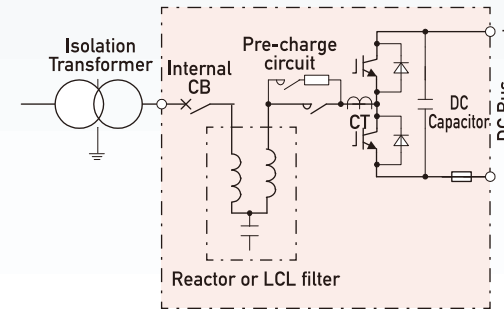


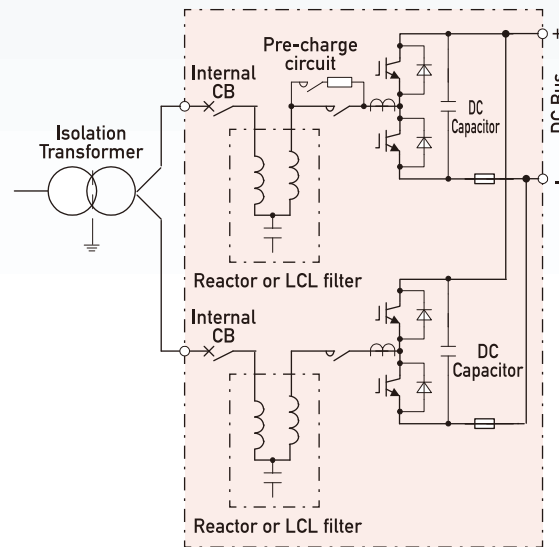
**TMdrive-P10e3 PWM Converter Specification**

**Configuration of main circuit**

**Single configuration**



**Twin configuration**



Item	Standard specifications	
Voltage	Input voltage	Output voltage
	380 - 400 Vac	600 Vdc
	440 - 460 Vac	680 Vdc
Allowable power supply voltage variation	±10 %	

**TMdrive-10e3, -P10e3 Common Specifications**

Item	Specifications			
Compliant and conforming standard	JIS, JEC, JEM, IEC, cULus, EC directives ( CE marking )			
Installation location	Indoor			
Ambient temperature	0°C ~ 40°C			
Relative humidity	5 % to 85 % or less ( no condensation )			
Control power	200 / 220 Vac-50 Hz or 220 / 230 Vac-60 Hz, voltage deviation : within ±10 %			
Paint color	Munsell 5Y7 / 1 ( leather tone semi-gloss )			
Panel protection structure	Standard : IP 20, option : IP 32			
Control network communication	TC-net I/O Loop ( electrical )	TC-net I/O Loop ( optical )	TOSLINE-S20	MELPLAC
	PROFIBUS-DP	PROFINET	CC-LINK	CC-LINK IE Field
	EtherCAT®	EtherNet / IP™	DeviceNet™	ControlNet®
	Modbus TCP	Modbus RTU		
Surveillance / data collection network	Ethernet 100Base, UDP			
Input	DI	UVS : 1 ch ( 24 Vdc )	AI	±10 Vdc or 4-20 mA : 1 ch
		Programmable DI : 4 ch ( 24 Vdc )		
		STO1, STO2 : 2 ch ( 24 Vdc )		
Output	DO	STO1_F, STO2_F : 2 ch ( 24 Vdc )	AO	±10 Vdc : 1 ch
		Programmable DO : 3 ch ( 24 Vdc )		
		Fault signal fixed DO : 1 ch ( 24 Vdc )		
Enhanced input and output	Yes ( option )			

