TMEIC

We drive industry

MEDIUM VOLTAGE DRIVE SYSTEM

TMdrive™-MVe3 series

Type-D3

TMEIC Corporation

MEDIUM VOLTAGE DRIVE SYSTEM

TMdrive-MVe3 series

Progress of drive performance with field data collection and analysis functions for high-voltage inverters as variable speed operation of medium voltage motors.

Our "TMdrive-MVG2","TMdrive-MVe2" with multi-level PWM control for variable speed operation of medium-voltage motors have a lot of experience as high performance MV drive equipment.

New TMdrive-MVe3 with ‘e3 control’ can achieve the progress with above main circuits, higher-speed, high-precision motor control and easy connection with PLC, field data collection and analysis functions as high performance drive equipment.

In addition, the drive's maintenance and adjustment functions have been improved with a full range of monitoring and maintenance tools.

TMEIC can contribute to a reduction of CO_2 emissions through high-efficiency AC variable speed drives and energy-savings applications with medium voltage induction motors.

technologies provide epoch-making Inverter

BENEFIT1. High efficiency

- Reduced harmonic losses in the motor due to almost sinusoidal output current.
- No transformer on output side and no loss due to not require output transformer.
- Multi-level PWM control reduces IGBT switching losses.

BENEFIT2. High reliability

- Latest IGBTs for MV converter main circuit makes improvement of the reliability.
- Improved control reliability by using a reduced number of components.
- Highly reliable control is possible, even if sudden momentary power failure.
- Active power control makes it possible to minimize the reactive power of the entire system (Type-P).

BENEFIT3. Low impact on the power system,high power factor makes it friendly to power supply and motors

- Reduced harmonic currents by multiplexing the input transformer.
- No need of phase advance capacitors and harmonic filters.

BENEFIT4. Easy maintenance

- Film capacitors are used for DC smoothing.
  Maintenance and replacement is not necessary,which significantly reduces the life cycle cost.

BENEFIT5. Energy saving

- In variable torque load applications such as fans, pumps or blowers,
  variable speed operation of inverters achieves significant energy saving effect.
- The power regeneration function allows rotational energy to be returned to the power source (Type-P).

Type-P

Benefit of TMdrive-MVe3

BENEFIT1. High efficiency

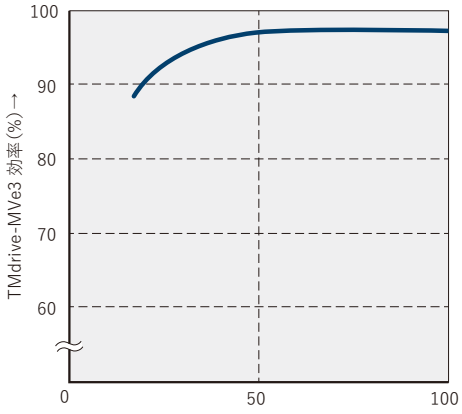
High-voltage IGBTs ensure highly efficient variable speed operation

■TMdrive-MVe3 uses latest IGBTs for MV inverters, reduces switching losses in the main circuit semiconductor by unique multi-level PWM control, and reduces harmonic losses in primary winding of VFD input transformer by lowering harmonic currents on power supply, resulting in a highly efficient variable speed drive system.*1 (Request us if efficiency specified)

■Furthermore, compared to previous drive systems that require harmonic filters and phase advance capacitor, no losses are incurred by these devices,contributing to improved overall facility equipment efficiency.

*1. At rated speed and full load.

Efficiency curve of TMdrive-MVe3
(including input transformer)



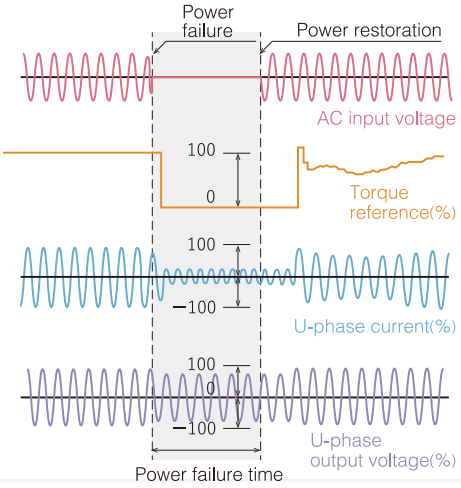
BENEFIT2. High reliability

High reliability, even in sudden momentary power failure

■The rated voltage output continues even in case of short-time power supply voltage drop or power failure(up to 300ms).(Ride-through operation during an instantaneous power failure)When a power failure occurs, torque output is reduced to zero without tripping, and then returns after the power recovery.

■Automatic restart can be selected when operation is stopped due to sudden power failure.(automatically re-start and accerarate facntion that motor is decelerating or has stopped due to free run)

Ride-through control during power failure



BENEFIT3. Low impact on the power system, high power factor makes it friendly to power supply and motors

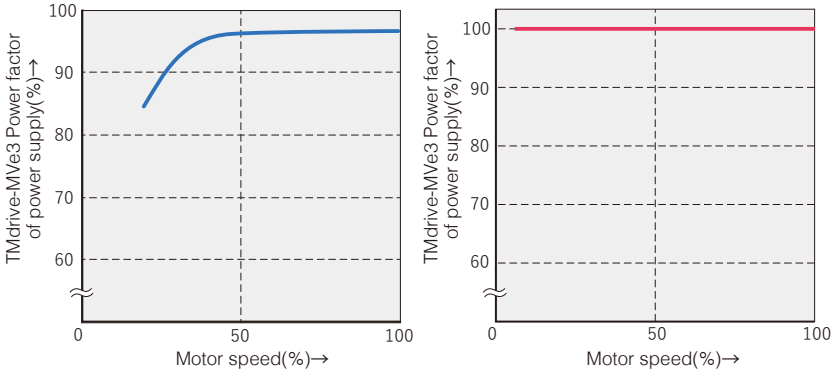
High power factor achieved over all operating speed range

■Main circuit configuration of the TMdrive-MVe3 (Type-D1/D3) consists of a multi-phase diode front-end, which enables operation with a higher power factor than the motor alone(0.95 or higher*2). Therefore, phase advance capacitor is also unnecessary.

*2. At rated speed and full load.

■The TMdrive-MVe3 (Type-P) uses a PWM converter to achieve operation with a power factor of 1, which helps reduce the basic contract fee with the power company.

Power factor curve of power supply for TMdrive-MVe3
(Type-D1[Left],Type-P[Right])
(Example of actual load test results of a TMEIC standard 4-pole motor)



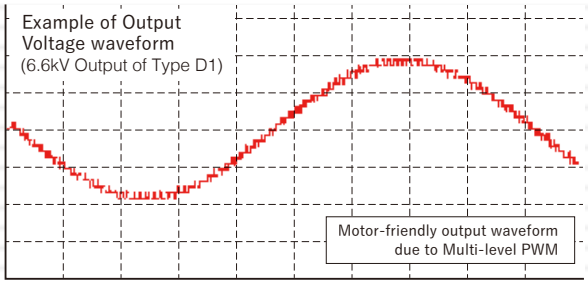
BENEFIT3. Low impact on the power system, high power factor makes it friendly to power supply and motors

TMdrive-MVe3 can feed standard type existing medium-voltage motors

■Multi-level PWM control of TMdrive-MVe3 provides an almost sinusoidal current waveform by using staircase output voltage that also approximates to a sinusoidal waveform.In addition, TMEIC's unique switching shift control, in which the on/off timing of the IGBT does not overlap with the line-to-line output voltage, reduces switching surges to a minimum, enabling energy-saving drive of existing motors without capacity reduction.

*If existing motor will be driven by useing variable speed, please confirm motor or load equipment have no roblem by using variable speed operation.

Output voltage waveform example



■In case of harmonic currents are included in motor current, pulsating torque (torque ripple) is generated at motor shaft, causing torsional vibration torque on the drive shaft and load. In addition, if frequency of torque ripple coincides with torsional natural frequency of entire mechanical shaft system, torsional vibration torque increases further due to resonance phenomena.However, harmonic current components in the output current of TMdrive-MVe3 are extremely small, The influence of torque ripple is almost negligible.

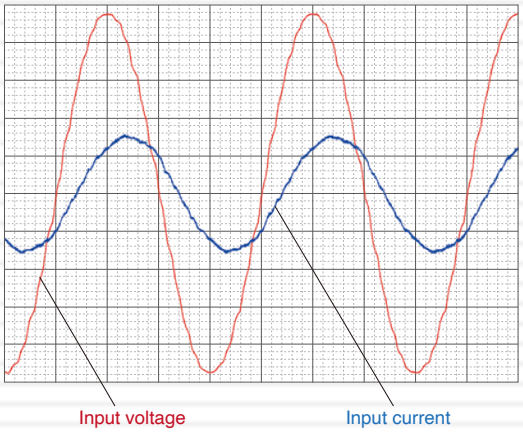
Integrated multiplexing input transformer can reduce input current harmonics

■In recent years, power electronics equipment have been widely used.
Harmonic currents generated by these equipments flow into power system, distorting power system voltage and causing problems with some devices.
TMdrive-MVe3 is "low in harmonic current = friendly for power supply" converter by using integrated multiplexing input transformer.Harmonic currents to power supply are greatly reduced and meet the IEEE standard 519 (Recommended Practice and Requirements for Harmonic Control in Electric Power Systems).

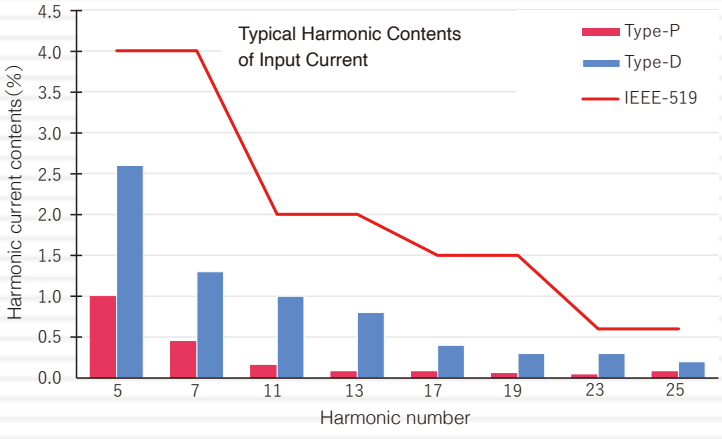
TMdrive-MVe3 relative harmonic content on the input side

Order		5th	7th	11th	13th	17th	19th	23th	25th
Relative harmonic content (%)*3	Type-D	2.6	1.3	1.0	0.8	0.4	0.3	0.3	0.2
	Type-P	1.0	0.45	0.16	0.08	0.08	0.06	0.04	0.08
IEEE-519(2022) (%)		4.0	2.8	1.8	1.5	1.1	1.0	0.87	0.8

TMdrive-MVe3 (Type-D)
input waveforms(Example of 24-pulse)



Relative harmonic content on the input side



*3. TMdrive-MVe3 harmonic current is a representative value calculated by statistical processing of VFD product measurement results.

Benefit of TMdrive-MVe3

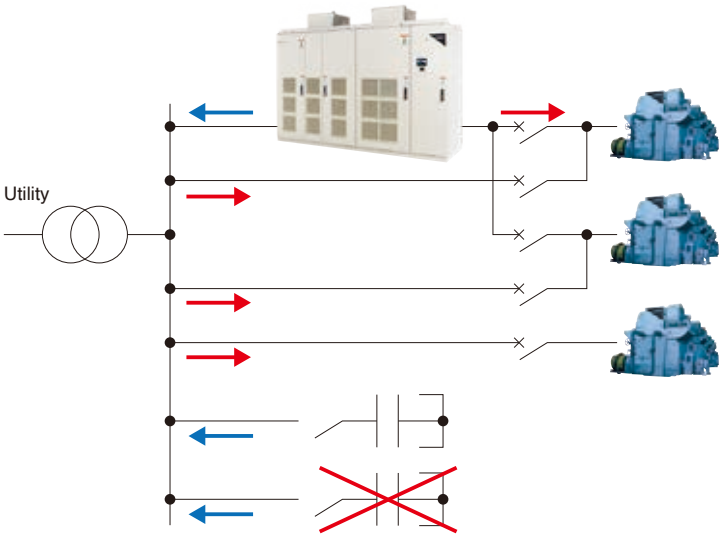
BENEFIT3. Low impact on the power system, high power factor makes it friendly to power supply and motors

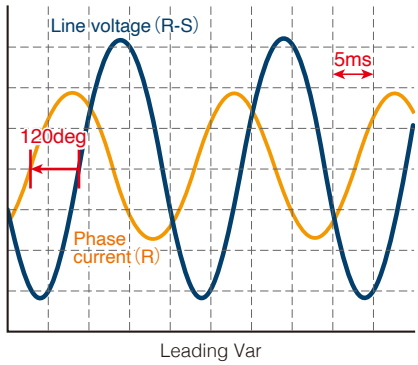
Static Var Compensation (Only Type-P)

■ Leading/Lagging reactive power is controlled by Static Var Compensation.
Utility reactive power is quickly and stability minimized by this system.

