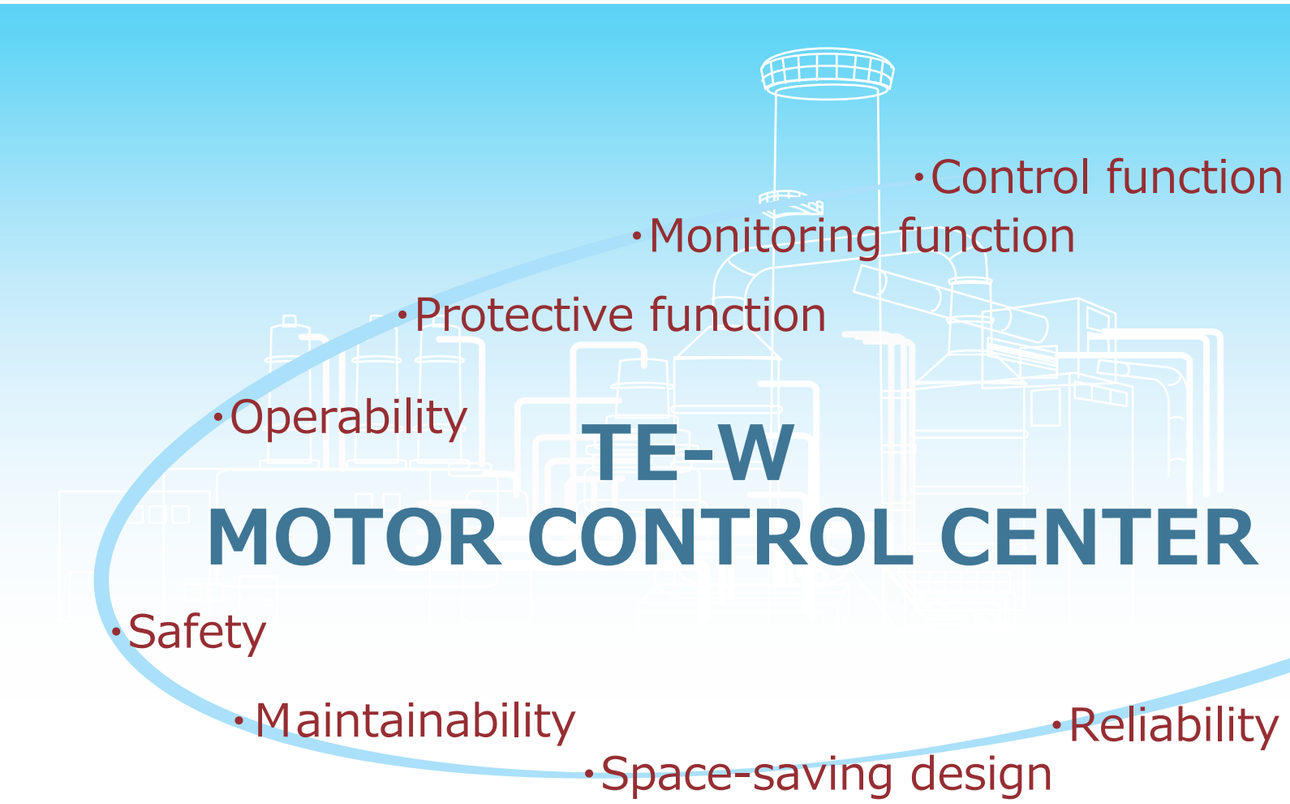
TOSHIBA

TYPE TE-W MOTOR CONTROL CENTER

M series and G series

Fully-fledged functions and high performance through advancing motor control technology

Since Toshiba started the production of Motor Control Centers in 1954, we have been advancing our technology for over 60 years. Taking advantage of the technology, we have developed the Type TE-W Motor Control Center, which is compliant with the international standards.



CONTENTS

■ Long life, high-luminance, and large 7-segment LED display

The LED display has a longer life than an LCD. The values are clearly readable in a well-lit or dark setting.
The 6-digit display allows the user to see the setting item and setting value at a glance.

■ Easy-to-understand trip indication

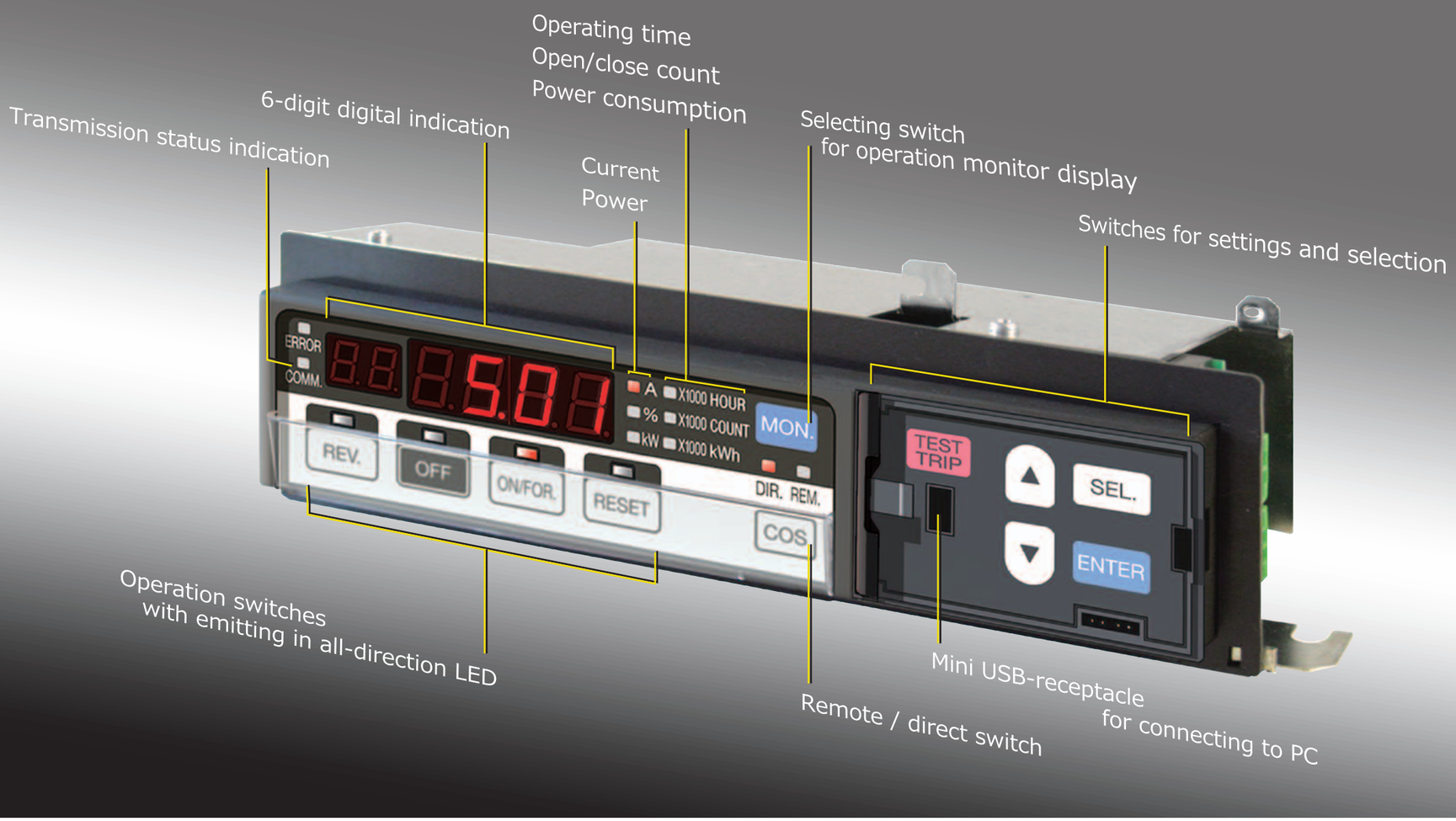
When a trip occurs, the orange lamp above the RESET switch illuminates, and the 7-segment LED display blinks and indicates the cause of the failure.

■ Power factor measurement in addition to conventional power and power consumption measurements

Power, power consumption, and power factor can be measured to help in energy-saving management.

* Pulsed output (insulated) of power consumption is available by standard.

MOTOR MULTI-RELAY MODEL CCR22



■ Highly visible operation lamps

A lens that makes the lamp look bright and visible from any direction has been added to each lamp.

■ Upward compatibility

The motor multi-relay is compatible with the older models and can be used to replace one for enhanced monitoring functions.

■ Easy connection to a PC

A commercial USB cable can be used.

■ Energy saving and failure analyses supported

Motor protection, control, and monitoring can be managed using a PC.

■ Security function

You can set the setting lock function to lock operations with switches.
To unlock operations, insert the unlock key.

* Unlock key (optional)
Type CCR-RKEY

Protective functions

You can choose from various protective functions to protect your valuable equipment based on the characteristics of the load.

Setting range of overload protection (0.11 A to 630 A)

- Overload protection
- Earth fault protection
- Undercurrent protection
- Under power protection
- Single phase protection
- Instantaneous overcurrent protection
- Power overload protection

Monitoring functions

The enhanced monitoring functions help you in energy saving, managing equipment replacement timing, and identifying the cause in case of a load failure, allowing for an early recovery of the equipment.

- Indication of failure factors
  - OL : Over Load
  - SP : Single Phase
  - EF : Earth Fault
  - OC : Instantaneous Over Current
  - UC : Under Current
  - OP : Over Power
  - UP : Under Power
- Time Monitoring
  - Cumulative operation time
  - Cumulative open/close operation count (Contactor open/close operation count)
  - Starting time
  - Time elapsed after a failure
- Contactor Monitoring
  - Contactor malfunction
  - Chattering
- Power Monitoring
  - Power
  - Power consumption
  - Power factor
- Current Monitoring
  - Operating current
  - Leak current
  - Fault current (The past 8 fault currents)

Control functions

You can choose from various control functions according to the intended use of the load.

- Input operation condition selection
- Output condition selection
- Starting method selection
- Applicable load selection
- Operation, Stop, Reset after failure
- Remote and direct switching selection
- Selection of restart function after voltage dip
  - Voltage dip compensation time
    0 (None), 0.1, 0.2, 0.5, 1, 2, 3, 4, 5, 10 to 60 sec (in steps of 5 sec)
  - Restarting delay time
    None, 1 to 180 sec (in steps of 1 sec)
  - Voltage dip compensation time for immediate restart
    0 (None), 0.1 sec (optionally 0.2 sec)

Transmitting functions (optional)

The transmission equipment can reduce the wiring.

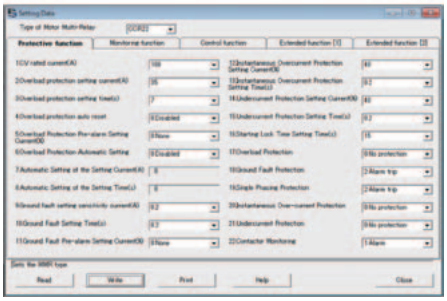
- High speed multi-station transmission equipment
  TOSLINE-F10M
- Open field network

CC-Link PROFIBUS®

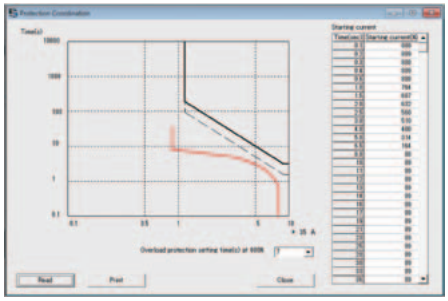
Motor multi-relay setting tool for function and failure analysis (optional)

You can connect the motor multi-relay to a PC with the function setting and failure analysis tools installed using a USB cable to view the setting values of the motor multi-relay, current waveforms, and protection coordination on the PC.
You can also view the values expressed in percentage for the past 8 fault currents and the current for 20 seconds before the fault (5 seconds after the fault).

