200	7500	980	800
	1800	MVD1□F120A□□	2480	5100	1200	7500	980	800
	2000	MVD1□F135A□□	2850	6000	1400	9500	980	800
	2400	MVD1□F150A□□	2850	6000	1400	9500	980	800
	2800	MVD1□F175A□□	2850	6000	1400	9500	980	800
	3000	MVD1□F190A□□	2850	6000	1400	9500	980	800
	3150	MVD1□F200A□□	2850	6400	1400	12000	980	800
	3400	MVD1□F215A□□	2850	6400	1400	12000	980	800
	3800	MVD1□F240A□□	2850	6400	1400	12000	980	800
	4000	MVD1□F250A□□	2850	6400	1400	12000	980	800
	4200	MVD1□F265A□□	2850	6400	1400	13100	980	800
	4600	MVD1□F290A□□	2850	6400	1400	13100	980	800
	5000	MVD1□F315A□□	2850	6400	1400	13100	980	800
	5600	MVD1□F350A□□	2850	6400	1400	13100	980	800
	6000	MVD1□F375A□□	2850	9900	1400	13900	980	800
6680	MVD1□F420A□□	2850	9900	1400	13900	980	800	
8540	MVD1□F535A□□	2850	11900	1400	15000	980	800	
10360	MVD1□F650A□□	2850	12500	1400	16800	980	800	
12800	MVD1□F750A□□	2850	12500	1400	19000	980	800	

## MVD1000 Outline Drawings for All-In-One Cabinet

Subject to the medium voltage drive under the spec of 6kV/1000kW, 6.6kV/1000kW, 10kV/900kW and 11kV/1000kW, and All-In-One cabinet with various models provided for option, which the standard type are as shown below.



## MVD1000 – All-In-One Cabinet Selection

Rated Voltage	Motor Power	MVD Model Nme	H	W1	D	Weight
kV	kW		mm	mm	mm	kg
6	280	MVD13C035A□□	2490	2210	1500	3100
	315	MVD13C040A□□	2490	2210	1500	3100
	355	MVD13C045A□□	2490	2210	1500	3100
	400	MVD13C050A□□	2490	2210	1500	3100
	450	MVD13C055A□□	2490	2210	1600	3600
	500	MVD13C060A□□	2490	2210	1600	3600
	560	MVD13C070A□□	2490	2210	1600	3600
	630	MVD13C075A□□	2490	2410	1600	3800
	710	MVD13C085A□□	2490	2410	1600	3800
	800	MVD13C100A□□	2490	2410	1600	3800
	900	MVD13C110A□□	2490	2410	1600	3800
1000	MVD13C120A□□	2490	2410	1600	3800	
6.6	250	MVD13D030A□□	2490	2210	1500	3100
	315	MVD13D035A□□	2490	2210	1500	3100
	355	MVD13D040A□□	2490	2210	1500	3100
	400	MVD13D045A□□	2490	2210	1500	3100
	450	MVD13D050A□□	2490	2210	1500	3100
	500	MVD13D055A□□	2490	2210	1600	3600
	560	MVD13D065A□□	2490	2210	1600	3600
	630	MVD13D070A□□	2490	2210	1600	3600
	710	MVD13D080A□□	2490	2410	1600	3800
	800	MVD13D090A□□	2490	2410	1600	3800
	900	MVD13D100A□□	2490	2410	1600	3800
1000	MVD13D110A□□	2490	2410	1600	3800	

Rated Voltage	Motor Power	MVD Model Nme	H	W1	D	Weight
kV	kW		mm	mm	mm	kg
10	280	MVD13E020A□□	2490	2910	1500	4100
	315	MVD13E022A□□	2490	2910	1500	4100
	355	MVD13E025A□□	2490	2910	1500	4100
	400	MVD13E030A□□	2490	2910	1500	4100
	450	MVD13E035A□□	2490	2910	1500	4100
	500	MVD13E036A□□	2490	2910	1500	4100
	560	MVD13E040A□□	2490	2910	1500	4100
	630	MVD13E045A□□	2490	2910	1500	4100
	710	MVD13E055A□□	2580	2860	1800	4900
	800	MVD13E060A□□	2580	2860	1800	4900
	900	MVD13E065A□□	2580	2860	1800	4900
11	315	MVD13F020A□□	2490	2910	1500	4100
	355	MVD13F025A□□	2490	2910	1500	4100
	450	MVD13F030A□□	2490	2910	1500	4100
	530	MVD13F035A□□	2490	2910	1500	4100
	560	MVD13F040A□□	2490	2910	1500	4100
	630	MVD13F045A□□	2490	2910	1500	4100
	710	MVD13F050A□□	2490	2910	1500	4100
	800	MVD13F055A□□	2580	2860	1800	4900
	900	MVD13F060A□□	2580	2860	1800	4900
	1000	MVD13F065A□□	2580	2860	1800	4900

