Automation for a Changing World

Delta Industrial Automation

MS300 Delta Solar Pump Controller

www.DeltaThailand.com

DELTA

Smarter. Greener. Together.

Delta Solar Pump Controller

Solar-powered pump

A solar-powered pump is a pump running on electricity generated by photovoltaic panels or the thermal energy available from collected sunlight as opposed to grid electricity or diesel run water pumps. The operation of solar powered pumps is more economical mainly due to the almost zero operation and maintenance costs and has less environmental impact than pumps powered by an diesel engine. Solar pumps are useful where grid electricity is unavailable.

Components

A photovoltaic solar powered pump system has three parts:

- Pump
- Controller
- Solar Panels

The size of the PV-system is directly dependent on the size of the pump, the amount of water that is required (m^3/d) and the solar irradiance available.

The purpose of the controller is twofold. Firstly, it matches the output power that the pump receives with the input power available from the solar panels. Secondly, a controller usually provides a low voltage protection, whereby the system is switched off, if the voltage is too low or too high for the operating voltage range of the pump. This increases the lifetime of the pump thus reducing the need for maintenance.

Traditional DC motors not being suitable for submissable pumps because of maintenance implications. Hence a converter which converts DC generated by PV cells into variable frequency AC is more suitable for AC motors, which are more reliable.

Applications

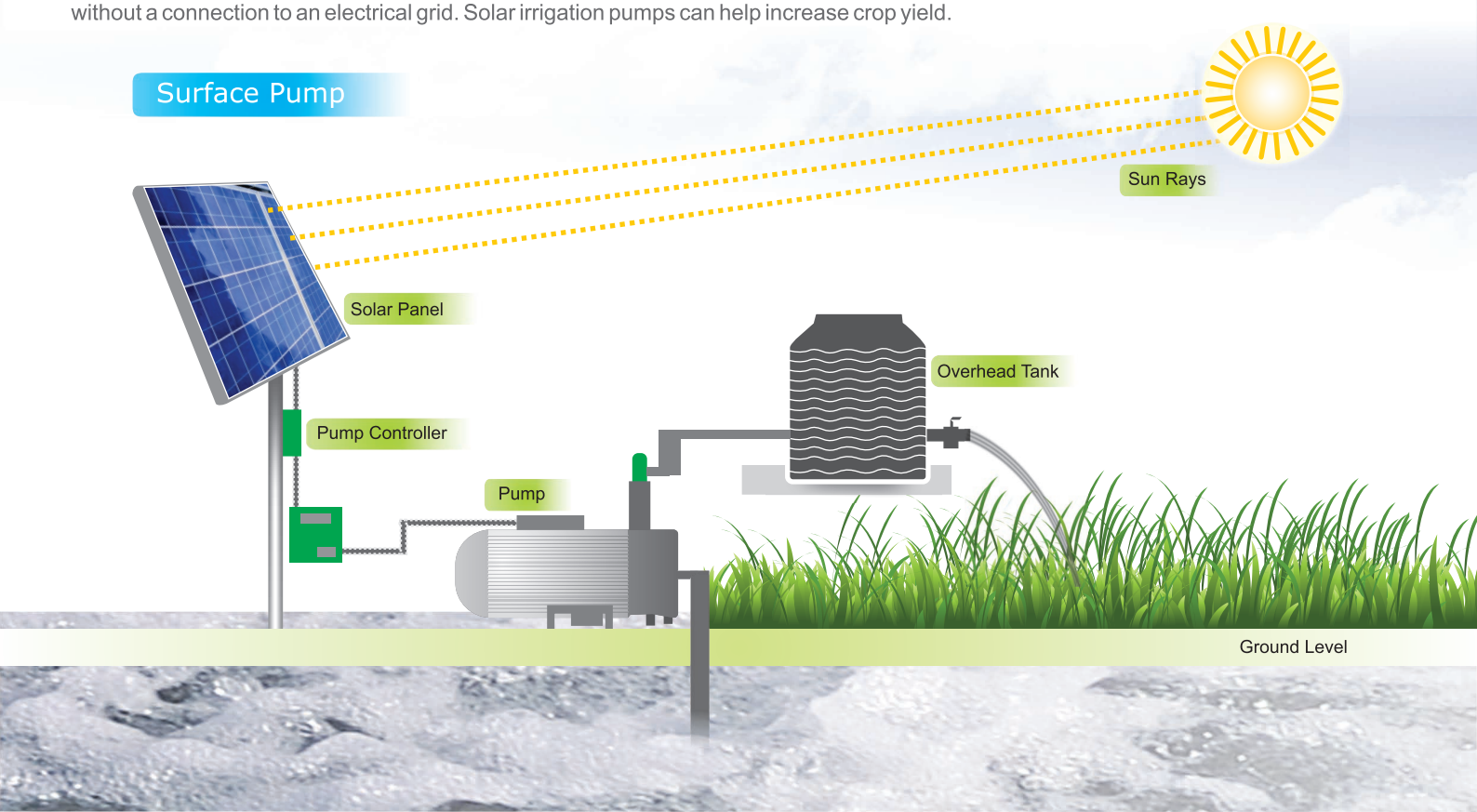
Solar powered water pumps

Can deliver drinking water as well as water for livestock or irrigation purposes. Solar water pumps may be especially useful in small scale or community based irrigation, as large scale irrigation requires large volumes of water that in turn require a large solar PV array. As the water may only be required during some parts of the year, a large PV array would provide excess energy that is not necessarily required, thus making the system inefficient.

Solar PV water pumping systems are used for irrigation and drinking water in India. The majority of the pumps are fitted with a 1hp to 10hp motor that receives energy from a suitable PV array. The larger systems can go upto 30hp or so.

Solar powered irrigation pumps

Make agriculture possible in areas that previously could not be farmed. Innovations in solar pump design now make all kinds of irrigation possible. Drip irrigation, sprinklers, micro-emitters, flood irrigation, even center-pivot irrigation systems can be powered without fuel, and without a connection to an electrical grid. Solar irrigation pumps can help increase crop yield.



Models Overview

Standard Models

115V single-phase

Applicable Motor Output (kW)	0.2	0.4	0.75
Applicable Motor Output (HP)	0.25	0.5	1
Frame Size	A		C

230V single-phase

Applicable Motor Output (kW)	0.2	0.4	0.75	1.5	2.2
Applicable Motor Output (HP)	0.25	0.5	1	2	3
Frame Size	A		B	C	

230V single-phase (Built-in EMC filter)

Applicable Motor Output (kW)	0.2	0.4	0.75	1.5	2.2
Applicable Motor Output (HP)	0.25	0.5	1	2	3
Frame Size	B			C	

230V 3-phase

Applicable Motor Output (kW)	0.2	0.4	0.75	1.5	2.2	3.7/4	5.5	7.5	11	15
Applicable Motor Output (HP)	0.25	0.5	1	2	3	5	7.5	10	15	20
Frame Size	A			B	C		D	E		F

460V 3-phase

Applicable Motor Output (kW)	0.4	0.75	1.5	2.2	3.7/4	5.5	7.5	11	15	18.5	22
Applicable Motor Output (HP)	0.5	1	2	3	5	7.5	10	15	20	25	30
Frame Size	A		B	C		D		E		F	

460V 3-phase (Built-in EMC filter)

Applicable Motor Output (kW)	0.4	0.75	1.5	2.2	3.7/4	5.5	7.5	11	15	18.5	22
Applicable Motor Output (HP)	0.5	1	2	3	5	7.5	10	15	20	25	30
Frame Size	B			C		D		E		F	

575V 3-phase

Applicable Motor Output (kW)	0.75	1.5	2.2	3.7	5.5	7.5
Applicable Motor Output (HP)	1	2	3	5	7.5	10
Frame Size	A	B	C	C	D	D

Standard Models (IP66)

230V single-phase

Applicable Motor Output (kW)	0.4	0.75	1.5	2.2
Applicable Motor Output (HP)	0.5	1	2	3
Frame Size	A			B

Standard Models (IP66)

230V single-phase (Built-in EMC filter)

Applicable Motor Output (kW)	0.4	0.75	1.5	2.2
Applicable Motor Output (HP)	0.5	1	2	3
Frame Size	A		B	

230V 3-phase

Applicable Motor Output (kW)	0.4	0.75	1.5	2.2	3.7/4	5.5
Applicable Motor Output (HP)	0.5	1	2	3	5	7.5
Frame Size	A			B		C

460V 3-phase

Applicable Motor Output (kW)	0.4	0.75	1.5	2.2	3.7/4	5.5	7.5
Applicable Motor Output (HP)	0.5	1	2	3	5	7.5	10
Frame Size	A				B	C	

460V 3-phase (Built-in EMC filter)

Applicable Motor Output (kW)	0.4	0.75	1.5	2.2	3.7/4	5.5	7.5
Applicable Motor Output (HP)	0.5	1	2	3	5	7.5	10
Frame Size	A			B		C	

High-speed Models (IP20/IP40)

230V single-phase

Applicable Motor Output (kW)	1.5	2.2
Applicable Motor Output (HP)	2	3
Frame Size	C	

230V single-phase (Built-in EMC filter)

Applicable Motor Output (kW)	1.5	2.2
Applicable Motor Output (HP)	2	3
Frame Size	C	

230V 3-phase

Applicable Motor Output (kW)	1.5	2.2	3.7/4	5.5	7.5	11	15
Applicable Motor Output (HP)	2	3	5	7.5	10	15	20
Frame Size	B	C		D	E		F

460V 3-phase

Applicable Motor Output (kW)	1.5	2.2	3.7/4	5.5	7.5	11	15	18.5	22
Applicable Motor Output (HP)	2	3	5	7.5	10	15	20	25	30
Frame Size	B	C		D		E		F	