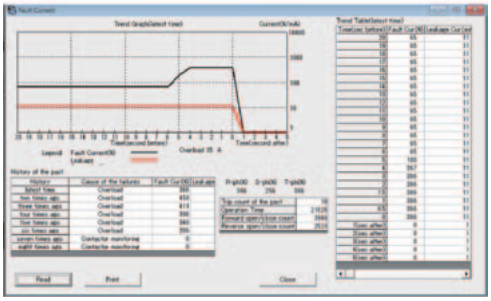
- Data can be saved in the CSV or TXT format.
- A commercial USB cable (Mini-B) can be used to connect to a USB port of the PC.



Motor Multi-Relay setting



Protection coordination



Fault current

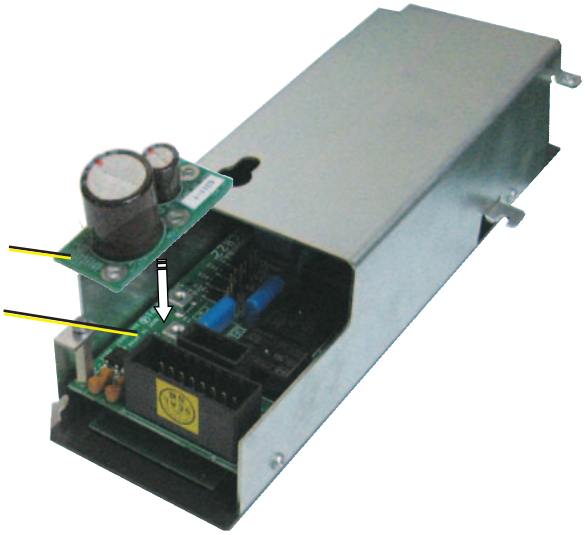
Output function

A 0 to 1 mA output (non-insulated) or a 4 to 20 mA output (non-insulated) is provided as standard for the ammeter on the control panel on site. The optional board allows for an insulated 4 to 20 mA output. Also, pulsed output (insulated) of power consumption is available by standard.
(10 Wh, 100 Wh, or 1 kWh per pulse)
* The insulated 4-20 mA output and the transmitting functions cannot be used simultaneously.

Output terminals
Analog output for load current
Pulse output for power consumption

Maintenance

The structure that allows easy replacement of electrolytic capacitor with relatively short life.



Circuit board with electrolytic capacitor

Main circuit board

■ Selection of restart function after voltage dip

In case of an instantaneous voltage dip, the contactor automatically turns on to resume motor operation as soon as or in a specified period of time after the voltage is recovered, as long as the contactor was on before the voltage dip.
The CCR22 provides 3 setting modes to support voltage dip times and operations after the voltage is recovered.

• Setting of voltage dip compensation time

0(None), 0.1, 0.2, 0.5, 1, 2, 3, 4, 5, 10 to 60 sec (in steps of 5 sec)

- When an instantaneous voltage dip occurs, the motor stops if the voltage is not recovered within the preset time period.
- When an instantaneous voltage dip occurs, the motor restarts if the voltage is recovered within the preset time period.

• Setting of restarting delay time

0(None), 1 to 180 sec (in steps of 1 sec)

- When an instantaneous voltage dip occurs, each of the motors restarts after the restarting delay time set for the motor if the voltage is recovered within the time period specified as the voltage dip compensation time. (The motors stop when an instantaneous voltage dip is detected.)

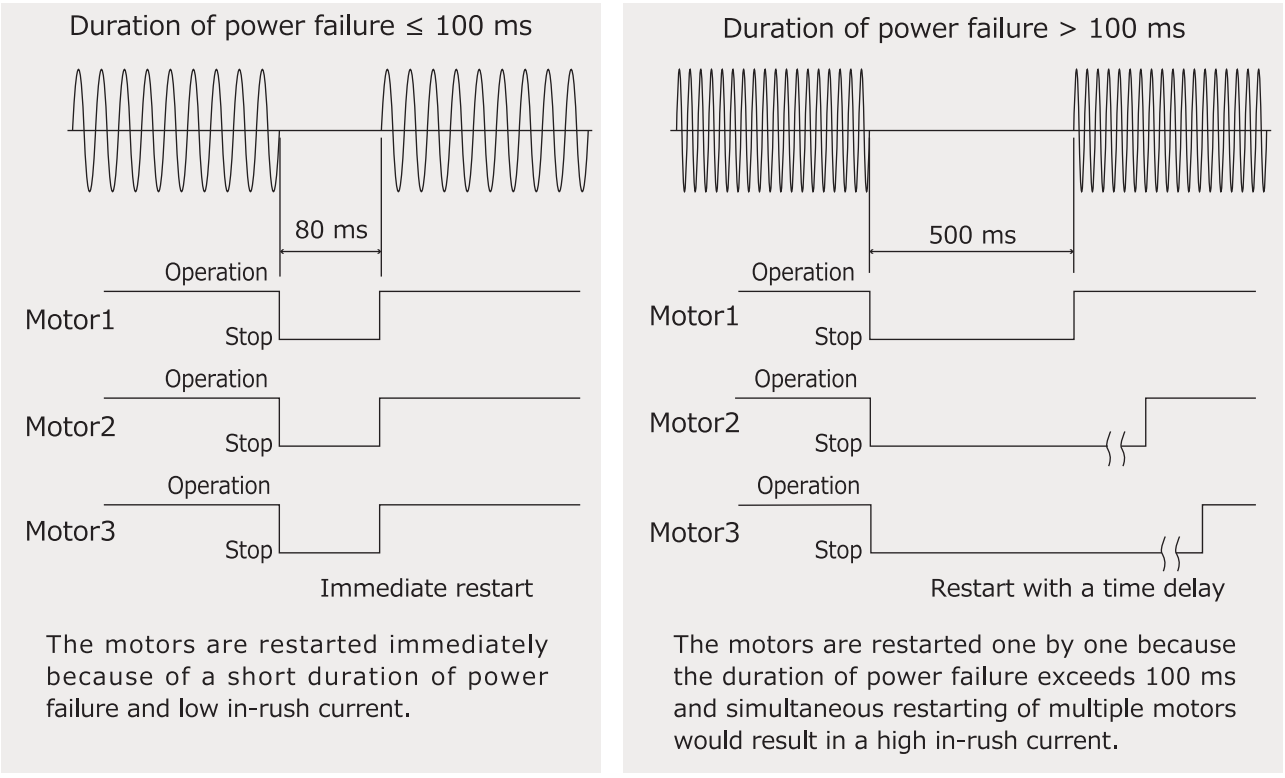
• Setting of voltage dip compensation time for immediate restart

0(None), 0.1 sec (optionally 0.2 sec)

This mode is available only if both the voltage dip compensation time and restarting delay time are set.

- When an instantaneous voltage dip occurs, the motors restart immediately if the voltage is restored within the specified time (0.1 sec).
- When an instantaneous voltage dip occurs, each of the motors restarts after the specified restarting delay time if the voltage is not restored within the specified time (0.1 sec) but is restored within the time period specified as the voltage dip compensation time.

Voltage dip compensation function for immediate restart



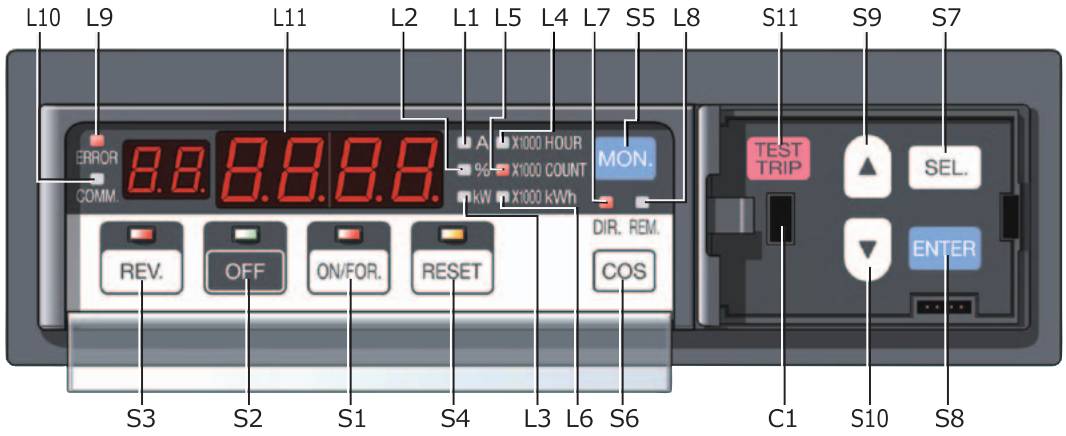
The motors are restarted immediately because of a short duration of power failure and low in-rush current.

The motors are restarted one by one because the duration of power failure exceeds 100 ms and simultaneous restarting of multiple motors would result in a high in-rush current.

Specifications of CCR22

Dependent on the used load and the purpose of control, main board, expansion board and transmission board are combined.

Parts information



Item	No.	Name	Function
Switch and Indicator	S1	ON／FOR.	To start the motor (in the forward direction). Lit in red while the motor is running.
	S2	OFF	To stop the motor. Lit in green when motor is idle.
	S3	REV.	To start the motor (in the reverse direction). Lit in red while the motor is running.
	S4	RESET	To reset the protective function. Lit in orange during failure (while the protective function is operating).
Switch	S5	MON.	To select the display on the monitor
	S6	COS	To select the operating location (remote or direct)
	S7	SEL.	Selects a fault display and a function setting display and to change setting.
	S8	ENTER	To enter setting values. (for confirmation)
	S9	△	To select functions and to change values (increasing the values)
	S10	▽	To select functions and to change values (reducing the values)
	S11	TEST TRIP	To cause a test trip during test
LED	L1	A	For digital display of current
	L2	%	For % display of current
	L3	kW	For indication of power *1, *2
	L4	×1000HOUR	For displaying hours (In the case of 1 hour, the display is 0.001.)
	L5	×1000COUNT	For displaying the count (In the case of 1 time, the display is 0.001.)
	L6	×1000kWh	For indication of power consumption *1, *2
	L7	DIR.	This indicates the location of the operation and is lit when the direct operation can be made.
	L8	REM.	This indicates the location of the operation and is lit when the remote operation can be made.
	L9	ERROR	This is lit when the CPU fails.
	L10	COMM.	This is lit when transmission is normal.
	L11	Digital indicator	This digitally indicates a current value and a setting value.
Connector	C1	miniUSB	Connectors for function setting and for reading of maintenance data (For PC connection)

*1:Indication display of electric power is available only when the connected current sensor type is CV3-***.
*2:Electric power and power consumption at the secondary side of the inverter cannot be measured.

