Digital Electronic Over Current Relays

EOCR Samwha EOCR

by Schneider Electric

Samwha EOCR
by Schneider Electric

Digital type

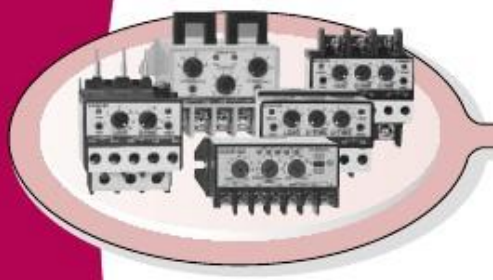
3DM, FDM

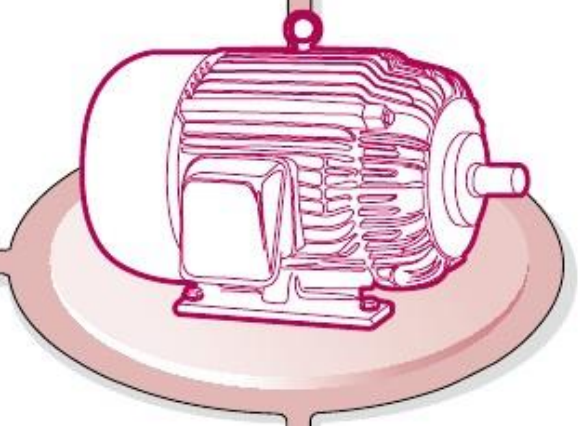
- The first multi function digital relay.
- Display trip causes and load factor.
- Ground fault protection
  (Earth leakage current display)
- Registered as a new power technology No.5.
  (Ministry of commerce, Industry and energy)
- Integrated components
  (Ammeter, Transducer, A/S switch, Timer etc.)

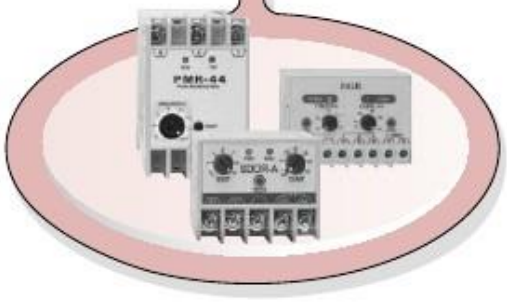
Analog type

SS, SP, DS3, DZ

- The first electronic motor protection relay
- New technology against thermal
  overload realys
- Easy to use
- 10 Million pieces have been sold







Application type

PMR, SDDR, EVR-FD, EGR

- Voltage protection management
- DC motor protection management
- Shut Down Delay Function
- Load Limiter function
  Application products except AC
  overcurrent protection.

New Digital

i-Series (i3DM, iFDM)
- Integrated model, Improved functions
- Modbus RS-485 Communication
- RoHS Compliant
- Support thermal inverse protection

DM-Series (3DM2, FDM2)
- Integrated model, Improved functions
- RoHS Compliant

Contents

1. Selection guide	4
2. i Series (with Communication)	9
Specifications	11
Front face	12
Setting menu	14
Trip indication	17
TCC curve	18
Typical wiring	19
Dimension	22
Ordering	24
3. DM2 series	27
Specifications	29
Front face	30
Setting menu	32
Trip indication	34
TCC curve	35
Typical wiring	36
Dimension	39
Ordering	40
4. Technical guide	44
General information	44
Technical infotmation	45
Setting guide	47
Troubleshooting guide	49
Communication guide	50

Selection guide

Old model	Measurement methodTCC	Operation	Reset	Mounting	Protections function			Additional function		New model
3DD	3CT	Definite TCC Inverse TCC	Manual	Panel Din-Rail	Overcurrent, Phase loss, Phase reversal, Lock rotor, Imbalance	-	-	Alert	Trip cause display	3DM2 or i3DM
3DE			Manual			Under current			Trip cause display-store the latest three histories.	
3DM			Manual auto						Bar graph, Running hour timer, Trip cause display-store the latest three histories.	
FD			Manual	Panel Din-Rail Flush mount		-			Bar graph, Trip cause display	FDM2 or iFDM
FDE			Manual			Under current			Bar graph, Trip cause display-store the latest three histories.	
FDM			Manual auto						Bar graph, Running hour timer, Trip cause display-store the latest three histories.	
3DZ	3CT	Definite TCC Inverse TCC	Manual	Panel Din-Rail	Overcurrent, current Phase loss, Phase reversal, Lock rotor, Imbalance	-	Ground Fault	-	Trip cause display	3MZ2 or i3MZ
3EZ			Manual			Under current		-	Trip cause display-store the latest three histories.	
3MZ			Manual auto					-	Bar graph, Running hour timer, Trip cause display-store the latest three histories.	
FDZ			Manual	Panel Din-Rail Flush mount		-		-	Bar graph, Trip cause display	FMZ2 or iFMZ
FEZ			Manual			Under current		-	Bar graph, Trip cause display-store the latest three histories.	
FMZ			Manual auto					-	Bar graph, Running hour timer, Trip cause display-store the latest three histories.	
3D420	3CT	Definite TCC Inverse TCC	Manual	Panel Din-Rail	Overcurrent, Phase loss, Phase reversal, Lock rotor, Imbalance	-	-	-	Trip cause display	i3M420
3E420			Manual			Under current		-	Trip cause display-store the latest three histories.	
3M420			Manual auto					-	Bar graph, Running hour timer, Trip cause display-store the latest three histories.	
FD420			Manual	Panel Din-Rail Flush mount		-		-	Bar graph, Trip cause display	iFM420
FE420			Manual			Under current		-	Bar graph, Trip cause display-store the latest three histories.	
FM420			Manual auto					-	Bar graph, Running hour timer, Trip cause display-store the latest three histories.	
3DS	3CT	Definite TCC Inverse TCC	Manual	Panel Din-Rail	Overcurrent, Phase loss, Phase reversal, Lock rotor, Imbalance	-	Short circuit	-	Bar graph, Trip cause display	i3MS
3MS			Manual auto			Under current			Bar graph, Running hour timer, Trip cause display-store the latest three histories.	
FDS			Manual	Panel Din-Rail Flush mount		-			Bar graph, Trip cause display	iFMS
FMS			Manual auto			Under current			Bar graph, Running hour timer, Trip cause display-store the latest three histories.	

New digital

		New digital		
Model		3DM2/ FDM2	3MZ2/ FMZ2	i3
Control voltage		AC/DC 100 ~ 240V	AC/DC 100~240V	AC
		DC/AC 24V	DC/AC 24V	
Frequency		50/60 Hz	50/60 Hz	
Single phase		●	●	
Three phase		●	●	
CT type	Window hole	●	●	
	Bottom hole	●	●	
	Terminal	●	●	
Protection function	Overcurrent	●	●	
	Undercurrent	●	●	
	Stall	●	●	
	Jam	●	●	
	Phase loss	●	●	
	Phase reversal	●	●	
	Imbalance	●	●	
	Ground fault	-	●	
	Short circuit	-	-	
	Thermal inverse	-	-	
4-20mA output		-	-	
Additional function	Alert output	A, F, H	-	
	Bar graph	●	●	
	Display	5 Digit 7 Segment	5 Digit 7 Segment	5 Di
	Password function	-	-	
	Fail safe ON/OFF	●	●	
	Trip cause display and Store	●	●	
	Total running hour	●	●	
	Running hour timer	●	-	
	Reset	Manual/Auto/Electric	Manual/Auto/Electric	Manu
Comm. protocol		-	-	MO
Existing model		3DD, 3DE, 3DM FD, FDE, FDM	3DZ, 3EZ, 3MZ FDZ, FEZ, FMZ	3D FD

New digital with Communication

3DM / iFDM	i3MZ / iFMZ	i3M420 / iFM420	i3MS / iFMS
/DC 100~240V	AC/DC 100~240V	AC/DC 100~240V	AC/DC 100~240V
DC/AC 24V	DC/AC 24V	DC/AC 24V	DC/AC 24V
50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz
•	•	•	•
•	•	•	•
•	•	•	•
•	•	•	•
•	•	•	•
•	•	•	•
•	•	•	•
•	•	•	•
•	•	•	•
•	•	•	•
•	•	•	•
•	•	•	•
-	•	-	-
-	-	-	•
•	•	•	•
-	-	•	-
A, F, H	-	-	-
•	•	•	•
igit 7 Segment	5 Digit 7 Segment	5 Digit 7 Segment	5 Digit 7 Segment
•	•	•	•
•	•	•	•
•	•	•	•
•	•	•	•
•	-	-	-
ual/Auto/Electric	Manual/Auto/Electric	Manual/Auto/Electric	Manual/Auto/Electric
DBUS RS-485	MODBUS RS-485	MODBUS RS-485	MODBUS RS-485
DD, 3DE, 3DM	3DZ, 3EZ, 3MZ	3D420, 3E420, 3M420	3DS, FDS, 3MS, FMS
D, FDE, FDM	FDZ, FEZ, FMZ	FD420, FE420, FM420	