Note: The table above shows the standard dimensions of the MVD1000 medium voltage drive, and the final dimensions of the product will be specifically designed and determined by the technical personnel according to the requirements of the customer.

# Reliability & Certification

Delta provides quality assurance through rigorous inspection and testing based on international standards. To ensure that the drive operates as predicted upon start-up, Delta Electronics has built a state-of-the-art, multi-megawatt test facility for full load capacity and full load burn-in verification. A detailed test procedure reduces start-up time during installation and commissioning in the field.

## Advanced Testing



• High Voltage Distribution Cabinets



• Low voltage inverter (re-generation)



• Central Control Room



• Full Load Burn-in Chamber



• Thermal Chamber



• Motor-Generator Groups

## International Certification



ISO 9001:2008



ISO 14001:2004



OHSAS 18001:2007



QC 080000:2007



TL 9000 R5.0



CE(EMC)



## Delta MVD1000 Specifications

Input Frequency	50Hz/60Hz (-5%~+5%)
Control Power	AC380V (three-phase four-wire) or AC220V, 3kVA
Input current distortion	<5% (at rated speed and load, complying with IEEE 519)
Power factor	>0.96 (at rated speed and load)
Efficiency	>98% (at rated frequency and load, excluding transformer)
Frequency range	0~75Hz
Frequency resolution	0.01Hz
Overload capacity	120% for 1 min every 10 min; 150% stop immediately
PID function	Built-in PID regulator with configurable parameters
Modulation method	SPWM/SVPWM
Speed acceleration & deceleration time	0~3000s (configurable)
Function configuration	Torque boost, frequency skipping, automatic voltage regulation, failure diagnosis, flying start, system bypass, ride through, multipoint V/F control, power cell bypass (optional), space heater synchronous transfer switch (optional)
Analog inputs	0~10V / 4~20mA 2 channels (expandable)
Analog outputs	0~10V / 4~20mA 4 channels (expandable)
Digital I/Os	10 digital inputs and 8 digital outputs (expandable)
Communication interface	Isolated RS485, Industrial Ethernet (optional), GPRS (optional)
Communication protocol	MODBUS, PROFBUS, Others
Operating temperature	-5°C to +40°C (normal operation)
Storage/transportation temperature	-40 °C to +70 °C
Relative humidity	5% to 95%, non condensating
Altitude	<1000m (normal operation) derated use at higher altitude
Cooling	Forced air cooling
Protection level	IP30 (standard) others can be customized
Regulations and certification	IEC, IEEE, GB, CE, GOST



### Input Voltage:

3.3 kV~11 kV  
(-/+10%)

### Motor Shaft Power:

3.3 kV: 160~3840kW	4.16 kV: 160~4840kW
6 kV: 280~6980kW	6.6 kV: 250~7680kW
10 kV: 280~11640kW	11 kV: 315~12800kW