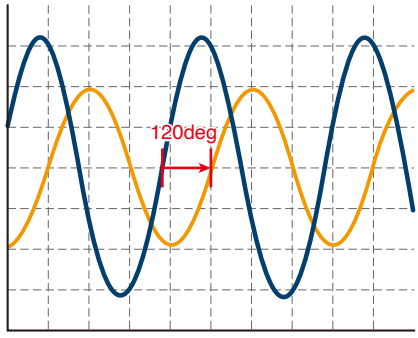
Minimizing peripheral equipment

Initial cost reduction and space-saving are realized by minimizing phase advance capacitor and receiving transformer capacity. Static Var Compensation is possible with max 70% capacity of inverter capacity.





Leading Var

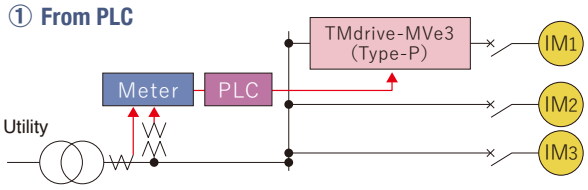


Lagging Var

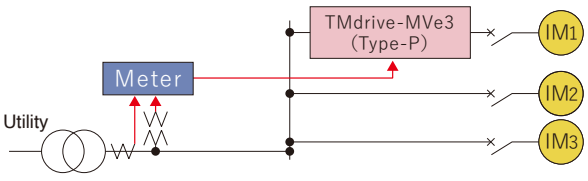
Various connection methods

To input the feedback signal for Static Var Compensation.

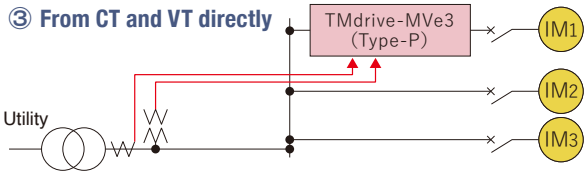
① From PLC



② From Reactive power meter / power factor meter

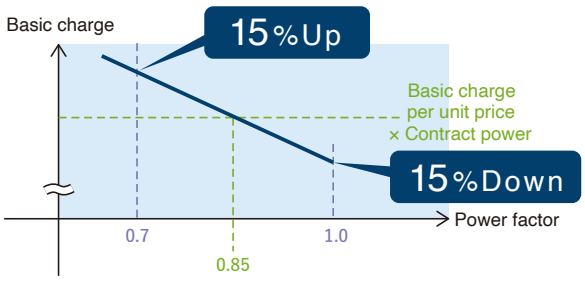


③ From CT and VT directly



Electric charges reduction

Preferential electric power charge are applied (P.F. > 0.85).
Basic charge =
Basic price per unit price × Contract power × (1.85 – P.F.)



The above is example in Japan.
Price system is depended on the country.

BENEFIT3. Low impact on the power system, high power factor makes it friendly to power supply and motors

Reactive power compensation amount by Static Var Compensation (Only Type-P)

■ Following reactive power [kVar] can be supplied depend on inverter capacity [kVar] and motor power [kW].

Inverter capacity [kVA]	Motor output [kW] (Eff. = 0.95)												
	160	320	650	1,000	1,250	1,420	1,600	1,800	2,250	2,600	3,150	3,550	4,000
400	200	–	–	–	–	–	–	–	–	–	–	–	–
800	500	400	–	–	–	–	–	–	–	–	–	–	–
1,200	800	700	400	–	–	–	–	–	–	–	–	–	–
1,600	1,100	1,000	800	300	–	–	–	–	–	–	–	–	–
1,900	1,300	1,200	1,100	800	100	–	–	–	–	–	–	–	–
2,200	1,500	1,500	1,300	1,100	800	300	–	–	–	–	–	–	–
2,600	1,800	1,700	1,600	1,400	1,200	1,000	600	–	–	–	–	–	–
3,000	2,000	2,000	1,900	1,800	1,600	1,400	1,200	900	–	–	–	–	–
3,600	2,500	2,400	2,400	2,200	2,100	2,000	1,800	1,600	800	–	–	–	–
4,400	3,000	3,000	3,000	2,800	2,700	2,600	2,500	2,400	1,900	1,400	–	–	–
5,000	3,400	3,400	3,400	3,300	3,200	3,100	3,000	2,900	2,500	2,100	1,100	–	–
6,000	4,100	4,100	4,100	4,000	3,900	3,900	3,800	3,700	3,400	3,100	2,500	1,900	–
7,350	5,100	5,100	5,000	5,000	4,900	4,900	4,800	4,700	4,500	4,300	3,900	3,500	2,900

* Above table is rough estimation. Please contact our sales staff about actual compensation amount
* In this calculation, right side equation is used (Second digit truncation).

$$\text{Compensation value} = \sqrt{(\text{Inverter capacity [kVA]} \times 0.7)^2 - (\text{Motor output [kW]} \div \text{motor efficiency})^2}$$

* Inverter capacity [kVA] is based on 6.6 kV class in 400-4400 kVA and 11 kV class in over 5000 kVA. In case of applying inverter capacity is nothing, please use a smaller than the capacity.
Ex) In case of 3.3 kV-1500 kVA inverter, 1200 kV table is used.

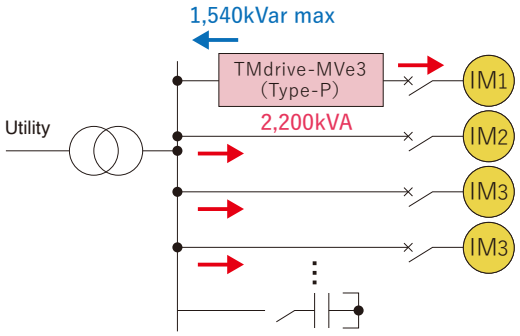
Example

1200 kVA inverter is needed for driving the 1000 kW motor (P.F. = 0.9, Eff. = 95%) as following.
Apparent power : 1000 kW/0.9/0.95 = 1169 kVA

① Inverter drive one motor by variable frequency and other motors by commercial fixed speed.

In case of 2200 kVA inverter is applied, at most 1540 kVar reactive power can be supplied. (2200 kVA × 0.7 = 1540 kVar)
When 2200 kVA inverter is applied to the above 1000 kW motor, the inverter supply the motor with 1000 kW power and other motors with following reactive power at the same time.

$$\sqrt{1540\ \text{kVA}^2 - (1000\ \text{kW}/0.95)^2} = 1120\ \text{kVar}$$

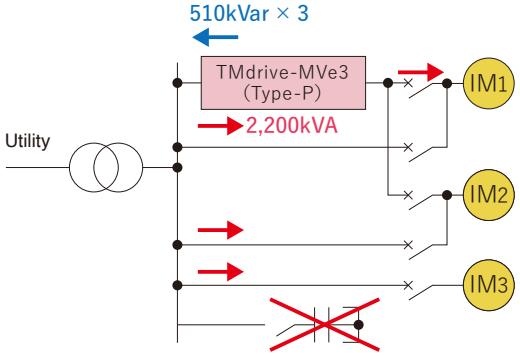


② Inverter is used for multi synchronous transfer motors and static var compensator

Following reactive power is required from the each synchronous transfer driving motor.

$$1169\ \text{kVA} \times \sqrt{1 - 0.9^2} = 510\ \text{kVar}$$

In this case, if 2200 kVA inverter (1540 kVar reactive power can be supplied) is applied as right side figure, 1530 kVar reactive power (required reactive power for three motors) can be supplied from 2200 kVA inverter.



Benefit of TMdrive-MVe3

BENEFIT4. Maintenance cost reduction

Long life film capacitors for DC voltage smoothing of main circuit

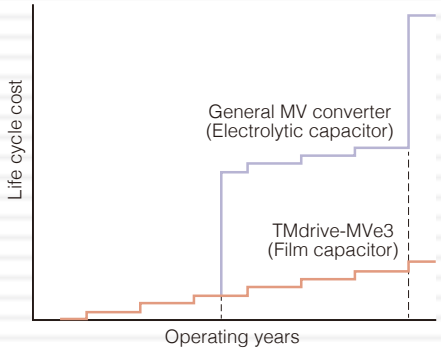
■Film capacitors are used for DC voltage smoothing. Maintenance and replacement is not necessary, which significantly reduces the life cycle cost.

■Front access structure for easy maintenance. VFD input transformer is integrated into the inverter panel, not requiring external cables.

*Except for Type-D 10kV and 11kV VFD, 1200 and 1400 frames.

■The cooling system uses air cooling to effectively cool IGBT semiconductors, and the use of a draw-out cell inverter reduces the MTTR to 30 minutes or less (excluding Type-P 600 Cell frame), ensuring high maintainability.

*1.MTTR:Mean Time To Repair

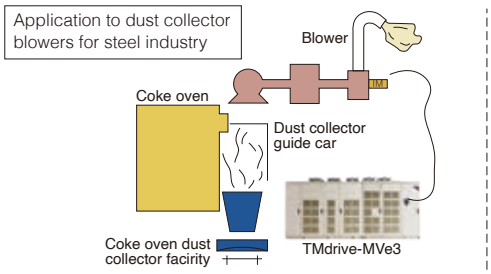


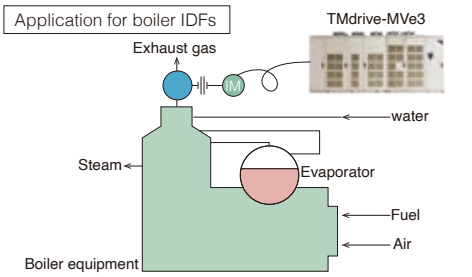
BENEFIT5. Energy saving

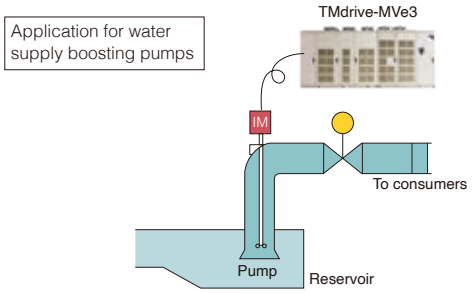
Speed control by VFD can provides significant energy savings and CO_2 emission reductions

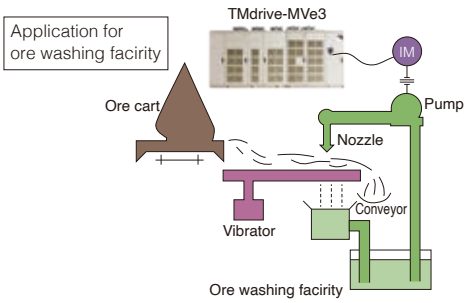
■In variable torque load applications such as fans, pumps or blowers, variable speed operation of inverters achieves significant energy saving effect as compared to the constant speed operation using a commercial power supply (50 Hz or 60 Hz).

■When motor speed control is used in an applications such as a fans, pumps or blowers
Air volume (flow) ∝ Speed
Required power ∝ $(\text{Speed})^3$. For example, when 80% air volume (flow) is required, significant power saving can be achieved by performing the speed control:Required power = $(80\%)^3 \fallingdotseq 50\%$









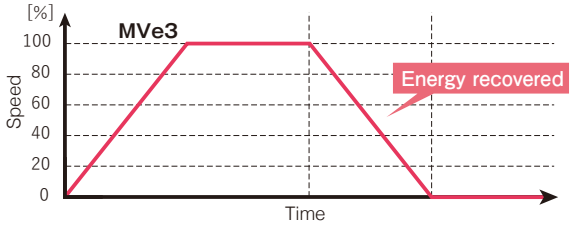

Pumping facirity


Boiler facirity


Conveyor facirity

Regenerative power feedback to the power supply (Type-P)

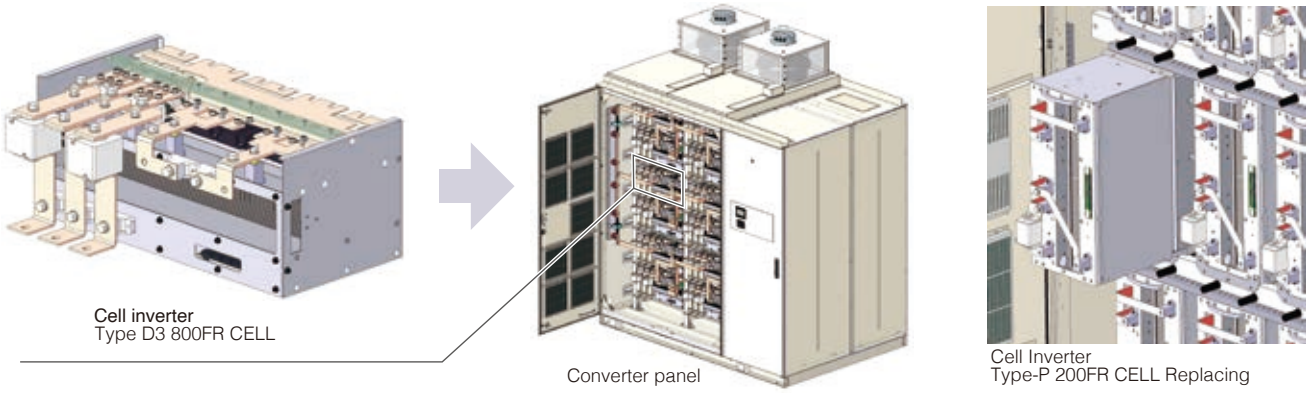
■The power regeneration function enables stopping of large inertia loads in a short time. During deceleration, the rotational energy is returned to the power supply, which contributes to a reduction in energy consumption and a reduction in electricity costs.