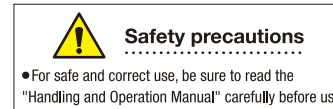


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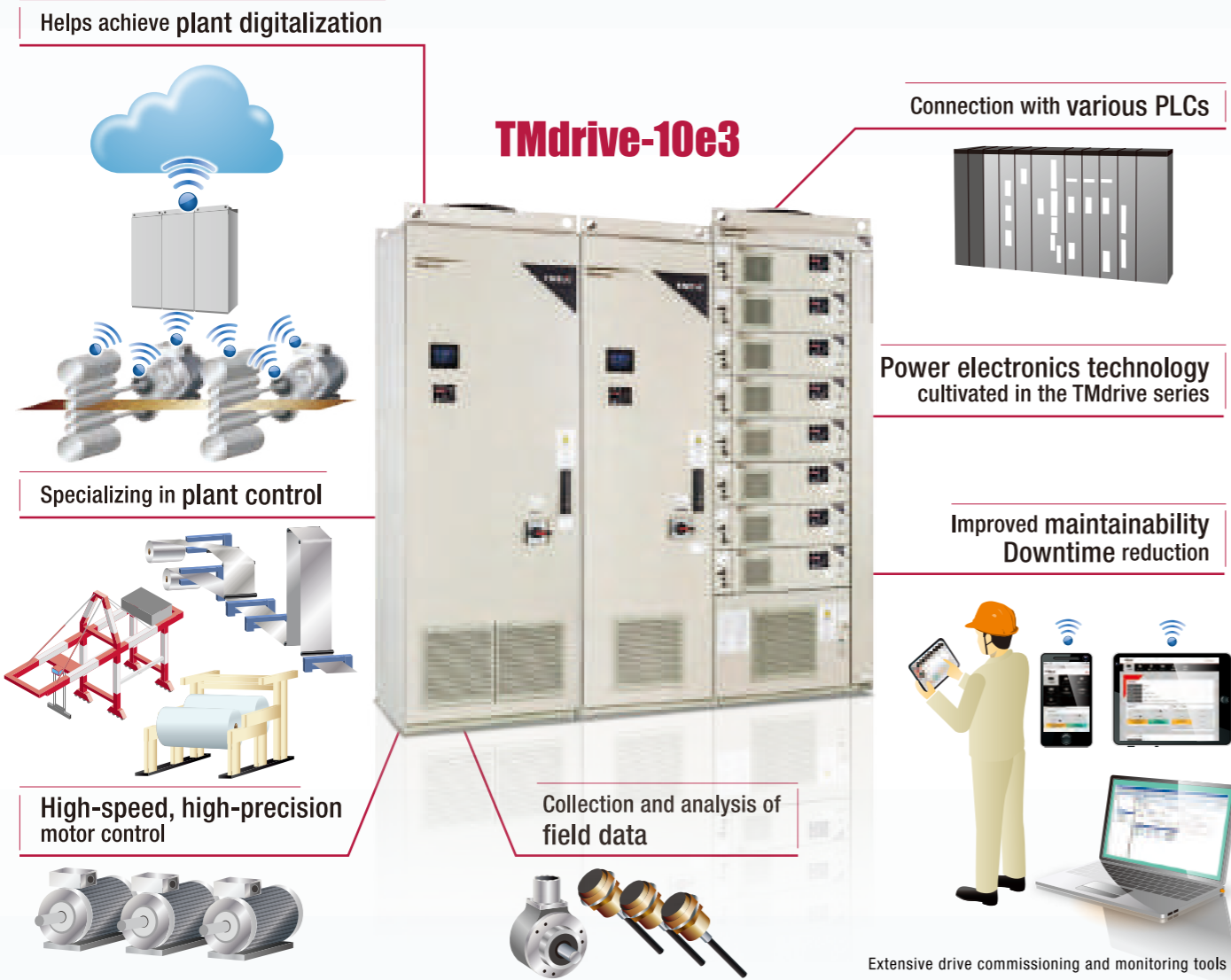
**LOW VOLTAGE IGBT INVERTER / CONVERTER**  
**TMdrive™-10e3**  
 series



# AC adjustable speed low voltage inverter / converter electrical power drive that combines high reliability and cutting-edge technology for plant applications **TMdrive-10e3**