## Compliance & Standards

Standard No.	Standard Name
<b>GB 156-2007</b>	Standard voltages
<b>GB/T 1980-2005</b>	Standard frequencies
<b>GB/T 2423.10</b>	Electric and electronic products--Basic environmental test regulations for electricians--Guidelines for vibration (sine)
<b>GB/T 2681</b>	Colors of insulated conductors used in electrical assembly devices
<b>GB 2682</b>	Colors of indicator lights and push-buttons used in electrical assembly devices
<b>GB/T 4588.1-1996</b>	Specification for single and double sided printed boards with plain holes
<b>GB/T 4588.2-1996</b>	Sectional specification: Single and double sided printed boards with plated-through holes
<b>GB 7678-87</b>	Semiconductor self-commutated converters
<b>GB/T 10233-2005</b>	Basic test method for electric-driven control gear assemblies
<b>GB 12668-90</b>	General specification for speed control assembly with semiconductor adjustable frequency for A.C. motor
<b>GB/T 15139-94</b>	General technical standard for electrical equipment structure
<b>GB/T 13422-92</b>	Power semiconductor converters--Electrical test methods
<b>GB/T 14549-93</b>	Quality of electric energy supply harmonics in public supply network
<b>IEEE 519-1992</b>	IEEE recommended practices and requirements for harmonic control in electrical power systems
<b>GB/T 12668.4-2006</b>	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
<b>GB/T 3797-2005</b>	Electric-driven control gear-Part 2: Electric-driven control gear incorporating electronic devices
<b>GB/T 2900.18-2008</b>	Electrotechnical terminology--Low voltage apparatus (eqv IEC60050-441:1984)
<b>GB/T 3859.1-93</b>	Semiconductor converters. Specification of basic requirements--eqv IEC60146-1 -1:1991)
<b>GB/T 3859.2-93</b>	Semiconductor converters. Application guide (eqv IEC60146-1-2:1991)
<b>GB/T 3859.3-93</b>	Semiconductor converters. Transformers and reactors (eqv IEC 60146-1-3,1991)
<b>GB 4208-2008</b>	Degrees of protection provided by enclosures (IP Code) (eqv IEC 60529:1989)
<b>GB/T 16935.1-2008</b>	Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests (idt IEC 60664-1-1992)
<b>IEC 60038:1983</b>	IEC Standard voltages
<b>IEC 60050-151:2001</b>	International electrotechnical vocabulary, chapter 151: electrical and magnetic devices.
<b>IEC 60050-551:1999</b>	International Electrotechnical Vocabulary. Chapter 551: Power electronics.
<b>IEC 60076</b>	Electric power transformer
<b>IEC 60721-3-1:1997</b>	Classification of environmental conditions Part 3: classification of groups of environmental parameters and their severities, storage.
<b>IEC 60721-3-2:1997</b>	Classification of environmental conditions Part 3. Classification of groups of environmental parameters and their severities, transportation.
<b>IEC 60721-3-3:2008</b>	Classification of environmental conditions Part 3. Classification of groups of environmental parameters and their severities, operation. Stationary use at weather protected locations.
<b>IEC 61000-2-4:2002</b>	Electromagnetic compatibility (EMC) Part 2- Environment chapter 4- Compatibility levels in industrial equipment for low frequency conducted disturbances.
<b>IEC 61000-4-7:2002</b>	Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques chapter 7. General guide on harmonics and inter-harmonics measurements and instrumentation, for power supply systems and equipment connected.
<b>IEC 61800-3:2004</b>	Adjustable speed electrical power drive systems Part 3: product standard including specific test methods.
<b>IEC 60757-1983</b>	Identification of insulated and bare conductors by colors.
<b>IEC 61800-5-1</b>	Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical , thermal and energy
<b>IS 2147</b>	Degrees of protection provided by enclosures (IP Code)
<b>IS 13118</b>	High voltage a.c. circuit breaker
<b>IS 4237</b>	General requirement for switchgear and control for voltages not exceeding 100 AC or 1200 DC
<b>IS 12729</b>	general requirements for switchgear & control gear for voltages exceeding 1000V

# Delta MVD1000 Successful Application

Delta MVD1000 Application for Water Circulation Pump in Coking Plant

## 1. Water Circulation Pump Introduction

Prior to installing the MVD1000, the water circulation pump at the Shandong Coking Group CO was driven by an induction motor directly started from the grid. During startup the valve used to control pressure was closed, and then open accordingly to regulate the required pressure at the top of the cooling tower. The original system presented the following problems:

- (1) The outlet pressure and flow was higher than the actual needs, which caused low efficiency and serious losses in the pipeline.
- (2) The performance of the valve tuning system was inefficient and since the valve's sealing was not perfect, water leak was observed.
- (3) The process efficiency is quite low, especially at light load.
- (4) The overall installation required heavy maintenance work and high cost.