Calculation examples

A machine which decelerates with 1500 kW power in 15 minutes, with a 25% torque
→ Each time it is stopped, power equivalent to 50 kWh is generated.*1
*1 Mechanical losses and losses in the motor and the inverter are not included.

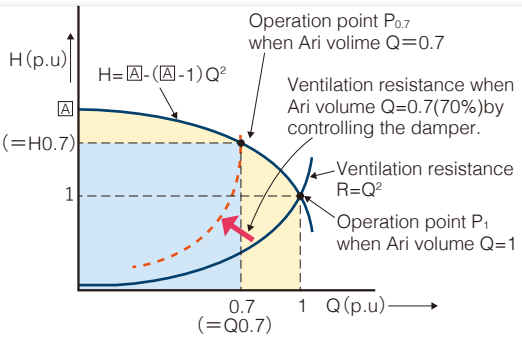
●Regenerative Braking of a conveyor application allows saving of energy during each conveyor stop.Regenerative operation of downhill conveyors allows long term energy savings.



Power saving with speed control / CO_2 emission reduction

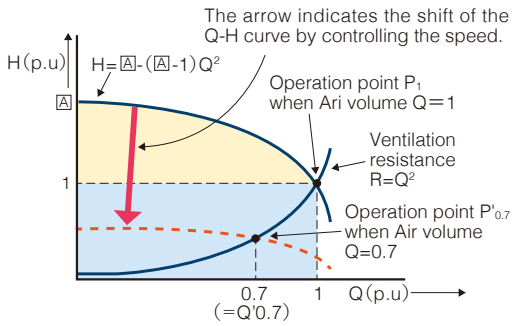
Power consumption for damper control (at the rated motor speed)

The figure on the right shows a general relationship diagram when the air volume of a fan or a blower is changed from 100% to 70% during the damper control.
(H = 1：Rated air pressure, Q = 1：Rated air volume)
The necessary shaft power P_1 when Q = 1 is the rated shaft power (kW) of the fan (blower). (= H0.7)The shaft power $P_{0.7}$ required when Q = 0.7 ($Q_{0.7}$) is as follows when the changein efficiency of the fan (blower) is disregarded：$P_{0.7} = P_1 \times Q_{0.7} \times H_{0.7}$.
Consequently, when the motor efficiency is ηM, the input power P_{I1} when Q = 1and the input power $P_{I0.7}$ when Q = 0.7 are as follows：$P_{I1} = P_1 / \eta M$ (kW), $P_{I0.7} = P_{0.7} / \eta M$ (kW)
(However, reduction in the motor efficiency due to reduction in the load rate is disregarded.)



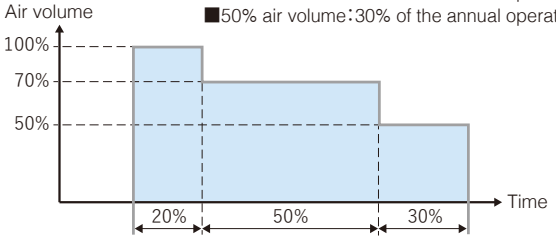
Power consumption for speed control of inverter

The figure on the right shows a relationship diagram when the air volume regulation of a fan or a blower is changed from 100% to 70% by the speed control of inverter.
The input P_{I1} required when Q = 1 is the same as that of the damper control.
$P_{I1}=P_1 / \eta M$ (kW)
On the other hand, when the 70% air volume = $Q'_{0.7}$, the operation point is $P'_{0.7}$.
The shaft power $P'_{0.7}$ required in this case is as follows：$P'_{0.7} = P_1 \times Q'_{0.7} \times H' = P_1 \times Q'^3_{0.7}$. Consequently, the input $P'_{I0.7}$ required in this case when the inverter efficiency is ηINV is as follows：$P'_{I0.7} = P'_{0.7} / \eta M / \eta INV = P_1 \times 0.7^3 / \eta M / \eta INV$



Calculation examples

Motor efficiency=96.5%
TMdrive-MVe3 efficiency=97%(including transfomer)
Fan shaft power at rated air volume：1,100kW
Fan characteristics……H(when Q=0)=1.4p.u
Annual operation time…8,000h
Fan operation pattern… ■100% air volume：20% of the annual operation time
■70% air volume：50% of the annual operation time
■50% air volume：30% of the annual operation time



Damper control

When P_{100} = 100% air volume, P_{70} = 70% air volume, P_{50} = 50% air volume,
P_{100} = 1,100 / 0.965 = 1,140 kW
P_{70} = 1,100×0.7×(1.4-0.4×0.7×0.7) / 0.965 = 961 kW
P_{50} = 1,100×0.5×(1.4-0.4×0.5×0.5) / 0.965 = 741 kW
Power consumption = 1,140×8,000×0.2+961×8,000×0.5+741×8,000×0.3
= 7,446,400 kWh / year

Speed control

When P'_{100} = 100% air volume, P'_{70} = 70% air volume, P'_{50} = 50% air volume,
P'_{100} = 1,100 / 0.965 / 0.97 = 1,176 kW
P'_{70} = 1,100×0.7^3 / 0.965 / 0.97 = 403 kW
P'_{50} = 1,100×0.5^3 / 0.965 / 0.97 = 147 kW
Power consumption = 1,176×8,000×0.2+403×8,000×0.5+147×8,000×0.3
= 3,846,400 kWh / year

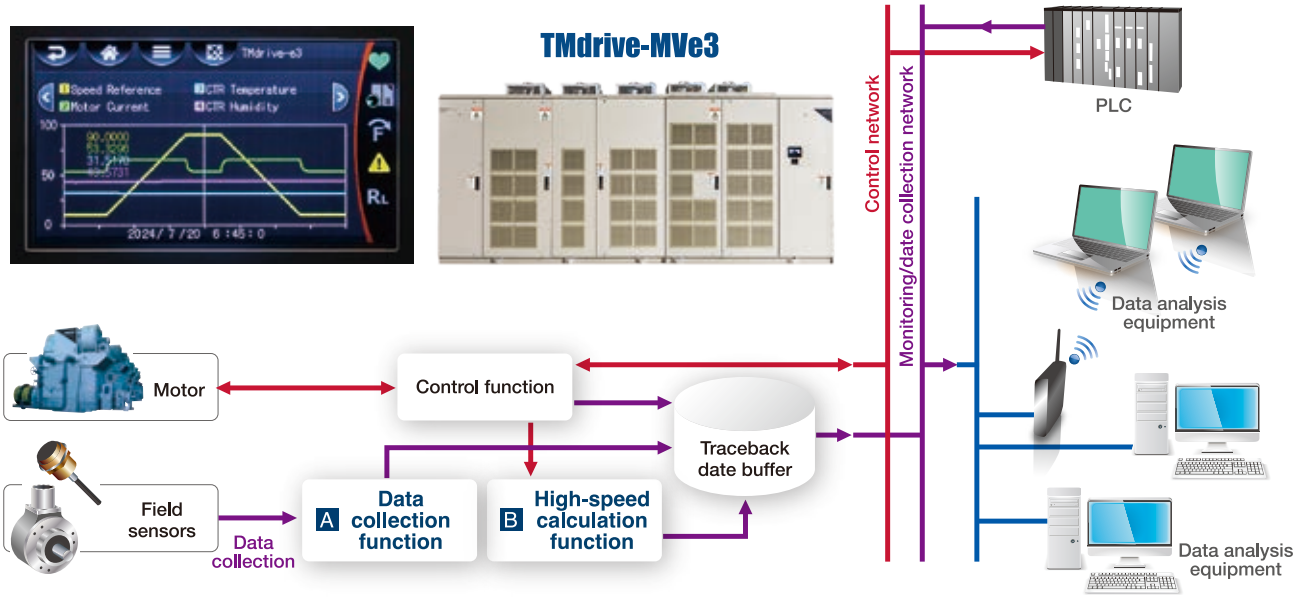
Difference between the damper control and the speed control

■Power saving amount：7,446,400 kWh−3,846,400 kWh=3,600,000 kWh / year
■Power cost saving：When the electric power unit price is 0.1dollars / kWh,
3,600,000kWh×0.1(dollars) / kWh=360,000dollars / year
■CO_2 reduction：When the CO_2 emission factor is 0.000451t-CO_2 / kWh*2,
3,600,000kWh×0.000451t-CO_2 / kWh=1,624ton

*2 An example emission factor of Tokyo Electric Power Company, Inc. from "Emission factors by electric utility in 2021" published by the Ministry of the Environment. In actual calculations, use a factor such as an emission factor default value 0.000555 t-CO_2 / kWh defined in the Ordinance No. 3 of the Ministry of Economy, Trade and Industry and the Ministry of the Environment in 2006, or an emission factor by electric utility company in each year.

TMdrive-MVe3 Function / Features

Helps achieve plant Digitalization



A Data collection function

Plant Digitalization can be achieved by using the data collected such as motor currents, motor voltage, motor speed, self-diagnostics and field data from various sensors.TMdrive-MVe3 uses extended inputs / outputs to collect field data. It can uniquely process data based on the application. It can store data temporarily using a buffer or it can store long-term history data using built-in SD card. A faster data collection and enhanced security is achieved by isolating Control Network from Diagnostic Network.

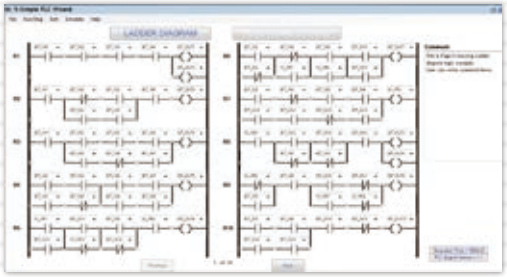
B High-speed calculation function

The high-speed calculation function enables high-speed sampling and high-speed analysis of functions such as frequency domain analysis. TMdrive-MVe3 can store high-speed data and results of high-speed calculations in a temporary buffer and it can broadcast them to external supervisory / diagnostic devices. Due to separation of Control Network from Data collection / diagnostics Network as well as of Control Function from High-Speed Analysis function, impact on CPU processing power and motor control is avoided.

Drive Specialized for Plant Control

Built-in micro PLC

TMdrive-MVe3 has built-in micro PLC which can be programed to add simple ladder logic functions or simple application specific functions. In addition, the number of external signal input / output points can be expanded by connecting additional I/O boards.



Ladder sequence

Downtime Reduction

Parameter Migration

It is possible to take over the drive information by inserting the SD card with the saved parameters into the new board.

Preventive maintenance

TMdrive-MVe3 tracks operation time of certain parts within the drive. To complement preventive maintenance, TMdrive-MVe3 will announce when a particular component is approaching end of its recommended operating life.

The Group of Tools that Improve Maintainability

TMdrive-Navigator

TMdrive-Navigator is a world class tool that can be used to adjust and / or monitor drive parameters. In addition to individual parameter adjustments, it is now possible to change a group of parameters specific to a function or application. It is also possible to fine tune parameters to "increase response" or "suppress vibrations" to improve motor control and process performance. In the event of failures, TMdrive-MVe3 can store a larger number of Traceback files and with a longer duration than previous model, allowing a better fault diagnosis.

TMdrive-Monitor

It is possible to monitor the driving status and failure information of the drive from WEB browser of PC, smartphone or tablet. Traceback data can be uploaded when a failure occurs.