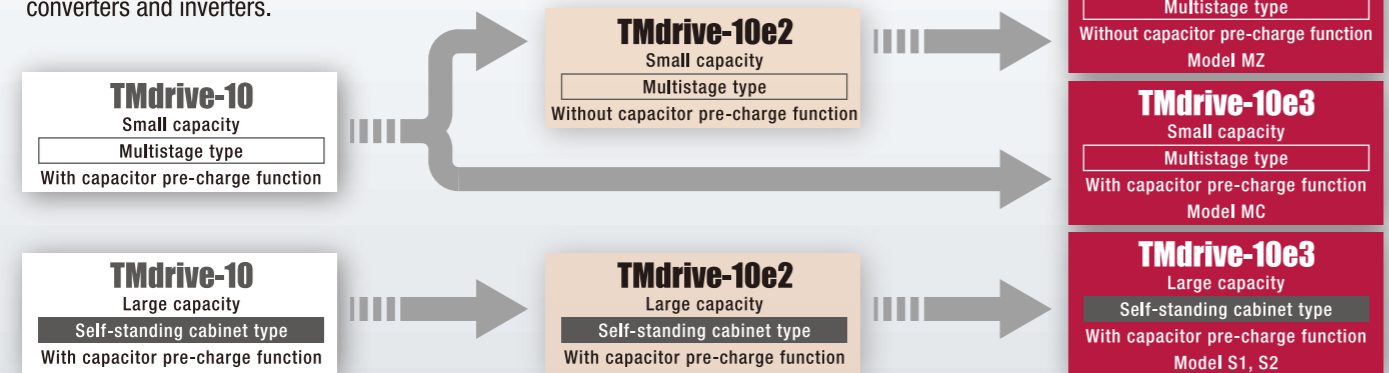
**TMdrive-10e3**  
series

TMdrive-10e3 utilizes the proven main circuit of the TMdrive series and implements the latest control devices. In addition to high performance as a drive equipment such as high-speed and high-precision motor control and connection with various PLCs, it has field data collection and analysis functions and expandability that satisfies the unique requirements of facilities and equipment to which the drive is applied. In addition, extensive drive commissioning and monitoring tools have improved drive maintenance and adjustment functions. TMdrive-10e3 is an AC drive specialized for controlling plants such as steel plants, paper plants, and cranes, and contributes to improved controllability, maintainability, and digitalization.