Type (CCR22)

CCR22－＊＊＊＊＊＊＊

1st digit	Control voltage / Expansion board	0:100 V AC/110 V AC without expansion board 1:100 V AC/110 V AC with expansion board 2:200 V AC/220 V AC without expansion board 3:200 V AC/220 V AC with expansion board
2nd digit	Optional board	0:None 1:TL-F10M (T-US005) 2:CC-Link (C-US002) 3:Transducer (CCR22-AN) 6:PROFIBUS-DP (P-US000)
3rd digit	Case	0:Standard 1:Old type, MMR compatible
4th digit	CV･ZCT	0:CV3 (standard) ZCT:Hikari Trading (standard) 1:CV3 (standard) ZCT:Seiko Electric 2:CV2 ZCT:Hikari Trading (standard) 3:CV2 ZCT:Seiko Electric
5th digit	Optional function	0:None 1:Voltage dip compensation time for immediate restart 0.2sec
6th digit	User sequence	0:Standard 1:Variable sequence used
7th digit	For future use	0:Standard

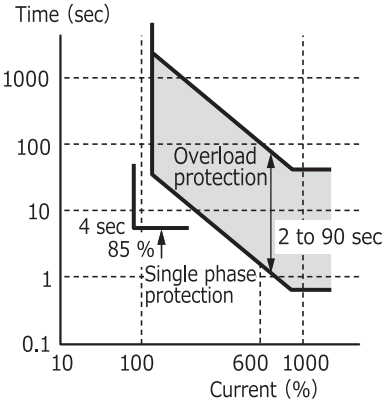
Basic specifications

Power supply voltage	:20 V AC 50/60 Hz
Allowable voltage fluctuation	:85 to 110 %
Operating voltage	:100/110 V AC 50/60 Hz 200/220 V AC 50/60 Hz
Noise resistance	:2000 V for 1 μs (by noise simulator)
Operating ambient temperature	:－10 ℃ to ＋60 ℃
Storage ambient temperature	:－20 ℃ to ＋60 ℃
Operating ambient humidity	:10 to 85 %RH (no condensation)
Environment	:free from dust and corrosive gas
Insulation resistance	:100 MΩ (500 V megger) (between terminals tied together and ground)

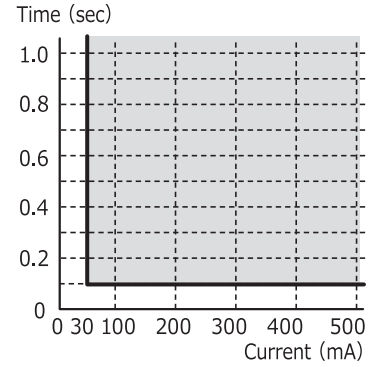
Functions list of CCR22

Items			Description
Protective functions	Overload protection	Setting current	35 to 105 % (in steps of 1 %) of CV rated current.
		Minimum operating value	105 % of the set-up current
		Current setting range	0.11 to 630 A
		Pre-alarm operating current	None, 50 to 100 % (in steps of 1 %) of the set-up current
		Operating time characteristics	2 to 90 sec (in steps of 1 sec)
		Heat accumulation characteristics	With hot characteristics
		Reset	Auto, Manual
	Single phase protection	Umbalance ratio of single phase operation	None, 30 %, 60 %
	Earth fault protection	Sensitivity current	None, 30, 100 to 500 mA
		Operating time	0.1 to 1 sec (in steps of 0.1 sec)
		Pre-alarm operating current	None, 30 to 95 % of the sensitivity current (in steps of 1 %)
	Instantaneous overcurrent protection	Operating current	None, 40 to 600 % of the set-up current (in steps of 5 %)
		Operating time	0.1 to 9 sec (in steps of 0.1 sec)
		Starting operation lock time	1 to 180 sec (in steps of 1 sec)
	Undercurrent protection	Operating current	None, 15 to 100 % of the set-up current (in steps of 1 %)
		Operating time	0.2 to 9 sec (in steps of 0.1 sec)
	Power overload protection	Set-up power	1 to 200 kW
		Operating time	0.1 to 10 sec
	Under power protection	Set-up power	1 to 200 kW
		Operating time	0.2 to 10 sec
Monitoring functions	Operating current monitoring		Digital (A) or percentage (%) switchable
	Leak current monitoring		Digital (A)
	Power monitoring		Indicated in kW
	Power consumption monitoring		Indicated in kWh
	Power factor monitoring		Percentage (%)
	Control voltage monitoring (Under voltage)		80% or less of the relay rated voltage
	Contactor monitoring		Non-operation monitoring when one second passes after open/close operation
	Chattering monitoring		Monitoring for open/close (twice or more) within 0.15 sec
	Cumulative operation time monitoring		Operation time accumulation monitoring
	Cumulative open/close operation count monitoring		Contactor open/close operation count
	Indication of failure factors		Overload, Overload pre-alarm, Earth fault, Pre-alarm for grounding, Single phase, Instantaneous overcurrent, Undercurrent, Over power, Under power, Starting jam, Contactor malfunction, and Contactor chattering
	Starting time indication		Time from the start of operation until the current reaches 110 % or less
	Elapsed time indication		Indication of time elapsed after a failure
	Faulty current indication		Past 8 fault current values (expressed in percentage of load current) , leakage current values, and phase current values of R, S, and T (in A)
Control functions	Input operation condition selection		Select from 15 functions via the general-purpose input terminals
	Output condition selection		Select from 35 output conditions via the 2 standard relays and 3 optional relays
	Starting method selection		Non-reversible, reversible, 人−△ , closed 人−△ , pole change, reactor, korndorfer, inverter non-reversible, inverter reversible
	Applicable load selection		Single phase load, 3 phase load
	Operation, Stop, Reset after failure		Operation, stop, and reset after failure by illuminated (LED) push-button switch
	Remote and direct switching selection		Select from 5 circuit conditions with remote (REM) or direct (DIR) switching
	Restart after voltage dip	Voltage dip compensation time	0 (None) , 0.1, 0.2, 0.5, 1, 2, 3, 4, 5 sec, 10 to 60 sec (in steps of 5 sec)
		Voltage dip compensation time for immediate restart	0 (None) , 0.1, (optionally 0.2 sec)
		Restarting delay time	0 (None) , 1 to 180 sec (in steps of 1 sec)
	Operation at a failure		Select from whether to stop or continue operation in case of a CPU failure
Other	Transducer output		0 to 1 mA (not insulated) or 4 to 20 mA (not insulated)
	Test trip		For problem simulation in sequence test
	Interface		USB

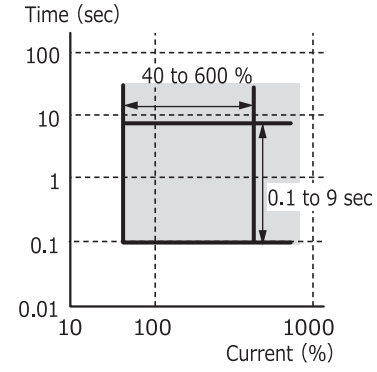
■Overload protection characteristics and single phase protection characteristics



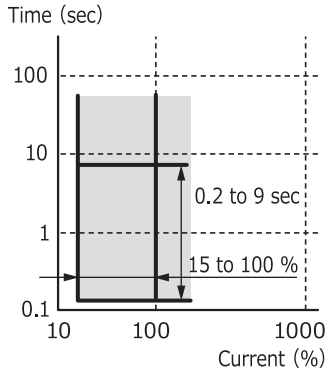
■Earth fault protection characteristics



■Instantaneous overcurrent protection characteristics



■Undercurrent protection characteristics



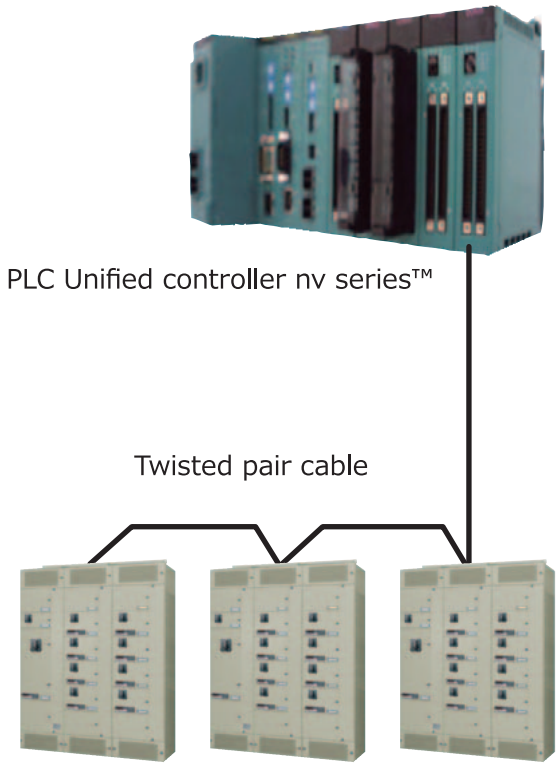
High speed, multi-station transmission equipment TOSLINE-F10M

High speed, multi-station transmission equipment (TOSLINE-F10M) is used for the motor control center for more efficient operation of plant and reduction of total equipment costs.

* It can be supplied to M series as an option.

- The TOSLINE-F10M is high speed (750 kbps), multi-station transmission equipment with multi-drop configuration using twisted pair. Relay control is performed by cyclic scan transmission and maintenance support system is realized by message transmission.
- Up to 128 stations (2 words per station) can be connected to a main station, with execution speed 100 milliseconds or less. The main station can be expanded to 4 main stations and thus up to 512 stations can be connected.
- Transmission distance is 500 m between stations and a repeater (RP) is installed every 32 stations. Total extension can be 2 km.
- When distance between stations exceeds 500 m, electro-opto converter (EO) is used for opto-transmission for up to 1 km.
- A unit station can be put in the motor multi-relay, therefore installation space is not necessary.
- For redundancy of transmission route, the main station can be duplexed and transmission route can also be duplexed.

Transmission cable must be selected from those featured in the manual.



■General specifications

Specification	Description
Transmission cable	Twisted pair cable (F10M special cable)
Communication distance	2 km at maximum
Transmission speed	750 kbps
Scan time	100 msec
Number of units connected	128/main station
Transmission functions	Cyclic scan transmission, Message transmission
Check method	CRC check
Insulation method	Photo coupler

■Example of transmit data set up

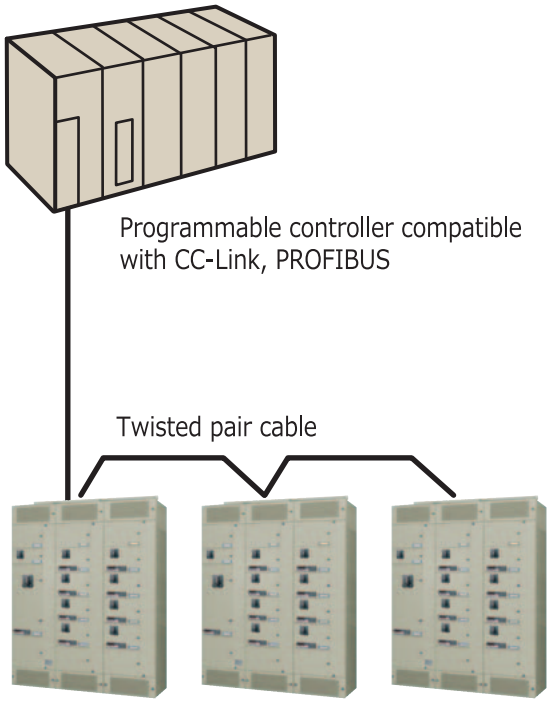
Sending data of PLC (PLC to motor control center)		Receiving data of PLC (Motor control center to PLC)
Scan transmission	Forward operation command Stop command Reverse operation command Alarm reset	Forward operation status Reverse operation status General purpose relay output status Input status of general input Forward interlock input status Reverse interlock input status Operating current
Message transmission	————	Operation time ON/OFF count Trip count Cause of fault in the past Load current in fault Power, power consumption,others

Note:
The general purpose relay can, with no restriction, set up the failure factors such as overload plus single phase, earth fault, pre-alarm, etc.