TMdrive-e3 Support

A QR code will be displayed on the operation panel on the drive panel. By reading the QR code with a smartphone or tablet with TMdrive-Support installed, device information such as ratings can be obtained. In addition, by reading the QR code that is displayed at the time of failure, troubleshooting for the corresponding failure will be displayed on the smartphone or tablet.

TMdrive-MVe3 operating panel

Easy-to-read control panel for easy operation and adjustment

An LC display is used on the operation panel.The inverter operating condition can be monitored on the easy-to-view display screen.Parameter setting and troubleshooting can be also performed easily.

Display and operating unit (high-function display unit)

7.0 inch color graphic touch screen is available with not only Japanese but also 9 country languages.

Language

●Japanese ●Chinese ●Spanish ●French ●Korean
●English ●Russian ●Portuguese ●Italian ●Polish

Japanese

English

Chinese

LED indicator (hard interface)

① **DC BUS DISCHARGED**
Indicater light on after Dc Bus Discharged ··· Green

MAINTENANCE REQUIRED
Indicater light on When need maintenance ··· Yellow

② **LED display**
7segments×4characters Alphanumeric

③ **Ethernet connector**
(For PC connection
modular jack type connector)

④ **Operation status indicator**
READY : Ready to run ····· Light on Green
RUN : Drive run ····· Light on Green
ALARM : Alarm of VFD ····· Light flashing Red
FAULT : Stop as fault ····· Light on Red

⑤ **Equipment surface interlock switch**
INTER LOCK····· Light on Red

⑥ **Fault reset switch**

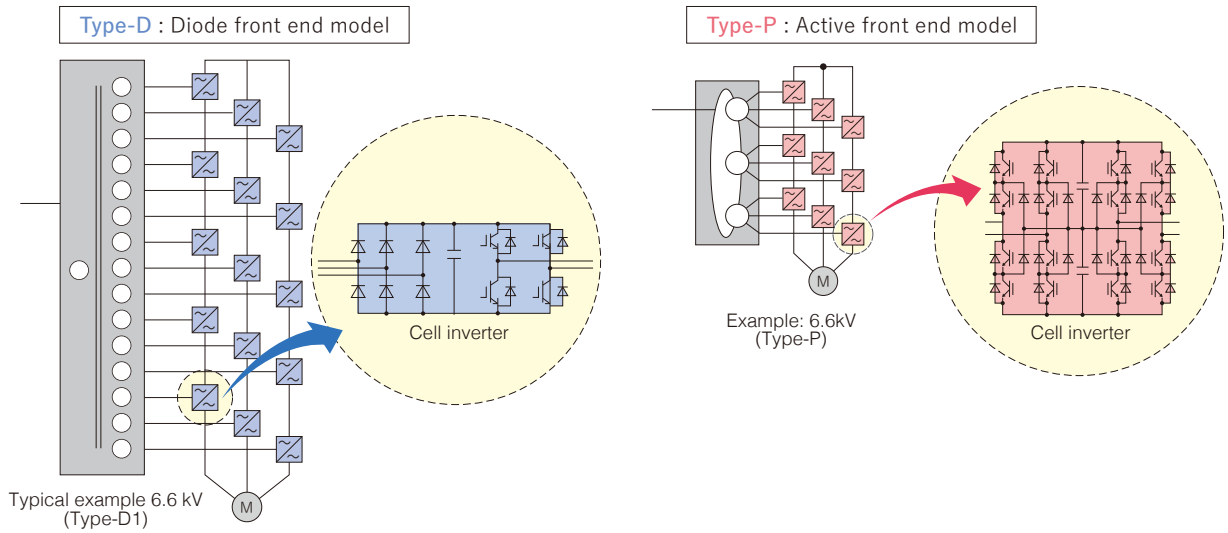
Circuit Configuration

Main circuit configuration diagram

The TMdrive-MVe3 consists of a dedicated input transformer and a single phase IGBT inverters (cell inverters).

VFD can operate as 3.3 kV and (4.16kV Type-D3 and Type-P), 6.6kV, 10kV and 11kV high-voltage three-phase AC output.*1

*1. The number of cell stages depends on the output voltage.See number of cells (per phase) in standard ratings lineup.



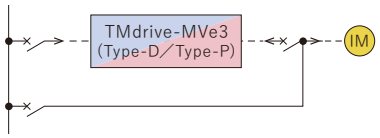
System configuration

①Inverter individual operation

The inverter operation alone

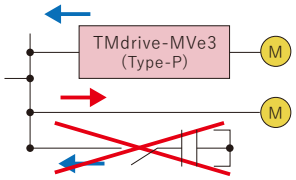
②Electronic bypass opreation

Operation using a commerclal power supply is also avallable.It is sultable for appllcations in which , for example, a motor is driven at a rated speed for a certain perlod of time , or a duplex power supply is used for a motor.



③VAR control operation

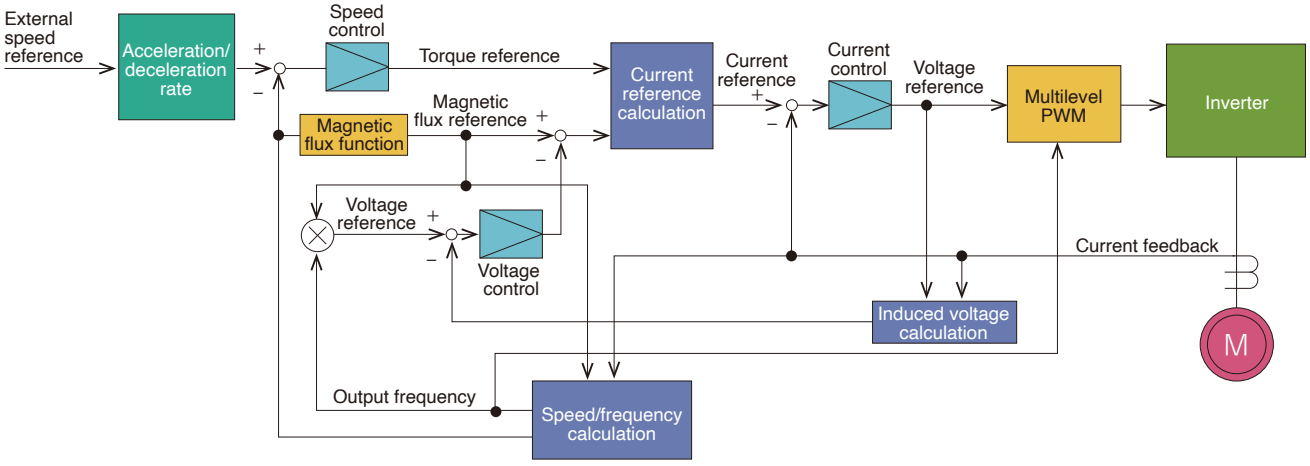
For starter applications, VAR control is possible by utilizing the standby period during the acceleration of high-voltage motors.



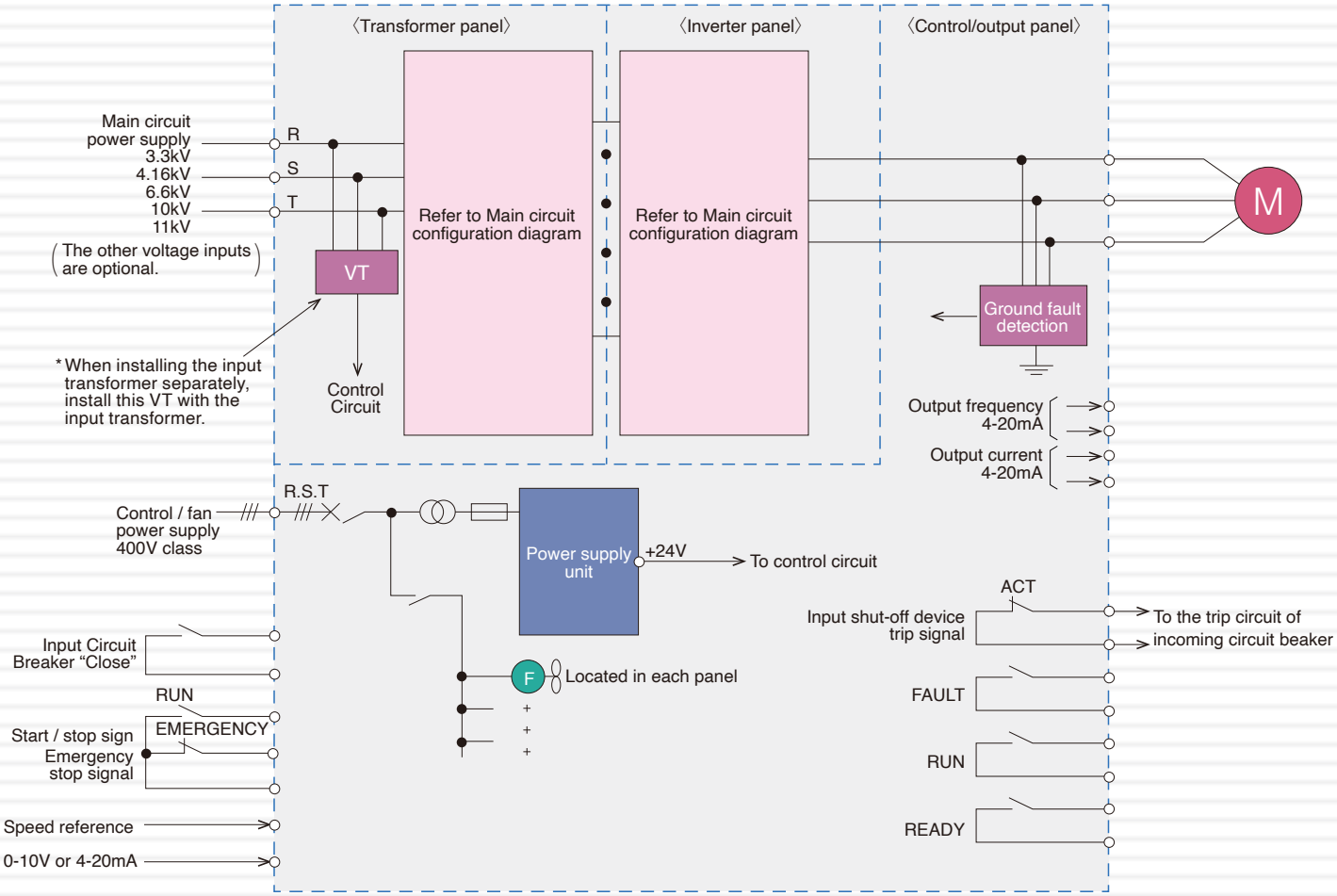
Control block diagram

Sensorless vector control ensures powerful and smooth operation

The vector control with sensor is also available depending on requirements for a high quality speed control or a larger starting torque.An open loop type V/f control is also available.