## Transition of TMdrive-10e3 Series

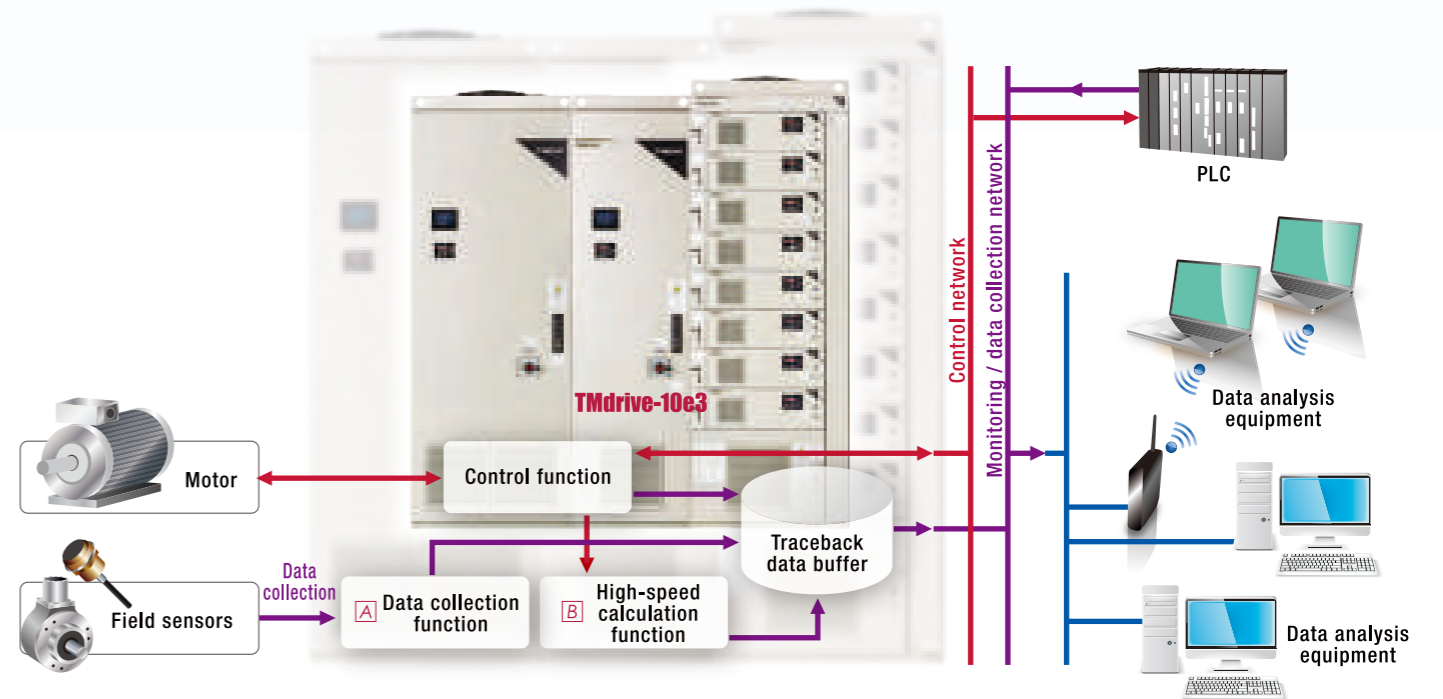
There are three types of inverter structures for TMdrive-10e3: multi-stage type ( with or without capacitor pre-charging function ) and self-standing cabinet type. Since it is possible to share the converter with the conventional TMdrive series, it is possible to expand the facility by mixing existing converters and inverters.



## Helps Achieve Plant Digitalization

### A Data collection function

Plant Digitalization can be achieved by using the data collected by TMdrive-10e3 such as motor currents, motor voltage, motor speed, self-diagnostics and field data from various sensors. TMdrive-10e3 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.

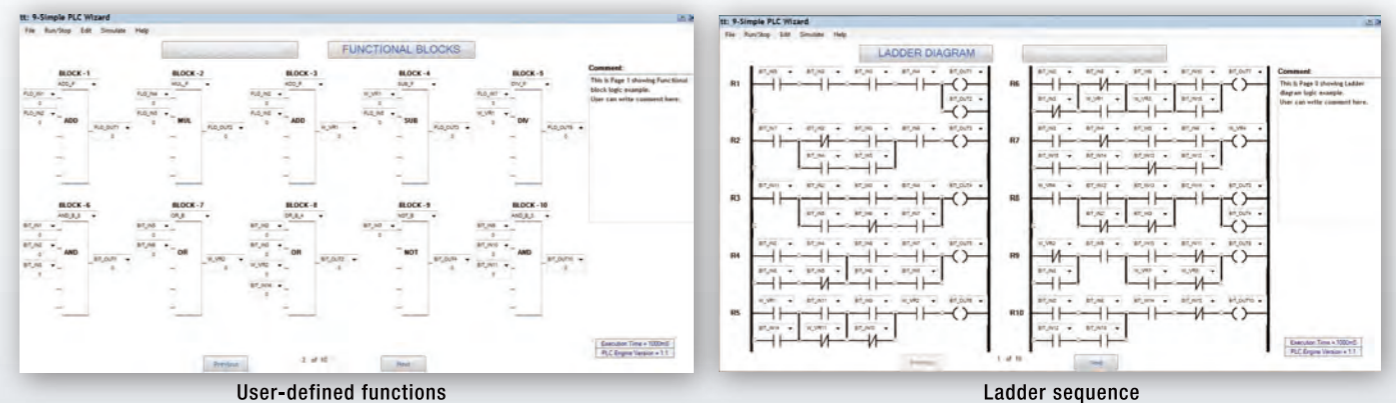


### B High-speed calculation function

The high-speed calculation function enables high-speed sampling and high-speed analysis of functions such as frequency domain analysis. TMdrive-10e3 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

TMdrive-10e3 has built-in micro PLC which can be programmed 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.