CC-Link、PROFIBUS

Open field networks --- CC-Link and PROFIBUS ---are used to meet different needs.
* Supplied to M series (optional).

- Can be connected to many items of field equipment compatible with CC-Link and PROFIBUS thanks to open transmission equipment.
- Substantial and reliable functions
  - ・For CC-Link, by setting the standby master in advance, data link can be continued even if an error has occurred in the master station.
  - ・When an error has occurred in a slave station while data link is being activated and it is made inactive, the slave station is disconnected and data link is activated between normal stations only.
- Even if the host system is of a different manufacturer, PROFIBUS, whose specifications are available globally, allows our motor control centers to be connected to a programmable controller (PLC) of the manufacturer.
- Data transmission is performed by high speed transmission (CC-Link:625 kbps, PROFIBUS:500 kbps)
- Special transmission cables used can achieve a transmission distance of up to 900m with CC-Link or up to 4km with PROFIBUS (including 9 repeaters).
- With CC-Link, up to 42 unit stations can be connected per master station when one station is occupied. With PROFIBUS, up to 122 unit stations can be connected per master station.



■ CC-Link

・General specifications

Specification	Description
Transmission cable	Twisted pair cable (CC-Link special cable)
Communication distance	900m at maximum
Transmission speed	625kbps
Scan time	85ms (one station occupied, 42units)
Number of units connected	42/master station
Communication method	Polling
Check method	CRC check
Insulation method	Photo coupler

・Example of transmission data setup

Sending data of PLC (PLC to motor control center)		Receiving data of PLC (Motor control center to PLC)
Bit information	Forward operation command Stop command Reverse operation command Alarm reset	Forward operation status Reverse operation status General purpose relay output status Input status of general input Forward interlock input status Reverse interlock input status
Word information	———	Operating current Leak current Power

■ PROFIBUS

・General specifications

Specification	Description
Transmission cable	Twisted pair cable (PROFIBUS special cable)
Communication distance	4km at maximum (including 9 repeaters)
Transmission speed	500kbps
Number of units connected	122/master station
Communication method	Polling
Insulation method	Photo coupler (insulation inside of the unit)
External power source	Network power source

・Example of transmission data setup

Sending data of PLC (PLC to motor control center)	Receiving data of PLC (Motor control center to PLC)
Forward operation command Stop command Reverse operation command Alarm reset	Forward operation status Reverse operation status General purpose relay output status Input status of general input Forward interlock input status Reverse interlock input status Operating current Leak current Power

Wide variation allowing choice of functions, installation conditions

Series	Breaking capacity at 480 V	Installation condition
M series with motor multi relay	30 kA 50 kA 70 kA 85 kA	
G series with thermal relay		

	Height	Width	Depth
Basic type	2300 ×	600 ×	550(*)
Wide type	2300 ×	700 ×	550(*)

・Wide type: 700 mm wide cabinet with 260 mm wire way
For example, in case of outgoing cables are armored cable, this type is applied.
・Divided into 3 cabinets as standard for shipment. See the outline drawing for the division points.

Vertical box

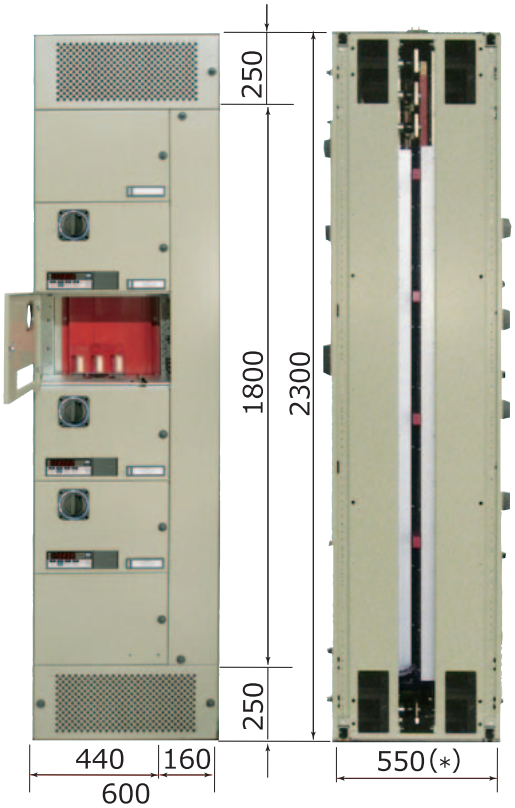
- High strength molding

  The vertical box is manufactured by high strength molding technology with at least 1.6t steel plate in compliance with UL845.
  It must be chosen from protective structure by IEC 60529.
  - General: IP20, IP40
  - Drip proof type: IPX1

- Space saving by piling-up

  Space-saving can be realized thanks to the possibility of piling up maximum 9 units.
  - Smallest size unit: 2 size unit (up to 75 A feeder)
  - Accommodation space: 1800 mm

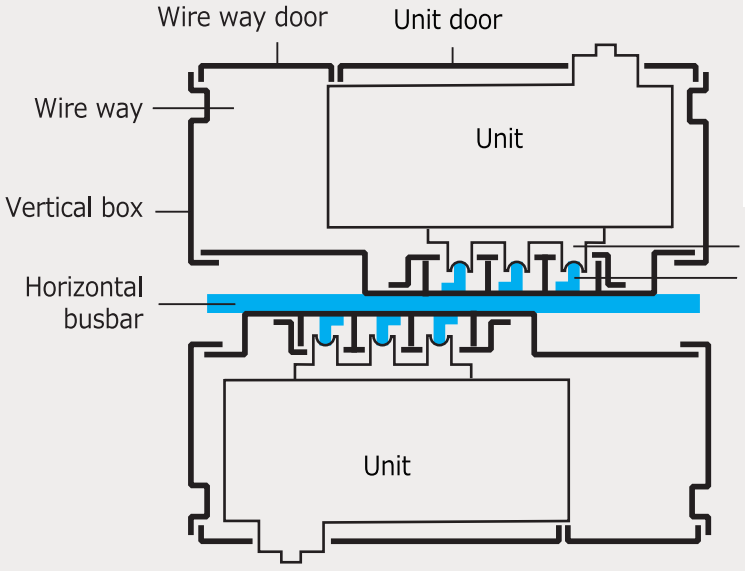
Vertical box (basic type)



* When the rated busbar short-time withstand current is 70 kA or 85 kA -1sec, the depth of the panel is 560 mm.

Vertical busbar of basic type (double front)

The vertical busbar is front side, back side independent type compatible with the unit.



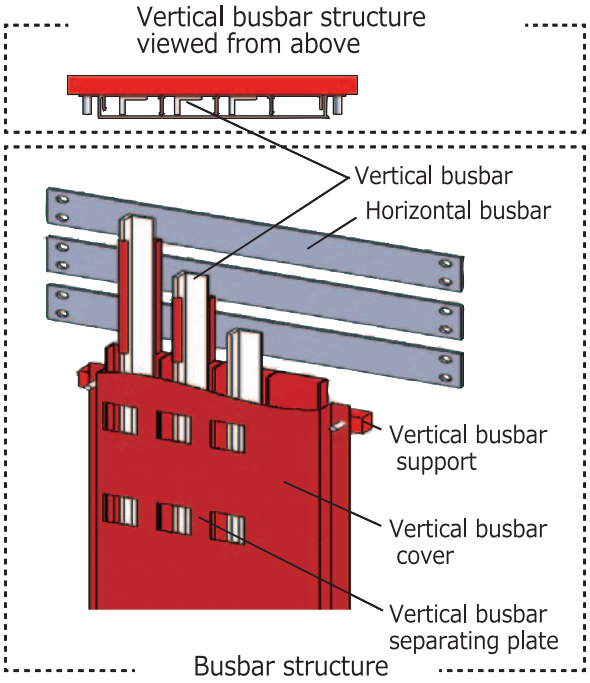
In the case of the double front, vertical busbars are for R phase, S phase, and T phase from the left on the front side and back side, and the units can be mounted on the front side and back side.

Designed for ultimate reliability, safety, and handleability

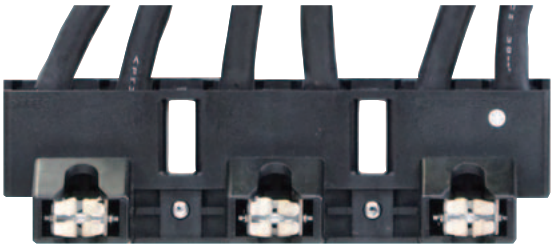
■ Structure for preventing insulation deterioration and repercussions of accidents

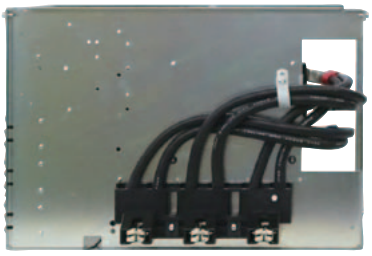
- A vertical busbar support that supports vertical busbars are installed on the outer surface of the vertical busbar cover. There is no projection or depression that may cause the accumulation of dust in the area between the phases of vertical busbars or in the grounding side.
  It prevents insulation deterioration over time and requires easy maintenance.

- The phases of vertical busbars are isolated by barriers to prevent phase to phase faults.
  Even if a short circuit occurs elsewhere, it does not escalate to a phase to phase fault at the vertical busbars, preventing repercussions of the accident.



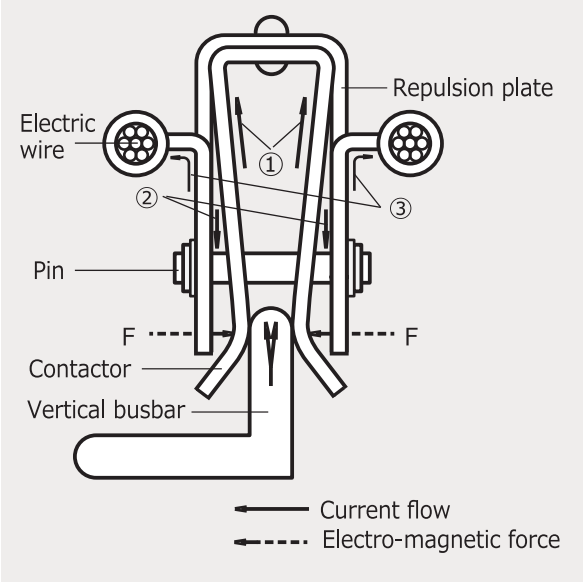
■ Disconnector with W-M grips





- Contacting mechanism suitable in principle for a large current.
  The main circuit disconnector adopts the connection method that utilizes the electromagnetic repulsive force between the springy contactor and conductive repulsion plate.