Selection guide

Old reference	New reference	Display	Cable	Option
				ZCT
3DD-05DB, 3DD-60DB, 3DE-WRDB, 3DM-WRDB	3DM2-WRDBW(T)	-	-	-
	3DM2-WRDBH(T)	-	-	-
3DD-05DZ7, 3DD-60DZ7, 3DE-WRZF7, 3DE-WRDZ7, 3DMWRDZ7	3DM2-WRDUW	-	-	-
	3DM2-WRDUH	-	-	-
FD-05DBW(T), FD-60DBW(T), FDE-WRDBW(T), FDMWRDBW(T)	FDM2-WRDBW	EOCR-PDM	CABLE-RJ45-xxx	-
	FDM2-WRDBH	EOCR-PDM	CABLE-RJ45-xxx	-
FD-05DZ7W(T), FD-60DZ7W(T), FDE-WRDF7W(T), FDMWDZ7W(T), 3DM-WDZ7W(T)	FDM2-WRDUW	EOCR-PDM	CABLE-RJ45-xxx	-
	FDM2-WRDUH	EOCR-PDM	CABLE-RJ45-xxx	-
3DZ-05ABA(B), 3DZ-60ABA(B), 3EZ-WRABA, 3MZWRABA(B)	3MZ2-WRABW	-	-	ZCT-xxx
	3MZ2-WRABH	-	-	ZCT-xxx
3DZ-05CBA(B), 3DZ-60CBA(B), 3MZ-WRCBA(B)	3MZ2-WRCBW	-	-	ZCT-xxx
	3MZ2-WRCBH	-	-	ZCT-xxx
3DZ-05AZ7A(B), 3DZ-60AZ7A(B), 3EZ-WRAF7A, 3EZ-WRAM7A, 3MZ-WRAZ7W(T)A(B)	3MZ2-WRDBW	-	-	ZCT-xxx
	3MZ2-WRDBH	-	-	ZCT-xxx
3DZ-05CZ7A(B), 3DZ-60CZ7A(B), 3MZ-WRCZ7W(T)A(B)	3MZ2-WRAUW	-	-	ZCT-xxx
	3MZ2-WRAUH	-	-	ZCT-xxx
3DZ-05DBA(B), 3DZ-60DBA(B), 3MZ-WRDBA(B)	3MZ2-WRCUW	-	-	ZCT-xxx
	3MZ2-WRCUH	-	-	ZCT-xxx
3DZ-05DZ7A(B), 3DZ-60DZ7A(B), 3MZ-WRDZ7W(T)A(B)	3MZ2-WRDUW	-	-	ZCT-xxx
	3MZ2-WRDUH	-	-	ZCT-xxx
FDZ-05ABW(T)A(B), FDZ-60ABW(T)A(B), FEZ-WRABW(T)A, FMZ-WRABW(T)A(B)	FMZ2-WRABW	EOCR-PDM	CABLE-RJ45-xxx	ZCT-xxx
	FMZ2-WRABH	EOCR-PDM	CABLE-RJ45-xxx	ZCT-xxx
FDZ-05CBW(T)A(B), FDZ-60CBW(T)A(B), FMZWRCBW(T)A(B)	FMZ2-WRCBW	EOCR-PDM	CABLE-RJ45-xxx	ZCT-xxx
	FMZ2-WRCBH	EOCR-PDM	CABLE-RJ45-xxx	ZCT-xxx
FDZ-05DBW(T)A(B), FDZ-60DBW(T)A(B), FMZWRDBW(T)A(B)	FMZ2-WRDBW	EOCR-PDM	CABLE-RJ45-xxx	ZCT-xxx
	FMZ2-WRDBH	EOCR-PDM	CABLE-RJ45-xxx	ZCT-xxx
FDZ-05AZ7W(T)A(B), 3DZ-60AZ7W(T)A(B), FEZWRAF7W(T)A, 3EZ-WRAM7W(T)A, 3MZ-WRABW(T)A(B)	FMZ2-WRAUW	EOCR-PDM	CABLE-RJ45-xxx	ZCT-xxx
	FMZ2-WRAUH	EOCR-PDM	CABLE-RJ45-xxx	ZCT-xxx
FDZ-05CZ7W(T)A(B), 3DZ-60CZ7W(T)A(B), FMZWRCZ7W(T)A(B)	FMZ2-WRCUW	EOCR-PDM	CABLE-RJ45-xxx	ZCT-xxx
	FMZ2-WRCUH	EOCR-PDM	CABLE-RJ45-xxx	ZCT-xxx
FDZ-05DZ7W(T)A(B), 3DZ-60DZ7W(T)A(B), FMZWRDZ7W(T)A(B)	FMZ2-WRDUW	EOCR-PDM	CABLE-RJ45-xxx	ZCT-xxx
	FMZ2-WRDUH	EOCR-PDM	CABLE-RJ45-xxx	ZCT-xxx
3D420-059, 3D420-609, 3E420-WR9, 3M420-WR9	i3M420-WRDBW	-	-	-
	i3M420-WRDBH	-	-	-
3D420-053, 3D420-603, 3D420-056, 3D420-606, 3E420-WR91, 3M320-WR3, 3M420-WR6	i3M420-WRDUW	-	-	-
	i3M420-WRDUH	-	-	-
FD420-0539, FD420-6039, FD420-0569, FD420-6069, FE420-WR91(3), FM420-WR91(3)	iFM420-WRDBW	EOCR-PDM	CABLE-RJ45-xxx	-
	iFM420-WRDBH	EOCR-PDM	CABLE-RJ45-xxx	-
FD420-0531(3), FD420-6031(3), FD420-0561(3), FD420-6061(3), FE420-WR3(1), FE420-WR6(1), FM420-WR31(3), FM420-WR61(3)	iFM420-WRDUW	EOCR-PDM	CABLE-RJ45-xxx	-
	iFM420-WRDUH	EOCR-PDM	CABLE-RJ45-xxx	-
3DS-05DB, 3DS-20DB, 3MS-05DB, 3MS-20DB	i3MS-WRDBW	-	-	-
	i3MS-WRDBH	-	-	-
3DS-05DZ7, 3DS-20DZ7, 3MS-05DZ7, 3MS-20DZ7	i3MS-WRDUW	-	-	-
	i3MS-WRDUH	-	-	-
FDS-05DBW(T), FDS-20DBW(T), FMS-05DBW(T), FMS-20DBW(T)	iFMS-WRDBW	EOCR-PDM	CABLE-RJ45-xxx	-
	iFMS-WRDUH	EOCR-PDM	CABLE-RJ45-xxx	-
FDS-05DZ7W(T), FDS-20DZ7W(T), FMS-05DZ7W(T), FMS-20DZ7W(T)	iFMS-WRDBW	EOCR-PDM	CABLE-RJ45-xxx	-
	iFMS-WRDUH	EOCR-PDM	CABLE-RJ45-xxx	-

EOCR-i Series (with communication)

Basic model : EOCR-i3DM (Z, S, 420) / iFDM (Z, S, 420)

EOCR-i3DM Window type

EOCR-i3DM Bottom hole type

EOCR-iFDM Window type

EOCR-iFDM Bottom hole type

EOCR-i3DM Terminal type

EOCR-iFDM Terminal type

General features

- Micro-Controller Unit based
- Real time processing / High precision
- Protections : Over current, Under current, Phase loss, Phase reversal, Stall, Jam, Current imbalance, Earth fault (i3MZ/iFMZ), Short circuit (i3MS/iFMS)
- Thermal protection / Inverse available up to 32Amps without external CTs.
- Auxiliary functions : Fail safe, Pre-alarm (i3DM/iFDM), Accumulated running hour, 3 fault records & limitation of auto-restart. Analog output (i3M420/iFM420).
- Communication : Modbus / RS-485
- Reinforced monitoring function : Monitoring distance up to 400M, 3 phase current display, Pre-alarm (i3DM/iFDM) & Trip cause indication
- Bar graph indication of a load current to the current setting.
- Available application on single and 3 phase motor
- RoHS Compliance
- For iFDM/iFMZ/iFMS/iFM420, normal protections are guaranteed even if PDM is disconnected.

EOCR-i Series (with communication)

Basic model : EOCR-i3DM (Z, S, 420) / iFDM (Z, S, 420)

Protection functions

Protection item	Condition & Setting range	Operation time
Over current (oc)	Condition : Load current (In) exceeds setting current (Is) Setting range : 0.5~60A (Def), 0.5~32A (Inv & th)	Definite (Def) : 0.2~30s Adjust. Inverse (Inv) & Thermal (th) : 1~30 class
Under current (uc)	Condition : Load current (In) less than setting currentIn ≤ uc uc should be less than oc setting	oFF, 1~10s Adjustable
Phase loss (PL)	Condition : max imbalance is more than 85% among 3 phase current, Enable or disable : Selectable	oFF, 0.5~5s Adjustable
Reverse phase (RP)	Condition : Reversed phase sequence input on EOCR. Enable or disable : Selectable	Within 0.15s
Stall (Sc)	Condition : In ≥ Stall current setting (Sc). Active only in motor starting 0.5~30A : 2~8 times of oc setting ~40A : 2~6 times, ~60A : 2~4 times.	Right after D-time elapsed
Jam (JA)	Condition : In ≥ Jam current setting (JA). Active only in motor running 0.5~50A : 1.5~5 times of oc setting ~60A : 1.5~4 times of oc setting	0.2~5s Adjustable
Imbalance (IM)	Condition : Current imbalance ≥ Setting imbalance % Setting range : 10~50% of imbalance	1~10s Adjustable
Earth fault (EF)	Condition : EF current (Ie) exceeds setting current (Ies) OFF, 0.03~10A	0.05~5s Adjustable -- i3MZ/iFMZ only --
Short circuit (SH)	Condition : SC current (Is) exceeds setting current (Iss) 0.5~10A : 2~22 times of oc setting, ~20A : 2~11 times of oc setting	0.05sec -- i3MS/iFMS only --

Auxiliary functions

Password	For secured setting parameters
Communication	Monitoring currents and trip status by network
Phase selection	For single phase / three phase motor selection
TCC selection	Available three time-current-characteristics (Definite, Inverse, Thermal inverse)
CT ratio	For the current setting more than 60A (20A : i3MS/iFMS) and less than 0.5A
Fail safe selection	Fail safe operation for OL trip output
Pre alarm selection	Pre alarm signaling by the 07-08 output contact -- i3MS/iFDM only --
Total running hour	Total accumulated running hour from the installation which cannot be modified and reset .
Running hour	Display or provied a time-out signal to the 07-08 output contact. -- i3MS/iFDM only --
Reset mode	Manual / Auto / Electrical ; selectable
Trip cause memory	Store the latest 3 trip causes
Restart limitation	The maximum auto-restart number within 30 minutes in auto-reset mode.

EOCR-i Series (with communication)

Basic model : EOCR-i3DM (Z, S, 420) / iFDM (Z, S, 420)