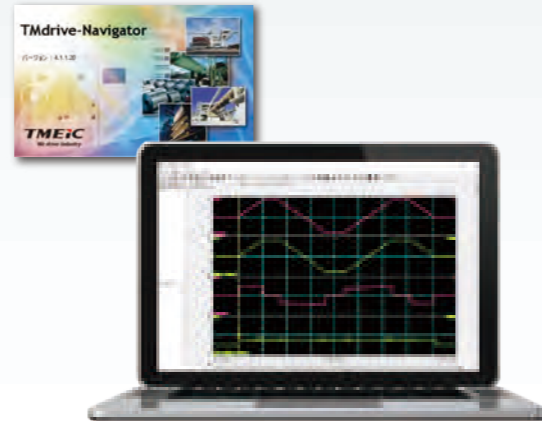


The maximum I/O points for each type: Analog input 8 ch max., analog output 8 ch max., digital input 16 ch max., digital output 16 ch max., RTD input 2 ch max.

**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's 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 a failure, TMdrive-10e3 can store Traceback data for longer duration. Number of saved Tracebacks as well as recording duration of Traceback is increased to allow enhanced diagnostics during a failure.



**TMdrive-Monitor**

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



**TMdrive-Support**

A QR code will be displayed on the Key Pad operation panel<sup>1)</sup> 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.

NOTE 1) Key Pad is an option.



**TMdrive-10e3 Structure**

**TMdrive-10e3 Multistage Type**



Model MC  
With capacitor pre-charge function

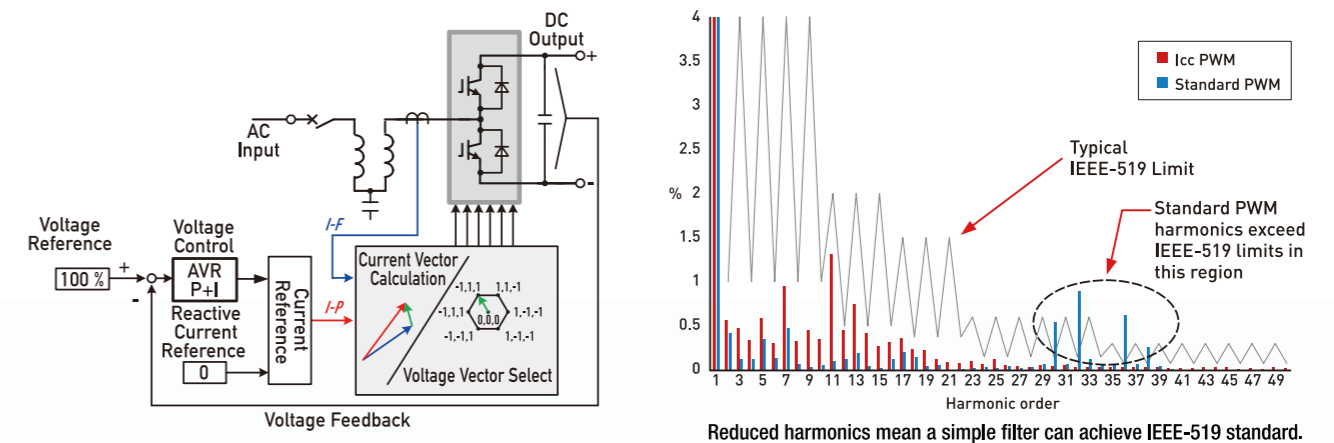
The TMdrive-10e3 multi-stage unit can be pulled out with the handle to disconnect the unit from the DC power supply. The unit can be replaced by pulling out the unit further.