460V 3-phase (Built-in EMC filter)

Applicable Motor Output (kW)	1.5	2.2	3.7/4	5.5	7.5	11	15	18.5	22
Applicable Motor Output (HP)	2	3	5	7.5	10	15	20	25	30
Frame Size	B	C		D		E		F	

Hardware Design

Compact design and user-friendly interface

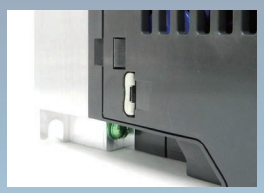
Removable Keypad

Press to remove; supports remote operation away from drive

5 digits 7 segments LED display, frequency knob, Up and Left/Down function keys

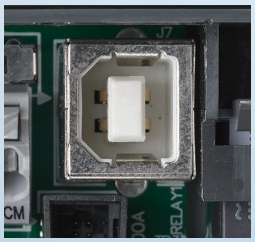
Removable RFI Jumper

Applicable for different application needs



Built-in USB Port

Easy and fast programming setting, update and real-time monitoring and tuning



Specified Product Label

Input/output current, voltage and protection rating

Screwless Top Cover Design

Press on both side tabs to remove the cover

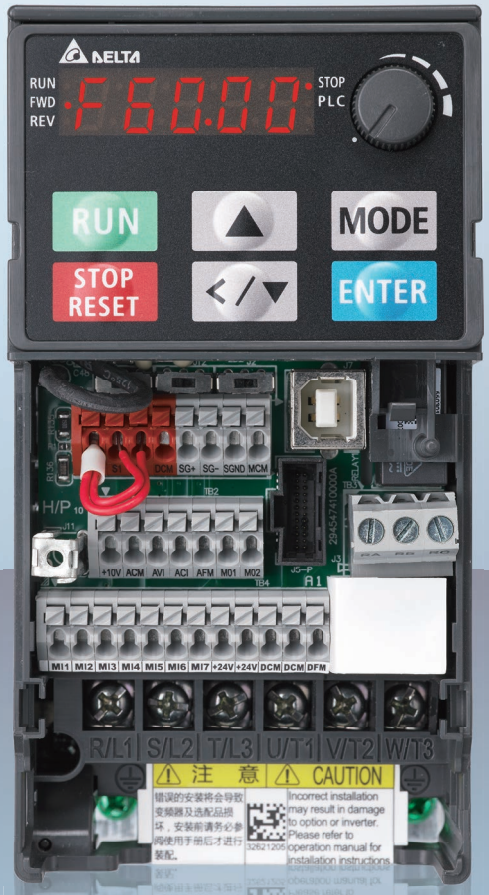
Removable Fan

Easy to replace and maintain for a longer lifetime

MS 300 IP 66

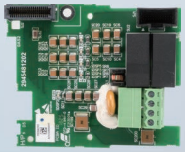
Option Cards

A wide selection of option cards for highly flexible applications



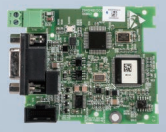
External Power Supply Card (DC 24V)

EMM-BPS01

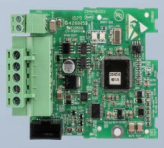


Communication Cards

CMM-PD01
PROFIBUS DP

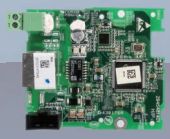


CMM-DN01
DeviceNet

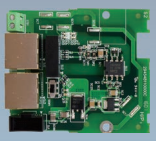


CMM-MOD01
Modbus TCP

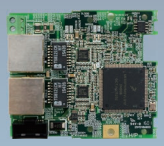
CMM-EIP01
EtherNet/IP



CMM-COP01
CANopen



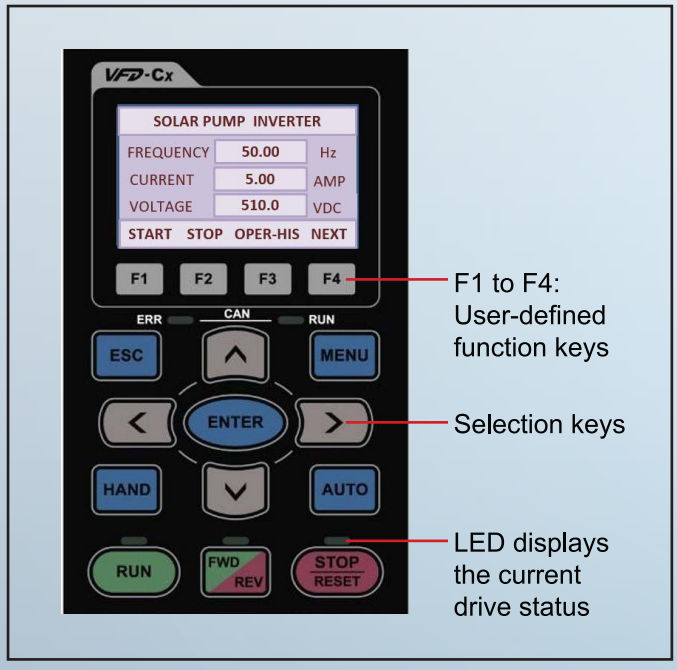
CMM-EC01 NEW
EtherCAT



Built-in 1 Option Slot

Quick and Easy Parameters Setting via the LCD Keypad

- Multi-column display for the drive status
- Simple and intuitive operation
- User-defined parameter groups
- Real Time Clock and calendar function
- Language selection for display
- Copy function saves parameters and PLC programs to the keypad memory for later transfer to another drive
- IP66 protection level

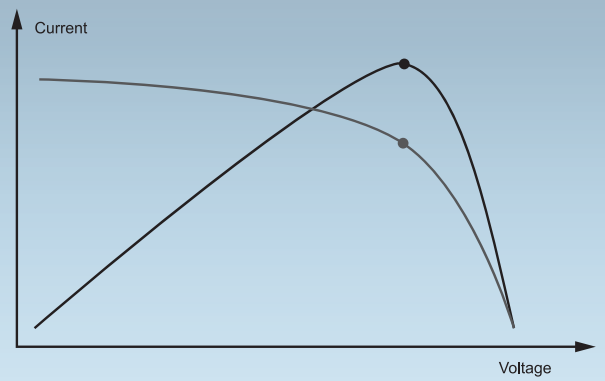


Special Functions

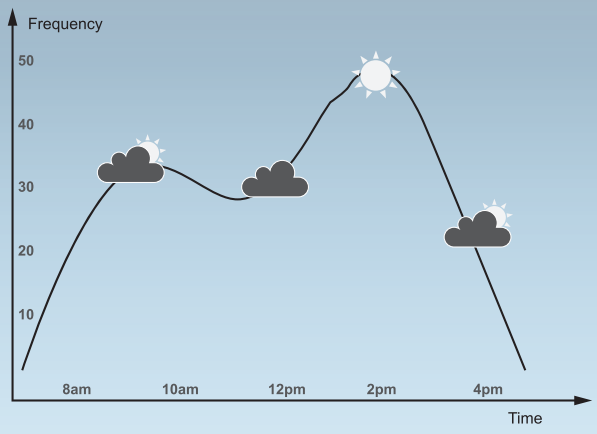
- Low frequency
- Dry run
- Over current of pump
- Minimum power
- PQ curve
- Dormancy

Advanced MPPT Technology

MPPT efficiency up to 99.99%



Auto-track at any daytime

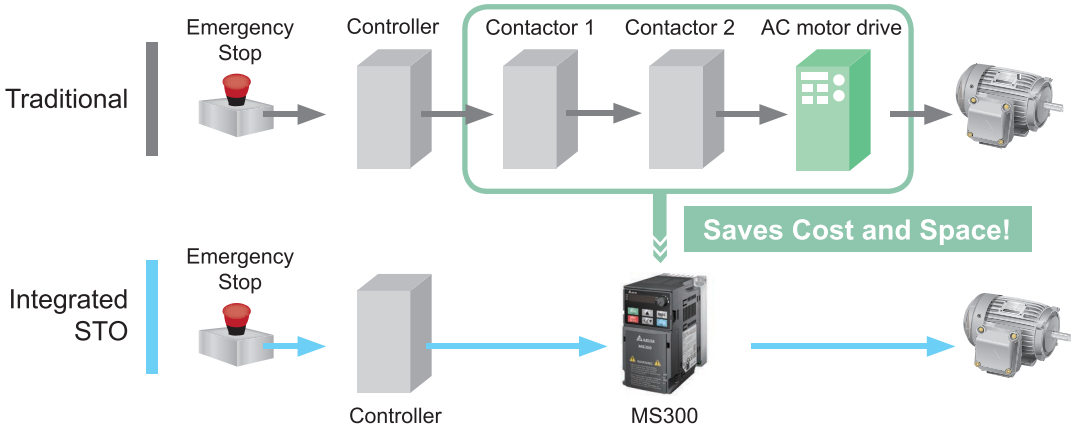


Stable, Safe and Reliable

Safety Standard

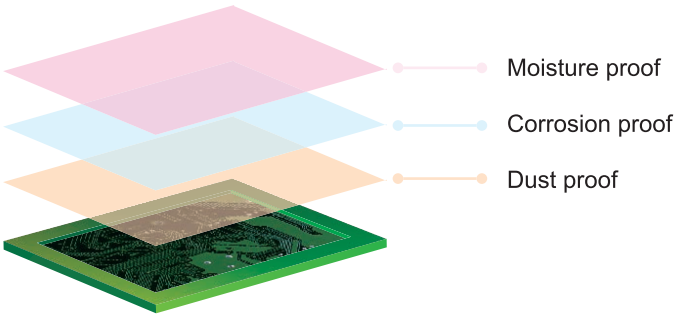
Integrated Safe Torque Off (STO), compliance with:

- ISO 13849-1:2015 Category 3 PL d
- EN 61508 SIL2
- EN 60204-1 Category 0
- EN 62061 SIL CL 2



PCB Coating

100% PCB coating (IEC 60721-3-3 class 3C2 standard) ensures drive operation stability and safety in critical environments

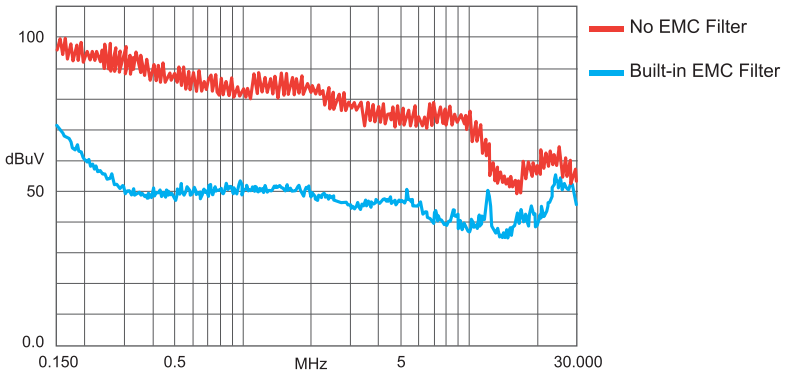


IP40 Models

Strengthened fan coating and concealed air vent prevent dust and other particles from entering the drive, suitable for critical environment applications

Built-in EMC Filter

Built-in Class A (C2) standard EMC filter; saves on additional procurement cost and wiring time, and provides more cabinet space for other devices to use



Specifications

IP20/IP40 Models

Single-phase 115 V (Models w/o Built-in EMC Fielter)					
Frame			A		C
Applicable Motor Output (kW)			0.2	0.4	0.75
Applicable Motor Output (HP)			1/4	1/2	1
Inverter Output	Heavy Duty	Rated Output Current (A)	1.6	2.5	4.8
	Normal Duty	Rated Output Current (A)	1.8	2.7	5.5
Input	Rated Voltage / Frequency		1-Phase AC 100 V ~ 120 V (-15% ~ +10%), 50 / 60 Hz		
	Mains Input Voltage Range		85 ~ 132 V		
	Mains Frequency Range		47 ~ 63 Hz		
Carrier Frequency (kHz)			2~15 (default 4)		
Brake Chopper			Built-in		
DC Reactor			Optional		
AC Reactor			Optional		
Cooling Method			Natural air cooling		Fan cooling
Size: W x H (mm)			68 × 128		87 × 157
Size: D (mm)			96	125	152

Single-phase 230 V (Models with Built-in EMC Filter)							
Frame			B			C	
Applicable Motor Output (kW)			0.2	0.4	0.75	1.5	2.2
Applicable Motor Output (HP)			1/4	1/2	1	2	3
Inverter Output	Heavy Duty	Rated Output Current (A)	1.6	2.8	4.8	7.5	11
	Normal Duty	Rated Output Current (A)	1.8	3.2	5	8.5	12.5
Input	Rated Voltage / Frequency		1-Phase AC 200 V ~ 240 V (-15% ~ +10%), 50 / 60 Hz				
	Mains Input Voltage Range		170 ~ 265 V				
	Mains Frequency Range		47 ~ 63 Hz				
Carrier Frequency (kHz)			2~15 (default 4)				
Brake Chopper			Built-in				
DC Reactor			Optional				
AC Reactor			Optional				
Cooling Method			Natural air cooling	Fan cooling			
Size: W x H (mm)			72 × 142			87 × 157	
Size: D (mm)			159			179	

Single-phase 230 V (Models w/o an EMC Filter)						
Frame			A		B	C
Cooling Method			Natural air cooling			Fan cooling
Size: W x H (mm)			68 × 128	68 × 128	72 × 142	87 × 157
Size: D (mm)			96	125	143	152

3-phase 230 V (Models w/o Built-in EMC Filter)

Frame			A			B	C		D	E		F
Applicable Motor Output (kW)			0.2	0.4	0.75	1.5	2.2	3.7/4	5.5	7.5	11	15
Applicable Motor Output (HP)			1/4	1/2	1	2	3	5	7.5	10	15	20
Inverter Output	Heavy Duty	Rated Output Current (A)	1.6	2.8	4.8	7.5	11	17	25	33	49	65
	Normal Duty	Rated Output Current (A)	1.8	3.2	5	8	12.5	19.5	27	36	51	69
Input	Rated Voltage / Frequency		3-Phase AC 200 V ~ 240 V (-15% ~ +10%), 50 / 60 Hz									
	Mains Input Voltage Range		170 ~ 265 V									
	Mains Frequency Range		47 ~ 63 Hz									
Carrier Frequency (kHz)			2 ~ 15 (default 4)									
Brake Chopper			Built-in									
DC Reactor			Optional									
AC Reactor			Optional									
Cooling Method			Natural air cooling			Fan cooling						
Size: W x H (mm)			68 × 128			72 × 142	87 × 157		109 × 207	130 × 250		175 × 300
Size: D (mm)			96	110	143	143	152		154	185		192

3-phase 460 V (Models with Built-in EMC Filter)

Frame			B			C		D		E		F	
Applicable Motor Output (kW)			0.4	0.75	1.5	2.2	3.7/4	5.5	7.5	11	15	18.5	22
Applicable Motor Output (HP)			1/2	1	2	3	5	7.5	10	15	20	25	30
Inverter Output	Heavy Duty	Rated Output Current (A)	1.5	2.7	4.2	5.5	9	13	17	25	32	38	45
	Normal Duty	Rated Output Current (A)	1.8	3	4.6	6.5	10.5	15.7	20.5	28	36	41.5	49
Input	Rated Voltage / Frequency		3-Phase AC 380 V ~ 480 V (-15% ~ +10%), 50 / 60 Hz										
	Mains Input Voltage Range		323 ~ 528 V										
	Mains Frequency Range		47 ~ 63 Hz										
Carrier Frequency (kHz)			2 ~ 15 (default 4)										
Brake Chopper			Built-in										
DC Reactor			Optional										
AC Reactor			Optional										
Cooling Method			Fan cooling										
Size: W x H (mm)			72 × 142			87 × 157		109 × 207		130 × 250		175 × 300	
Size: D (mm)			159			179		187		219		244	

3-phase 460 V (Models w/o an EMC Filter)

Frame	A		B	C	D	E	F
Cooling Method	Natural air cooling		Fan cooling				
Size: W x H (mm)	68 × 128		72 × 142	87 × 157	109 × 207	130 × 250	175 × 300
Size: D (mm)	129	143	143	152	154	185	192

3-phase 575 V (Models w/o an EMC Filter)

Frame			A	B	C		D	
Applicable Motor Output (kW)			0.75	1.5	2.2	3.7	5.5	7.5
Applicable Motor Output (HP)			1	2	3	5	7.5	10
Inverter Output	Heavy Duty	Rated Output Current (A)	1.7	3	4.2	6.6	9.9	12.2
	Normal Duty	Rated Output Current (A)	2.1	3.6	5	8	11.5	15
Input	Rated Voltage / Frequency		3-phase AC 500 V ~ 600 V (-15% ~ +10 %), 50/60 Hz					
	Mains Input Voltage Range		425~660					
	Mains Frequency Range		47~63					
Carrier Frequency (kHz)			2~15 (default 4)					
Brake Chopper			Built-in					
DC Reactor			Optional					
AC Reactor			Optional					
Cooling Method			Natural air cooling	Fan cooling				
Size: W x H (mm)			68 × 128	72 × 142	87 × 157		109 × 207	
Size: D (mm)			143	143	152		154	

IP66/NEMA 4X Models

Single-phase 230 V										
Frame			A					B		
VFD_ _ _ _ _ _ _SAA			2A8MS21_ _		4A8MS21_ _		7A5MS21MN	7A5MS21MF	11AMS21_ _	
			M N	M E	M N	M E			M N	M E
Applicable Motor Output (kW)			0.4		0.75		1.5	1.5	2.2	
Applicable Motor Output (HP)			0.5		1		2	2	3	
Inverter Output	Heavy Duty	Rated Output Current (A)	1.1		1.8		2.9	2.9	4.2	
		Rated Output Current (A)	2.8		4.8		7.5	7.2	11	
		Carrier Frequency (kHz)	7A5MS21MN							
	Normal Duty	Rated Output Current (A)	1.2		1.9		3.2	3.2	4.8	
		Rated Output Current (A)	3.2		5		8.5	8.5	12.5	
		Carrier Frequency (kHz)	7A5MS21MN							
Input	Heavy Duty	Rated Output Current (A)	7.3		10.8		16.5	16.5	24.2	
	Normal Duty	Rated Output Current (A)	8.3		11.3		18.5	18.5	27.5	
	Rated Voltage / Frequency		1-phase AC 200V~240 V, 50/60Hz							
	Operating Voltage (Vac)		170~264 (-15%~+10%)							
	Mains Frequency Range (Hz)		47~63							
Net Weight (kg)			2.25	2.65	2.6	2.9	3.1	3.95	3.5	4.0
Cooling Method			Natural air cooling					Fan cooling		
EMC Filter			Optional	Built-in	Optional	Built-in	Optional	Built-in	Optional	Built-in
Protection Rating			IPP / NEMA 4X							