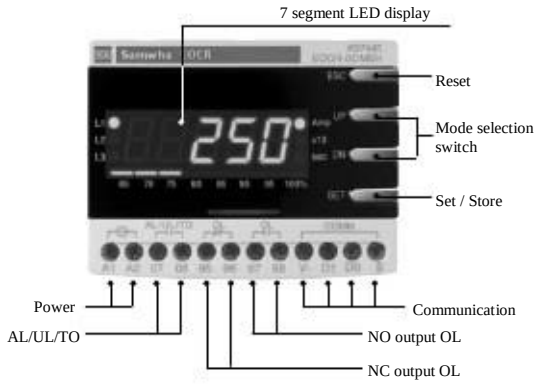
Specifications

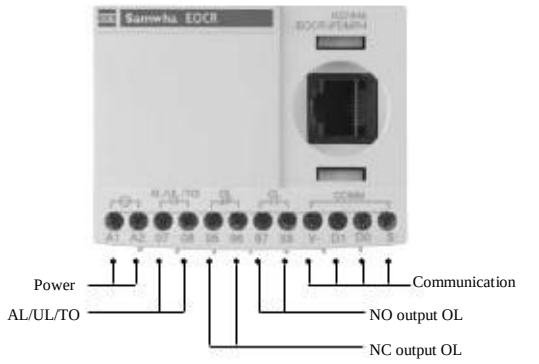
Model			i3DM / iFDM, i3MZ/iFMZ, i3MS/iFMS, i3M420/iFM420	
Over current		Rated setting range (A)	Definite TCC : 0.5~60A. : use external CT higher than 60A	
			i3MS/iFMS : 0.5~20A : use external CT higher than 20A	
			Inverse & th TCC : 0.5~32A. use external CT higher than32A	
Under current		Rated setting range (A)	0.5A ~ less than oc setting	
Operating time characteristics			Definite(Def) / Inverse(Inv) / Thermal(th)	
Time setting	Def	D-time	0~200s	
		O-time	0.2~30s	
	Inv & th (cLS)		1~30 classes	
	GF delay time (Edt)		0~30s (i3MZ/iFMZ)	
	GF O-time (Et)		0.05~10s (i3MZ/iFMZ)	
	SH delay time (SHd)		0~30s (i3MS/iFMS)	
	SH O-time		Within 0.05s fixed (i3MS/iFMS)	
	Auto-reset		0.5s~20min.	
	Reset mode		Manual reset (H-r) / Electric reset (E-r) / Auto-reset (A-r)	
Control power	Voltage		100~240VAC/DC(85% ~110%, Free voltage), 24VAC/DC(±5%)	
	Frequency		50/60Hz	
	Power consumption		Lower than 7VA	
Output	Capacity		3A/250VAC resistive.	
	Composition		1a1b : OC (i3DM/iFDM, i3MS/iFMS, i3M420/iFM420)	
			1a : GR (i3MZ/iFMZ), or AL (i3DM/iFDM), or SH (i3MS/iFMS)	
Display	7 segment LED		3 phase amps, Cause of trip, Setting parameters indication.	
	Bar-graph		Load factor.	
Communication			Modbus/ RS-485	
Mounting			Panel mounting (i3DM/i3MZ/i3MS/i3M420)	
			Flush mounting (iFDM/iFMZ/iFMS/iFM420)	
Insulation		Between case & Circuit	Over DC500V 10MΩ	
Dielectric strength		Between case & Circuit	2kV, 50/60Hz, I Min.	
		Between contacts	1kV, 50/60Hz, I Min.	
		Between circuit	2kV, 50/60Hz, 1 Min	
Electrostatic discharge (ESD)		IEC61000-4-2	Level 3 : Air discharge : ±8KV, Contact discharge : ±6KV	
Radiated disturbance		IEC61000-4-3	Level 3 : 10V/m, 80 ~ 1000MHz	
Conducted disturbance		IEC61000-4-6	Level 3 : 10V,0.15~80MHz	
EFT/Burst		IEC61000-4-4	Level 3 : ±2KV, 1 Min	
Surge		IEC61000-4-5	Level 3 : 1.2 x 50μs, ±4KV (0˚, 90˚, 180˚, 270˚)	
Emission		CISPR11	Class A (Conducted and radiated)	
Environment	Temperature	Store	-40˚C ~ +85˚C	
		Operation	20˚C ~ +60˚C	
	Humidity		30~85% RH (Non-condensate)	
Dimension		Window type	70W × 74.5H × 83.8D	
		Bottom hole type	70W × 56.3H × 108.1D	
Weight			i3DM / i3MZ / i3MS / i3M420	iFDM / iFMZ / iFMS / iFM420
		Window type	330g	420g
		Bottom hole type	370g	460g
		Terminal type	370 + 120(PDM) = 490g	460 + 120(PDM) = 580g
		Display (W/3M cable)	-	125g
Power consumption			Less than 7VA.	

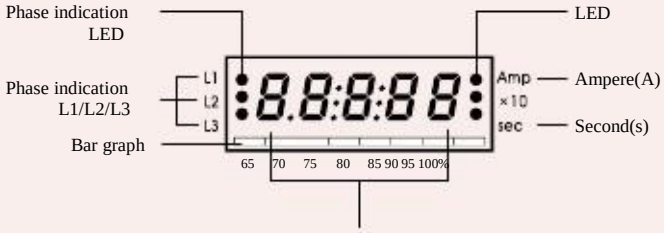
EOCR-i Series (with communication)

Basic model : EOCR-i3DM (Z, S, 420) / iFDM (Z, S, 420)

Front face







5 digit 7 segment LED display

3 phase load currents (In) and a leakage current (i3MZ/iFMZ) are displayed every 2 seconds in sequence.

Bar graph

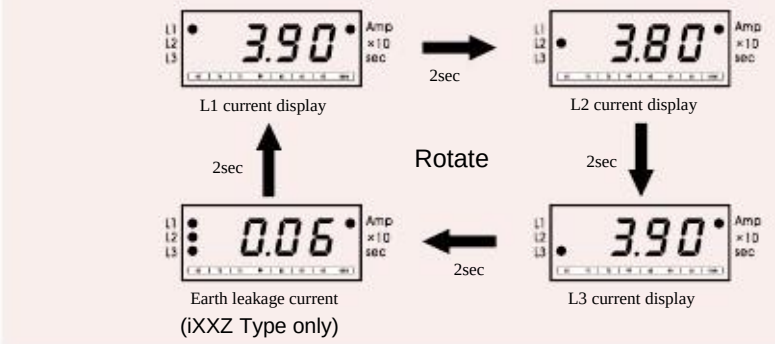
- it shows the load factor to OC setting value by %
- % value = (running current/setting current) * 100%
- Min scale is 65%
- if the setting value is the rated motor current, it shows the load factor of the motor.

Current Display

- Shows the highest current among three phases for OC, Stall, Jam trips.
- Shows the lowest current among three phases for UC, UB
- Shows the lost phase for PL.
- Shows the phase and the current during running.

Amp : Ampere. LED is on when a current display.
x 10 : Shows the unit changed to 10 times.
Sec : Second. LED is on when a time display.

3 phase digital ammeter function



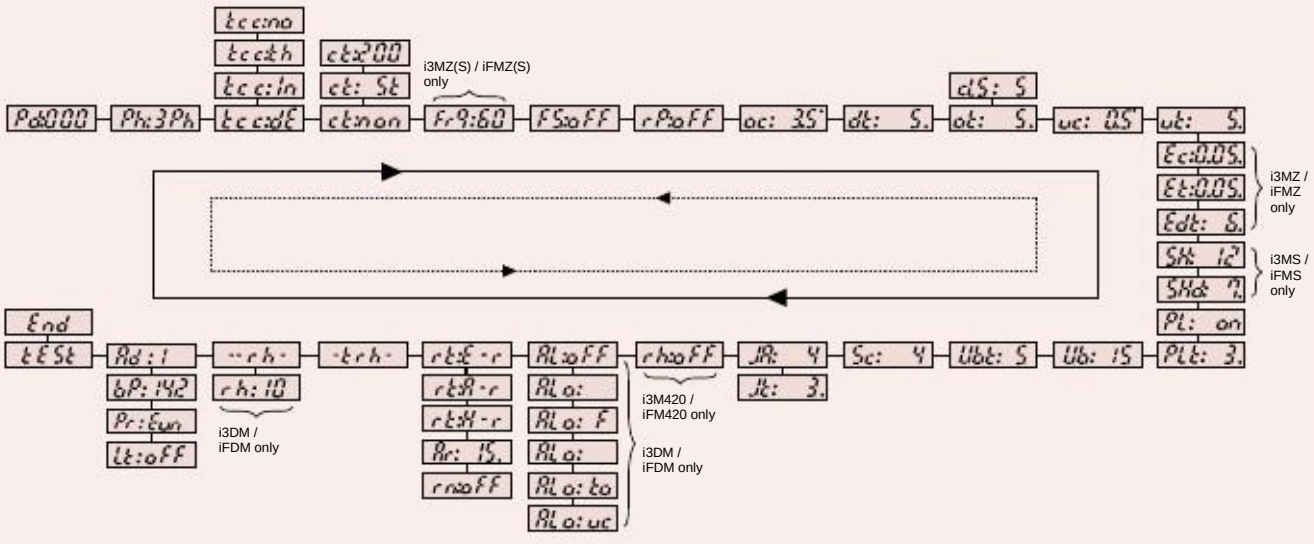
※ Blocking display rotation can be done by pressing the SET button once during running. whenever press the SET button, the each phase current displays by turns. A fixed phase current display can be done by this.
※ Pressing the ESC button, it returns to the Auto current display rotation mode.

Buttons and setting sequence

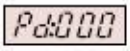
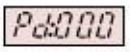
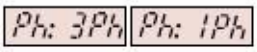
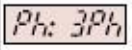
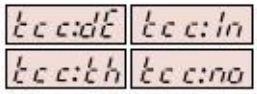
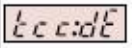
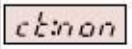
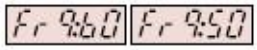
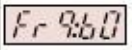
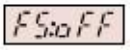
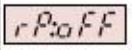
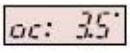
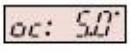
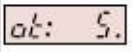
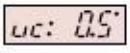
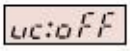
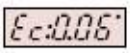
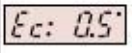
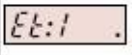
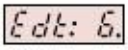
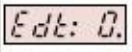
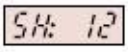
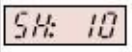
Button	Description
▲UP ▼DN	Navigate menus by pressing UP/DN button.
SET	Select a parameter to change, then the parameter starts blinking.
▲UP ▼DN	Modify a parameter value by pressing UP/DN button.
SET	Memorize the values in the relay by pressing SET button. blinking stops to show it's stored.
ESC	Pressing ESC button, it returns to the current display. Without pressing ESC button, it returns to the load current display in 50sec automatically.

※ Fault history check : Pressing the ESC button more than 5sec, it displays the latest fault cause and the fault current or fault phase. Continuing to press DN button, you can see the current of L1(R), L2(S), L3(T), (GR) in turn. press the DN button again to check the previous fault continually. In the latest fault display, the 100% LED of bar graph lights on and two LEDs of 95%, 100% lights on for the second fault display, three LEDs of 90%, 95%, 100% lights on for the oldest fault display. When you press the ECS button in this mode, it returns to the normal current display mode. The oldest fault record is over written when the number of fault to record exceeds three.