Standard connection diagram



Standard interface

Customer ➡ Inverter		
Main circuit power supply	Main circuit power supply	
Control/fan power supply*2	Control / fan power supply	380 to 440V(50Hz) / 400 to 440V(60Hz) / Other options
Start/stop signal	"Closed"to operate,"opened" to stop	Dry contact：24VDC-12mA
Emergency stop signal	"Closed" during normal operation, "opened" to initate an emergency stop (coast-to-stop)	Dry contact：24VDC-12mA
Incoming contactor status signal(or CBS)	"Closed" when the circuit breaker is closed	Dry contact：24VDC-12mA
Output circuit breaker status signal(or CBS)	"Closed" when the circuit breaker is closed	Dry contact：24VDC-12mA(if an output contactor is installed)
Speed reference signal	0-10V=0-100% or	Input impedance 8kΩ(0-10V)
	4-20mA=0-100%	Input impedance 500Ω(4-20mA)

*2 Separate step-down transformer for the control power supply (from 400V to 200V)(option)

Inverter ➡ Customer		
Operation ready signal	"Closed" when the inverter is ready for operation	Dry contact(maximum 220VAC-0.8A,110VDC-0.2A,24VDC-1.5A)
Running signal	"Closed" when the inverter is running	Dry contact(maximum 220VAC-0.8A,110VDC-0.2A,24VDC-1.5A)
Fault signal	"Closed" when the inverter fault occurs	Dry contact(maximum 220VAC-0.8A,110VDC-0.2A,24VDC-1.5A)
Incoming circuit breaker trip signal	"Closed" when the inverter fault occurs (for tripping incoming circuit breaker)	Dry contact(maximum 220VAC-0.8A,110VDC-0.2A,24VDC-1.5A)
Output current	4-20mA=0-125% current	Resistive load 500Ωor lower
Motor speed	4-20mA=0 to 125% speed	Resistive load 500Ωor lower

TMdrive-MVe3 Specifications

Standard Specifications (Type-D)

Output voltage (kV)	Output capacity (kVA)	Rated output current (A)	Overload current (A)	Overload (60sec)	Approx.Motor Power (kW)	Type	Outline drawing
3.3	200	35	43.8	125%	160	D1	Fig.1
	300	53	66.3	125%	250		
	400	70	87.5	125%	330		
	420	74	92.5	125%	350		
	440	77	84.7	110%	360		
	600	105	131	125%	490		
	800	140	175	125%	650		
	840	147	184	125%	690		
	880	154	169	110%	720		
	950	166	208	125%	770		
	1,100	192	240	125%	900		
	1,150	201	251	125%	940		
	1,200	210	231	110%	980		
	1,300	227	284	125%	1,100		
	1,500	263	329	125%	1,200		
	1,580	276	345	125%	1,300		
	1,650	289	318	110%	1,300		
	1,800	315	394	125%	1,500		Fig.2
	2,000	350	438	125%	1,600		
	2,200	385	481	125%	1,800		
	2,310	404	444	110%	1,900		
	2,400	420	525	125%	2,000		
	3,000	525	656	125%	2,400		
	3,150	551	606	110%	2,600		
	3,750	657	821	125%	3,100		
	4,500	788	985	125%	3,700		
	4,500	798	998	125%	3,700		Fig.3
	5,700	997	1,246	125%	4,700		
	6,000	1,050	1,155	110%	4,900		
3.3	950						
	1,100						
	1,150						
	1,240						
	1,300						
	1,500						
	1,580						
	1,790						
	1,800	315	394	125%	1,500	D3	Fig.2
	2,000	350	438	125%	1,600		
	2,200	385	481	125%	1,800		
	2,310	404	457	110%	1,900		
	2,400	420	525	125%	2,000		
	3,000	525	656	125%	2,400		
	3,410	597	656	110%	2,800		
	4,560						
	5,700						
	6,480						
4.16	1,440						
	1,560						
	1,980						
	2,260						
	2,770	385	481	125%	2,300	D3	Fig.2
	2,910	404	457	110%	2,400		
	3,780	525	656	125%	3,100		
	4,300	597	656	110%	3,500		
	5,260						
	5,530						
	7,180						
	8,170						
Output voltage (kV)	Output capacity (kVA)	Rated output current (A)	Overload current (A)	Overload (60sec)	Approx.Motor Power (kW)	Type	Outline drawing

Dimensions					Approx.Weight (kg)	FM (mm) Front side maintenance space	TM (mm) Minimum Height of Ceiling for Maintenance	RM (mm) Rear side maintenance space
W (Panel Width)	D (Panel depth)	H1 (Panel Height)	F (Fan Height)	H (Total Height)				
2,300	900	2,350	405	2,755	2,900	1,600min.	700min.	20min.
2,400					3,850			
3,000	1,000	2,400	505	2,905	4,700	1,700min.		
3,300	1,100				5,800			
4,600					6,850			
5,100	1,300				8,300	1,900min.		
5,400	1,700		540		10,000			600min.
5,900	1,800	2,600		3,140	12,000	2,000min.		1,000min.
ASK								

TBA

4,700	1,650	2,400	515	2,915	ASK	1,700min.	700min.	600min.
4,800								

TBA

5,500	1,650	2,400	515	2,915	ASK	1,700min.	700min.	600min.
5,750								

TBA

Dimensions					Approx.Weight (kg)	FM (mm) Front side maintenance space	TM (mm) Minimum Height of Ceiling for Maintenance	RM (mm) Rear side maintenance space
W (Panel Width)	D (Panel depth)	H1 (Panel Height)	F (Fan Height)	H (Total Height)				

TMdrive-MVe3 Specifications

Standard Specifications (Type-D)

Output voltage (kV)	Output capacity (kVA)	Rated output current (A)	Overload current (A)	Overload (60sec)	Approx.Motor Power (kW)	Type	Outline drawing
6.0	6,000	578	723	125%	4,900	D1	Fig.3
	6,500	626	783	125%	5,300		
	7,000	674	843	125%	5,700		
	7,500	730	913	125%	6,200		
	8,200	790	988	125%	6,700		
	9,000	867	1,084	125%	7,400		
6.6	400	35	44	125%	330	D1	Fig.2
	600	53	66	125%	500		
	800	70	88	125%	660		
	840	74	93	125%	690		
	880	77	85	110%	720		
	1,000	87	109	125%	810		
	1,200	105	131	125%	980		
	1,400	122	153	125%	1,100		
	1,600	140	175	125%	1,300		
	1,680	147	184	125%	1,400		
	1,760	154	169	110%	1,400		
	1,900	166	208	125%	1,600		
	2,200	192	240	125%	1,800		
	2,300	201	251	125%	1,900		
	2,400	210	231	110%	2,000		
	2,600	227	284	125%	2,100		
	3,000	262	328	125%	2,500		
	3,150	276	345	125%	2,600		
	3,300	289	318	110%	2,700		
	3,600	315	394	125%	2,900		
	4,000	350	438	125%	3,300		
	4,400	385	481	125%	3,600		
	4,620	404	444	110%	3,800		
	4,800	420	525	125%	3,900		
	5,400	473	591	125%	4,400		
	6,000	525	656	125%	4,900		
	6,300	551	606	110%	5,200		
	6,500	569	711	125%	5,300		Fig.3
	7,000	613	766	125%	5,700		
	7,500	657	821	125%	6,100		
	8,200	718	898	125%	6,700		
	9,000	788	985	125%	7,400		
	10,260	898	1,123	125%	8,400		
	11,400	997	1,246	125%	9,300		
	12,000	1,050	1,155	110%	9,800		
6.6	1,900						
	2,200						
	2,300						
	2,480						
	2,600						
	3,000						
	3,150						
	3,590						
	3,600	315	394	125%	2,900	D3	Fig.2
	4,000	350	438	125%	3,300		
	4,400	385	481	125%	3,600		
	4,620	404	457	110%	3,800		
	4,800	420	525	125%	3,900		
	5,400	473	591	125%	4,400		
	6,000	525	656	125%	4,900		
	6,820	597	656	110%	5,600		
	9,100						
	10,260						
	11,400						
	12,960						
Output voltage (kV)	Output capacity (kVA)	Rated output current (A)	Overload current (A)	Overload (60sec)	Approx.Motor Power (kW)	Type	Outline drawing

Dimensions					Approx.Weight (kg)	FM (mm) Front side maintenance space	TM (mm) Minimum Height of Ceiling for Maintenance	RM (mm) Rear side maintenance space
W (Panel Width)	D (Panel depth)	H1 (Panel Height)	F (Fan Height)	H (Total Height)				
7,100	1,800	2,600	505	3,105	17,350	1,900min.	700min.	600min.
10,400			540	3,140	25,000	2,000min.		1,000min.
3,700	900	2,350	405	2,755	4,320	1,600min.	700min.	20min.
4,500	1,000				6,250			
5,500	1,000	2,400		2,805	7,500	1,700min.		
5,600	1,100		505	2,905	9,100			
6,100	1,200				10,850			
	1,400				13,050	1,900min.		
7,100	1,800	2,600	540	3,105	17,350			600min.
10,400				3,140	25,000	2,000min.		1,000min.
ASK								

TBA

5,500	1,650	2,400	515	2,915	ASK	1,700min.	700min.	600min.
5,750					12,900			

TBA

Dimensions					Approx.Weight (kg)	FM (mm) Front side maintenance space	TM (mm) Minimum Height of Ceiling for Maintenance	RM (mm) Rear side maintenance space
W (Panel Width)	D (Panel depth)	H1 (Panel Height)	F (Fan Height)	H (Total Height)				

TMdrive-MVe3 Specifications

Standard Specifications (Type-D)

Output voltage (kV)	Output capacity (kVA)	Rated output current (A)	Overload current (A)	Overload (60sec)	Approx.Motor Power (kW)	Type	Outline drawing
10	600	35	44	125%	490	D1	Fig.2
	900	53	66	125%	740		
	1,200	70	88	125%	980		
	1,280	74	93	125%	1,000		
	1,330	77	85	110%	1,100		
	1,500	87	109	125%	1,200		
	1,800	105	131	125%	1,500		
	2,100	122	153	125%	1,700		
	2,400	139	174	125%	1,900		
	2,540	147	184	125%	2,100		
	2,660	154	169	110%	2,200		
	2,800	162	203	125%	2,300		
	3,300	191	239	125%	2,700		
	3,480	201	251	125%	2,800		
	3,630	210	231	110%	2,900		
	3,900	226	283	125%	3,200		Fig.5
	4,500	263	329	125%	3,700		
	4,780	276	345	125%	3,900		
	5,000	289	318	110%	4,000		
	5,400	315	394	125%	4,400		
	6,000	347	434	125%	4,900		
	6,680	386	483	125%	5,400		
	7,010	404	483	110%	5,700		
	7,200	420	444	125%	5,900		
	8,100	473	591	125%	6,600		
	9,000	525	656	125%	7,300		
	9,540	551	606	110%	7,700		
	10,000	578	723	125%	8,100		
	11,000	636	795	125%	8,900		
	12,600	730	913	125%	10,218		
	13,600	786	983	125%	11,000		
	14,700	850	1,063	125%	11,900		
	15,000	867	1,084	125%	12,100		
	17,500	1,024	1,280	125%	14,300		Fig.6
	18,000	1,050	1,155	110%	14,700		
10	2,800						
	3,300						
	3,480						
	3,760						
	3,900						
	4,500						
	4,780						
	5,430						
	5,400	315	394	125%	4,400	D3	Fig.4
	6,000	347	434	125%	4,900		
	6,680	386	483	125%	5,400		
	7,010	404	457	110%	5,700		
	7,200	420	525	125%	5,900		
	8,100	473	591	125%	6,600		
	9,000	525	656	125%	7,300		
	10,330	597	656	110%	8,400		
	17,100						
	19,630						
Output voltage (kV)	Output capacity (kVA)	Rated output current (A)	Overload current (A)	Overload (60sec)	Approx.Motor Power (kW)	Type	Outline drawing

Dimensions					Approx.Weight (kg)	FM (mm) Front side maintenance space	TM (mm) Minimum Height of Ceiling for Maintenance	RM (mm) Rear side maintenance space
W (Panel Width)	D (Panel depth)	H1 (Panel Height)	F (Fan Height)	H (Total Height)				
5,300	1,400	2,600	505	3,105	8,280	1,800min.	900min.	600min.
6,400					9,590			
6,900	1,500				12,800	1,900min.		
7,100					14,960			
11,600					23,630	2,000min.		
					27,470			
13,700	1,800		540		31,050			
14,500				3,140	37,000			1,000min.
ASK								

TBA

10,750	1,700	2,600	515	3,115	ASK	2,000min.	900min.	600min.
11,150								

TBA

W (Panel Width)	D (Panel depth)	H1 (Panel Height)	F (Fan Height)	H (Total Height)	Approx.Weight (kg)	FM (mm) Front side maintenance space	TM (mm) Minimum Height of Ceiling for Maintenance	RM (mm) Rear side maintenance space
Dimensions								

TMdrive-MVe3 Specifications

Standard Specifications (Type-D)

Output voltage (kV)	Output capacity (kVA)	Rated output current (A)	Overload current (A)	Overload (60sec)	Approx.Motor Power (kW)	Type	Outline drawing
11	660	35	44	125%	540	D1	Fig.2
	990	53	66	125%	810		
	1,320	70	88	125%	1,100		
	1,410	74	93	125%	1,100		
	1,460	77	85	110%	1,200		
	1,650	87	109	125%	1,300		
	2,000	105	131	125%	1,600		
	2,310	122	153	125%	1,900		
	2,640	139	174	125%	2,100		
	2,800	147	184	125%	2,300		
	2,930	154	169	110%	2,400		
	3,080	162	203	125%	2,500		
	3,630	191	239	125%	2,900		
	3,830	201	251	125%	3,100		
	4,000	210	231	110%	3,200		
	4,290	226	283	125%	3,500		
	5,000	263	329	125%	4,000		
	5,250	276	345	125%	4,200		
	5,500	289	318	110%	4,400		
	6,000	315	394	125%	4,800		Fig.5
	6,600	347	434	125%	5,300		
	7,350	386	483	125%	5,900		
	7,710	404	444	110%	6,200		
	8,000	420	525	125%	6,400		
	9,000	473	591	125%	7,300		
	10,000	525	656	125%	8,000		
	10,500	551	606	110%	8,400		
	11,000	578	723	125%	8,900		
	12,600	662	828	125%	10,148		
	13,600	714	893	125%	10,900		
	15,000	788	985	125%	12,100		
	17,500	923	1,153	125%	14,200		Fig.6
	19,500	1,024	1,280	125%	15,700		
	20,000	1,050	1,155	110%	16,100		
11	3,080						
	3,630						
	3,830						
	4,130						
	4,290						
	5,000						
	5,250						
	5,980						
	6,000	315	394	125%	4,800	D3	Fig.5
	6,600	347	434	125%	5,300		
	7,350	386	483	125%	5,900		
	7,710	404	457	110%	6,200		
	8,000	420	525	125%	6,400		
	9,000	473	591	125%	7,300		
	10,000	525	656	125%	8,000		
	11,370	597	656	110%	9,200		
	19,000						
	21,600						
Output voltage (kV)	Output capacity (kVA)	Rated output current (A)	Overload current (A)	Overload (60sec)	Approx.Motor Power (kW)	Type	Outline drawing