3-phase 230 V								
Frame			A			B		C
VFD_ _ _ _ _ _ _SAA			2A8MS23MN	4A8MS23MN	7A5MS23MN	11AMS23MN	17AMS23NB	25AMS23MN
Applicable Motor Output (kW)			0.4	0.75	1.5	2.2	3.7	5.5
Applicable Motor Output (HP)			0.5	1	2	3	5	7.5
Inverter Output	Heavy Duty	Rated Output Current (A)	1.1	1.8	2.9	4.2	6.5	9.5
		Rated Output Current (A)	2.8	4.8	7.5	11	17	25
		Carrier Frequency (kHz)	2 ~ 15 (default 4)					
	Normal Duty	Rated Output Current (A)	1.2	1.9	3.0	4.8	7.4	10.3
		Rated Output Current (A)	3.2	5	8	12.5	19.5	27
		Carrier Frequency (kHz)	2 ~ 15 (default 4)					
Input	Heavy Duty	Rated Output Current (A)	3.4	5.8	9.0	13.2	20.4	30
	Normal Duty	Rated Output Current (A)	3.8	6.0	9.6	15	23.4	32.4
	Rated Voltage / Frequency		3-phase AC 200 V ~ 240 V, 50/60Hz					
	Operating Voltage (Vac)		170~264 (-15%~+10%)					
	Mains Frequency Range (Hz)		47~63					
Net Weight (kg)			2.3	2.45	2.75	3.4	3.5	4.25
Cooling Method			Natural air cooling			Fan cooling		
EMC Filter			Optional					
Protection Rating			IPP / NEMA 4X					

3-phase 460 V

Frame			A							B		
VFD_ _ _ _ _ _ _SAA			1A5MS43_ _		2A7MS43_ _		4A2MS43_ _		5A5MS43MN	5A5MS43MF	9A0MS43_ _	
			MN	MF	MN	MF	MN	MF			MN	MF
Applicable Motor Output (kW)			0.4		0.75		1.5		2.2	2.2	3.7	
Applicable Motor Output (HP)			0.5		1		2		3	3	5	
Inverter Output	Heavy Duty	Rated Output Current (A)	1.1		2.1		3.2		4.2	4.2	6.9	
		Rated Output Current (A)	1.5		2.7		4.2		5.5	5.5	9	
		Carrier Frequency (kHz)	2 ~ 15 (default 4)									
	Normal Duty	Rated Output Current (A)	1.4		2.3		3.5		5.0	5.0	8.0	
		Rated Output Current (A)	1.8		3		4.6		6.5	6.5	10.5	
		Carrier Frequency (kHz)	2 ~ 15 (default 4)									
Input	Heavy Duty	Rated Output Current (A)	2.1		3.7		5.8		6.1	6.1	9.9	
	Normal Duty	Rated Output Current (A)	2.5		4.2		6.4		7.2	7.2	11.6	
	Rated Voltage / Frequency		3-phase AC 380 V ~ 480 V, 50/60Hz									
	Operating Voltage (Vac)		323~528 (-15%~+10%)									
	Mains Frequency Range (Hz)		47~63									
Net Weight (kg)			2.35	2.65	2.6	2.8	2.8	3.1	3.6	3.8	3.45	3.95
Cooling Method			Natural air cooling							Fan cooling		
EMC Filter			Optional	Built-in	Optional	Built-in	Optional	Built-in	Optional	Built-in	Optional	Built-in
Protection Rating			IP66 / NEMA 4X									

3-phase 460 V

Frame			C			
VFD_ _ _ _ _ _ _SAA			13AMS43_ _		17AMS43_ _	
			MN	MF	MN	MF
Applicable Motor Output (kW)			5.5		7.5	
Applicable Motor Output (HP)			7.5		10	
Inverter Output	Heavy Duty	Rated Output Current (A)	9.9		13	
		Rated Output Current (A)	13		17	
		Carrier Frequency (kHz)	2 ~ 15 (default 4)			
	Normal Duty	Rated Output Current (A)	12		15.6	
		Rated Output Current (A)	15.7		20.5	
		Carrier Frequency (kHz)	2 ~ 15 (default 4)			
Input	Heavy Duty	Rated Output Current (A)	14.3		18.7	
	Normal Duty	Rated Output Current (A)	17.3		22.3	
	Rated Voltage / Frequency		3-phase AC 380 V ~ 480 V, 50/60Hz			
	Operating Voltage (Vac)		323~528 (-15%~+10%)			
	Mains Frequency Range (Hz)		47~63			
Net Weight (kg)			4.25	4.95	4.25	5.05
Cooling Method			Fan cooling			
EMC Filter			Optional	Built-in	Optional	Built-in
Protection Rating			IP66 / NEMA 4X			

General Specifications and Accessories

Technical Specification

Items		Specification
Power Supply Input	Voltage, frequency	115 VAC Model: 90-400 VDC 50/60 Hz 230 VAC Model: 150-450 VDC 50/60 Hz 460 VAC Model: 300-850 VDC 50/60 Hz
	Allowable Fluctuations	Voltage Imbalance Rate: <3% Frequency Fluctuation: ±5% Distortion Rate: confirm to IEC 61800-2
	VFD Efficiency	Up to 97.5%
	Total Voc range (V) of recommended panels	115 VAC Model: 175-380 VDC 230 VAC Model: 360-430 VDC 460 VAC Model: 620-750 VDC
Output	MPPT Efficiency	Up to 99.9%
	Output Frequency Range	0.0-599.0 Hz
	Overload Capacity	150% of rate current for 1 minute, 200% of rate current for 3 second
Protection Function	Solar Pump Protection Function	Dry run, low frequency, low power, dormancy, water full, pump over current protection
	AC/DC Switching Function	Self indentification light intensity, automatic switching AC and DC power supply
	IOT Function	Support Delta DIAcloudsolution
	Water Pump Type	Three-phase AC AM pump, three-phase AC PMSM pump, BLDC (5.5kW or below), single-phase water pump (2.2kW or below)
	Multi Function Input	Supports 4 way x input
	Analog Input	Support 2 analog AI input, can choose 0-10V/0-20mA
	Basic Protection Function	Bus overvoltage, undervoltage, inverter over current, module fault, inverter overload, motor overload, current detection phase shift, motor grounding short circuit fault, input phase loss, output phase loss, inverter overheat, communication fault, motor parameter self-tuning fault
	Motor Grounding Short-circuit Detection	Automatically detect whether the motor is short-circuit to ground, auto detection while electrify
	Communication Network	Support 485 / Modbus protocol; can realize the network,
	Remote and Monitoring Functions	Support connect to Delta 3G clod
Environment	Installation Site	Outdoor, altitude less than 1000m, free corrosive gases and direct sunlight
	Temperature, Humidity	-20-60 degree, 20-95% humidity (no condensation)
	Vibration	Less than 0.5g when frequency less than 20Hz
	Storage Temperature	-40-85 degree
	Installation Mode	Hanging machine
	Ingress Protection	IP20 IP40 IP66
	Cooling Method	Natural cooling / forced air cooling
International Certificate	CE, UL, EN61800-3, EN61800-5	

Technical Specification

230V single-phase

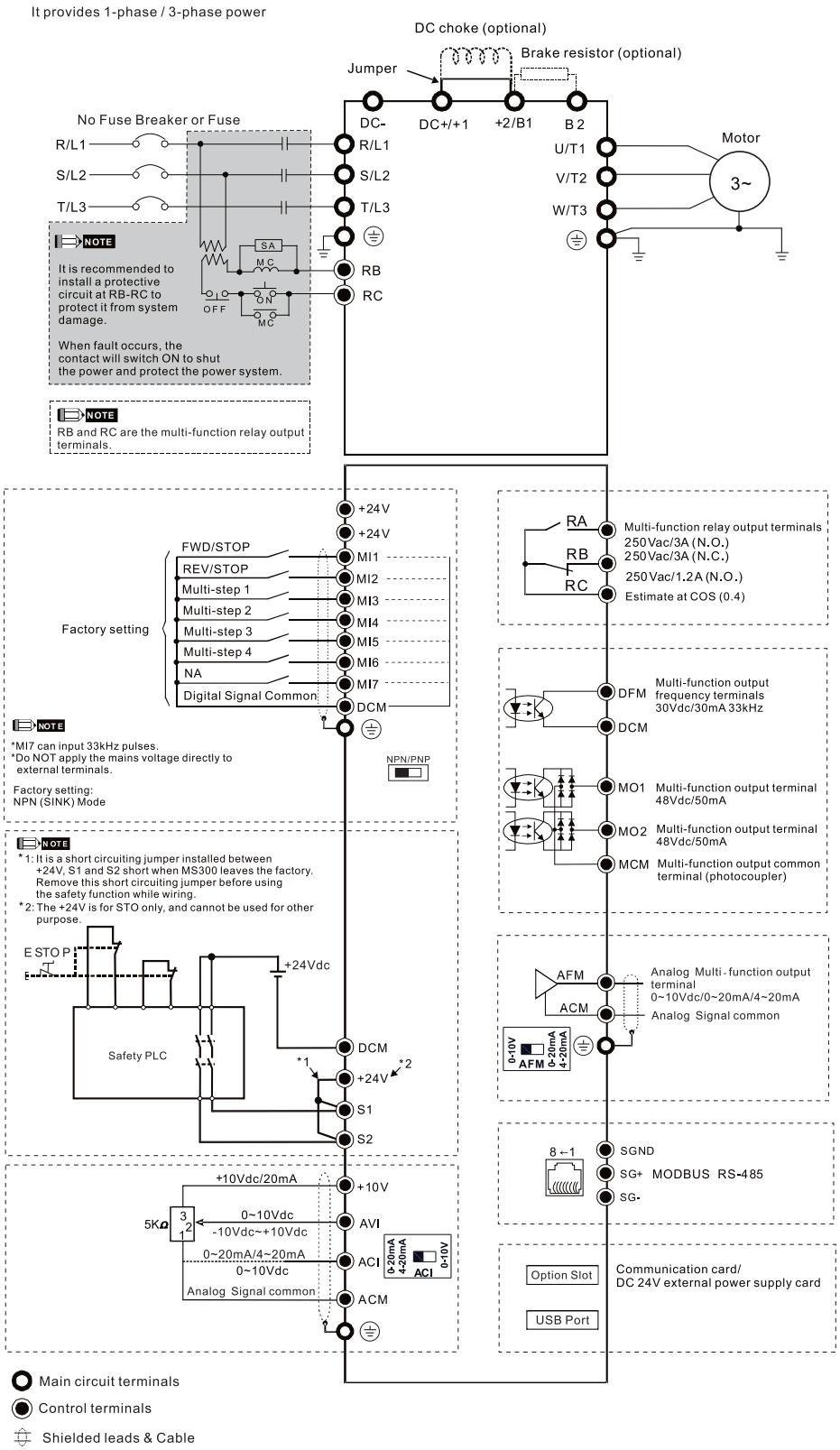
Solar Pump Inverter Power (kW)	Pump Power (kW)	Maximum DC Input Voltage (V)	Total VOC Range Recommended (VDC)	Output Current (A)	Output Frequency (Hz)
0.2	0.2	410	360-380	1.6	0-50/60
0.4	0.4	410	360-380	2.8	0-50/60
0.75	0.75	410	360-380	4.8	0-50/60
1.5	1.5	410	360-380	7.5	0-50/60
2.2	2.2	410	360-380	11	0-50/60