**TMdrive-10e3 Self-standing Cabinet Type**



The self-standing cabinet type of TMdrive-10e3 has a Standard Display on the panel surface. Four-digit display alternates between speed and current while running, or a fault code when there is an error. The disconnecter (option) can be operated from the door surface to disconnect the inverter from the DC bus. Even if the door is opened, the main circuit is protected by Equipment Safety Covers.

**TMdrive-P10e3 Intelligent Current Control, IccPWM**



The TMdrive-P10e3 converter introduces a new modulation strategy IccPWM that improves harmonic performance when compared to standard PWM control. The Intelligent Current Control generates a PWM signal utilizing the current deviation vector derived from current feedback and current reference. When combined with a simple harmonic filter, compliance with IEEE-519 harmonic limits is achieved with the Intelligent Current Control.

**Downtime Reduction**

**Parameter Migration**

When replacing the CTR board ( main control board ) , 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-10e3 tracks operation time of certain parts within the drive. To complement preventive maintenance, TMdrive-10e3 will announce when a particular component is approaching end of its recommended operating life.

**Functional Safety**

Equipped with safety functions that comply with the functional safety standard IEC / EN 61800-5-2<sup>2)</sup>. As an option, STO, SS1, SLS, SBC, and SSM safety functions can be realized with SIL 3 and PL e.

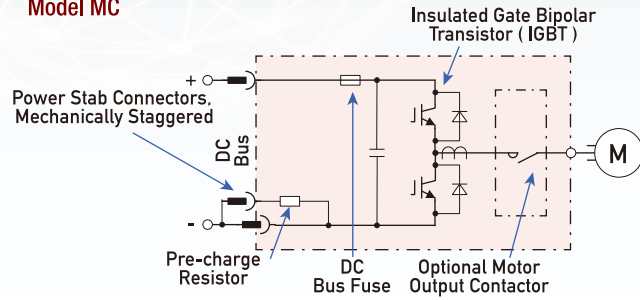
	Safety function	performance level	Remarks
standard	STO	Safe Torque Off	SIL2, PL d
	STO	Safe Torque Off	
	SS1	Safe Stop 1	
option	SLS	Safely-Limited Speed	SIL 3, PL e
	SBC	Safe Brake Control	
	SSM	Safe Speed Monitor	
			Requires functional safety board

NOTE 2) Certification is scheduled after 2024

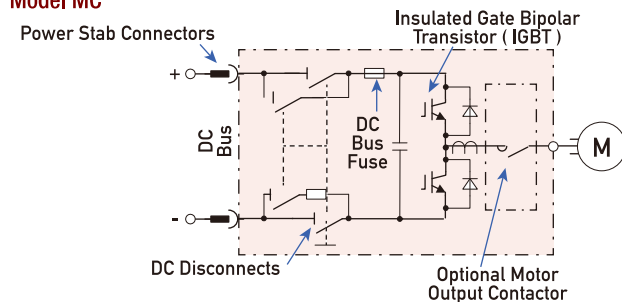
## TMdrive-10e3 Inverter Specification

### Main Circuit Configuration

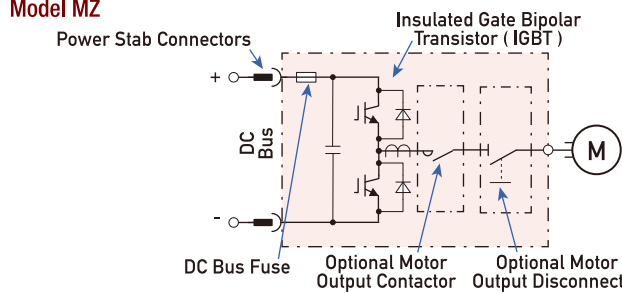
Multistage type / with capacitor pre-charge function ( Frame 15 ~ 125 )  
Model MC