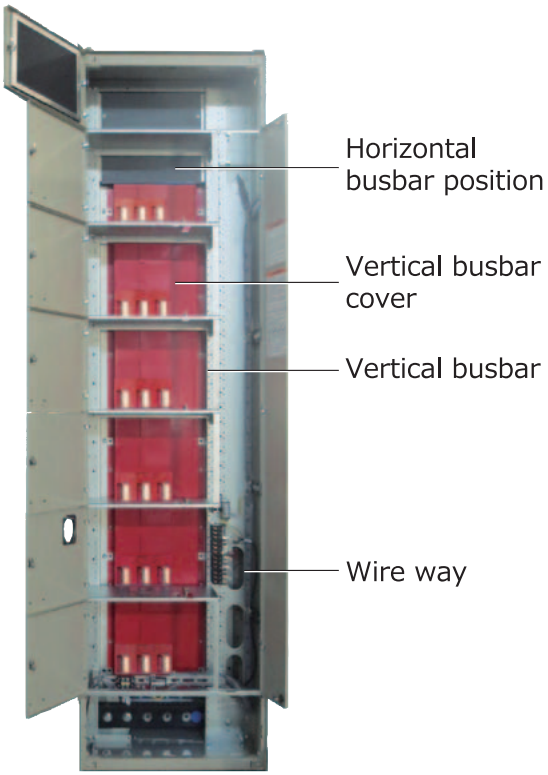
- A fault current flows through ①, ②, and ③ as indicated by the arrows.
  Contact pressure between the contactor and vertical busbar is increased by pressing with a pin to counter the electromagnetic repulsive force between ① and ②, in addition to the spring force of the contactor material itself and the electromagnetic attractive force of ①.
  This structure prevents the separation of the vertical busbar and disconnector due to the electromagnetic repulsive force at the contact.



Construction of bus bar

Horizontal busbar

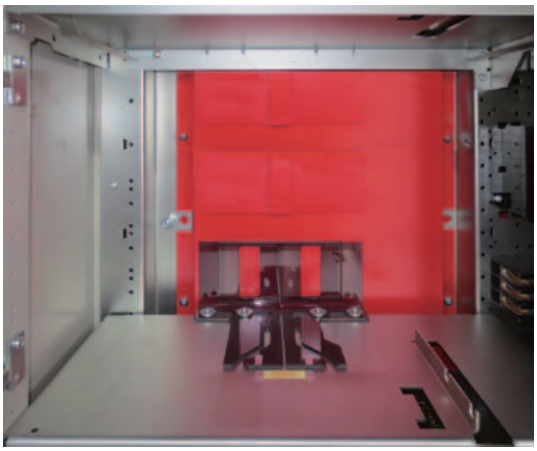
- The horizontal busbars are arranged vertically in the upper part of the panel (I-LINE busbars) allowing for flexible cabling from the above and below direction.
- The size of neutral phase of 3 phase, 4-wire type horizontal busbar is one-half that of positive phase as standard.
- The horizontal busbars are positioned in the same manner as for the existing panels of TM type. (However, units are not compatible.)



Vertical busbar

- The vertical busbar is entirely-insulated having a barrier between phases to prevent erroneous contact and propagation of arc discharge. In case of the double front type, vertical busbars are divided into front side and back side. 3 phase, 4 wire type can also be selected.
- The unit opening of vertical busbar has an insulation plate for shielding.
- A shutter can also be supplied as an option according to customers' specifications.

‣ Shutter (optional)



Material of busbar

The horizontal and vertical busbars are made of copper.
The horizontal busbar is tin-plated for resistance against corrosion and the vertical busbar, having a sliding portion, is silver plated against abrasion.

Wire way

The live part section of main circuits in the wire way is isolated to secure the safety of adjacent unit's modification and wiring works.

Construction of unit

There are two types of units, the M series accommodating the motor multi-relay and G series having a thermal relay.
These types can be combined and mounted on the same vertical box. See “Unit Selection Table” for unit size.

Unit position

The unit can be placed at the position shown below by the operation of the racking screw for unit insertion and pulling-out.
For a large unit with which pulling-out is not feasible, only the circuit breaker unit can be pulled out.

Unit position	Main circuit disconnection switch	Auxiliary circuit disconnection switch
Connection position	Connection	Connection
Test position (Disconnection position)	Disconnection	Overall test:connection
		Unit test:disconnection

＊The unit door remains open at the test position (disconnection position).

Unit connection

The main circuit (power side and load side) is automatically connected as the unit is inserted.
The auxiliary circuit is connected manually.
Some units are connected when screws are tightened.

Unit (M series)

Unit (G series)

Unit pull out

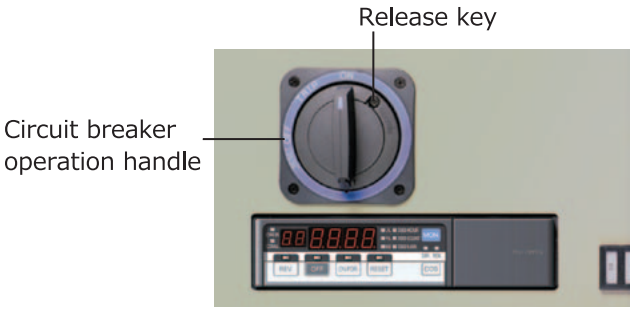
Functions of circuit breaker operation handle

Each unit has a circuit breaker operation handle with multiple functions as shown below.
Select one according to your intended use.

Function list of circuit breaker operation handle (multiple handle)

Function name	Function	Remarks
Door interlock	The door cannot be opened when MCCB is ON. When the door is open, MCCB cannot be ON.	Standard
Handle lock (ON/OFF position)	Handle control cannot be performed when MCCB is ON or OFF.	Standard (Padlock is optional.)
Forced release	Even when MCCB is ON, the door can be opened (in emergencies).	Standard
Trip indication	When MCCB trips, the operation handle works closely with it and trip is shown. (except in case of using padlock)	Standard

Forced release of door interlock



Handle lock

Ratings and applicable standards

Applicable standards	IEC61439-2
Maximum rated insulation voltage	690 V AC
Rated operating voltages Main circuits Auxiliary circuits	 200, 220, 400, 440, 460, 480 V AC 100, 110, 200, 220 V AC
Rated frequency	50, 60 Hz
Rated busbar current Horizontal busbar Vertical busbar	 800, 1250, 2000, 3150 A 400, 600 A
Rated short time withstand current	30, 50, 70 kA - 0.5 sec 30, 50, 70, 85 kA -1 sec
Rated breaking capacity	30, 50, 70, 85 kA (at 480 V) (Cutoff duty:Cutoff once)
Dielectric voltage at commercial frequency Main circuits Auxiliary circuits	 2500 V/1min 1500 V/1min

Types

Bank type

TE – 50 G W

- TE – Type
- 50 – Rated breaking current
  - 30:30 kA
  - 50:50 kA
  - 70:70 kA
  - 85:85 kA
- G – Series symbol
  - G: thermal relay incorporated
  - M: motor multi-relay incorporated
  - D: DC MCC
  - B: distribution panel

Unit type

NR 2 – 20 M

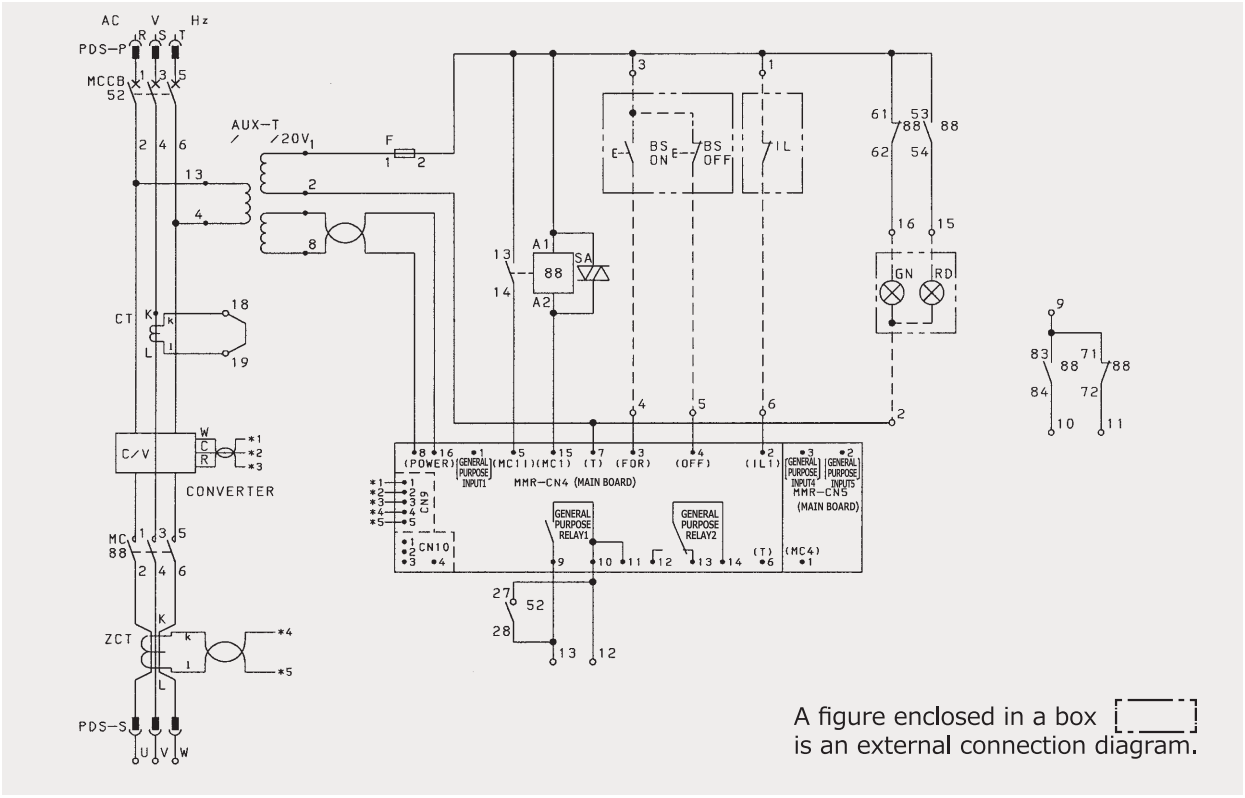
- NR – Unit styles

Without earth fault protection	With earth fault protection	Applied unit
NR	ML	Non reversible
HR	HL	Non reversible (SSC)
RG	RL	Reversible (general)
RM	KL	Reversible (with mechanical)
VR	VL	Reversible (SSC)
PD	DL	Pole change (2xMC)
PT	PL	Pole change (3xMC)
YD	YL	Star delta
XS	XL	Reactor start
IN	IL	Inverter
NF	NL	MCCB, FU-SW feeder
ND	BL	2 circuits incorporated by MCCB feeder
CF	CL	MCCB having MC, FU-SW feeder
GR	GL	Group starter
ST	SL	1ϕTR (MCCB with FU-SW)
TT	TL	3ϕTR (MCCB with FU-SW)
ES		Empty unit
DS		Space not usable for unit
AU		Others

- 2 – Unit heights
  - 2: 200 mm
  - 3: 300 mm
  - ⟆
- 20 – Unit rated current
  - Indicates the rated current of electromagnetic contactor for the starter unit.
  - Indicates the frame current of circuit breaker for the feeder unit.
  - Indicates the capacity (kVA) of inverter for the inverter unit.
- M – Protection method
  - M : motor multi-relay incorporated (M series)
  - T : motor multi-relay(with transmission equipment) incorporated (M series)
  - □ : thermal relay incorporated (G series)