230V 3-phase

Solar Pump Inverter Power (kW)	Pump Power (kW)	Maximum DC Input Voltage (V)	Total VOC Range Recommended (VDC)	Output Current (A)	Output Frequency (Hz)
0.2	0.2	410	360-380	1.6	0-50/60
0.4	0.4	410	360-380	2.8	0-50/60
0.75	0.75	410	360-380	4.8	0-50/60
1.5	1.5	410	360-380	7.5	0-50/60
2.2	2.2	410	360-380	11	0-50/60
3.7	3.7	410	360-380	17	0-50/60
5.5	5.5	410	360-380	25	0-50/60
7.5	7.5	410	360-380	33	0-50/60
11	11	410	360-380	49	0-50/60
15	15	410	360-380	65	0-50/60

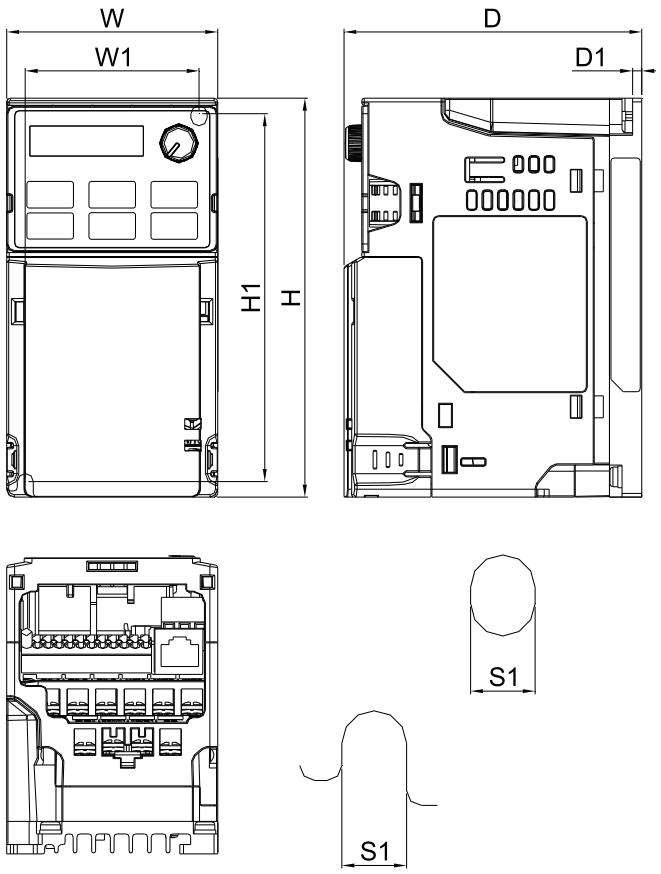
460V 3-phase

Solar Pump Inverter Power (kW)	Pump Power (kW)	Maximum DC Input Voltage (V)	Total VOC Range Recommended (VDC)	Output Current (A)	Output Frequency (Hz)
0.4	0.4	820	620-780	1.5	0-50/60
0.75	0.75	820	620-780	2.7	0-50/60
1.5	1.5	820	620-780	4.2	0-50/60
2.2	2.2	820	620-780	5.5	0-50/60
3.7	3.7	820	620-780	9	0-50/60
5.5	5.5	820	620-780	13	0-50/60
7.5	7.5	820	620-780	17	0-50/60
11	11	820	620-780	25	0-50/60
15	15	820	620-780	32	0-50/60
18.5	18.5	820	620-780	38	0-50/60
22	22	820	620-780	45	0-50/60


It provides 1-phase / 3-phase power
DC choke (optional)
Brake resistor (optional)
Jumper
No Fuse Breaker or Fuse
R/L1
S/L2
T/L3
DC-
DC+/+1
+2/B1
B 2
U/T1
V/T2
W/T3
Motor
3~
NOTE
It is recommended to install a protective circuit at RB-RC to protect it from system damage.
When fault occurs, the contact will switch ON to shut the power and protect the power system.
SA
MC
OFF
ON
MC
RB
RC
NOTE
RB and RC are the multi-function relay output terminals.
+24V
+24V
FWD/STOP
REV/STOP
Multi-step 1
Multi-step 2
Multi-step 3
Multi-step 4
NA
Digital Signal Common
Factory setting
MI1
MI2
MI3
MI4
MI5
MI6
MI7
DCM
NOTE
*MI7 can input 33kHz pulses.
*Do NOT apply the mains voltage directly to external terminals.
Factory setting:
NPN (SINK) Mode
NPN/PNP
RA
RB
RC
Multi-function relay output terminals
250Vac/3A (N.O.)
250Vac/3A (N.C.)
250Vac/1.2A (N.O.)
Estimate at COS (0.4)
DFM
DCM
Multi-function output frequency terminals
30Vdc/30mA 33kHz
MO1
Multi-function output terminal
48Vdc/50mA
MO2
Multi-function output terminal
48Vdc/50mA
MCM
Multi-function output common terminal (photocoupler)
NOTE
*1: It is a short circuiting jumper installed between +24V, S1 and S2 short when MS300 leaves the factory. Remove this short circuiting jumper before using the safety function while wiring.
*2: The +24V is for STO only, and cannot be used for other purpose.
E STO P
+24Vdc
Safety PLC
DCM
*1
*2
+24V
S1
S2
AFM
ACM
Analog Multi-function output terminal
0~10Vdc/0~20mA/4~20mA
Analog Signal common
0-10V
AFM
0-20mA
4-20mA
8←1
SGND
SG+
SG-
MODBUS RS-485
+10Vdc/20mA
5KΩ
3
2
1
0~10Vdc
-10Vdc~+10Vdc
0~20mA/4~20mA
0~10Vdc
Analog Signal common
+10V
AVI
ACI
ACM
0-20mA
4-20mA
ACI
0-10V
Option Slot
USB Port
Communication card/
DC 24V external power supply card
Main circuit terminals
Control terminals
Shielded leads & Cable

Dimensions-IP20 / IP40 Models

Frame A



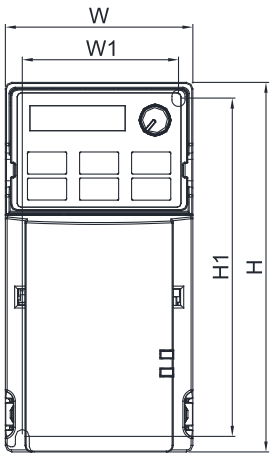
Mounting hole

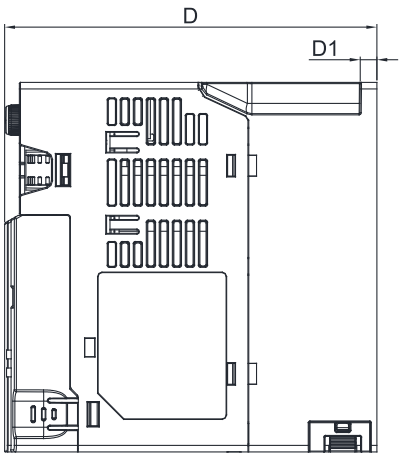
MODEL FRAME A1	FRAME A2	FRAME A3	FRAME A4	FRAME A5
VFD1A6MS11ANSAA	VFD2A8MS23ANSAA	VFD2A5MS11ANSAA	VFD1A5MS43ANSAA	VFD4A8MS23ANSAA
VFD1A6MS11ENSAA	VFD2A8MS23ENSAA	VFD2A5MS11ENSAA	VFD1A5MS43ENSAA	VFD4A8MS23ENSAA
VFD1A6MS21ANSAA		VFD2A8MS21ANSAA		VFD2A7MS43ANSAA
VFD1A6MS21ENSAA		VFD2A8MS21ENSAA		VFD2A7MS43ENSAA
VFD1A6MS23ANSAA				VFD1A7MS53ANSAA
VFD1A6MS23ENSAA				

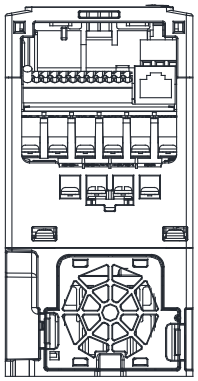
Frame		W	H	D	W1	H1	D1	S1
A1	mm	68.0	128.0	96.0	56.0	118.0	3.0	5.2
	inch	2.68	5.04	3.78	2.20	4.65	0.12	0.20
Frame		**W**	**H**	**D**	**W1**	**H1**	**D1**	**S1**
A2	mm	68.0	128.0	110.0	56.0	118.0	3.0	5.2
	inch	2.68	5.04	4.33	2.20	4.65	0.12	0.20
Frame		**W**	**H**	**D**	**W1**	**H1**	**D1**	**S1**
A3	mm	68.0	128.0	125.0	56.0	118.0	3.0	5.2
	inch	2.68	5.04	4.92	2.20	4.65	0.12	0.20