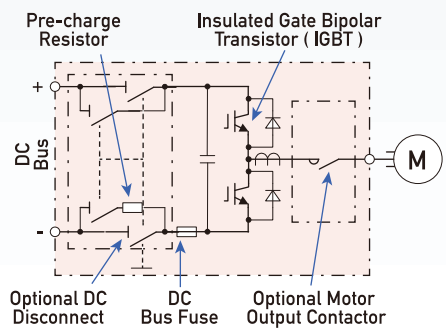
Multistage type / with capacitor pre-charge function ( Frame 250 )  
Model MC



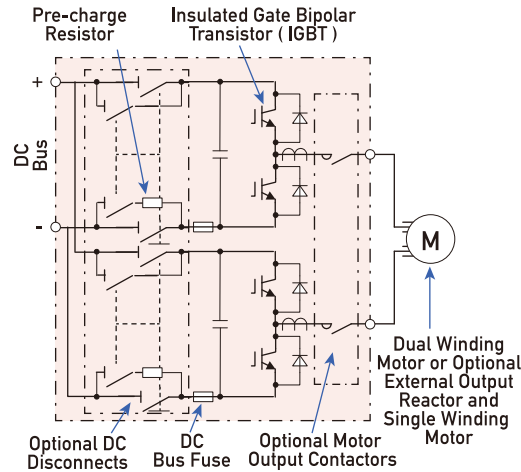
Multistage type / without capacitor pre-charge function ( Frame 15 ~ 250 )  
Model MZ



Self-standing cabinet type, single ( Frame 400 ~ 900 )  
Model S1, S2



Self-standing cabinet type, twin ( Frame 1200 ~ 1800 )  
Model S2



Item	Vector control ( with speed feedback )	Sensor-less vector control	Remarks
Inverter input voltage	560 ~ 680 Vdc		440 / 460 Vac models
Inverter output voltage	0 ~ 0.71 x input voltage		
Maximum rotation speed	6000 min <sup>-1</sup> for 4 pole motors, 12000 min <sup>-1</sup> for 2 pole motors		
output frequency range	0 ~ 200 Hz	1.8 Hz ~ 200 Hz	
Speed control range	0 ~ 100 %	3 % ~ 100 %	
Speed control accuracy	±0.01 %	±0.1 %	For sensor-less vector control, with motor temperature sensor, one driven motor
	±1.0 %		For sensor-less vector control, with motor temperature sensor, multiple driven motors
Speed control response	60 rad/s	20 rad/s	At uncoupled test
Torque control range	0 ~ 100 %		For vector control with speed feedback, static torque applicable, a torque limit in the extremely low speed range
Torque control accuracy	±3 %	Torque control not applicable	For vector control with speed feedback, when R2 is compensated by the motor temperature sensor 1)
	±10 %		For vector control with speed feedback, without the motor temperature sensor 1)
Maximum torque control response	1000 rad/s		For vector control with speed feedback
Maximum field weakening range	1 : 5	1 : 1.5	
Current control method	2-level triangular wave PWM		
PWM carrier frequency	1.5 kHz		
Speed sensor	PLG	-	Power supply voltage : 5 to 15 Vdc Maximum frequency : Differential : 200 kHz, Single end : 10 kHz
	Resolver	-	1 X or 4 X
Driven motor	Squirrel cage induction motor		

NOTE 1) Torque control accuracy and response are when using conventional vector control.