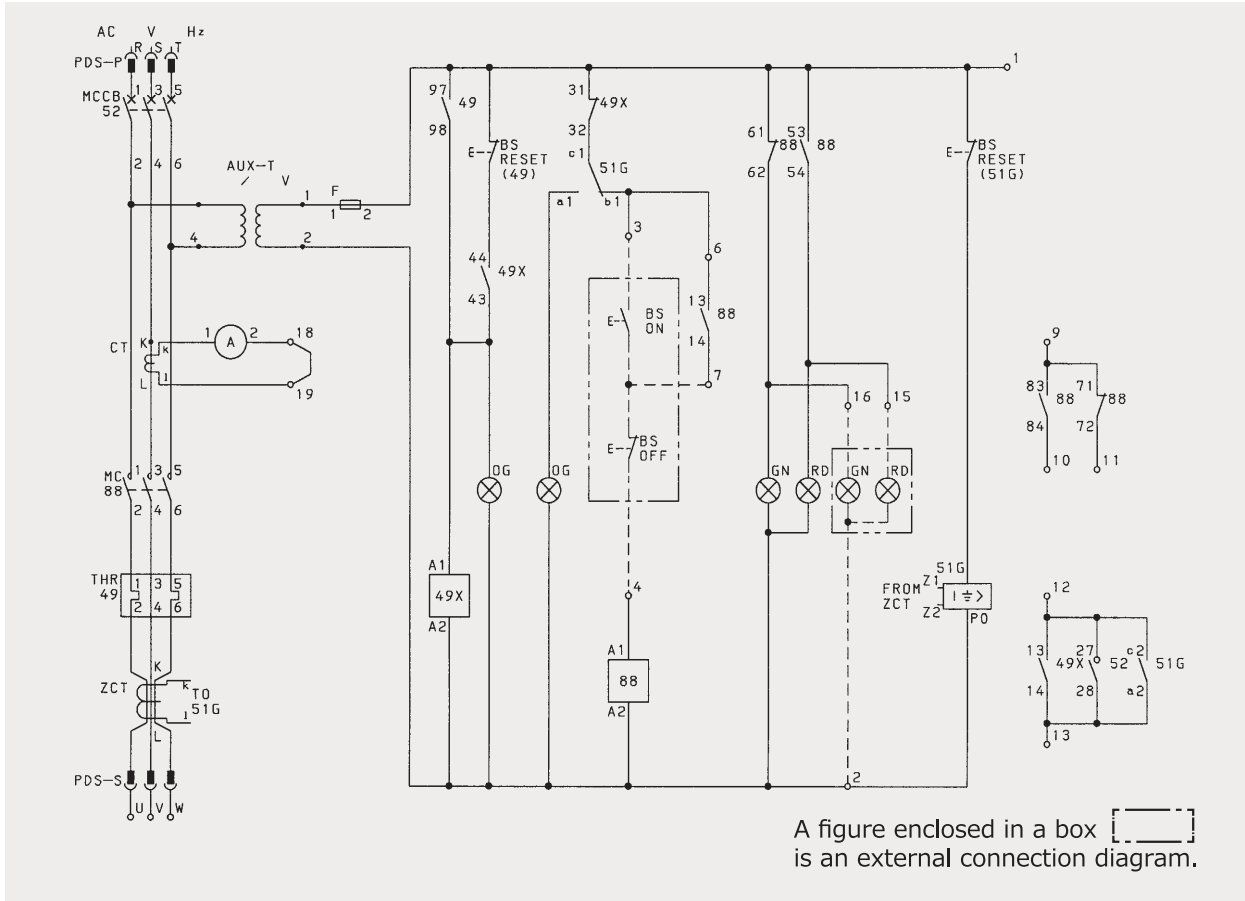
Note: “E” is attached to a unit for the future (wiring in the panel has be done.).

Non reversible unit of M series (with earth fault protection)



A figure enclosed in a box [ ] is an external connection diagram.

Non reversible unit of G series (with earth fault protection)

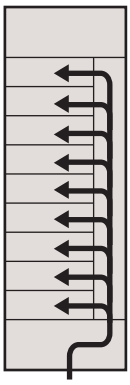
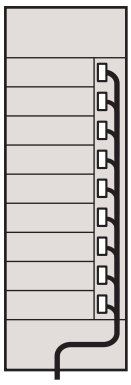
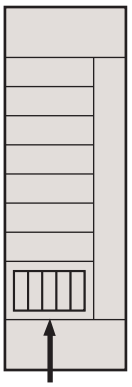


A figure enclosed in a box [ ] is an external connection diagram.

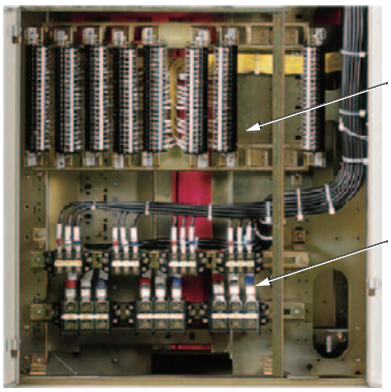
External connection method

- The following external connection methods are provided as maker's standard. The most suitable one can be chosen according to unit piling-up and operability.
- A screw-up terminal block is adopted for the auxiliary circuit terminal block to reduce auxiliary cable connection work. (Up to 2mm² is available to the auxiliary cable. 5.5mm² is optional.)

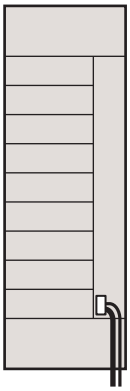
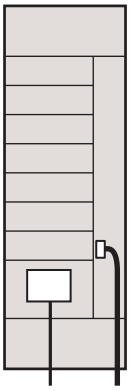
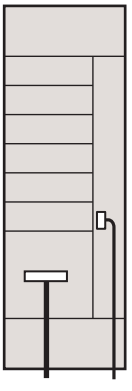
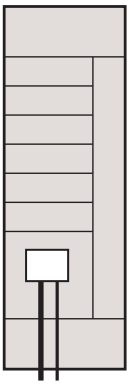
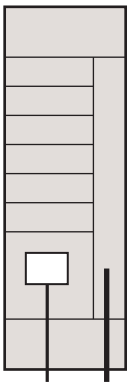
■ Connection method

External connection method	type A	type B	type C
Features	Directly connected to the device terminals in the units. Terminal block is not provided.	Connected to the terminal block near each unit.	Connected to the terminal block in terminal room.
Figures			

■ Terminal room of CC method

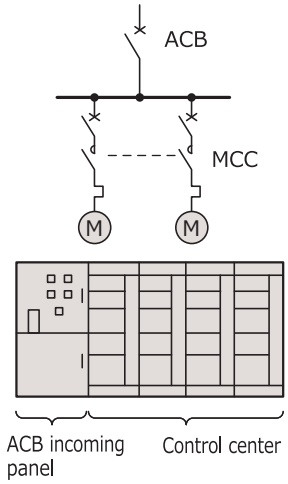
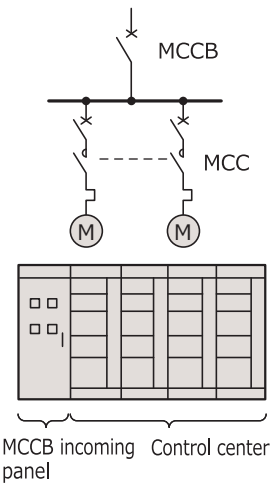
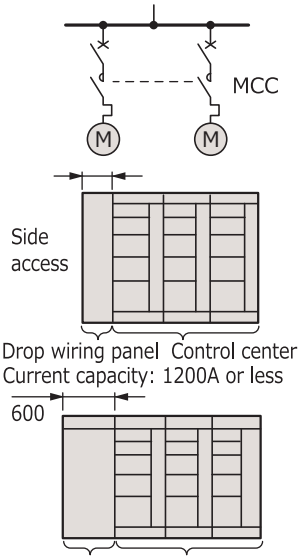
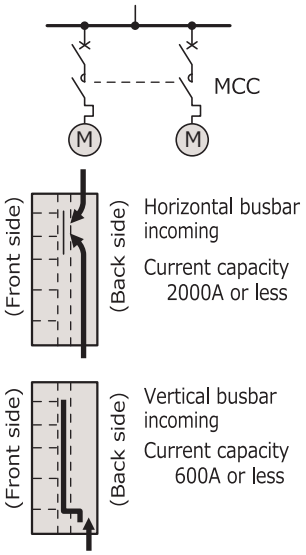


■ Types of connection method (maker's standard)

Manufacturer code		BB	BC	CB	CC	RC
JEM1195 Nomenclature	Main circuit	Method B	Method B	Method C	Method C	Method C (back)
	Auxiliary circuit	Method B	Method C	Method B	Method C	Method C
Maximum number of units piled-up	Unit height: 200mm	9	7	6	6	6
Features		*Units can be piled-up and most economical. *Good for single front type and double front type	*Second only to BB method in economicalness. *Applicable when there are many auxiliary cables.	*Second only to BB method in economicalness. *Applicable when main circuit cables are thick.	*Applicable when method C is adopted both for main and auxiliary circuits.	*Single front type only *Applicable when there are many auxiliary cables.
Terminal layout figures						

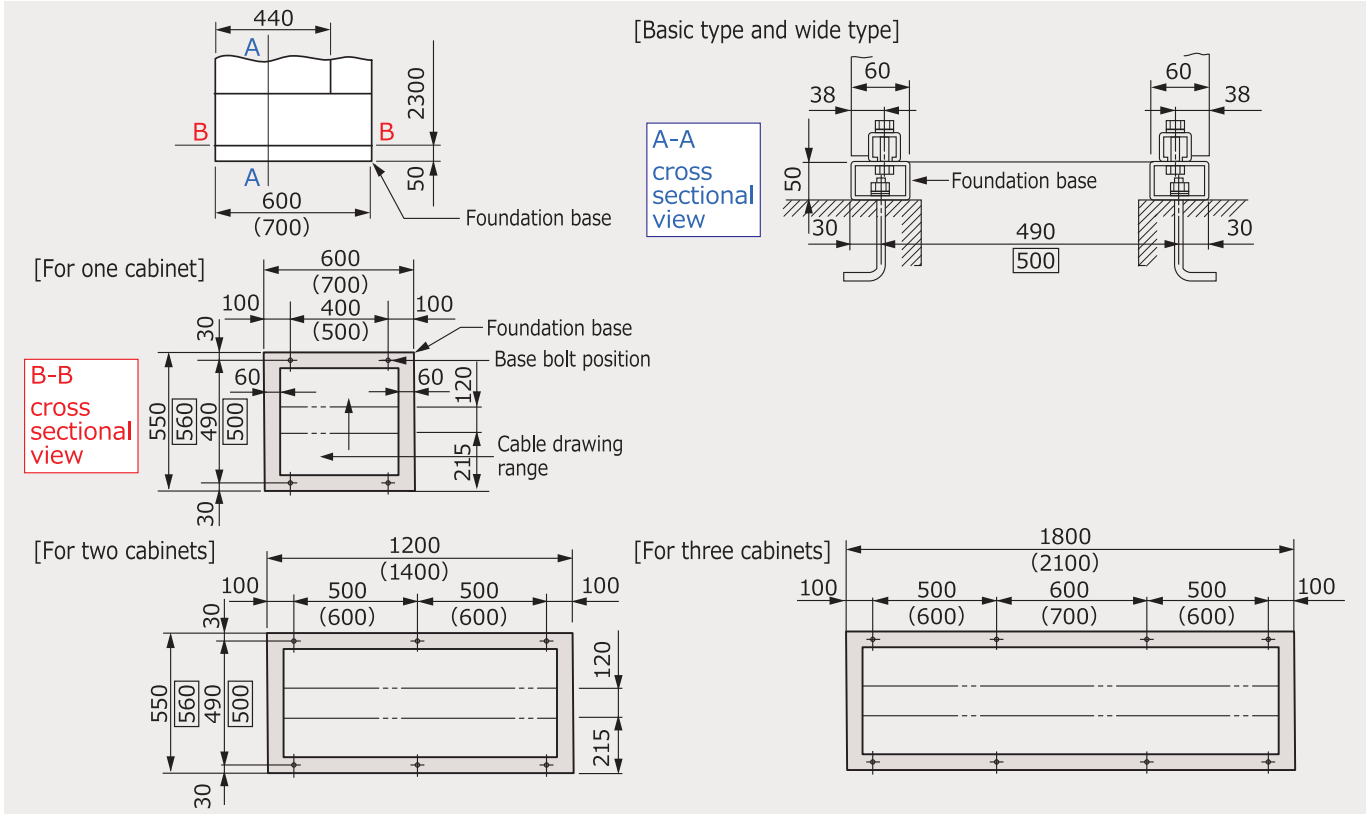
Incoming method

There are the following incoming methods. The most suitable one must be selected according to the system, capacity, and installation space. Consult us for details.