**Circulation pump drive motor overview:**

### 10kV drive and load parameters:

Parameter Device	Quantity	Rated Power (kW)	Rated Speed (rpm)	Rated Voltage (kV)	Rated Current (A)
Circulation pump	1	560	1490	10	40

### Measured parameter of:

Parameter Device	Actual Input Voltage (kV)	Operating Current (A)	Pressure (Mpa)	Valve Open rate	Pressure Requirement (Mpa)	Remark
Circulation pump	10.5	27.9	5.0	100%	3.5	Direct online startup

## 2.MVD Application

The MVD system has been installed indoors with the following steps accounted for:

- (1) A remote user's control panel has been setup for operation. The user can control the on / off MVD state, set speed and monitor the status via the remote control panel
- (2) The MVD can feedback its status to the plant DCS (distributed control system). For the remote control available case, the MVD can accept the DCS remote control command.
- (3) The DCS can set load speed via 4~20mA analog input signal. In return, the MVD can send back to DCS the speed, current, and other variables relative to its status via 4~20mA analog output signal.
- (4) The end user's existing DCS valve control system is preserved, so the DCS can switch to original valve control system whenever the MVD is under scheduled maintenance.

## 3. Energy Saving Effect with MVD

### 10kV Energy Saving Economic Analysis

#### Energy saving estimation

• Data provided by user

- (1) Pump rated speed,  $n_1 = 1490\text{rpm}$
- (2) Operation point ( $Q_0, H_0$ ):  $Q_0, H_0$  with real power on the grid side = 462kW
- (3) Operation point ( $Q_1, H_1$ ):  $Q_1, H_1 = 5\text{MPa}$  and  $P_1 = 353\text{kW}$
- (4) Efficiency,  $\eta$ , vs. speed,  $n$ , pump characteristic curve
- (5) Desired operation point ( $Q_2, H_2$ ):  $H_2 = 3.5\text{MPa}$



• From affinity laws

$$(1) Q_1 / Q_2 = n_1 / n_2$$

$$(2) H_1 / H_2 = (n_1 / n_2)^2 \rightarrow 5 / 3.5 = (1490 / n_2)^2 \rightarrow n_2 = 1246 \text{rpm}$$

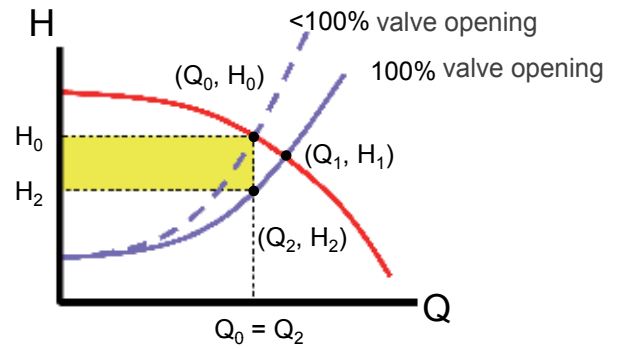
$$(3) P_1 / P_2 = (n_1 / n_2)^3 \rightarrow 353 / P_2 = (1490 / 1246)^3 \rightarrow P_2 = 206 \text{kW}$$

• Power saving  $\Delta P = P_{\text{grid}} - (P_2 / \eta_{\text{pump}, 2} / \eta_{\text{MVD}})$

$$= 462 - (206 / 0.8 / 0.96)$$

$$= 214 \text{kW}$$

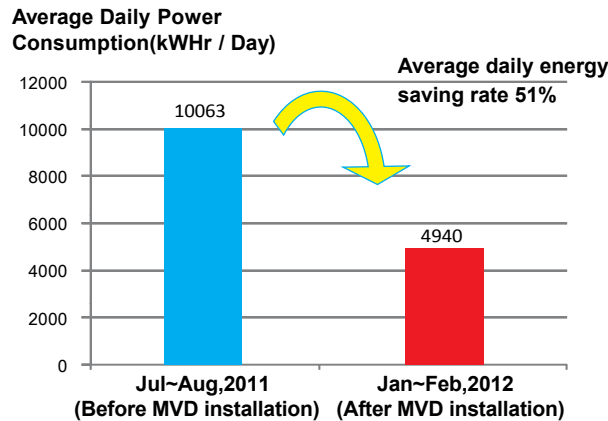
$$\text{Power saving rate} = 214 / 462 \times 100\% = 46\%$$



### Other MVD Application Benefits:

- ( 1 ) Elimination of the grid voltage fluctuation during motor startup.
- ( 2 ) Elimination of the inrush motor current and its impact on mechanical stresses.
- ( 3 ) Extension of motor and pipeline lifetime, reducing maintenance and costs.