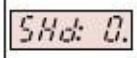
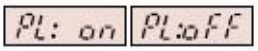
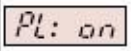
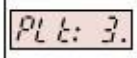
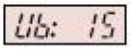
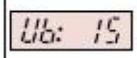
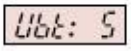
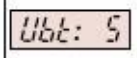
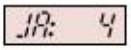
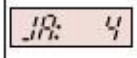
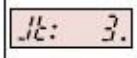
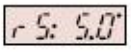
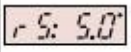
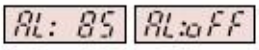
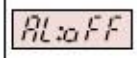
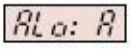
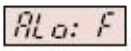
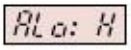
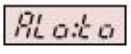
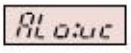
●Setting sequence



Setting sequence and menu

No.	Menu	Parameter	Description	Default
1	Pass word		Use password other than zero for secured settings. This feature enables limitation of setting modification by unauthorized person. Zero value is used for disabling password checking.	
2	Selection of Phase No.		"Ph:3Ph" mode for a 3 phase load, "Ph:1Ph" mode for a 1 phase load should be selected. If you select the "Ph:1Ph", RP, PL and Ub functions will be disabled and not displayed in the menu mode	
3	Operation curve		Time-current characteristic(TCC) setting. "dE" is for definite TCC, "In" is for inverse TCC, "th" is for thermal Inverse TCC. Refer to the time-current characteristic curve. If tcc=no, only overcurrent protection is disabled	
4	CT ratio		External CT ratio setting mode. This is applied to definite TCC; higher than 60A and inverse TCC; higher than 32A. Set the primary value of the external CT. For example, 200:5 CT, setting is "ct:200". For the low-range current "ct: 2t" is for 2 pass through, "ct: 5t" is for 5 pass through. Select "ct:non" in case of no externel CT and no loop.	
5 #1, #2	Frequency		Frequency setting mode. Select 50 or 60 based on the system fundamental frequency.	
6	Fail safe		Selection of fail safe(No volt release) mode for overload trip output, OL. Refer to fail-safe operation	
7	Reversed phase detection		Enable or disable reverse phase detection	
8	Over current threshold		Threshold for over current protection . this value cannot be set below the under current threshold (uc).	
9	Start delay time		Motor starting delay, OC, UC, Stall, Jam, Ub are blocked during starting but PL, RP are not blocked. For "In" TCC mode, ,the cold curve is appled before dt expires and, the hot curve is applied after dt expires.	
10	Over current duration (Trip delay time / Trip class)		(tcc:dE) ; the fault(over current) duration of definite overcurrent protection. (tcc:In) ; the trip class for inverse overcurrent protection(refer to TCC curve) (tcc:th) ; the thermal overload protection based on the thermal image by load current (refer to TCC curve).	
11	Under current threshold		Threshold for under current protection. The setting should be higher than no-load current of a motor. The current value cannot be set higher than OC.	
12	Under current duration (Trip delay time)		Fault (under current) duration for the under current Operation. If the setting of "oFF" in the "uc" mode is selected, this menu is not displayed	
13 #1	Earth fault (Ground fault) threshold		Threshold for earth fault protection. The capacitance leakage current of the motor and cable should be taken into account for the setting. The threshold value corresponds to the primary current of ZCT	
14 #1	Earth fault trip delay time		Earth fault duration (Trip delay time) TCC is definite characteristic	
15 #1	EF starting delay		Blocking time of Earth Fault detection during motor starting. OFF, 1~30s adjustable This timer is only active during motor starting.	
16 #2	Short circuit current threshold		Threshold for short circuit detection. This value is the multiples of the over current threshold (oc). The SC fault duration is fixed to 0.05 second.	

Setting sequence and menu

No.	Menu	Parameter	Description	Default
17 #2	SC starting delay		Blocking time of short circuit detection during motor starting. This timer is only active during motor starting.	
18	Phase loss		Enable or disable phase loss(Single phasing) detection. If the “Ph:1Ph” is selected, this menu is not displayed.	
19	Phase loss time		Fault duration for phase loss operation. The setting range is 0.5~5 sec. if “PL:oFF” is selected, this menu is not displayed	
20	Imbalance threshold		Threshold for current imbalance operation. To disable the function, set to “oFF”, the setting range is 10~50%. Imbalance factor (%) = ($I_{max\ phase}$ - I_{min_phase}) / I_{max_phase} x 100%	
21	Imbalance fault duration		Imbalance fault duration (trip delay time) for current imbalance operation. The setting range is 1~10 seconds.	
22	Stall threshold		Threshold for locked rotor detection during motor starting. The value is the multiples of the over current threshold(oc). If the locked rotor condition is detected, the trip relay operates in 0.5s after the “dt” expires. If dt=0, this function is disabled and not displayed in the menu. Setting range : oc=0.4~30A:2~8times, oc < 40A:2~6times, otherwise (oc<60A) : 2~4times, (with Ext. CT : 2~8times)	
23	Jam threshold		Threshold for locked rotor detection during motor running. The value is the multiples of the over current threshold (oc). Setting : oc=0.4~50A : 1.5~5times, otherwise (oc<60A) : 4times, (with Ext. CT : 15~5times)	
24	Jam fault duration		Jam fault duration (trip delay time) Setting : 0.2~10 sec	
25 #3	420 Output range		Reference value for max analog output (20mA) If the load current is equal or greater than this value, analog output is fixed to 20mA	
26 #4	Alert		Threshold of Alert output, set by % of the over current threshold (oc). If the load current is higher than this value, alert output(07-08 contact) is energized according to the setting of “ALo : XX”.	
			If the load current is detected, alert output(07-08 contact) is energized. The alert threshold is no meaning for this operation. Refer to the alert operation pattern.	
			If the load current is higher than the alert threshold, alert output(07-08 contact) repeats open for 1s and close for 1s (flickering), The flickering starts from the motor starting. Refer to the alert operation pattern.	
			If the load current is higher than the alert threshold, alert output(07-08 contact) is closed (holding) and remains closed until the load current decrease under the alert threshold. The alert output is blocked during motor starting. Refer to the alert operation pattern.	
			If the accumulated running hour is more than the running hour threshold, the alert output repeats close for 1s and open for 1s.	
			The alert output is used only for under current protection. If this mode is selected, a trip by an under current fault is signaled through alert output (07-08), instead of overload trip output(95-96 or 97-98).	

Setting sequence and menu

No.	Menu	Parameter	Description	Default
27	Reset	rtE-r	Fault reset (Electrical reset) by a power cycle or by pressing the ESC button.	rtE-r
		rtH-r	Fault reset (Hand reset) by only pressing the ESC button.	
		rtA-r / Ar: 15. / Ar:20n	Fault reset (Auto Reset) by a auto-reset timer, Setting range of the timer : 0.5sec~20min. Also the fault can be reset by power cycle or by ESC button. The relay cannot be reset automatically when the relay is tripped by Phase Reversal(rP), Phase Loss(PL), Stalll(Sc) and Jam(JA)	rnaFF
28	Restart limitation	rn: 3	The maximum auto-restart number during 30 minutes in auto-reset mode. The auto-restart counter (count) is stored in the non-volatile memory and is cleared by pressing ESC button when the counter(count) reaches the limitation. To disable limitation, select “oFF”. Setting range : oFF~5 times.	
29	Total running hour	-trh- / 033 ⟺	In this menu, toggle display, “-trh-” and the accumulated (time) value, is activated (?) The accumulation starts from the installation and the user cannot clear the accumulated value. This display unit is 1 hour.	read only
30	Running hour	--rh- / 43.3 ⟺	In this menu, toggle display, “--rh-” and the accumulated value, is activated (?) The user can clear the accumulated value by selecting the running hour threshold to “rh:oFF”. This display unit is 0.1 hour (6 minutes). By selecting “ALo:to”, the user can get the alert signal through alert output (07-08) when the accumulated value is more than the running hour threshold.	read only
31	Running hour threshold	rh: 10.	Threshold for alert output when the user selects “ALo:to”. The unit is 10 hours and this menu is not displayed when the motor is starting or running. Setting range : 10~9990 hours, oFF	
32	Communication	Ad:1	Modbus slave (ID) address. Range : 1 ~ 247.	Ad:1
		bP:19.2 / bP:38.4	Setting for communication speed Range : 1.2kbps, 2.4Kbps, 4.8Kbps, 9.6Kbps,19.2Kbps, 38.4Kbps.	bP:19.2
		Pr:Eun / Pr:non	Parity setting Range : odd, even, non.	Pr:Eun
		Lt:oFF / Lt:999	Duration (communication. alarm trigger delay) for communication loss detection. Displays alarm when no new communication data is received for the duration. If “oFF” is selected, no monitoring for communication channel is activated. Setting range : 1~999 sec, oFF	Lt:oFF
33	Test trip	tESt	When this menu activated, OL trip signal and enabled short or EF trip signal is generated when (3s+ot) expires. The display shows “End” when the test is done. By pressing ESC, returns to the load current display mode. This menu is not displayed when the motor is starting or running. Before (3s+ot) expires, pressing ESC or motor starting or running blocks the test trip and return to the load current display. No parameter	No parameter
34	End	End	This shows the end of test trip. Test result is stored in the fault record.	No parameter

※ #1 => These are applied to i3MZ & iFMZ only.
#2 => These are applied to i3MS & iFMS only.
#3 => This is applied to i3M420 & iFM420 only.
#4 => This is applied to i3DM & iFDM only.
※ Menusfrom password to reversed phase detection are not displayed during the motor running.

EOCR-i Series (with communication)

Basic model : EOCR-i3DM (Z, S, 420) / iFDM (Z, S, 420)

Alert operation pattern (i3DM & iFDM only)

ALo Selection \ Running Stage	Starting	Norma Operation	Higher than the preset Alert value	Trip
Aux (ALo: A)				
Flicker (ALo: F)				
Hold (ALo: H)				

- ALo "A" : Ampere relay function (The 07-08 output contact is closed when a current is detected)
- ALo "F" : Flickering (When a current flows, the output contact is closed and repeating the close and open on it in a higher current than the AL setting.)
- ALo "H" : Holding (The output contact is closed in a higher current than the AL setting).
- ALo "uc" : Applied to "uc" (under current protection) output contact.
- ALo "to" : When a running hour time is elapsed over the "rh" set value, the output contact repeats the close - open.