Dimensions					Approx.Weight (kg)	FM (mm) Front side maintenance space	TM (mm) Minimum Height of Ceiling for Maintenance	RM (mm) Rear side maintenance space
W (Panel Width)	D (Panel depth)	H1 (Panel Height)	F (Fan Height)	H (Total Height)				
5,600	1,400	2,600	505	3,105	8,620	1,800min.	900min.	600min.
6,800					10,280			
7,500	1,500				13,560	1,900min.		
7,700					15,880			
12,200					24,490	2,000min.		
					28,520			
13,700	1,800		540		31,050			
14,500				3,140	37,000			1,000min.
ASK								

TBA

11,800	1,700	2,600	515	3,115	ASK	2,000min.	900min.	600min.
12,300								

TBA

Dimensions					Approx.Weight (kg)	FM (mm) Front side maintenance space	TM (mm) Minimum Height of Ceiling for Maintenance	RM (mm) Rear side maintenance space
W (Panel Width)	D (Panel depth)	H1 (Panel Height)	F (Fan Height)	H (Total Height)				

TMdrive-MVe3 Specifications

Standard Specifications (Type-P)

Output voltage (kV)	Output capacity (kVA)	Rated output current (A)	Overload current (A)	Overload (60sec)	Approx.Motor Power (kW)	Type	Outline drawing
3.3	200	35	39	110%	160	P	Fig.1
	300	53	59	110%	250		
	400	70	78	110%	330		
	600	105	116	110%	490		
	800	140	154	110%	650		
	950	166	183	110%	770		Fig.2
	1,100	192	211	110%	900		
	1,300	227	250	110%	1,100		
	1,500	263	289	110%	1,200		
	2,090	364	400	110%	1,700		
	2,850	499	549	110%	2,300		
4.16	500	70	78	110%	410	P	Fig.1
	1,000	140	154	110%	820		
	1,380	192	211	110%	1,100		Fig.2
	1,890	263	289	110%	1,500		
	2,770	385	424	110%	2,300		Fig.3
	3,590	499	549	110%	2,900		
	5,260	731	804	110%	4,300		
6.6	400	35	39	110%	330	P	Fig.4
	600	53	59	110%	490		
	800	70	78	110%	650		
	1,200	105	116	110%	980		
	1,600	140	154	110%	1,300		
	1,900	166	183	110%	1,500		Fig.5
	2,200	192	211	110%	1,800		
	2,600	227	250	110%	2,100		Fig.6
	3,000	263	289	110%	2,500		
	3,600	315	347	110%	2,900		Fig.7
	4,180	364	400	110%	3,400		
	4,400	385	424	110%	3,600		
	5,700	499	549	110%	4,700		
	8,360	731	804	110%	6,800		
10	600	35	39	110%	500	P	Fig.8
	900	53	59	110%	750		
	990	57	63	110%	810		
	1,210	80	88	110%	1,100		
	1,800	105	116	110%	1,500		Fig.9
	2,000	115	127	110%	1,600		
	2,420	140	154	110%	2,000		
	2,800	162	179	110%	2,300		Fig.10
	3,080	178	196	110%	2,500		
	3,300	192	211	110%	2,700		
	3,900	226	249	110%	3,200		
	4,500	263	289	110%	3,700		
	5,400	312	344	110%	4,400		Fig.11
	6,680	385	424	110%	5,400		
11	660	35	39	110%	540	P	Fig.8
	990	53	59	110%	820		
	1,330	70	78	110%	1,100		
	2,000	105	116	110%	1,600		Fig.9
	2,660	140	154	110%	2,200		
	3,080	166	183	110%	2,600		
	3,630	192	211	110%	3,000		Fig.10
	4,290	226	249	110%	3,500		
	5,000	263	289	110%	4,100		
	6,000	315	347	110%	4,900		Fig.11
	7,350	385	424	110%	6,000		
Output voltage (kV)	Output capacity (kVA)	Rated output current (A)	Overload current (A)	Overload (60sec)	Approx.Motor Power (kW)	Type	Outline drawing

Dimensions					Approx.Weight (kg)	FM (mm) Front side maintenance space	TM (mm) Minimum Height of Ceiling for Maintenance	RM (mm) Rear side maintenance space
W (Panel Width)	D (Panel depth)	H1 (Panel Height)	F (Fan Height)	H (Total Height)				
2,800	900	2,100	405	2,505	3,800	1,700min.	700min.	20min.
	1,000				4,000			
3,700			495	2,590	5,300			
3,800	1,100		530	2,630	5,600			
ASK								
2,800	900	2,100	405	2,505	3,800	1,700min.	700min.	20min.
	1,000				4,000			
3,700			495	2,590	5,300			
3,800	1,100		530	2,630	5,600			
5,200	1,650	2,400	495	2,895	7,150	1,900min.		
ASK								
3,500	1,000	2,100	405	2,505	3,800	1,700min.	700min.	20min.
3,700					4,700			
5,100	1,100		495	2,595	6,750			
			530	2,630				
5,900	1,650	2,400	495	2,895	10,500	1,900min.		
ASK								
5,500	1,200	2,400	405	2,805	7,500	1,900min.	700min.	600min.
5,800					7,750			
7,300	1,400	2,500	495	2,995	14,050			
			530	3,030				
9,500	1,800	2,600		3,130	19,000			
5,500	1,200	2,400	405	2,805	7,500	1,900min.	700min.	600min.
5,800					7,750			
7,300	1,400	2,500	495	2,995	14,050			
			530	3,030				
9,500	1,800	2,600		3,130	19,000			
W (Panel Width)	D (Panel depth)	H1 (Panel Height)	F (Fan Height)	H (Total Height)	Approx.Weight (kg)	FM (mm) Front side maintenance space	TM (mm) Minimum Height of Ceiling for Maintenance	RM (mm) Rear side maintenance space
Dimensions								

TMdrive-MVe3 Specifications

Outline dimensions (Type-D)

Type-D Common Side

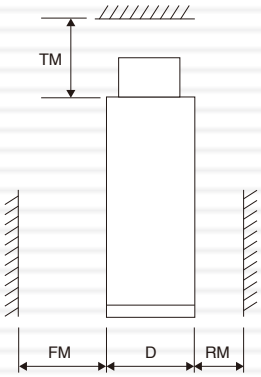


Fig.1

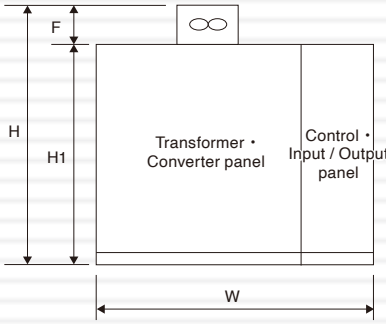


Fig.2

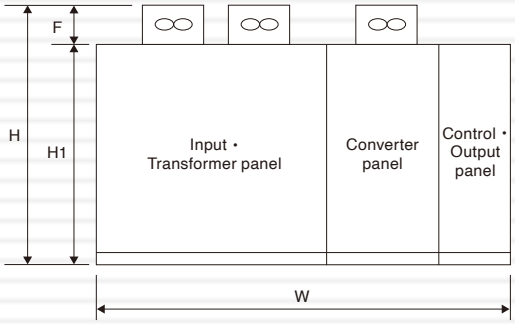


Fig.3

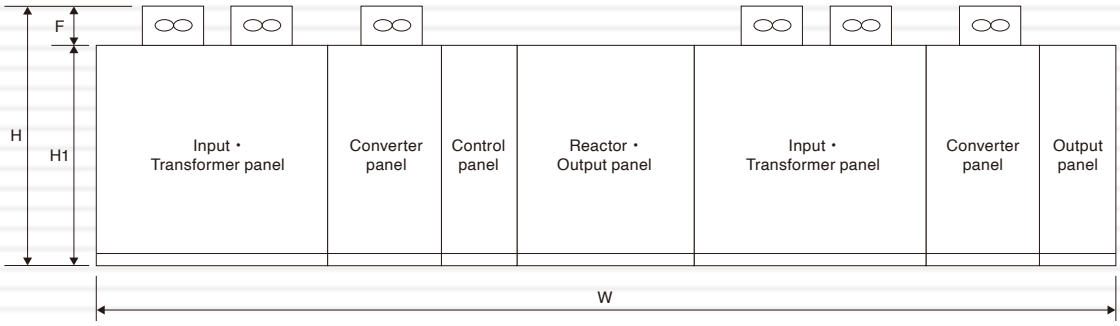


Fig.4

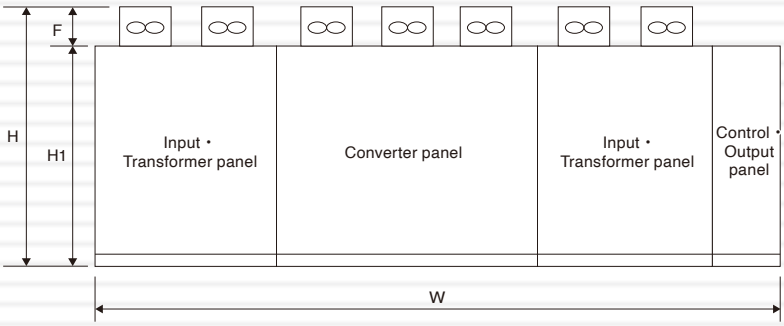


Fig.5

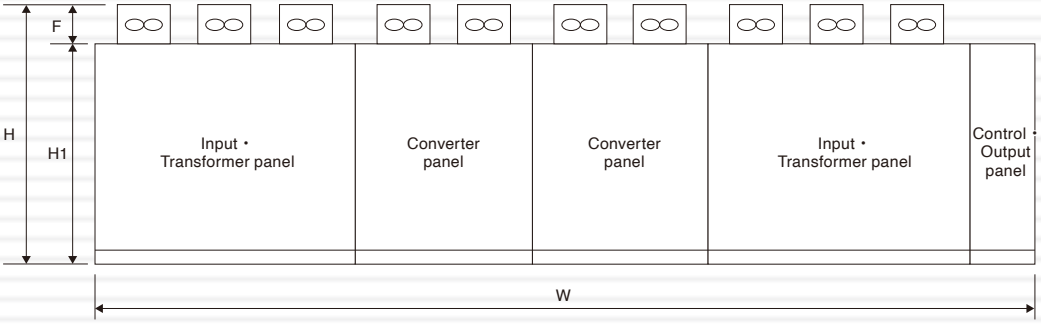
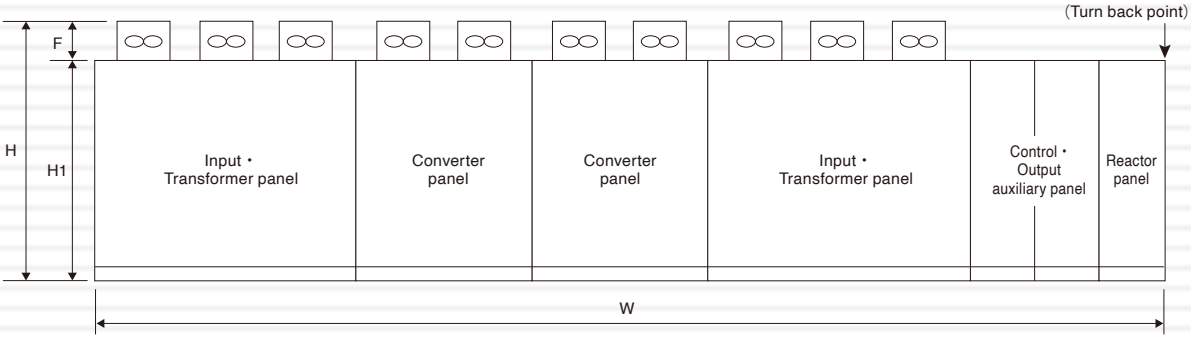


Fig.6



Outline dimensions (Type-P)