## TMdrive-10e3 Inverter 440 / 460Vac Class

Reference outline drawing 1)	Frame	Panel	Output current [ A ]				Mass [ kg ] each unit or each panel	Panel width W [ mm ]	Control power capacity [ kVA ]	Heat losses [ kW ]	
			100 % OL	150 % OL	175 % OL	200 % OL					
<p>Height of the unit 8 stages : 199mm 4 stages : 399mm 2 stages : 799mm</p>	4	8 stages	7.5	5.0	4.5	4.0	29	800	0.2	0.2	
	8	8 stages	15	10	9.0	8.0	29				
	15	8 stages	26	20	18	14	29				
	25	8 stages	44	34	30	27	29				
	45	8 stages	77	59	52	47	32				
	75	8 stages	113	98	87	78	33				
	125	4 stages	189	164	146	131	59				
	250	2 stages	322	270	242	218	110				
Multistage panel							260	0.3	2.0	3.6	
Multistage panel							260	0.5	-	-	
<p>Height of the unit 8 stages : 185mm 4 stages : 375mm 2 stages : 755mm</p>	4	8 stages	5.6	4.4	4.2	4.0	23	800	0.2	0.2	
	8	8 stages	11	8.8	8.5	8.0	23				
	15	8 stages	20	18	17	16	23				
	30	8 stages	45	35	34	32	25				
	60	8 stages	95	75	68	60	28				
	100	8 stages	125	125	112	103	28				
	150	4 stages	200	200	185	165	53				
	250	2 stages	315	270	242	218	83				
Multistage panel							260	-	0.5	-	
	400		504	455	420	395	280 (300)	800	0.35	5.4	
	600		833	700	670	630	460 (500)				
	750	1 cabinet	1000	935	810	718	470 (510)				
	900		1000	1000	1000	925	480 (520)				
	900	2 cabinets	1280	1150	1050	925	790				1400
	900		1280	1150	1050	925	790				1400
	1200		1666	1400	1340	1260	2x460 (2x500)	2x800	1.3	20.4	
	1500	2 cabinets	2000	1870	1870	1436	2x470 (2x510)				
	1800		2000	2000	2000	1850	2x480 (2x520)				
	1800	4 cabinets	2560	2300	2100	1850	2x790				2x1400

NOTE 1) Dimensions in the table are for Type-P and Type-A.

## TMdrive-P10e3 PWM Converter 440 / 460Vac Class

Reference outline drawing 2)	Frame	Panel	Output power [ kW ]	Output current [ A ]			Mass [ kg ] each unit or each panel	Panel width W [ mm ]	Control power capacity [ kVA ]	Heat losses [ kW ]
				150 % OL	175 % OL	200 % OL				
	150	2 cabinets	130	170	155	140	990	1400	0.3 +0.5	2.3
	400		298	390	350	308	1250	2000	0.9	4.3
	750	3 cabinets	631	825	740	650	1550	2200	1.2	10.6
	900		765	1000	880	790	1600			
	1200	4 cabinets	964	1260	1100	975	2120	3000	1.4	14.7
	1500		1263	1650	1480	1300	3100	4400	2.3	21.2
	1800	6 cabinets	1530	2000	1760	1580	3200			
2400	8 cabinets	1928	2520	2200	1950	4240	6000	2.7	29.4	
Type-F : standard Type-W : without AC breaker nor AC filter										

NOTE 2) Dimensions in the table are for Type-F.

Precautions for application of TMdrive-10e3 series

- Secure a space of 500 mm or more above the panel ( minimum requirement of 255 mm or more for ceiling fan replacement ).
- Secure 1,500 mm or more for front maintenance space.
- All panels have a front maintenance structure, and no maintenance space is required on the back.
- The cabinets must be installed on the channel base with flatness. The height of the standard channel base is 50mm. ( It is not included in the external dimensions in the rating table. )
- Recommended replacement period for limited life parts ( usage conditions: annual average temperature around the panel of 25°C )

Fuses	.....7 years	Control power supply units	.....11 years
Ceiling cooling fan	.....3 years	DC fan for units	.....11 years
Air filters	.....1 year	Battery ( on board )	.....7 years <sup>3)</sup>
Electrolytic capacitor	.....7 years		

NOTE 3) When "MT-4969" appears on the display, replace the battery immediately.  
Before replacing, make sure that the control power supply is turned off.  
After replacement, the time on the CTR board will shift, so it is necessary to adjust the time.