	Incoming with air circuit breaker (ACB incoming)	Incoming with wiring circuit breaker (MCCB incoming)	Incoming with drop wiring panel	Direct incoming on back side
Figures				
Descrip-tions	A incoming panel for which air circuit breaker is used. Available for one line and two lines. Current capacity is 4000A or less.	A incoming panel for which a wiring circuit breaker is used. Current capacity is 2000A or less.	A method in which a drop wiring panel is provided. Current capacity is 3150A or less.	A method in which the back side of motor control center is used. Horizontal busbars or vertical busbars are used for incoming.

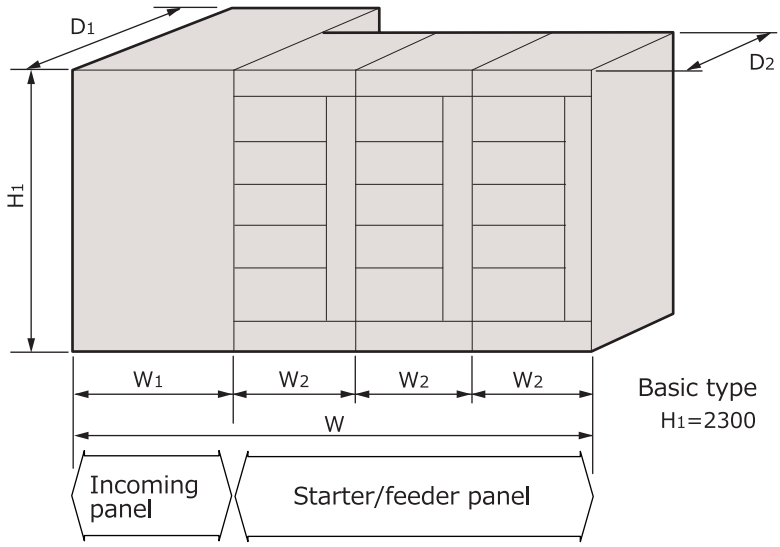
Installation

The dimensions in parentheses ( ) are for wide type. The dimensions in boxes ▭ are for 70kA, 85kA-1sec.
When the number of cabinets is more than 3, a combination of 1 - 3 will be adopted.

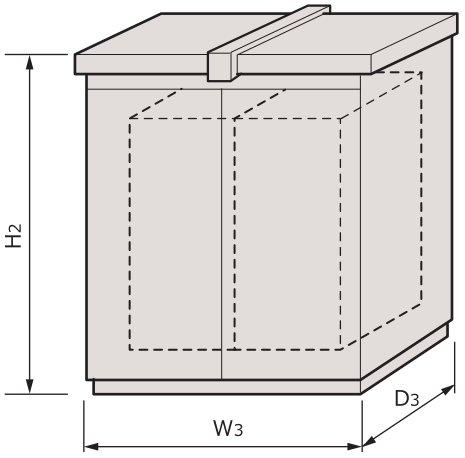


External dimensions and mass

Indoor type



Outdoor type



Basic type H2=2675

List of dimensions and mass

Type		Specification		Rated current (A)	External dimension / Mass					
					Indoor type				Outdoor type	
					Dimension			Mass(kg)	W3	D3
Incoming panel	ACB accommodated	Incoming for 1 line	3φ3W	800	W1	700	D1	1400	550	W1+400	D1+500
				1250					600		
				2000					650		
				2500		800			700		
				3150		1000		1500	1000		
			3φ4W	800		800		1400	650		
				1250					700		
				2000					800		
				2500		900			850		
				3150		1200		1500	1150		
		Incoming for 2 lines	3φ3W	800		1600		1400	1400		
				1250					1500		
				2000					1600		
				2500					1750		
				3150		2000		1500	2400		
			3φ4W	800		1600		1400	1500		
				1250					1600		
				2000					1700		
				2500		1800			1900		
				3150		2400		1500	2800		
	MCCB accommodated	Incoming capacity: 1200A or less				600		＊550	250	W2+300	D2+500
		Incoming capacity: 2000A or less				800		800	350		
	Direct incoming	Incoming capacity: 4000A or less				600		＊550	300		
Starter/feeder panel	Basic type				W2	600	D2	＊550	350		
	Wide type					700		＊550	400		
	Thin type					600		350	300		

＊ When the rated busbar short-time withstand current is 70 kA or 85 kA -1sec, the depth of the panel is 560 mm.

Note: The external dimensions of the incoming panel may vary depending on incoming instruments and options. If the rated current exceeds 3150A, please consult with TOSHIBA.

- The incoming panel for 2 lines consists of two panels.
- The mass for the starter/feeder panel is for single front type.
- The external dimensions of outdoor type are for non-walk type.

Unit selection table

■M series starter unit type (Braking capacity 70 kA or less)

Applied motor (W)		Non reversible unit		Reversible unit		Star delta		Maximum applicable cable size	
400V class	200V class	General	With earth fault protection	General	With earth fault protection	General	With earth fault protection	B method	C method
3.7	1.5	NR3-20M	ML3-20M	RM3-20M	KL3-20M	YD4-35M	YL4-35M	14mm²	14mm²
7.5	3.7	NR3-20M	ML3-20M	RM3-20M	KL3-20M	YD4-35M	YL4-35M		
11	5.5	NR3-35M	ML3-35M	RM3-35M	KL3-35M	YD4-35M	YL4-35M		
15	7.5	NR3-35M	ML3-35M	RM3-35M	KL3-35M	YD4-35M	YL4-35M		
22	11	NR3-50M	ML3-50M	RM4-50M	KL4-50M	YD4-35M	YL4-35M		22mm²
37	18.5	NR3-80M	ML3-80M	RM5-80M	KL5-80M	YD5-50M	YL5-50M	38mm²	38mm²
45	22	NR4-95M	ML4-95M	RM5-95M	KL5-95M	YD6-80M	YL6-80M		
55	30	NR6-180M	ML6-180M	RM9-180M	KL9-180M	YD6-80M	YL6-80M	80mm²	100mm²
75	37	NR6-180M	ML6-180M	RM9-180M	KL9-180M	YD10-95M	YL10-95M		
90	45	NR6-180M	ML6-180M	RM9-180M	KL9-180M	YD11-180M	YL11-180M		
110	55	NR9-220M	ML9-220M	RM10-220M	KL10-220M	YD12-180M	YL12-180M		200mm²
150	75	NR9-400M	ML9-400M	RM12-400M	KL12-400M	YD15-220M	YL15-220M		
200	100	NR11-400M	ML11-400M	RM13-400M	KL13-400M	YD18-400M	YL18-400M		

Note: The size is different when the external ammeter has a CT.

■G series starter unit type (Braking capacity 70 kA or less)

Applied motor(kW)		Non reversible unit		Reversible unit		Star delta		Maximum applicable cable size	
400V class	200V class	General	With earth fault protection	General	With earth fault protection	General	With earth fault protection	B method	C method
3.7	1.5	NR3-20	ML3-20	RM3-20	KL3-20	YD4-35	YL4-35	14mm²	14mm²
7.5	3.7	NR3-20	ML3-20	RM3-20	KL3-20	YD4-35	YL4-35		
11	5.5	NR3-35	ML3-35	RM4-35	KL4-35	YD4-35	YL4-35		
15	7.5	NR3-35	ML3-35	RM4-35	KL4-35	YD4-35	YL4-35		
22	11	NR3-50	ML3-50	RM4-50	KL4-50	YD5-35	YL5-35		22mm²
37	18.5	NR3-80	ML3-80	RM5-80	KL5-80	YD6-50	YL6-50	38mm²	38mm²
45	22	NR5-95	ML5-95	RM6-95	KL6-95	YD9-80	YL9-80		
55	30	NR6-180	ML6-180	RM10-180	KL10-180	YD9-80	YL9-80	80mm²	100mm²
75	37	NR6-180	ML6-180	RM10-180	KL10-180	YD11-95	YL11-95		
90	45	NR6-180	ML6-180	RM10-180	KL10-180	YD12-180	YL12-180		
110	55	NR9-220	ML9-220	RM12-220	KL12-220	YD13-180	YL13-180		200mm²
150	75	NR9-400	ML9-400	RM13-400	KL13-400	YD15-220	YL15-220		
200	100	NR11-400	ML11-400	RM14-400	KL14-400	YD18-400	YL18-400		

Note: The size is different when it's with the timer for restart after voltage dip or the external ammeter has a CT.

■Feeder unit and feeder unit with contactor (wiring circuit breaker, contactor insatalled) types (Braking capacity 70 kA or less)

Load current (A)	Feeder unit		Feeder unit with contactor		Maximum applicable cable size	
	General	With earth fault protection	General	With earth fault protection	B method	C method
15	NF2-100	NL2-100	CF3-20	CL3-20	14mm²	14mm²
25			CF3-35	CL3-35		
40			CF3-50	CL3-50	38mm²	38mm²
50			CF3-80	CL3-80		
75						
100	NF3-225	NL4-225	CF5-95	CL5-95	80mm²	
125			CF6-180	CL6-180		100mm²
150						
175						
200	NF4-400	NL7-400	CF9-180	CL9-180		200mm²
250			CF9-400	CL9-400		
300						
400	NF5-630	NL9-630	＊ CF18-600	＊ CL18-600		

Note: The size of unit depends on the circuits and devices accommodated. Please consult Toshiba.
The size is different when it's with the timer for restart after voltage dip or the external ammeter has a CT.
＊: Entirely fixed type

Unit selection table

G series starter unit type (Braking capacity 85 kA)

Applied motor (kW)		Non reversible unit		Reversible unit		Maximum applicable cable size	
400V class	200V class	General	With earth fault protection	General	With earth fault protection	B method	C method
3.7	1.5	NR3-20	ML3-20	RM3-20	KL4-20	14mm²	14mm²
7.5	3.7	NR3-20	ML3-20	RM3-20	KL4-35		
11	5.5	NR3-35	ML3-35	RM4-35	KL4-35		
15	7.5	NR3-35	ML3-35	RM4-35	KL4-35		
22	11	NR4-50	ML4-50	RM5-50	KL5-50		22mm²
37	18.5	NR4-80	ML4-80	RM7-80	KL7-80	38mm²	38mm²
45	22	NR5-95	ML5-95				
55	30	NR8-180	ML8-180			80mm²	100mm²
75	37	NR8-180	ML8-180				
90	45	NR8-180	ML8-180				
110	55	NR9-220	ML9-220				200mm²
150	75	NR9-400	ML9-400				
200	100	NR11-400	ML11-400				

Note: The size is different when it's with the timer for restart after voltage dip or the external ammeter has a CT.
For reversible units of 400 V class/45 kW or above and 200 V class/22 kW or above, please consult with TOSHIBA.
For M series starter units, please consult with TOSHIBA.