### Delta MVD Measured Energy Saving Effect



### 4. Remarks

The result after installing the MVD for the circulation water pump application has been very impressive. The stability of the process increased, providing a more economic operation. The system efficiency has been enhanced with more than 40% energy saving. It will save more than 75,000 USD on the power bill per year and provide very short payback time. Besides, MVD1000 extends the life time of the motor, pump and pipelines, and reduces carbon dioxide emissions.

Delta has been recognized and trusted by customers for delivering high performance operation, quality products, technical service, site technology, and energy savings. Delta MVD requires a small footprint, it is easy to install and has significantly improved plant efficiency, enhanced grid stability by providing motor soft start , and increased the lifetime of equipment.



• On-site picture



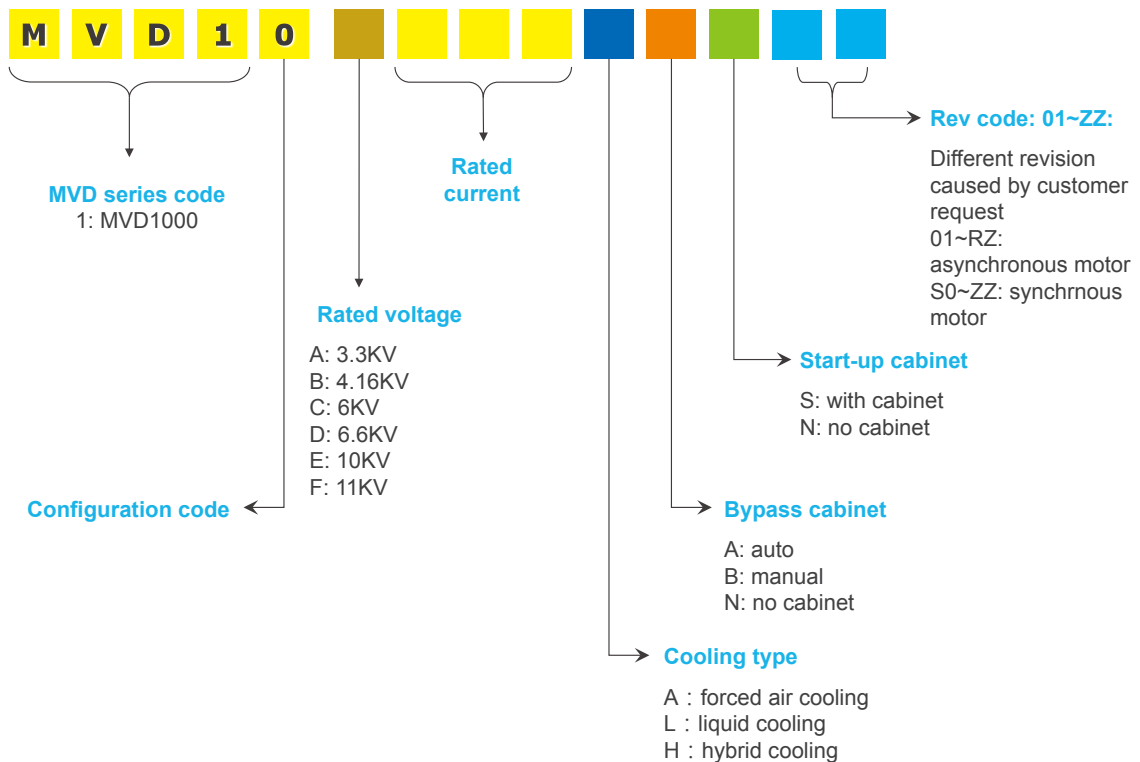
• MVD1000 for circulation water pump

# Global Sales & Service

Delta Electronics has sales and service locations around the world.



# System Model Names





Smarter. Greener. Together.