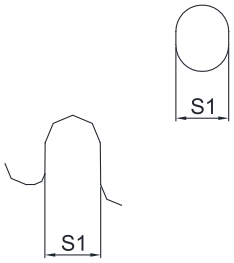
Frame		W	H	D	W1	H1	D1	S1
A4	mm	68.0	128.0	129.0	56.0	118.0	3.0	5.2
	inch	2.68	5.04	5.08	2.20	4.65	0.12	0.20
Frame		**W**	**H**	**D**	**W1**	**H1**	**D1**	**S1**
A5	mm	68.0	128.0	143.0	56.0	118.0	3.0	5.2
	inch	2.68	5.04	5.63	2.20	4.65	0.12	0.20

Frame B









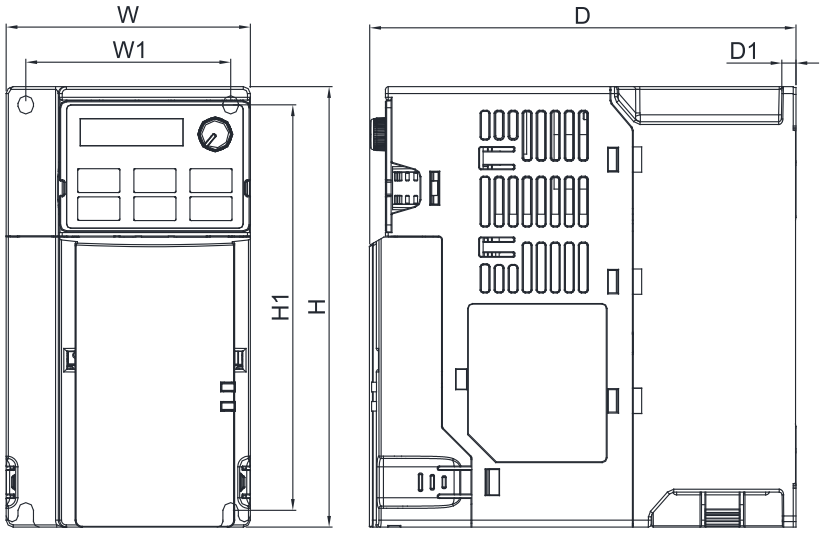
Mounting hole

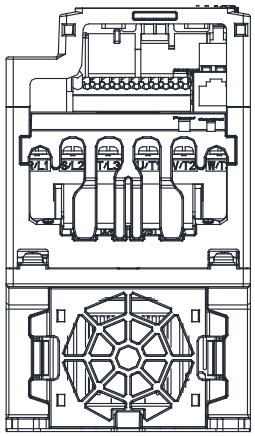
MODEL FRAME B1		FRAME B2	FRAME B3	
Standard Models: VFD7A5MS23ANSAA VFD7A5MS23ENSAA VFD4A2MS43ANSAA VFD4A2MS43ENSAA VFD3A0MS53ANSAA	High Speed Models: VFD7A5MS23ANSHA VFD7A5MS23ENSHA VFD4A2MS43ANSHA VFD4A2MS43ENSHA	Standard Models: VFD4A8MS21ANSAA VFD4A8MS21ENSAA	Standard Models: VFD1A6MS21AFSAA VFD2A8MS21AFSAA VFD4A8MS21AFSAA VFD1A5MS43AFSAA VFD2A7MS43AFSAA VFD4A2MS43AFSAA	High Speed Models: VFD4A2MS43AFSHA

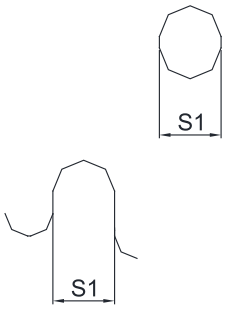
Frame		W	H	D	W1	H1	D1	S1
B1	mm	72.0	142.0	143.0	60.0	130.0	6.4	5.2
	inch	2.83	5.59	5.63	2.36	5.12	0.25	0.20
Frame		W	H	D	W1	H1	D1	S1
B2	mm	72.0	142.0	143.0	60.0	130.0	3.0	5.2
	inch	2.83	5.59	5.63	2.36	5.12	0.12	0.20
Frame		W	H	D	W1	H1	D1	S1
B3	mm	72.0	142.0	159.0	60.0	130.0	4.3	5.2
	inch	2.83	5.59	6.26	2.36	5.12	0.17	0.20

Dimensions-IP20 / IP40 Models

Frame C







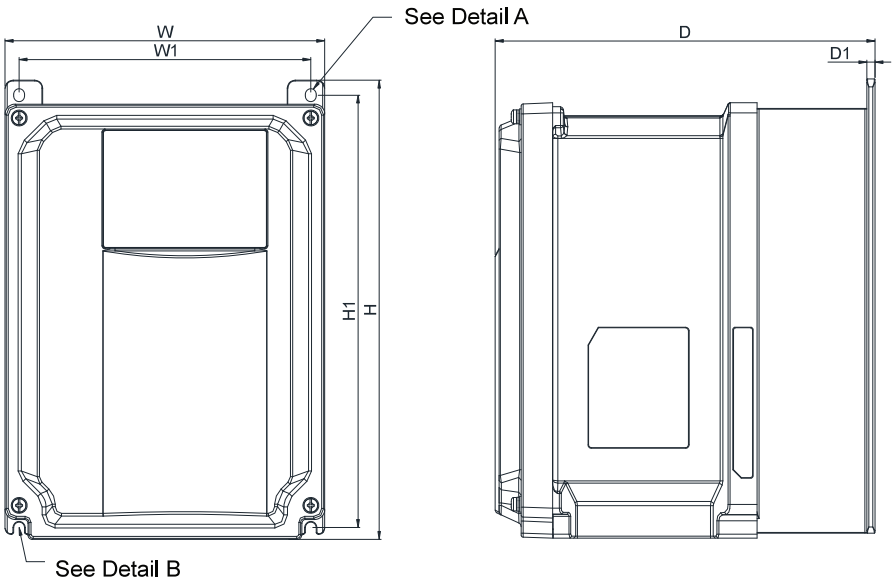
Mounting hole

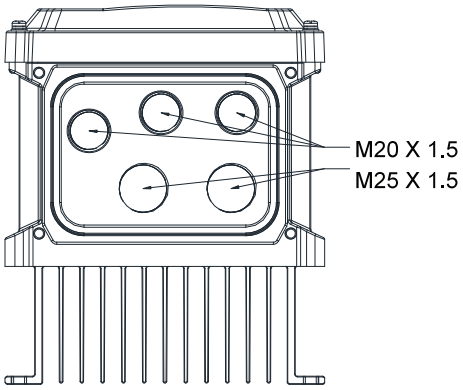
MODEL FRAME C1				FRAME C2	
Standard Models:		High Speed Models:		Standard Models:	High Speed Models:
VFD4A8MS11ANSAA	VFD4A8MS11ENSAA	VFD7A5MS21ANSHA	VFD7A5MS21ENSHA	VFD7A5MS21AFSAA	VFD7A5MS21AFSHA
VFD7A5MS21ANSAA	VFD7A5MS21ENSAA	VFD11AMS21ANSHA	VFD11AMS21ENSHA	VFD11AMS21AFSAA	VFD11AMS21AFSHA
VFD11AMS21ANSAA	VFD11AMS21ENSAA	VFD11AMS23ANSHA	VFD11AMS23ENSHA	VFD5A5MS43AFSAA	VFD5A5MS43AFSHA
VFD11AMS23ANSAA	VFD11AMS23ENSAA	VFD17AMS23ANSHA	VFD17AMS23ENSHA	VFD9A0MS43AFSAA	VFD9A0MS43AFSHA
VFD17AMS23ANSAA	VFD17AMS23ENSAA	VFD5A5MS43ANSHA	VFD5A5MS43ENSHA		
VFD5A5MS43ANSAA	VFD5A5MS43ENSAA	VFD9A0MS43ANSHA	VFD9A0MS43ENSHA		
VFD9A0MS43ANSAA	VFD9A0MS43ENSAA				
VFD4A2MS53ANSAA	VFD6A6MS53ANSAA				

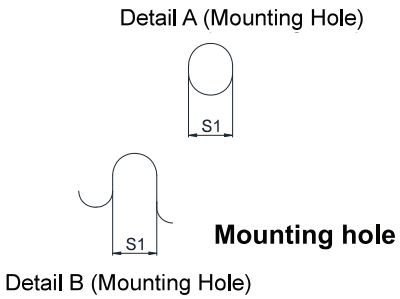
Frame		W	H	D	W1	H1	D1	S1
C1	mm	87.0	157.0	152.0	73.0	144.5	5.0	5.5
	inch	3.43	6.18	5.98	2.87	5.69	0.20	0.22
Frame		**W**	**H**	**D**	**W1**	**H1**	**D1**	**S1**
C2	mm	87.0	157.0	179.0	73.0	144.5	5.0	5.5
	inch	3.43	6.18	7.05	2.87	5.69	0.20	0.22