Type-P Common Side【Fig.1.2.4.5】

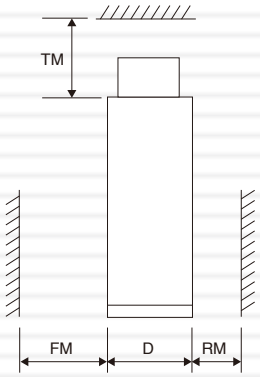


Fig.1

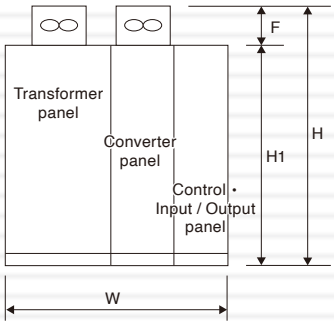


Fig.2

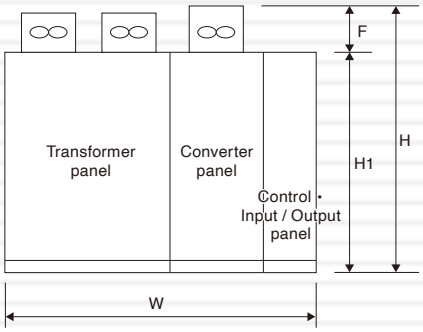


Fig.3

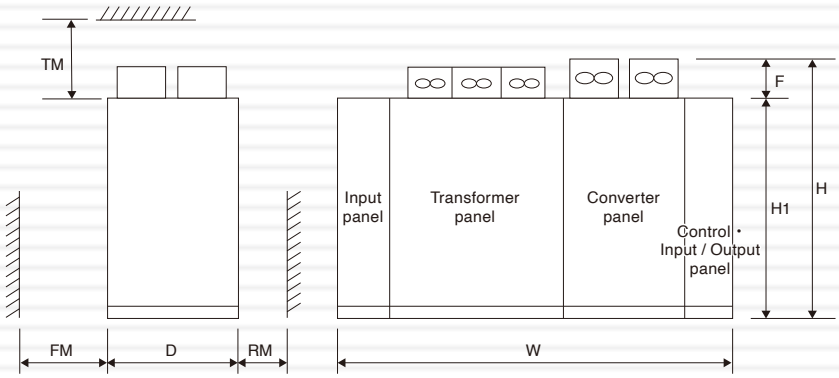


Fig.4

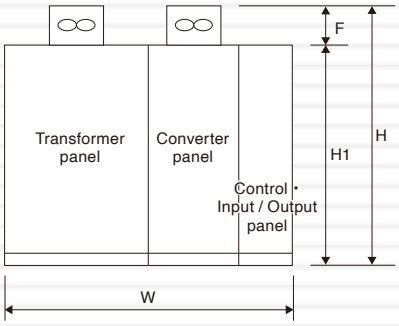
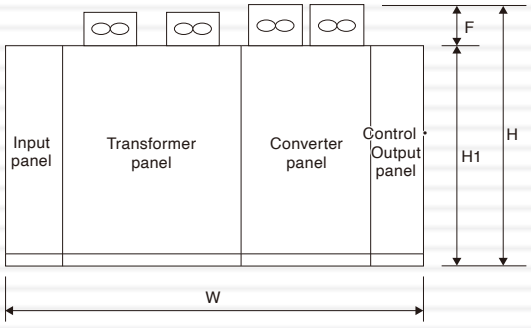


Fig.5



TMdrive-MVe3 Specifications

Outline dimensions (Type-P)

Type-P Common Side [Fig.6.7]

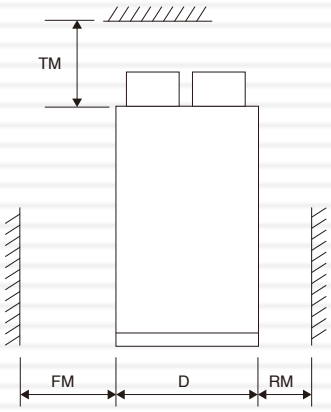


Fig.6

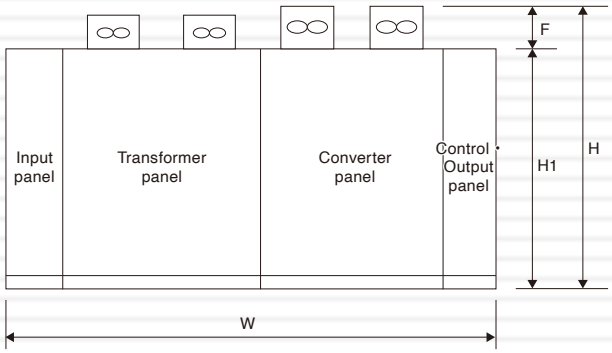
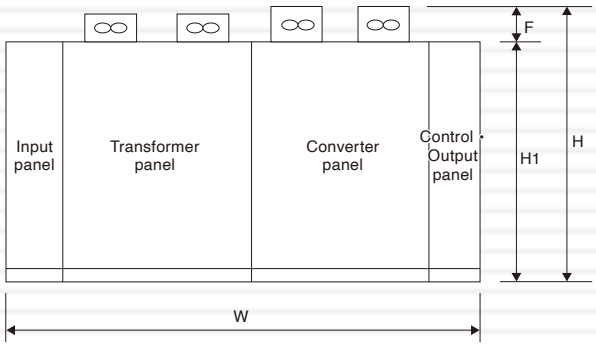


Fig.7



Type-P Common Side [Fig.8.9]

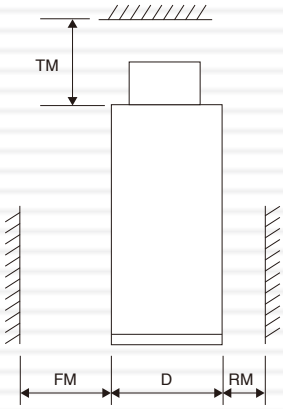


Fig.8

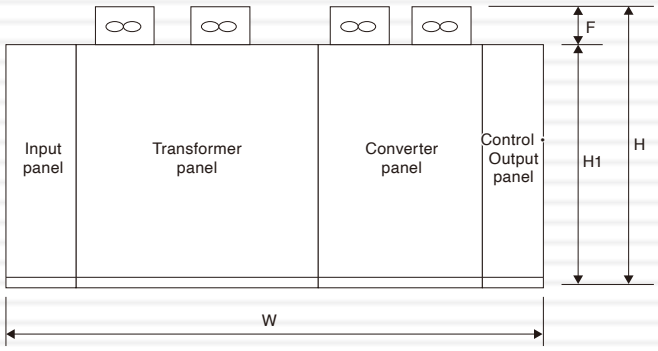
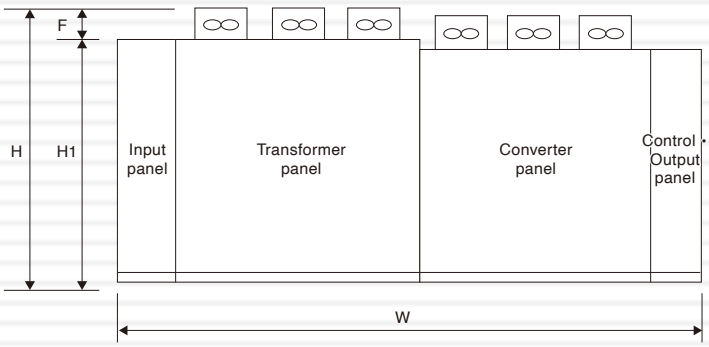


Fig.9



Outline dimensions (Type-P)

Fig.10

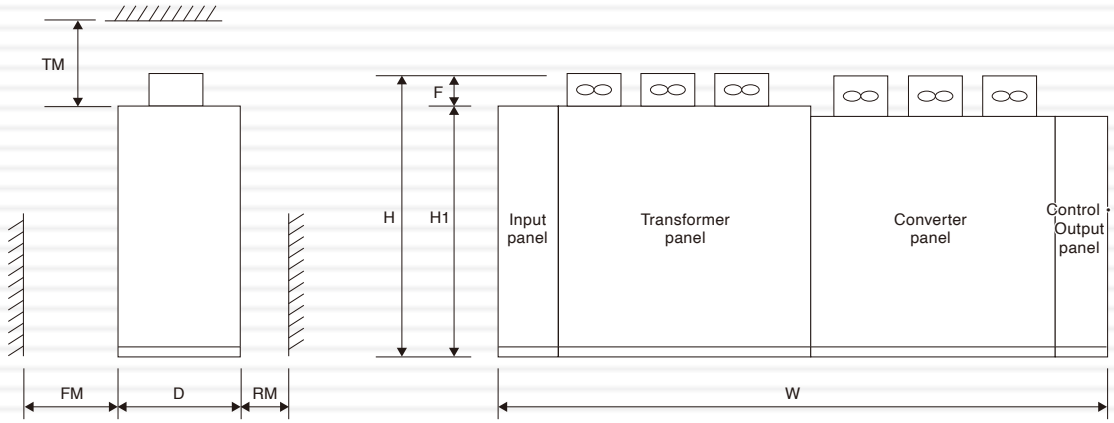
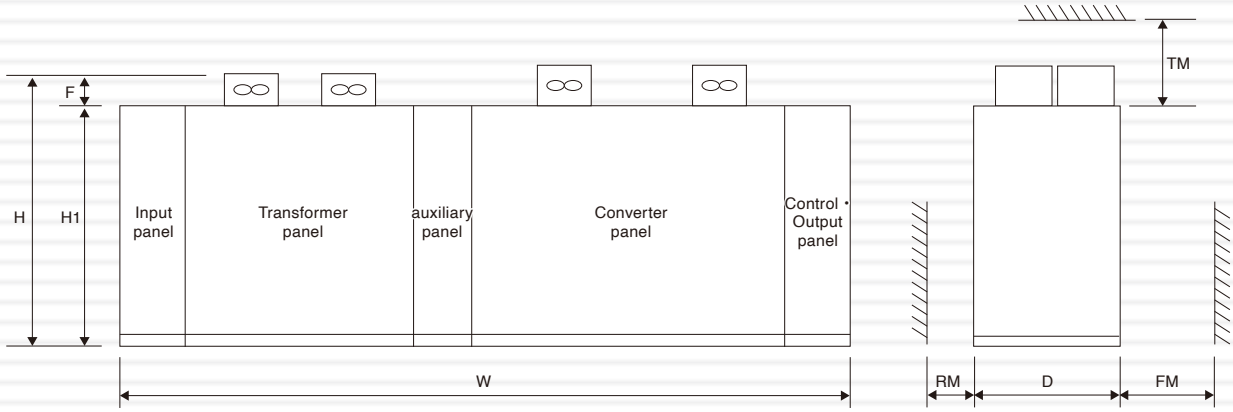
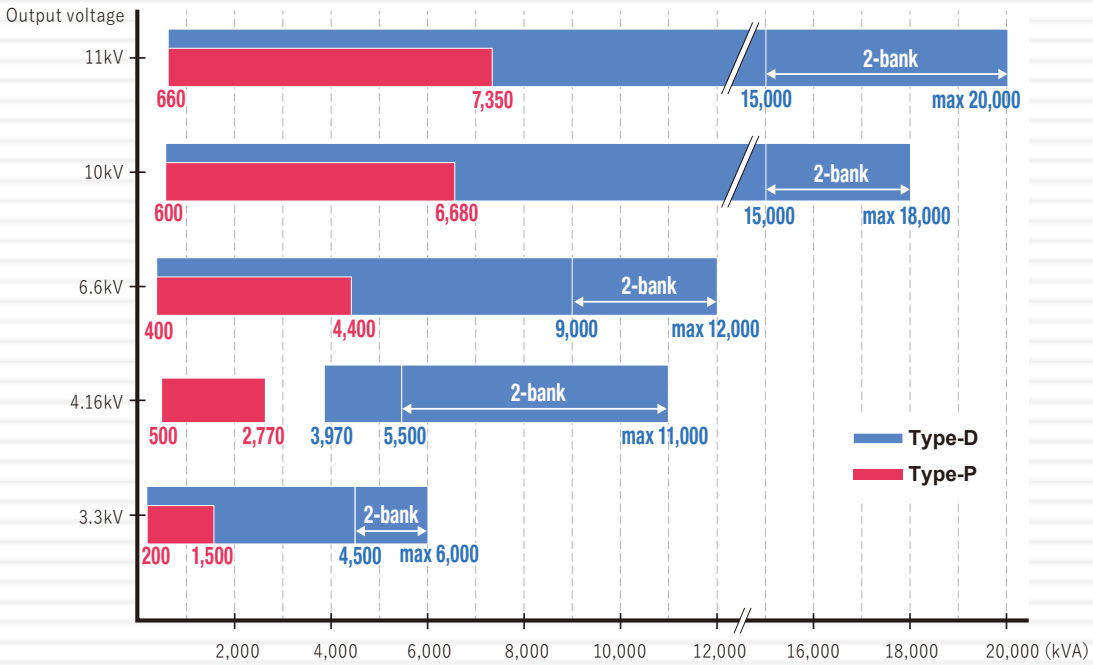