Fail-safe operation

Fail-Safe	A1-A2 not powered	A1-A2 powered and under normal operation	A1-A2 powered and Tripped
ON	95 ∅ 96 Close 97 ∅ 98 Open	95 ∅ 96 Open 97 ∅ 98 Close	95 ∅ 96 Close 97 ∅ 98 Open
OFF	95 ∅ 96 Close 97 ∅ 98 Open	95 ∅ 96 Close 97 ∅ 98 Open	95 ∅ 96 Open 97 ∅ 98 Close

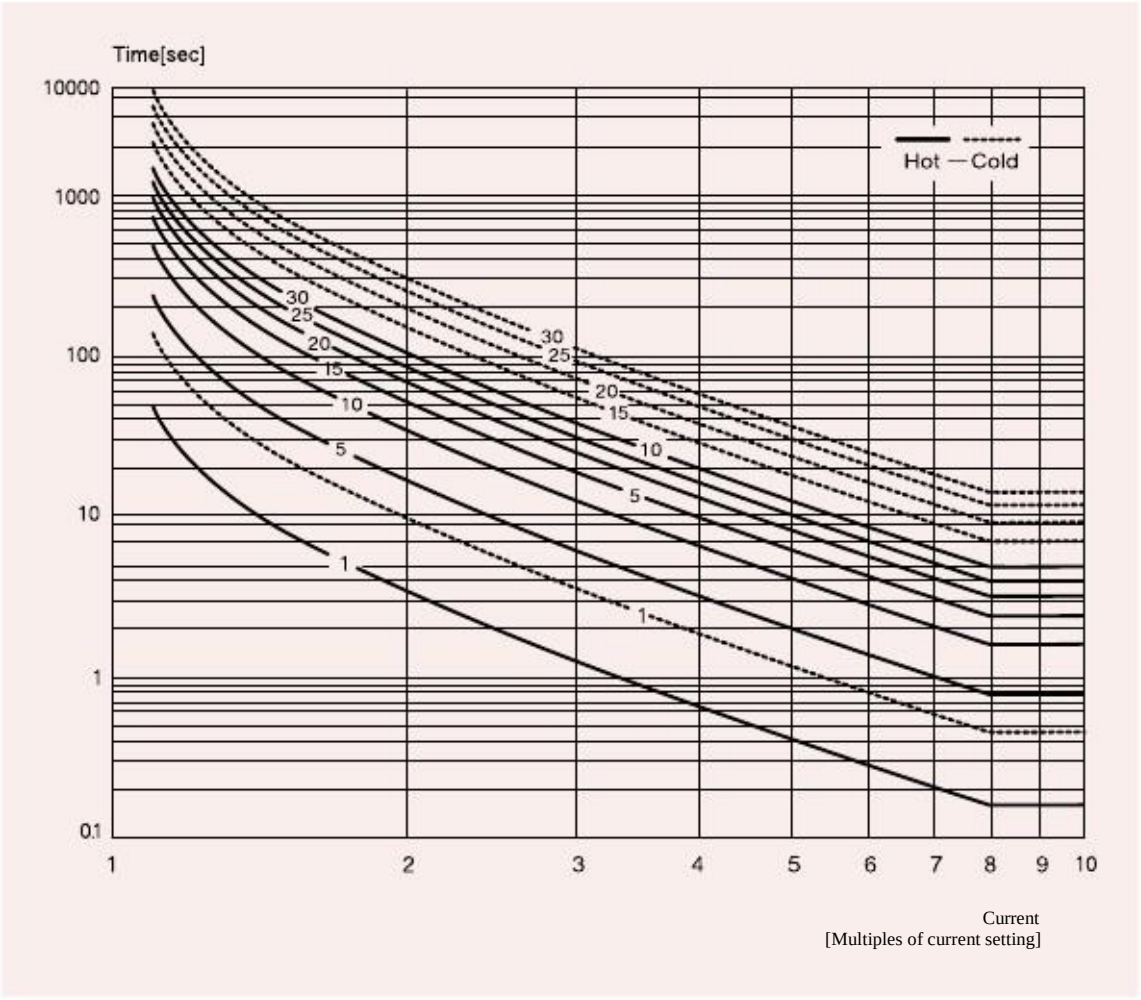
Trip cause indication and fault records

3 fault records including the trip cause and 3phase currents are stored in a non-volatile memory.
When the motor is running or stopped, trip cause can be navigated by pressing ESC button over 5seconds

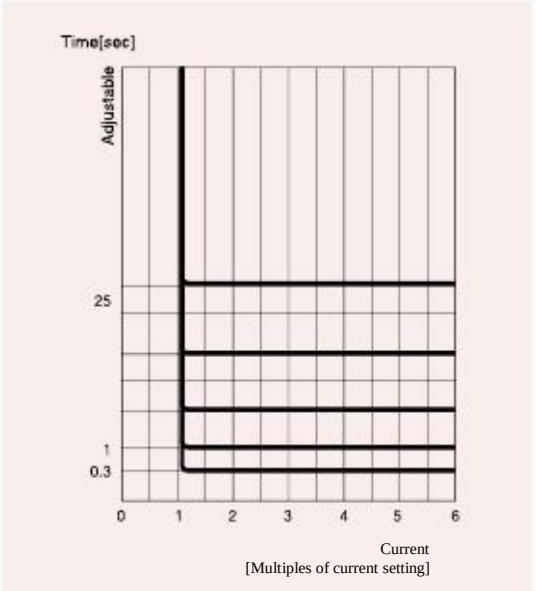
Trip indication					
Trip			Indication after trip with UP/ DN button pressing		
Trip cause	Indication	Contents of indication	L1 LED on	L2 LED on	L3 LED on
Over current	oc: 36	OC Trip caused by r(L1)-phase current	36	34	34
Phase loss	PL -r	Phase Loss caused by r(L1)-phase lost	00	55	55
Reversed phase	-rP-	Phase reversal trip	34	34	34
Stall	Sc:350	Stall trip during motor starting caused by s(L2)-phase curren	348	350	348
Jam	JA: 158	Jam trip during motor running caused by t(L3)-phase current	150	150	158
Imbalance	Ub: 4.2	Imbalance trip caused by t(L3)-phase current	58	58	4.2
Under current	uc: 16	Under current trip caused by s(L2)-phase current	2.2	15	2.2
Earth fault (i3MZ/iFMZ)	EF:005	Earth fault(Earth leakage) trip with Earth fault current indication	35	34	34
Short circuit (i3MS/iFMS)	SH:128	Short Circuit trip caused by s(L2)-phase current	120	128	120
Limitation of auto-restart	rn:FuL	In 30minutes, the number of auto-restar by auto-reset exceeds the setting	For emergency restart, manual reset by pressing ESC clears the restart counter to zero.		

Time-current characteristic curve

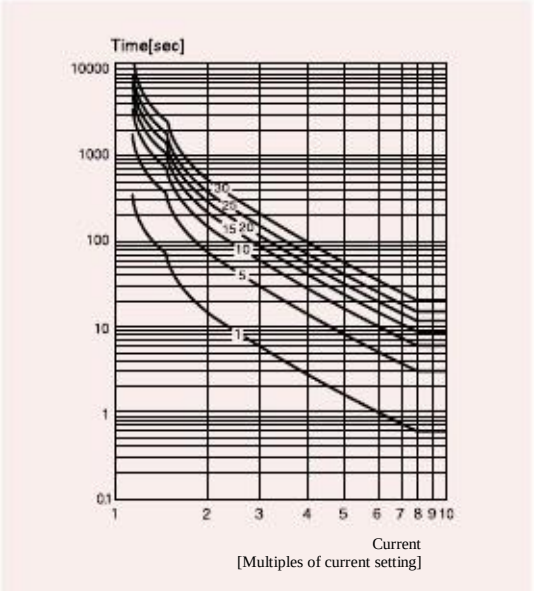
Inverse characteristic



Definite characteristic



Thermal inverse characteristic



EOCR-i Series (with communication)

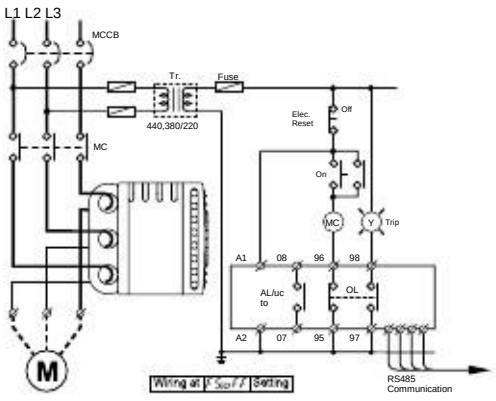
Basic model : EOCR-i3DM (Z, S, 420) / iFDM (Z, S, 420)

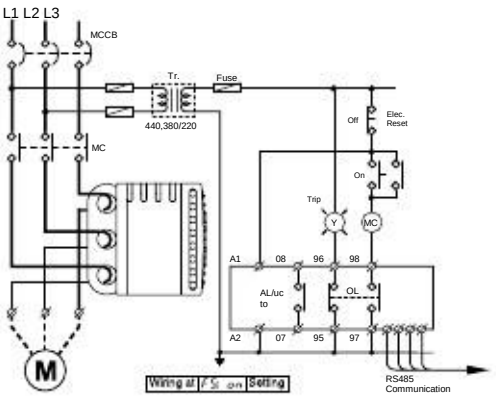
Current setting range

Setting range	Number of pass through the CT hole	External CT ratio	CT Setting	Remark
0.5 ~ 60A	1	No CT combination	ct:non	
0.25 ~ 3A	2	No CT combination	ct: 2t	
0.1 ~ 1.2A	5	No CT combination	ct: 5t	
0.5 ~ 32A	1	No CT combination	ct:non	Inverse TCC or thermal Inverse TCC
0.5 ~ 60A	1	No CT combination	ct:non	Definite TCC
10 ~100A	1	100 : 5	ct:100	Definite or inverse (th)
20 ~200A	1	200 : 5	ct:200	Definite or inverse (th)
30 ~ 300A	1	300 : 5	ct:300	Definite or inverse (th)
40 ~ 400A	1	400 : 5	ct:400	Definite or inverse (th)
50 ~ 500A	1	500 : 5	ct:500	Definite or inverse (th)
60 ~ 600A	1	600 : 5	ct:600	Definite or inverse (th)
70 ~ 700A	1	700 : 5	ct:700	Definite or inverse (th)
80 ~ 800A	1	800 : 5	ct:800	Definite or inverse (th)

Typical wiring schematic

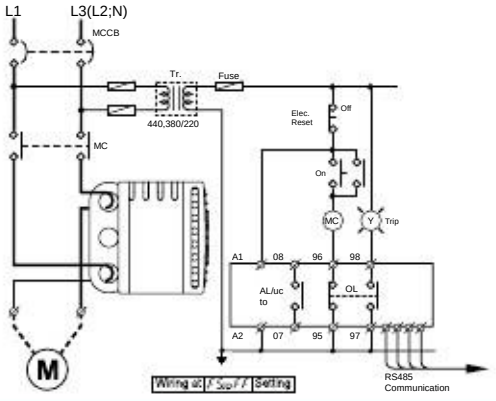
Typical wiring for EOCR-i3DM / iFDM (3 phase motor - window type)



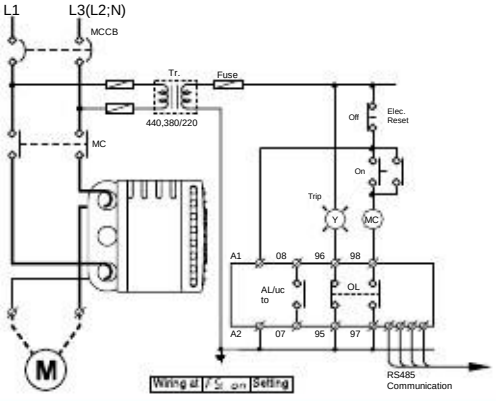


Bottomhole type

Single phase motor (window type)



Single phase motor (window type)