## Europe, Middle East & Africa

### Czech Republic

Delta Energy Systems (Czech Republic),  
spol.s r.o. Litevská 1174/8  
T +420 272 019 330  
F +420 271 751 799

### Finland

Delta Energy Systems (Finland) Oy  
Juvan teollisuuskatu 15  
T +358 9 8496 6421  
F +358 9 84 96 6100

### France

Delta Energy Systems (France) S.A.  
Route de Longjumeau  
T +33 1 69 102 434  
F +33 1 69 341 019

### Germany

Delta Energy Systems (Germany) GmbH  
Coesterweg 45  
T +49 2921 987 582  
F +49 2921 987 404

### Great Britain

Delta Electronics Europe  
1 Redwood Court  
Peel Park Campus  
East Kilbride, G74 5PF  
T +44 1355 588 888  
F +44 1355 588 889

### Italy

Delta Energy Systems (Italy) Socio unico s.r.l.  
Via Maggio, 6  
T +39 051 733 045  
F +39 051 731 838

### Poland

Delta Energy Systems (Poland) Sp. z.o.o.  
23 Poleczki Str.  
T +48 22 335 26 00  
F +48 22 335 26 01

### Russia

Delta Energy Systems LLC  
Vereyskaya Plaza II, office 401  
T +7 495 644 3240  
F +7 495 644 3241

### Spain

Delta Energy Systems (Spain) S.L.  
Telecom Power  
Calle Luis I nº 60, Nave 1a  
P.I. de Vallecas  
E-28031 Madrid  
T +34 91 223 74 20  
F +34 91 332 90 38

### Slovak Republic

Delta Energy Systems (Bratislava) spol.s.r.o  
Botanická 25/A  
T +421 2 65411 258  
F +421 2 65411 283

### Sweden

Delta Energy Systems (Sweden) AB  
P.O. Box 3096  
T +46 470 70 68 07  
F +46 470 70 68 90

### Switzerland

Delta Energy Systems (Switzerland) AG  
Freiburgstrasse 251  
CH-3018 Bern-Bümpliz  
T +41 31 998 53 11  
F +41 31 998 54 85

### Turkey

Delta Greentech Elektronik San. LTD. STI.  
Serifali Mevkii Barboros Bulvari Söylesi Sok.  
No:19  
K:1 34775, Y.Dudullu-Ümraniye-Istanbul  
T +90 216 499 9910  
F +90 216 499 8070

### United Arab Emirates

Delta Energy Systems AG (Dubai BR)  
Al Maktoum Road, Al Rigga Palace  
Building, Suite 504, P.O. Box 185668,  
Dubai, U.A.E.  
T +971 4 224 8595  
F +971 4 224 8596

### South Africa

Delta Energy Systems (South Africa)  
P.O. Box 3470 Brits  
0250 Republic of South Africa (ZAR)

## Americas

### Brazil

Delta Greentech (Brazil) S.A.  
Rua Itapeva, Nº 26 - 3º andar  
01332-000 - São Paulo - SP - Brazil  
T +55 11 3568 3850  
F +55 11 3568 3865

### Argentina

Delta Energy Systems  
Ayacucho 720 8 A Buenos Aires  
Argentina  
T +5411 4372 3105

### Colombia

Delta Greentech S.A.  
Sales Office Región Andina:  
CL 213 114-10 Of. 14-25 - Bogotá -  
Colombia  
T/F +57 1 673 4927

## Asia Pacific

### China

Delta Electronics Nanjing  
No. 198, Hexi Road, Jianye Zone, Nanjing  
City, Jiangsu Province, 210000, P.R.C.  
T +86 25 68573008 ext 5602  
F +86 25 68905267

### Delta GreenTech (China) Co. Ltd

E3 Building No.12 Yumin Zhong Road,  
Chaoyang, Beijing  
T +86 10 82253225 ext 6117  
F +86 10 8225 2308

### India

Delta Power Solutions (India)  
Plot No.43, Sector-35, HSIIDC  
Gurgaon 122001, Haryana, India.  
T +91 124 4874900 ext 4650  
F +91 124 4874945

### Taiwan

Delta Electronics Inc.  
3 Tungyuan Road, Chungli Industrial  
Zone, Taoyuan County 32063 Taiwan,  
R.O.C.  
T +886 3 452 6107 ext 6356  
F +886 3 452 7314

For more product information and sales inquiries, please consult [mvd@delta.com.tw](mailto:mvd@delta.com.tw)

[www.deltaww.com/mvd/en](http://www.deltaww.com/mvd/en)