Fig.11



Voltage/Capacity Range



TMdrive-MVe3 Specifications

Standard specifications list

Item		Content
Output	Output frequency	72Hz
	Overload capacity	110 % - 60 seconds or 125 % - 60 seconds (Refer to page 11 to 18)
Input	Main circuit	Three phase　3,000, 3,300, 4,160, 6,000, 6,600, 10,000, 11,000V-50 / 60Hz
	Control / fan circuit	Three phase　400 / 440V
	Permissible fluctuation	Voltage：±10%*1
Input power factor / regenerative capacity		0.95 lag
Control function	Control method	Sensorless vector control, or V / f control + Multilevel PWM (Pulse Width Modulation)
	Frequency accuracy	±0.5% for maximum output frequency (for the analog frequency reference input)
	Load torque characteristic	Variable torque load, constant-torque load
	Acceleration / deceleration time	0.1 to 10,000 seconds, individual setting possible (Setting depends on the load GD_2)
	Main control functions	Soft stall (Programmable speed reduction for fans and pumps during periods of overload), Ride-through control during instantaneous power failures, break point acceleration / deceleration function, specific frequency evasion function, continuous operation function during speed reference loss, total run time display function
	Main protective functions	Refer to page 21 to 22
	Comminication (option)	DeviceNet, Modbus RTU, Modbus TCP, EGD, ControlNet, PROFINET, PROFIBUS-DP, CC-Link, CC-Link IE Field, EtherNet / IP, EtherCAT, TC-net I / O
Display function	Display	LC Control Navigation Display 6×LED(READY, RUN, ALARM/FAULT, MAINTENANCE REQUIRED, DC BUS DISCHARGED, INTERLOCK ON/OFF)
	Push buttons	fault reset, interlock (drive run inhibit)
Input transformer		Class H, dry type, TMdrive-MVe3 dedicated specifications (External options and external oil type trans. options available)
Structure	Enclosure	IP30 (except for the cooling fan opening)
	Enclosure structure	Steel-plate, semi-closed, self-supporting enclosure structure for a front maintenance.*2
	Cooling system	Forced air cooling by a ceiling fan
	Finish color	Munsell 5Y7/1, leather-tone finish
Operating Environment	Ambient temperature	0 to 40°C (Higher temperature with derating)
	Humidity	85% or less (no dew condensation)
	Altitude	Up to 1,000m (Higher with derating)
	Vibration	0.5G or less (10 to 50 Hz)
	Installation location	Indoor (free from corrosive gas, dust and dirt)
Load applications		Fans, blowers, pumps, compressors, extruders, fan pumps, mixers, conveyors, etc.
Applicable standards		Electrical standards：JEC, IEC
		Component and others：JIS, JEC, JEM

*1 In case of -5% or more drop, power output will be limited (Type-D3)
*2 Excluding 10kV, 11kV class of Type-D and Type-P and 1200, 1400 frames of Type-D.

Option items

Item	Content
Output frequency	300Hz (20% current derating)
Control method	vector control with Speed sensor(PLG, Resolver)
	Restart after instantaneous interruption(Restart within 6s (Configurable)) selecting the commercial power supply(Shockless power wrap operation switching)
Maintenance Tools	PC-based maintenance and adjustment application software(OS：Windows® 11)
Others	synchronous motor control, Soft-start cooling fan·Control power supply 200 V input, redundant cooling fans
	Paint colour specified by customer

Inverter selection guide

Items to be informed *Please designate the following items on your inquiry.

（1）Application(equipment name)

（2）Load type(fan, blower, pump, compressor, etc.)

（3）Torque characteristics (square variable-torque, constant-torque, with constant output range, etc.)

●GD^2 of the load：[ ] (kgm^2) (Motor axis conversion)　●Required overload capacity：[ ]% – [ ] second

●Speed-torque curve of the load：[ ]　●Necessary starting torque：[ ]%

（4）Driving motor

●New or existing　●Power output：[ ](kW)　●Number of poles：[ ](P)　●Voltage：[ ](V)

●Speed：[ ](min^{-1})　●Rated frequency：[ ](Hz)　●Rated current：[ ](A)

（5）Main circuit input voltage / frequency：[ ](V)– [ ](Hz)

（6）Control / fan power supply voltage / frequency：Three-phase three-line [ ](V)– [ ](Hz)

（7）Range of operating frequency：[ ] Hz to [ ] Hz

（8）Operating frequency setting
(automatic signal <4 to 20 mA>,manual setting on the operation panel, speed increase / decrease signal, etc.)

（9）Commercial bypass operation (with / without)

(10) Installation condition

●Ambient temperature：[ ] to [ ] °C　●Humidity：[ ] %(no dew condensation)

●Air conditioning systems：(with / without)　●Space limitation for transportation on site：[ ]

Inverter capacity calculation

The rated current of the motor that the inverter is going to drive is I (A), and the related voltage V (kV), the necessary capacity of the inverter (kVA) is calculated by Inverter capacity (kVA) $=\sqrt{3}\times V\times I$...(1).
The capacity of inverter must be larger than the capacity calculated from(1).
Additionally, the inverter capacity on the standard specifications list is printed at 3.3 or 6.6 kV output. For the inverter capacity at 3 or 6 kV output, it requires multiplying 0.9.

TMdrive-MVe3 Specifications

Main protective functions

Item	Display	Content
Cell AC input overcurrent	xn_C_OCA*	The AC over current detection (hardware) of the x-phase n^{th} cell converter activated.
Cell DC overvoltage P-side	xn_OVDP*	The P-side DC overvoltage detection of the x-phase n^{th} cellactivated.
Cell DC overvoltage N-side	xn_OVDN*	The N-side DC overvoltage detection of the x-phase n^{th} cell activated.
Cell DC overvoltage	xn_OVD*	The DC overvoltage detection of the x-phase n^{th} cell activated.
Cell overheat	xn_OH*	The overheat detection of the x-phase n^{th} cell activated.
Cell gate power source failure	xn_GPSF*	The gate power source failure detection (hardware) of the x-phase n^{th} cell activated.
AC output overcurrent	OCA	The AC overcurrent detection (hardware) activated. (In 2 bank system, this function is activated for the A bank.)
AC output overcurrent B bank	OCA_B	The AC overcurrent detection (hardware) in the B bank activated. (This function is used only in 2 bank system.)
CPU error for control	CPU_R1, R2	The watchdog error occurred in the CPU for control in the CTR board.
CPU error for communication	CPU_M1, M2	The watchdog error occurred in the CPU for communication in the CTR board.
Output voltage PLL error	VPLL_ERR	Excessive phase error of the inverter output voltage PLL detected.
Motor overvoltage	MOT_OV	The motor voltage is greater than the overvoltage protection level.
Output current error of U / W-phase	CURU, CURW	The U / W-phase output current cannot be detected at motor start. (In 2 bank system, this function is activated for A bank.)
Output current error of U / W-phase B bank	CURU_B, CURW_B	The U / W-phase output current cannot be detected at motor start. (This function is used only in 2 bank system.)
Overspeed	OSS	The overspeed of the motor has been detected.
Output frequency exceeded	OSS_FO	The excessive output frequency has been detected.
Speed detection error	SP_ERR	The speed feedback error has been detected.
Zero speed startup interlock	SP_SIL	The startup interlock condition turns off because the motor speed is greater than the detection level.
External speed reference lost	SP_LOST	The external speed reference is lower than the detection level.
External speed reference lost alarm	SP_LST_A	The external speed reference is lower than the detection level.
Motor rotation error	ROT_F	The motor stall has been detected.
Motor reverse rotation detection	REV_ROT_F	The motor has been detected rotating in the reverse direction to the speed reference.
Control power source failure	CPSF	The control power source voltage dropped.
Main power source failure	MPSF	AC main power source failure has been detected during operation.
Control board power source failure	P5_F, P5EX_F, P15_F, PN15A_F, P5B_F, P15B_F	The voltage error of P5, P5EX, P15, PN15A, P5B or P15B power source has been detected in the control board.
Rectifier failure	REC_F	The DC undervoltage was detected while the AC main power source input is turned on.
AC input circuit breaker open	AC_P_T	The AC input circuit breaker (AC_MCCB) opened.
Main power source failure	UV_MPSF	AC main power source failure has been detected.
AC undervoltage startup interlock	C_UVA_SIL	The startup interlock condition turned off because the AC main power source undervoltage has been detected.
Output overload 5 minutes	OL5	The RMS of the output current for 5 minutes has exceeded the detection level.
Output overload 20 minutes	OL20	The RMS of the output current for 20 minutes has exceeded the detection level.
Output overload alarm	OL_A	The RMS of output current for 5 minutes or 20 minutes has exceeded the alarm level.
Output current limit timer	CL_T	The inverter operation above current limit continued for the time set with the timer.
Output current limit alarm	CL_TA	The inverter operation above current limit continued for the 80% of time set with the timer.

* The character “x” shows U, V, W-phase, and the “n” shows cell's stage.

Item	Display	Content
Input overload 5 minutes	C_OL5	The RMS of input current for 5 minutes exceeded the detection level.
Input overload 20 minutes	C_OL20	The RMS of input current for 20 minutes exceeded the detection level.
Input overload alarm	C_OL_A	The RMS of input current for 5 minutes or 20 minutes exceeded the alarm level.
Input current limit timer	C_CL_T	The converter operation above the current limit continued for the time set with the timer.
Input current limit alarm	C_CL_TA	The converter operation above the current limit continued for the 80% of time set with the timer.
Overload speed reduction operation	SOFT_STL	The operation is in soft stall mode due to an overload or high temperature.
Cooling fan stopped timer	CFN_T	The equipment cooling fan error continued for the time set by the timer.
Cooling fan stopped	CFN	The equipment cooling fan error has been detected.
Redundant cooling fan stopped	RFN	The equipment redundant cooling fan error has been detected.
Ground detection timer	GR_T	The ground fault continued to the detection timer.
Ground detection alarm	GR_A	The zero-phase voltage of output voltage feedback exceeds the ground detection alarm level.
DC voltage drop	UVD	The power source voltage drop of the DC main circuit has been detected.
DC voltage drop startup interlock	UVD_SIL	The startup interlock condition turns off because DC main power source undervoltage has been detected.
System configuration error	SYS_ERR	The system configuration setting error detected.
Parameter error	PARA_ERR	The checksum error of parameter setting was detected when the control power source was initialized.
External interlock	IL	The interlock signal from the external panel is "operation prohibitted".
External electrical ready condition	UVA_EX	The external electrical condition signal is turned off.
External safety switch	UVS	The operation interlock switch from outside (main panel) turned off.
Panel interlock switch on	P_SW	The interlock switch on the panel turned on (Switch lamp lighting = Operation prohibited).
AC output contactor fault	ACSW_F	The output contactor opened during operation.
AC output contactor open	ACSW	The output contactor opened.
AC output contactor closed	ACSW_CLS	The output contactor closed although it is not turned on.
Output open	NO_LOAD	The open load has been detected. This signal is generated when the feedback current becomes one eighth or less of the excitation current.
Input transformer overheat	OH_TR	The overheat detection of the input transformer activated.
Input transformer overheat alarm	OH_TR_A	The overheat alarm detection of the input transformer activated.
Input ACL overheat timer	OH_ACL_T	The ACL overheat continued for the time set by the timer.
Input ACL overheat	OH_ACL	The ACL overheat detected.
General analog input signal fault	AIN_FAULT	Current signal fell lower than 4mA when using the 4-20mA current type general analog input.
Input phase loss	C_PH_LOSS	Input AC voltage phase loss has been detected.
Output phase loss	PH_LOSS	Output AC current phase loss has been detected.
Input voltage reverse phase	C_VAC_ROT_F	Incorrect input AC voltage phase rotation has been detected.
Output voltage fault detection	VFBK_F	The output voltage failure of the inverter detected.
Output voltage fault detection alarm	VFBK_F_A	The output voltage failure of the inverter detected.
Precharge contactor failure	PRE_CTT_F	The pre-charge contactor circuit error detected.
Precharge contactor open	PRE_CTT	The pre-charge contactor circuit is open.

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Safety precautions

● For safe and correct use, be sure to read the "Handling and Operation Manual" carefully before use.

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