Dimensions - IP66 / NEMA 4X Models

Frame A



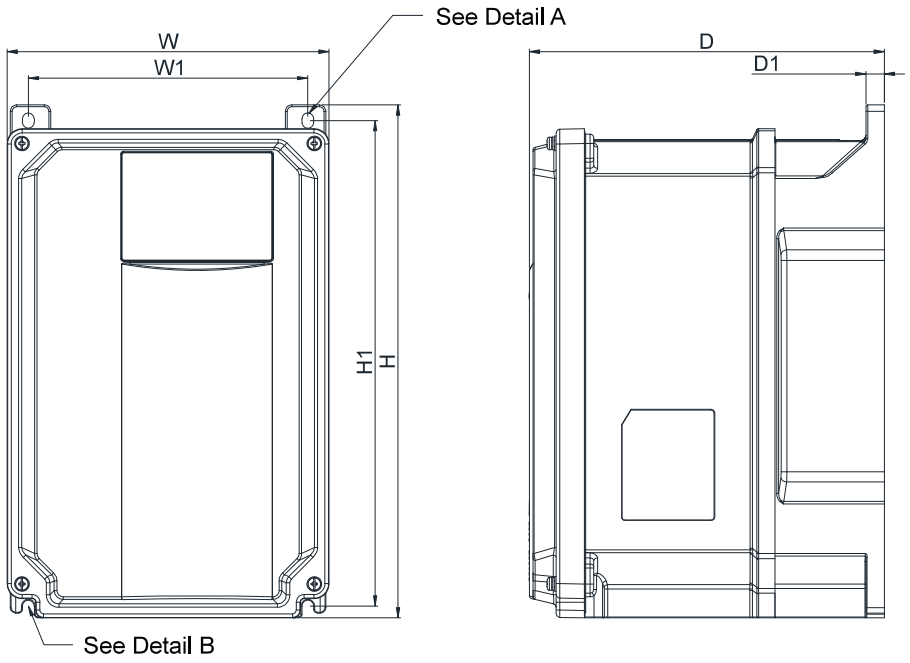


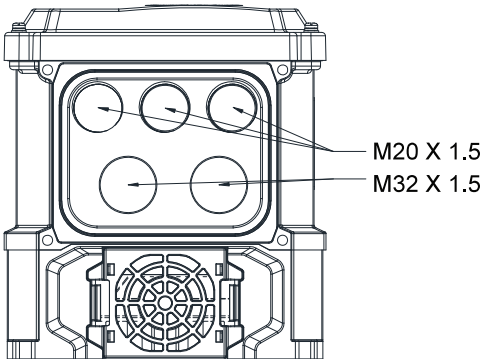


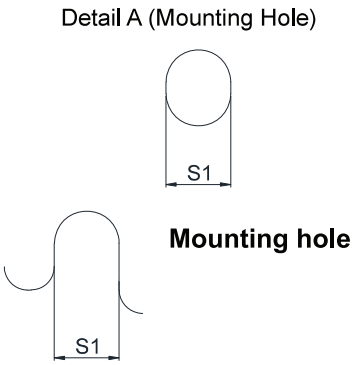
MODEL FRAME A1		FRAME A2	FRAME A3
VFD2A8MS21MNSAA	VFD2A8MS23MNSAA	VFD7A5MS21MNSAA	VFD5A5MS43MNSAA
VFD1A5MS43MFSAA	VFD4A8MS21MFSAA	VFD7A5MS23MNSAA	
VFD2A7MS43MNSAA	VFD1A5MS43MNSAA	VFD4A2MS43MNSAA	
VFD2A8MS21MFSAA	VFD4A8MS23MNSAA	VFD4A2MS43MFSAA	
VFD4A8MS21MNSAA			
VFD2A7MS43MFSAA			

Frame		W	H	D	W1	H1	D1	S1
A1	mm	160.0	230.0	151.0	146.0	216.5	4.0	5.5
	inch	6.30	9.06	6.57	5.75	8.52	0.16	0.22
Frame		**W**	**H**	**D**	**W1**	**H1**	**D1**	**S1**
A2	mm	160.0	230.0	167.0	146.0	216.5	4.0	5.5
	inch	6.30	9.06	6.57	5.75	8.52	0.16	0.22
Frame		**W**	**H**	**D**	**W1**	**H1**	**D1**	**S1**
A3	mm	160.0	230.0	190.0	146.0	216.5	4.0	5.5
	inch	6.30	9.06	7.48	5.75	8.52	0.16	0.22

Frame B







MODEL
FRAME B

VFD7A5MS21MFSAA	VFD11AMS21MNSAA	VFD11AMS21MFSAA	VFD11AMS23MNSAA
VFD5A5MS43MFSAA	VFD17AMS23MFSAA	VFD9A0MS43MNSAA	VFD9A0MS43MNSAA

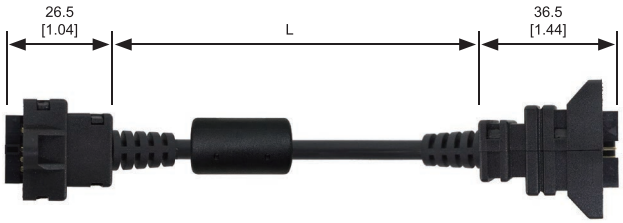
Frame		W	H	D	W1	H1	D1	S1
B	mm	175.0	280.0	193.0	152.0	266.0	10	6.4
	inch	6.89	11.02	7.60	5.98	10.43	0.39	0.25

Accessories

Standard Fieldbus Cables

Delta Cables	Part Number	Description	Length
CANopen Cable	UC-CMC003-01A	CANopen cable, RJ45 connector	0.3m
	UC-CMC005-01A	CANopen cable, RJ45 connector	0.5m
	UC-CMC010-01A	CANopen cable, RJ45 connector	1m
	UC-CMC015-01A	CANopen cable, RJ45 connector	1.5m
	UC-CMC020-01A	CANopen cable, RJ45 connector	2m
	UC-CMC030-01A	CANopen cable, RJ45 connector	3m
	UC-CMC050-01A	CANopen cable, RJ45 connector	5m
	UC-CMC100-01A	CANopen cable, RJ45 connector	10m
	UC-CMC200-01A	CANopen cable, RJ45 connector	20m
DeviceNet Cable	UC-DN01Z-01A	DeviceNet cable	305m
	UC-DN01Z-02A	DeviceNet cable	305m
EtherNet/EtherCAT Cable	UC-EMC003-02A	EtherNet/EtherCAT cable, Shielding	0.3m
	UC-EMC005-02A	EtherNet/EtherCAT cable, Shielding	0.5m
	UC-EMC010-02A	EtherNet/EtherCAT cable, Shielding	1m
	UC-EMC020-02A	EtherNet/EtherCAT cable, Shielding	2m
	UC-EMC050-02A	EtherNet/EtherCAT cable, Shielding	5m
	UC-EMC100-02A	EtherNet/EtherCAT cable, Shielding	10m
	UC-EMC200-02A	EtherNet/EtherCAT cable, Shielding	20m
CANopen/DeviceNet TAP	TAP-CN01	1 in 2 out, built-in 121Ω terminal resistor	1 in 2 out
	TAP-CN02	1 in 4 out, built-in 121Ω terminal resistor	1 in 4 out
	TAP-CN03	1 in 4 out, RJ45 connector, built-in 121Ω terminal resistor	1 in 4 out
PROFIBUS Cable	UC-PF01Z-01A	PROFIBUS DP cable	305m

Extension Cable for Digital Keypad



Part No.	L	
	mm	[inch]
EG0610C	600	23.6
EG1010C	1000	39.4
EG2010C	2000	78.7
EG3010C	3000	118.1
EG5010C	5000	196.8

Model Name Explanation

VFD 1A5 MS 43 A N S A A

Variable Frequency Drive

Rated Output Current
Under Heavy Duty Mode (150% 60 seconds)

Series Name
MS: Standard MS300

Input Voltage
11: 115V single-phase
21: 230V single-phase
23: 230V 3-phase
43: 460V 3-phase
53: 575V 3-phase*

IP Level
A: IP20
E: IP40 (Anti-dust)
M: IP66/NEMA 4X

EMC Filter
N: None
F: Built-in EMC Filter

Safe Torque Off (STO)
S: Integrated STO

Model Type
A: Standard Model
H: High Speed Model

Version

*Only for models with ANSAA at the end of model names

Ordering Information

IP20/IP60 Standard Models (0~599 Hz)

Power Range			Frame Size	Model Name	Standard Models (0 ~ 599 Hz)	
Max. Applicable Motor Capacity		Drive Rated Output Current			Built-in EMC Filter	IP40 Models
	[kW]	[A]				
115 V / single-phase						
0.25	0.2	1.6	A	VFD1A6MS11ANSAA	-	-
				VFD1A6MS11ENSAA	-	V
0.5	0.4	2.5	A	VFD2A5MS11ANSAA	-	-
				VFD2A5MS11ENSAA	-	V
1	0.75	4.8	C	VFD4A8MS11ANSAA	-	-
				VFD4A8MS11ENSAA	-	V
230 V / single-phase						
1/4	0.2	1.6	A	VFD1A6MS21ANSAA	-	-
			A	VFD1A6MS21ENSAA	-	V
			B	VFD1A6MS21AFSAA	V	-
0.5	0.4	2.8	A	VFD2A8MS21ANSAA	-	-
			A	VFD2A8MS21ENSAA	-	V
			B	VFD2A8MS21AFSAA	V	-
1	0.75	4.8	B	VFD4A8MS21ANSAA	-	-
				VFD4A8MS21AFSAA	V	-
				VFD4A8MS21ENSAA	-	V
2	1.5	7.5	C	VFD7A5MS21ANSAA	-	-
				VFD7A5MS21AFSAA	V	-
				VFD7A5MS21ENSAA	-	V
3	2.2	11.0	C	VFD11AMS21ANSAA	-	-
				VFD11AMS21AFSAA	V	-
				VFD11AMS21ENSAA	-	V
230 V / 3-phase						
0.25	0.2	1.6	A	VFD1A6MS23ANSAA	-	-
				VFD1A6MS23ENSAA	-	V
0.5	0.4	2.8	A	VFD2A8MS23ANSAA	-	-
				VFD2A8MS23ENSAA	-	V
1	0.75	4.8	A	VFD4A8MS23ANSAA	-	-
				VFD4A8MS23ENSAA	-	V
2	1.5	7.5	B	VFD7A5MS23ANSAA	-	-
				VFD7A5MS23ENSAA	-	V
3	2.2	11.0	C	VFD11AMS23ANSAA	-	-
				VFD11AMS23ENSAA	-	V
5	3.7 / 4	17.0	C	VFD17AMS23ANSAA	-	-
				VFD17AMS23ENSAA	-	V
7.5	5.5	25.0	D	VFD25AMS23ANSAA	-	-
				VFD25AMS23ENSAA	-	V
10	7.5	33.0	E	VFD33AMS23ANSAA	-	-
				VFD33AMS23ENSAA	-	V
15	11	49.0	E	VFD49AMS23ANSAA	-	-
				VFD49AMS23ENSAA	-	V
20	15	65.0	F	VFD65AMS23ANSAA	-	-