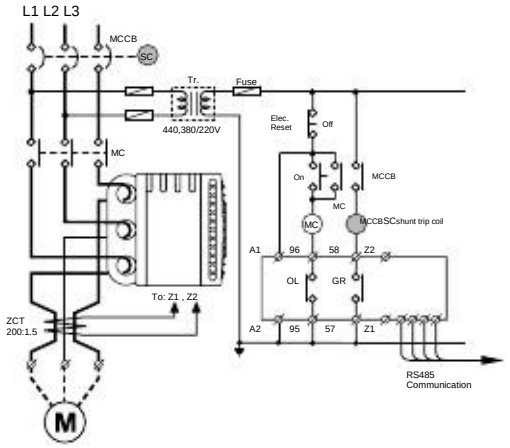
Bottomhole type

EOCR-i Series (with communication)

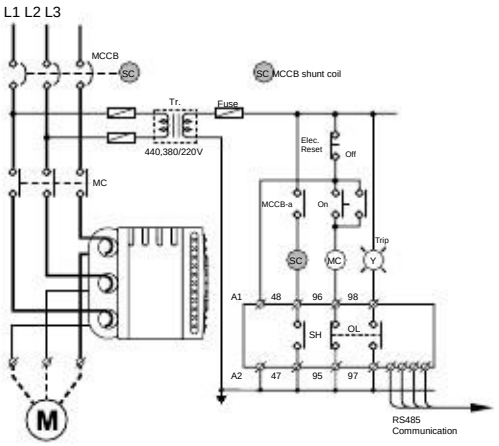
Basic model : EOCR-i3DM (Z, S, 420) / iFDM (Z, S, 420)

Typical wiring schematic

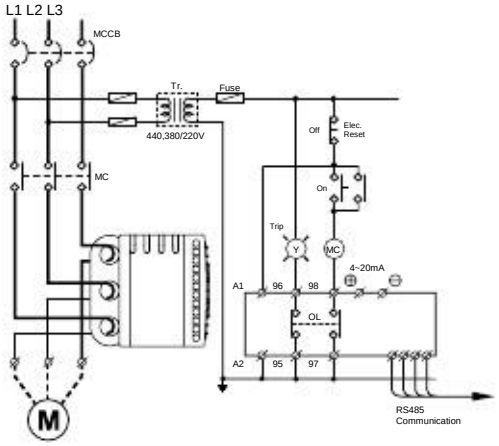
Typical wiring for EOCR-i3MZ / iFMZ



Typical wiring for EOCR-i3MS / iFMS



Typical wiring for EOCR-i3M420 / iFM420



Cabling for a three phase motor

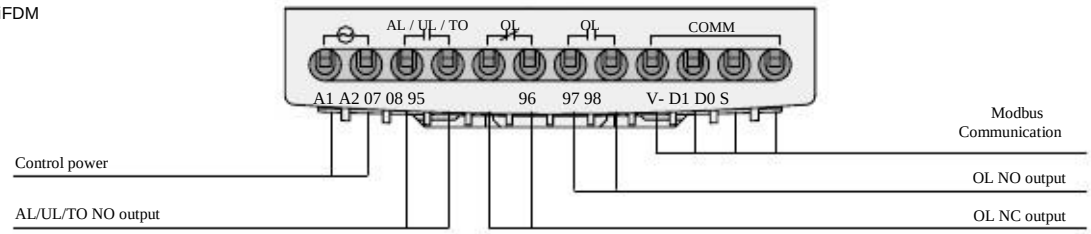
Cabling for a single phase motor

EOCR-i Series (with communication)

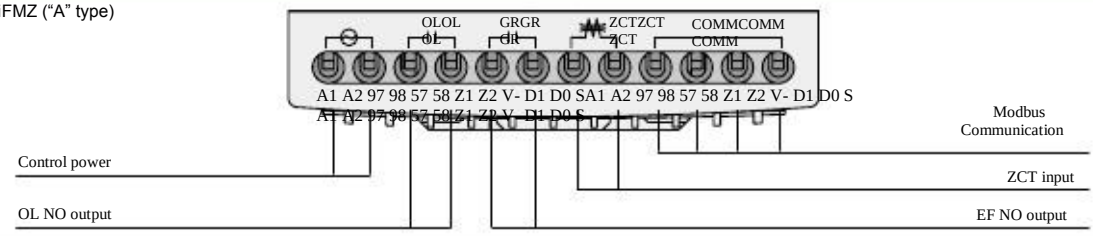
Basic Model : EOCR-i3DM (Z, S, 420) / iFDM (Z, S, 420)

Control terminals

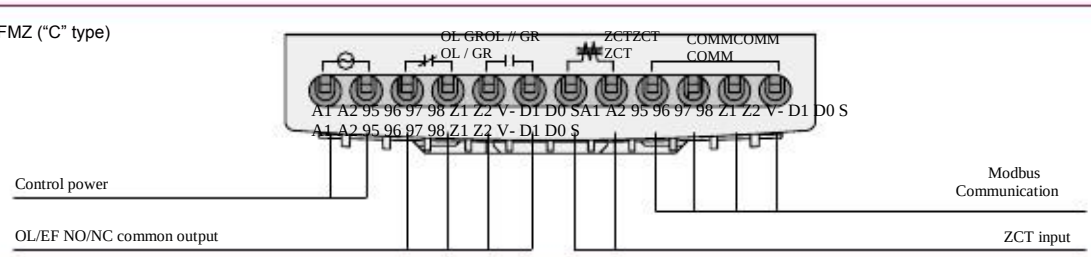
EOCR-i3DM/iFDM



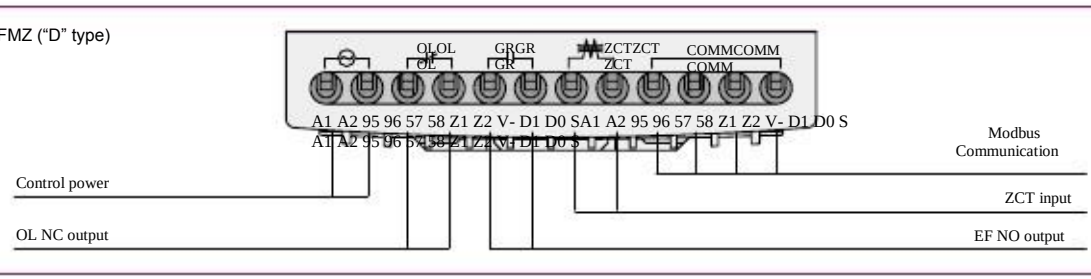
EOCR-i3MZ/iFMZ (“A” type)



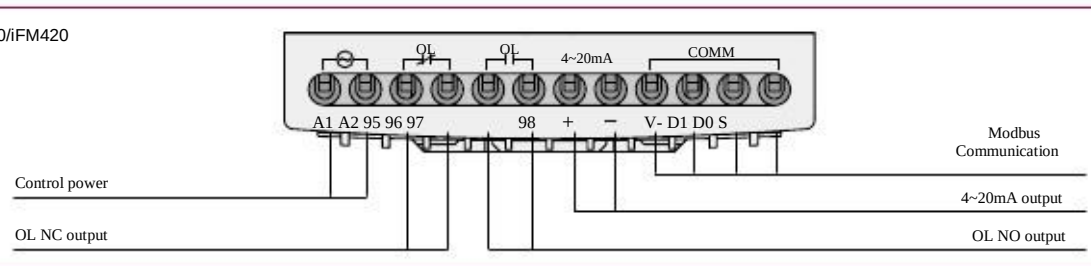
EOCR-i3MZ/iFMZ (“C” type)



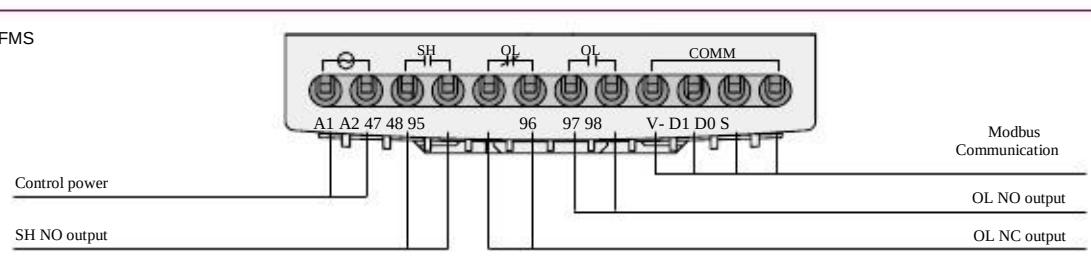
EOCR-i3MZ/iFMZ (“D” type)



EOCR-i3M420/iFM420



EOCR-i3MS/iFMS



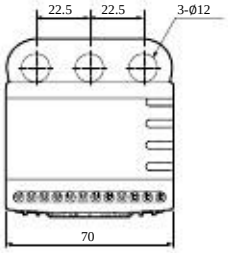
EOCR-i Series (with communication)

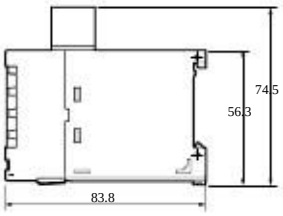
Basic model : EOCR-i3DM (Z, S, 420) / iFDM (Z, S, 420)

Dimension of i3XX

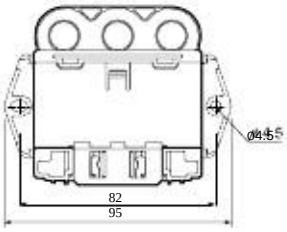
Window type
EOCR-i3DM
EOCR-i3MZ

EOCR-i3M420
EOCR-i3MS



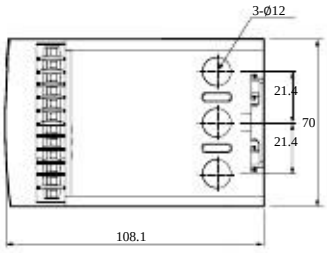


PANEL & DIN RAIL TYPE

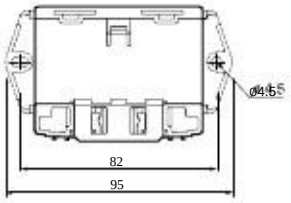


MOUNTING HOLE SIZE

Bottom hole type
EOCR-i3DMEOCR-i3M420
EOCR-i3MZEOCR-i3MS



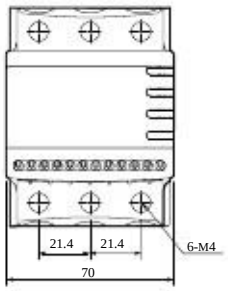
PANEL & DIN RAIL TYPE

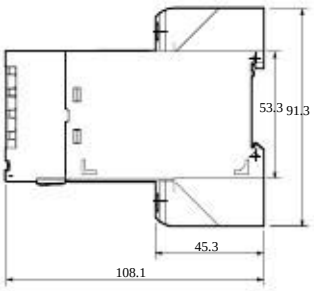


MOUNTING HOLE SIZE

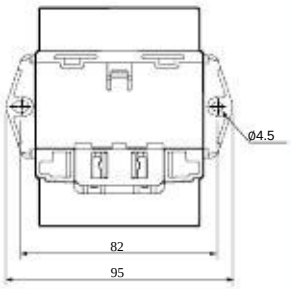
Terminal type
EOCR-i3DM
EOCR-i3MZ

EOCR-i3M420
EOCR-i3MS





PANEL & DIN RAIL TYPE



MOUNTING HOLE SIZE

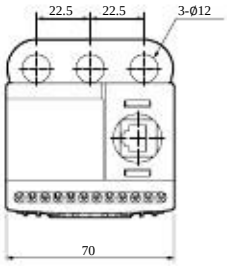
EOCR-i Series (with communication)