Feeder unit types (Braking capacity 85 kA)

Load current (A)	Feeder unit		Maximum applicable cable size	
	General	With earth fault protection	B method	C method
15	NF3-100	NL3-100	14mm²	14mm²
25				
40			38mm²	38mm²
50				
75				
100	NF3-225	NL4-225	80mm²	100mm²
125				
150				
175				
200	NF4-400	NL7-400		200mm²
250				
300				
400	NF5-630	NL9-630		

Note: The size of unit depends on the circuits and devices accommodated. Please consult Toshiba.
The size is different when it's with the timer for restart after voltage dip or the external ammeter has a CT.

Item				Standard specification	Optional specification
General	Unit			SI unit	————
	Screw bolt			ISO standard	————
	Language		Drawings	English	As specified by the customer
			Nameplate & label	English	As specified by the customer
	Electrical symbol			IEC	————
	Site condition		Installation location	Indoor	Outdoor
			Ambient Temp.	-5 ℃ to +40 ℃	-5 ℃ or less
					More than +40 ℃
			Altitude	Not to exceed 2000 m above sea level	————
	Limit of transportation and service entrance			No (3 cabinets at the maximum)	As specified by the customer
Color	External and internal surface			5Y7/1	As specified by the customer
	Components on the door			N1.5	————
Finish	Material			Melamine enamel	Polyurethane enamel
	Gloss			Semi-gloss (40)	High-gloss (70)
					Low-gloss (10)
	Thickness			Internal (30 μm) External (40 μm)	125 μm at the maximum
Main circuit	Placement of phase and pole		AC	1st phase, 2nd phase, 3rd phase, and Neutral phase from left to right, top to bottom, and near to far	As specified by the customer
			DC	Negative pole and positive pole from left to right Positive pole and negative pole from top to bottom and near to far	As specified by the customer
	Color coding of phase and pole		Three phase circuit	1st phase Red (R) 2nd phase White (S) 3rd phase Blue (T) Neutral phase Black (N)	Color: Red, White, Blue, Black, Yellow, Green Wire mark: as specified by the customer
			Single phase circuit	1st phase Red (R) Neutral phase Black (N) 2nd phase Blue (T)	
			DC circuit	Positive pole Red (P) Negative pole Blue (N)	
	Wires			600 V polyethylene insulated wires	
	Internal terminals			Crimp type terminal (Ring tongue, Non--insulated)	————
	Terminals for external cables		Accessory	None	Provided
			Type	Crimp type for 325 mm^2 or less Compression type for over 325 mm^2	Clamp type
					Compression type
Auxiliary circuit	Phase/pole/color coding			None	Vinyl tube
					Plastic ring
	Wire mark			Vinyl tube (Not for the inside of the unit)	Vinyl tube (Includes with the inside of the unit)
	Color of wire			Yellow: AC and DC Ct 2ry Vt 2ry Black : Shielding	As specified by the customer
	Wire size	Inside the unit		1.25 mm^2	2.0 mm^2
		Outside the unit	AC/DC Vt/Ct 2ry	1.25 mm^2	2.0 mm^2
					3.5 mm^2
					5.5 mm^2
			Shielding	0.5 mm^2	1.25 mm^2
	Type of wires			600 V polyethylene insulated wires	Non corrosive wires Wire (type SIS)
	Internal terminals		Inside the unit	Crimp type terminal (Fork tongue, Non insulated)	Crimp type terminal (Ring tongue, Non insulated)
					Crimp type terminal (Ring tongue, Insulated)
			Outside the unit	Crimp type terminal (Fork tongue, Non insulated)	Crimp type terminal (Fork tongue, Insulated)
	Terminals for external cables		Accessory	None	Provided
			Type	Crimp type terminal	As specified by the customer
			Size	2.0 mm^2 at the maximum	As specified by the customer

Item			Standard specification	Optional specification
Grounding	Color of wires		Green	Yellow/Green
	Size of wires		2.0 mm^2	3.5 to 5.5 mm^2
	Type of wires		Same as auxiliary circuit	Same as auxiliary circuit
	Outside cable terminal lug	Accessory	Provided	———
			Connecting point is shown in the outline drawing.	Connecting point as specified by the customer
		Type	Crimp type terminal (Ring tongue, Non--Insulated)	As specified by the customer
		Size	38 mm^2	As specified by the customer
	Number of phase wires		Three-phase three-wire	Three-phase four-wire
Ratings	Rated insulation voltage	Main circuit	690 V	———
		Auxiliary circuit	250 V	———
	Rated voltage		480 V AC or less	———
	Rated frequency		50, 60 Hz	DC
	Rated current	Horizontal bus	800 A	1250 to 3150 A
		Vertical bus	400 A	600 A
	Rated busbar short-time withstand current		30, 50, 70 kA - 0.5 sec	30 kA-1 sec, 50 kA - 1 sec
				70 kA-1 sec, 85 kA - 1 sec (＊)
	Rated breaking current		30, 50, 70 kA Sym. Rms (at 480 V)	85 kA Sym. Rms (at 480 V)
	Withstand voltage test	Main circuit	2200 V/1 min	2500 V/1 min
		Auxiliary circuit	1500 V/1 min	2000 V/1 min
	Rated impulse withstand voltage		4 kV	———
	Rated voltage (Auxiliary circuit)	Operation circuit	100 V AC/50 Hz	Other than the specifications in the left column Not exceeding 250 V
		Alarm circuit	110 V AC/60 Hz	
Applicable standards		MCC	IEC61439-2	———
		Installed components	Japanese standard	———
Type specifications	Type		S (single front) D (double front)	None
	Panel size		600W x 2300H x 550D (＊)	700W x 2300H x 550D (＊)
	External connection method	Main circuit	B (directly connected to the unit)	C
		Auxiliary circuit	B (directly connected to the unit)	C
	Internal separation (form)		3 b	4 b
Construction	Termination for ent. Cable (position)	Incoming	Bottom (cable pit)	Top
		Load cable	Bottom (cable pit)	Top
		Auxiliary circuit	Bottom (cable pit)	Top
	Protective structure		General (IP20)	Drip proof (IPX1)
				Dust proof
	Thickness of door		1.6 mm (Door for panel: 2.3 mm)	2.3 mm
	Rear door		2--split hinge type	2--split hook type
	Foundation base	Configuration	60W x 50H	50W x 100H
				100W x 50H
		Installation	Floor mount with anchor (with L-shaped foundation volt)	Flush-mount, Semi-flush mount
				As specified by the customer
	Material of busbar	Horizontal busbar	Copper (Tin coating)	———
		Vertical busbar	Copper (Silver coating)	———
		Grounding busbar	Copper (Tin coating)	———
	Name plate — Material		Acrylic resin Black letters on white	Acrylic resin Color specified by the customer
				Aluminum
				Laminated
	Name plate — Mounting method	Panel name	Bolted	———
		Load name	Card holder	Bolted
	Name plate — Mounting position	Panel name	Top of the center in the group	Position specified by the customer
		Load name	Unit door	Rear door
	Bottom plate		None	Steel
				Polyester (eco material)
				Fireproof plate

(＊) When the rated busbar short-time withstand current is 70 kA or 85 kA -1 sec, the depth of the panel is 560 mm.

Item					Standard specification	Optional specification
Incoming	Method				Direct	With MCCB
						Drop wiring panel
						With ACB
						V-bus
	Instrumentation				None	As specified by the customer
Unit sequence	Control power supply system				Unit transformer	Group transformer
						External power supply
	Operating method				Remote	Direct
						Remote and direct switching selection
						Auto and manual switching
	External contact for operation				None	As specified by the customer
	External contact for warning				49x, 52 (a contact)	As specified by the customer
	Alarm				49	As specified by the customer
Specifications of main components	Circuit breaker		Accessories		With alarm contact	ON/OFF monitoring
						Draw-out to outside
			Interlock with door		Impossible to open the door with ON Possible to open the door with OFF Impossible to ON with door-open	————
			Interlock with unit draw-out mechanism		None	Impossible to draw-out or push-in with ON
	Electromagnetic contactor Auxiliary relay		Excitation system		Regular excitation system	Regular no--excitation system
			Return system		Instantaneous return system	Delayed return system
			Coil voltage		100 V AC/50 Hz 110 V AC/60 Hz	Other than the specifications in the left column
			Rated contact (Open/Closed) capacity		Class: AC3	Class: AC4
						As specified by the customer
			Auxiliary contact		2a2b	Depending on circuit condition
	G series	Overload protection	Protection method		2 element thermal	Single phase type
			Reset system		Electrical	Mechanical
		Earth fault relay	Rated sensitivity current		0.2 A	0.03 to 0.5 A
			Operating time		0.2 sec	As specified by the customer
			Reset		Manual	Auto
		Restart after voltage dip	Coil voltage		100 V AC	200 V AC
			Setting time		0.5 sec	As specified by the customer
		Ammeter			3 times extended scale	With red pointer
		Signal lamp			LED 100 V AC	200 V AC
	M series	Motor multi relay	Sensitivity current (Earth fault protection)		30 to 500 mA	————
			Voltage dip compensation time		None, 0.1, 0.2, 0.5, 1, 2, 3, 4, 5 sec, 10 to 60 sec (in steps of 5 sec)	————
			Voltage dip compensation time for immediate restart		0.1 sec	0.2 sec
			Restarting delay time		1 to 180 sec (in steps of 1 sec)	————
			Output current		0 to 1 mA or 4 to 20 mA (non insulated)	4 to 20 mA (insulated)
			Power consumption		Pulse output: 1 point (insulated)	————
			Transmission		None	Yes
	Operating transformer		Capacity		50, 150, 500 VA	————
			Rated voltage	50Hz	400/100 V 200/100 V	Other than the specifications in the left column
				60Hz	440/110 V 220/110 V	Other than the specifications in the left column
	Current transformer		Rated load		15 VA, 1st class	40 VA, 1st class
			Secondary current		5 A	1 A
Acceptance test					Construction, Electrical operation, Withstand voltage	As specified by the customer
Accessories					Yes	As specified by the customer
Spare parts					None	As specified by the customer

⚠WARNING

- Before using the Type TE-W Motor control center, read the instruction manual with a great care to ensure completely familiar with it.
- For safety of operation, never modify the Type TE-W Motor control center or add extra functions which are not described in the manual. When modification or addition is to be done, contact Toshiba.
- Observe the following operating conditions to fully utilize the performance capability of the Type TE-W Motor control center. In the case that different operating conditions are inevitable, specify them at the time of placing your order.
  1) Ambient temperature: -5 to 40˚C (daily average of 35˚C or below)
  2) Relative humidity: 45 to 85% with no condensation
  3) Free of excessive water vapor, oil mist, smoke, dust, salt, and corrosive and inflammable hazardous gases.
  4) Free from abnormal vibration and shock.

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