Power Range			Frame Size	Model Name	Standard Models (0 ~ 599 Hz)	
Max. Applicable Motor Capacity		Drive Rated Output Current			Built-in EMC Filter	IP40 Models
[HP]	[kW]	[A]				
460 V / 3-phase						
0.5	0.4	1.5	A	VFD1A5MS43ANSAA	-	-
			A	VFD1A5MS43ENSAA	-	V
			B	VFD1A5MS43AFSAA	V	-
1	0.75	2.7	A	VFD2A7MS43ANSAA	-	-
			A	VFD2A7MS43ENSAA	-	V
			B	VFD2A7MS43AFSAA	V	-
2	1.5	4.2	B	VFD4A2MS43ANSAA	-	-
				VFD4A2MS43ENSAA	-	V
				VFD4A2MS43AFSAA	V	-
3	2.2	5.5	C	VFD5A5MS43ANSAA	-	-
				VFD5A5MS43ENSAA	-	V
				VFD5A5MS43AFSAA	V	-
5	3.7 / 4	9.0	C	VFD9A0MS43ANSAA	-	-
				VFD9A0MS43ENSAA	-	V
				VFD9A0MS43AFSAA	V	-
7.5	5.5	13.0	D	VFD13AMS43ANSAA	-	-
				VFD13AMS43ENSAA	-	V
				VFD13AMS43AFSAA	V	-
10	7.5	17.0	D	VFD17AMS43ANSAA	-	-
				VFD17AMS43ENSAA	-	V
				VFD17AMS43AFSAA	V	-
15	11	25.0	E	VFD25AMS43ANSAA	-	-
				VFD25AMS43ENSAA	-	V
				VFD25AMS43AFSAA	V	-
20	15	32.0	E	VFD32AMS43ANSAA	-	-
				VFD32AMS43ENSAA	-	V
				VFD32AMS43AFSAA	V	-
25	18.5	38.0	F	VFD38AMS43ANSAA	-	-
				VFD38AMS43ENSAA	-	V
				VFD38AMS43AFSAA	V	-
30	22	45.0	F	VFD45AMS43ANSAA	-	-
				VFD45AMS43ENSAA	-	V
				VFD45AMS43AFSAA	V	-
575 V / 3-phase						
1	0.75	1.7	A	VFD1A7MS53ANSAA	-	-
2	1.5	3.0	B	VFD3A0MS53ANSAA	-	-
3	2.2	4.2	C	VFD4A2MS53ANSAA	-	-
5	3.7	6.6		VFD6A6MS53ANSAA	-	-
7.5	5.5	9.9	D	VFD9A9MS53ANSAA	-	-

IP66 Standard Models (0~599 Hz)

Power Range			Frame Size	Model Name	High Speed Models (0 ~ 1500 Hz)
Max. Applicable Motor Capacity		Drive Rated Output Current			
[HP]	[kW]	[A]			
230V / single-phase					
1/2	0.4	2.8	A	VFD2A8MS21MNSAA	-
		2.8		VFD2A8MS21MNSAA	V
1	0.75	4.8	A	VFD4A8MS21MNSAA	-
		4.8		VFD4A8MS21MNSAA	V
2	1.5	7.5	A	VFD7A5MS21MNSAA	-
		7.5	B	VFD7A5MS21MNSAA	V
3	2.2	11	B	VFD11AMS21MNSAA	-
		11		VFD11AMS21MNSAA	V
230V / 3-phase					
1/2	0.4	2.8	A	VFD2A8MS23MNSAA	-
1	0.75	4.8	A	VFD4A8MS23MNSAA	-
2	1.5	7.5	A	VFD7A5MS23MNSAA	-
3	2.2	11	B	VFD11AMS23MNSAA	-
5	3.7	17	B	VFD17AMS23MNSAA	-
7.5	5.5	7.5	C	VFD25AMS23MNSAA	-
460V/3-phase					
1/2	0.4	1.5	A	VFD1A5MS43MNSAA	-
		1.5		VFD1A5MS43MNSAA	V
1	0.75	2.7	A	VFD2A7MS43MNSAA	-
		2.7		VFD2A7MS43MNSAA	V
2	1.5	4.2	A	VFD4A2MS43MNSAA	-
		4.2		VFD4A2MS43MNSAA	V
3	2.2	5.5	A	VFD5A5MS43MNSAA	-
		5.5	B	VFD5A5MS43MNSAA	V
5	3.7	9	B	VFD9A0MS43MNSAA	-
		9		VFD9A0MS43MNSAA	V
7.5	5.5	13	C	VFD13AMS43MNSAA	-
		13		VFD13AMS43MNSAA	V
10	7.5	17	C	VFD17AMS43MNSAA	-
		17		VFD17AMS43MNSAA	V

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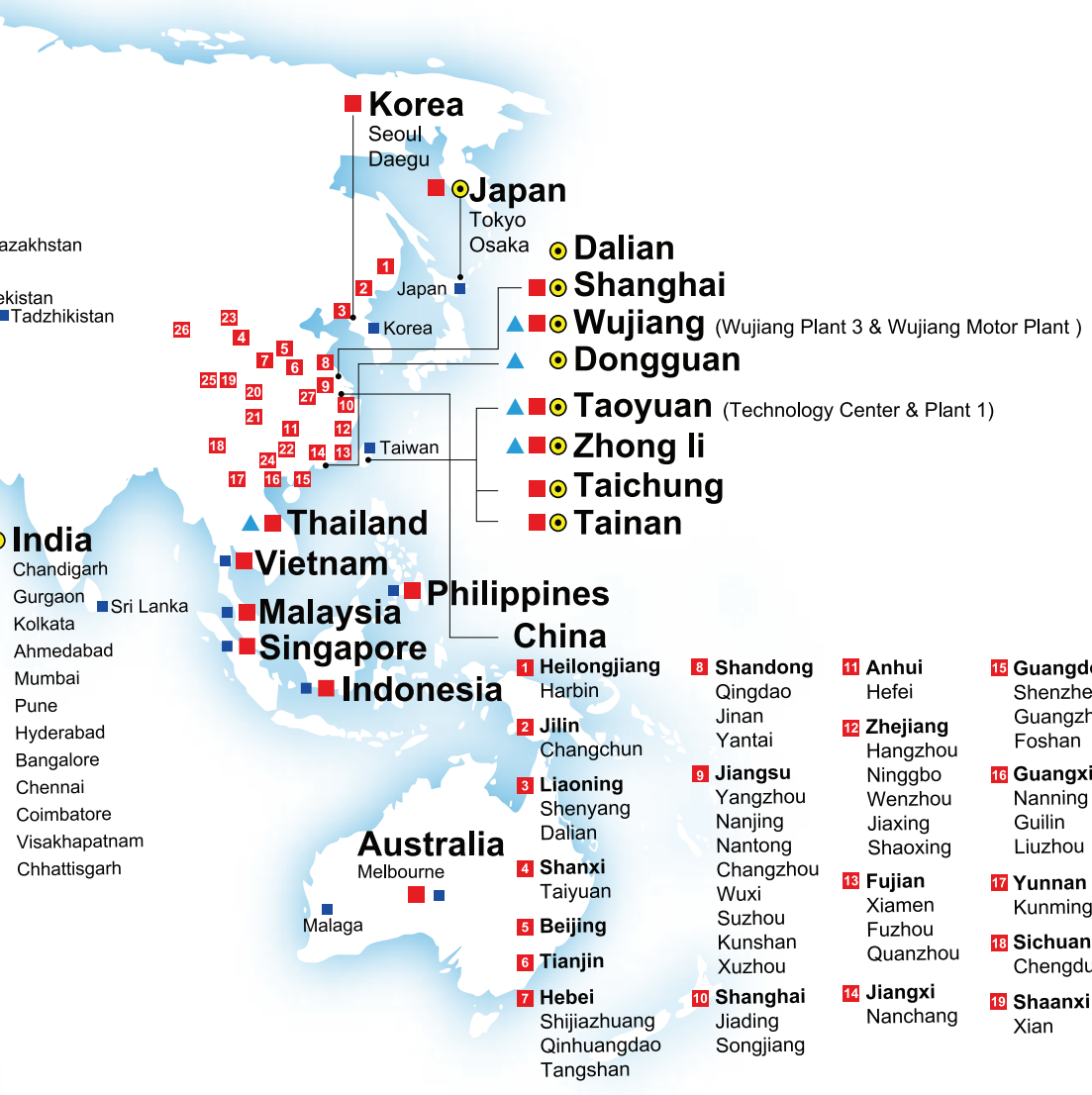

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