Basic model : EOCR-i3DM (Z, S, 420) / iFDM (Z, S, 420)

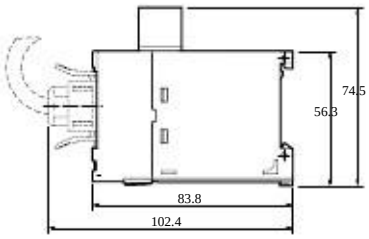
Dimension of iFXX

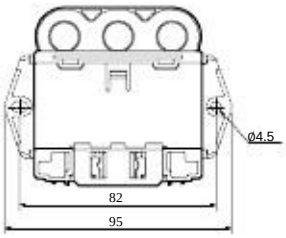
Window type
EOCR-iFDM
EOCR-iFMZ

EOCR-iFM420
EOCR-iFMS



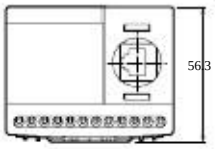
PANEL & DIN RAIL TYPE

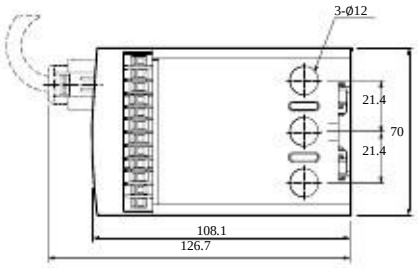




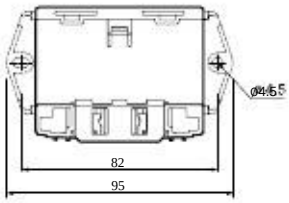
MOUNTING HOLE SIZE

Bottom hole type
EOCR-iFDMEOCR-iFM420
EOCR-iFMZEOCR-iFMS





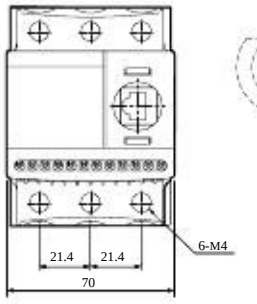
PANEL & DIN RAIL TYPE

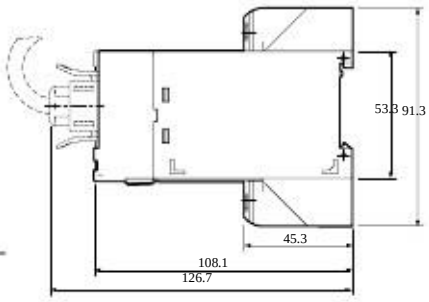


MOUNTING HOLE SIZE

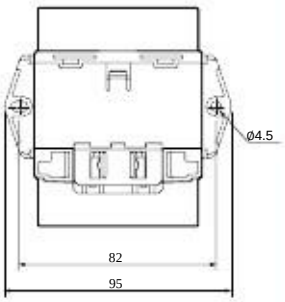
Terminal type
EOCR-iFDM
EOCR-iFMZ

EOCR-iFM420
EOCR-iFMS



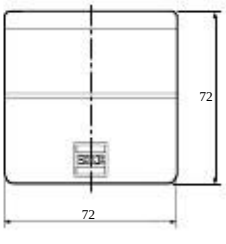


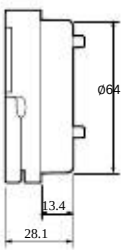
PANEL & DIN RAIL TYPE

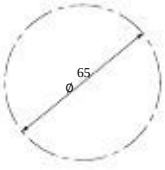


MOUNTING HOLE SIZE

Display
EOCR-PDM







MOUNTING HOLE SIZE

EOCR-i Series (with communication)

Basic model : EOCR-i3DM (Z, S, 420) / iFDM (Z, S, 420)

Ordering

EOCR-i3XX

Window CT

Bottom CT

Terminal

External CT combination type

i3DM - WR D U W Q

◆	Model name	i3DM		Basic model
		i3MZ		GF model
		~~i3M420~~		~~4~20mA output model~~
		i3MS		SC model
◆	Current Range	WR		0.5~60A ~~0.5~20A (i3MS)~~
		H1		100:5 3CT combination type
		HH		150:5 3CT combination type
		~~H2~~		~~200:5 3CT combination type~~
		H3		300:5 3CT combination type
		H4		400:5 3CT combination type
◆	Output contact type	i3MZ	A	a(97-98) :OC, a(57-58) : GR
			C	b(95-96), a(97-98) : OC.GR common
			D	b(95-96) :OC, a(57-58) : GR
		D		~~b(95-96), a(97-98)~~ 24VAC/DC
◆	Control voltage	B		100~240VAC/DC
		~~U~~		
◆	CT type	W		Window type
		H		Bottom hole type
		~~T~~		~~Terminal type~~
		Q		
◆	Export code			

EOCR-iFXX

Window CT

Bottom CT

Terminal

External CT combination type

iFDM - WR D U W Q

◆	Model name	iFDM		Basic model
		iFMZ		GF model
		~~iFM420~~		~~4~20mA output model~~
		iFMS		SC model
◆	Current Range	WR		0.5~60A ~~0.5~20A (iFMS)~~
		H1		100:5 3CT combination type
		HH		150:5 3CT combination type
		~~H2~~		~~200:5 3CT combination type~~
		H3		300:5 3CT combination type
		H4		400:5 3CT combination type
◆	Output contact type	iFMZ	A	a(97-98) :OC, a(57-58) : GR
			C	b(95-96), a(97-98) : OC.GR common
			D	b(95-96) :OC, a(57-58) : GR
		D		b(95-96), a(97-98)
◆	Control voltage	B		24VAC/DC
		U		100~240VAC/DC
		~~W~~		~~Window type~~
◆	CT type	H		Bottom hole type
		T		Terminal type
		Q		
◆	Export code			

EOCR-i Series (with communication)

Basic model : EOCR-i3DM (Z, S, 420) / iFDM (Z, S, 420)

Ordering

Display

EOCR-PDMQ

Cable connector

CABLE - RJ45 - 001

◆	Connector type	RJ45	
◆	Cable length	00H	0.5 m
		001	1m
		~~01H~~	~~1.5 m~~
		002	2m
		003	3m
		~~Others~~	~~Custom made~~

Square 3 CT

3CT - H1 - 100 - C

◆	CT ratio	H1-100-C	Square 3CT 100:5
		HH-150-C	Square 3CT 150:5
		H2-200-C	Square 3CT 200:5
		~~H3-300-C~~	~~Square 3CT 300:5~~
		H4-400-C	Square 3CT 400:5

SR-CT

SR-3CT - 100

◆	CT ratio	S1	100	100:5
		SH	150	150:5
		S2	200	200:5
		S3	300	300:5
		S4	400	400:5

ZCT

ZCT - 035

◆	Inner-diameter	035	35mm
		080	80mm
		120	120mm

EOCR-DM2 Series

Basic model : EOCR-3DM2 (Z) / FDM2 (Z)

EOCR-3DM2 Window type

EOCR-3DM2 Bottom hole type

EOCR-FDM2 Window type

EOCR-FDM2 Bottom hole type

EOCR-3DM2 Terminal type

EOCR-FDM2 Terminal type

General features

- Micro-controller unit based
- Real time processing / High precision
- Protections : Over current, Under current, Phase loss, Phase reversal, Stall, Jam, Current Imbalance, Earth fault (3MZ2/FMZ2)
- Inverse available up to 32Amps without external CTs.
- Ancillary functions : Fail safe, Pre-alarm (3DM2/FDM2), Accumulated running hour, 3 faults records & limitation of auto-restart.
- Reinforced monitoring function : Monitoring distance up to 400M, 3 phase current display, Pre-alarm (3DM2/FDM2) & Trip cause indication
- Bar graph indication of a load current to the current setting.
- Available application on single and 3 phase motor
- RoHS Compliance
- For FDM2/FMZ2, normal protections are guaranteed even if PDM is disconnected.

EOCR-DM2 Series

Basic model : EOCR-3DM2 (Z) / FDM2 (Z)

Protection functions

Protection item	Condition & Setting range	Operation time
Over current (oc)	Condition : Load current (In) exceeds setting current (Is) Setting range : 0.5~60A (Def), 0.5~32A (Inv)	Definite (Def) : 0.2~30s adjust. Inverse (Inv) : 1~30 class
Under current (uc)	Condition : Load current (In) less than setting currentIn ≤ uc uc should be less than oc setting	oFF, 1~10s adjustable
Phase loss (PL)	Condition : max imbalance is more than 85% among 3 phase current, Enable or disable : Selectable	oFF, 0.5~5s adjustable
Reverse phase (RP)	Condition : Reversed phase sequence input on EOCR. Enable or disable : Selectable	Within 0.15s
Stall (Sc)	Condition : In ≥ Stall current setting (Sc). Active only in motor starting 0.5~30A : 2~8 times of oc setting ~40A : 2~6 times, ~60A : 2~4 times.	Right after D-time elapsed
Jam (JA)	Condition : In ≥ Jam current setting (JA). Active only in motor running 0.5~50A : 1.5~5 times of oc setting ~60A : 1.5~4 times of oc setting	0.3~5s adjustable
Imbalance (IM)	Condition : Current imbalance ≥ Setting imbalance % Setting range : 10~50% of imbalance	1~10s adjustable
Earth fault (EF)	Condition : EF current (Ie) exceeds setting current (Ies) OFF, 0.03~10A	0.05~5s adjustable -- 3MZ2/FMZ2 only --

Ancillary functions

Password selection	For secured setting parameters.
Phase selection	For single phase / three phase motor selection
TCC selection	Available three time-current-characteristics (Definite, Inverse, Thermal inverse)
CT ratio	For the current setting more than 60A (20A : i3MS/iFMS) and less than 0.5A
Fail safe selection	Fail safe operation for OL trip output.
Pre alarm selection	Pre alarm signaling by the 07-08 output contact
Total running hour	Total accumulated running hour from the installation which cannot be modified and reset.
Running hour	Display or provide a time-out signal to the 07-08 output contact. (i3DM/iFDM)
Reset mode	Manual / Auto / Electrical ; Selectable
Trip cause memory	Store the latest 3 trip causes
Restart limitation	The maximum auto-restart number within 30 minutes in auto-reset mode.

EOCR-DM2 Series

Basic model : EOCR-3DM2 (Z) / FDM2 (Z)

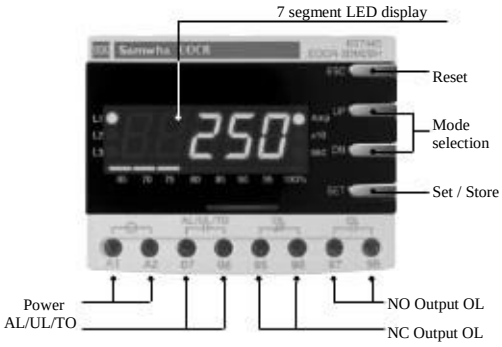
Specifications

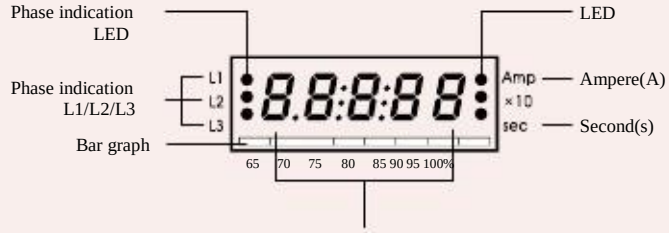
Model			3DM2 / FDM2, 3MZ2 / FMZ2	
Over current		Rated setting range (A)		
			Definite TCC : 0.5~60A : use external CT higher than 60A	
			Inverse TCC : 0.5~60A : use external CT higher than 32A	
Under current		Rated setting range (A)	0.5A ~ less than oc setting	
Operating time characteristics			Definite(Def) / Inverse(Inv)	
Time setting	Def	D-time	0~200s	
		O-time	0.2~30s	
	Inv (cLS)		1~30 classes	
	GF delay time (Edt)		0~30s (3MZ2/FMZ2)	
	GF O-time (Et)		0.05~10s (3MZ2/FMZ2)	
	Auto-reset		0.5s~20min.	
	Reset mode		Manual reset (H-r) / Electric reset (E-r) / Auto-reset (A-r)	
Control power	Voltage		100~240VAC/DC (85% ~110%, Free voltage), 24VAC/DC (± 5%) .	
	Frequency		50/60Hz	
	Power consumption		Lower than 7VA	
Output	Capacity		3A/250VAC resistive.	
	Composition		1a1b : OC or GR	
			1a : AL	
Display	7 segment LED		3 phase amps, Cause of trip, Setting parameters indication.	
	Bar-graph		Load factor.	
Mounting			Panel mounting (3DM2/3MZ2)	
			Flush mounting (FDM2/FMZ2)	
Insulation	Between case & circuit		Over DC500V 10MΩ	
Dielectric strength	Between case & circuit		2kV, 50/60Hz, I Min.	
	Between contacts		1kV, 50/60Hz, I Min.	
	Between circuit		2kV, 50/60Hz, 1 Min	
Electrostatic discharge (ESD)		IEC61000-4-2	Level 3 : Air discharge : ±8kV, Contact discharge : ±6kV	
Radiated disturbance		IEC61000-4-3	Level 3 : 10V/m, 80 ~ 1000MHz	
Conducted disturbance		IEC61000-4-6	Level 3 : 10V,0.15 ~ 80MHz	
EFT/Burst		IEC61000-4-4	Level 3 : ±2kV, 1 Min.	
Surge		IEC61000-4-5	Level 3 : 1.2 x 50μs, ±4kV (0˚, 90˚, 180˚, 270˚)	
Emission		CISPR11	Class A (Conducted and radiated)	
Environment	Temperature	Store	-40˚C ~ +85˚C	
		Operation	-20˚C ~ +60˚C	
	Humidity		30~85% RH (Non-condensate)	
Dimension		Window type	70W × 74.5H × 83.8D	
		Bottom hole type	70W × 56.3H × 108.1D	
Weight			3DM2 / 3MZ2	FDM2 / FMZ2
		Window type	265g	350g
		Bottom hole type	295g	390g
		Terminal type	295 + 120 = 415g	390 + 120 = 510g
		Display (W/3M cable)		125g
Power consumption			Less than 7VA.	

EOCR-DM2 Series

Basic model : EOCR-3DM2 (Z) / FDM2 (Z)

Front face





5 digit 7 segment LED display

3 phase currents (In) and a leakage current (3MZ2/FMZ2) are displayed every 2 seconds in sequence.

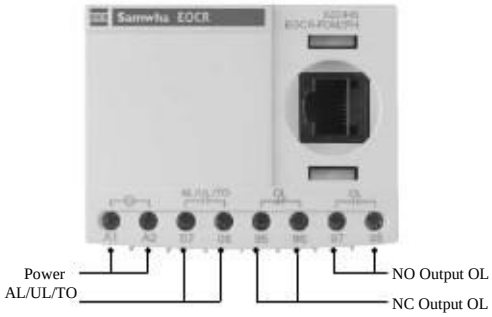
Bar graph

- it shows the load factor to OC setting value by %
- % value = (running current/setting current) * 100%
- Min scale is 65%
- if the setting value is the rated motor current, it shows the load factor of the motor.

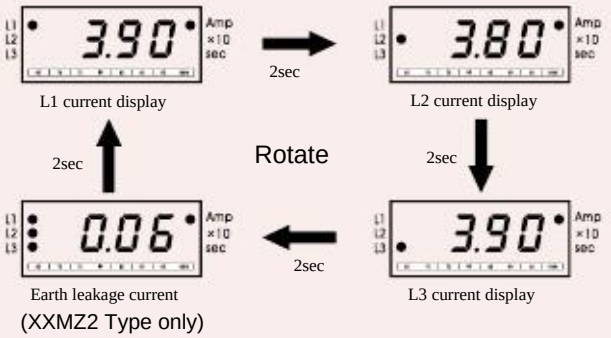
Current display

- Shows the highest current among three phases for OC, Stall, Jam trips.
- Shows the lowest current among three phases for UC, UB
- Shows the lost phase for PL.
- Shows the phase and the current during running.

Amp : Ampere. LED is on when a current display.
x 10 : Shows the unit changed to 10 times.
Sec : Second. LED is on when a time display.



3 phase digital ammeter function



※ Blocking display rotation can be done by pressing the SET button once during running. whenever press the SET button, the each phase current displays by turns. A fixed phase current display can be done by this.

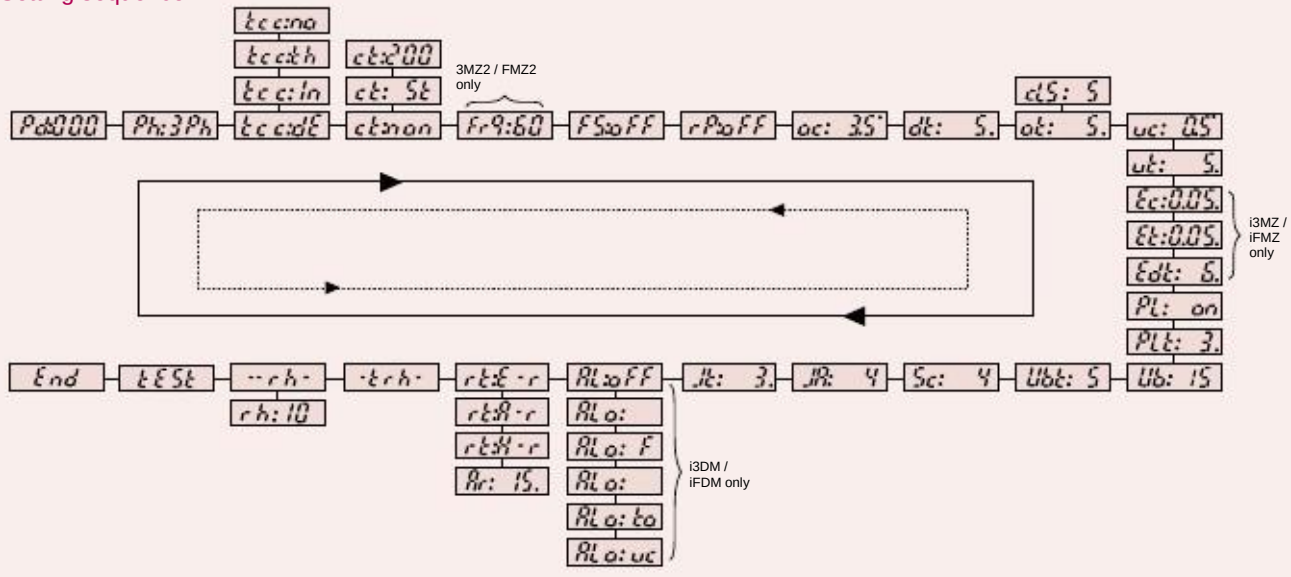
※ Pressing the ESC button, it returns to the Auto current display rotation mode.

Buttons and Setting Sequence

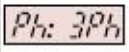
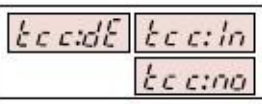
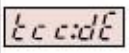
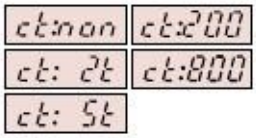
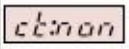
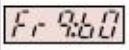
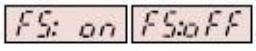
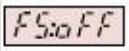
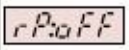
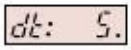
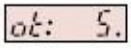
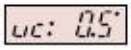
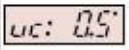
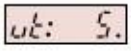
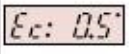
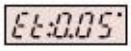
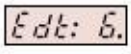
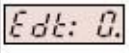
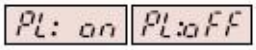
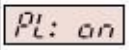
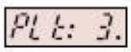
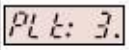
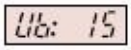
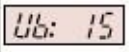
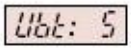
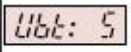
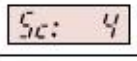
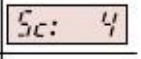
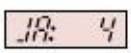
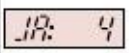
Button	Description
▲UP ▼DN	Navigate menus by pressing UP/DN button.
SET	Select a parameter to change, then the parameter starts blinking.
▲UP ▼DN	Modify a parameter value by pressing UP/DN button.
SET	Memorize the values in the relay by pressing SET button. blinking stops to show it's stored.
ESC	Pressing ESC button, it returns to the current display. Without pressing ESC button, it returns to the load current display in 50sec automatically.

※ Fault history check : Pressing the ESC button more than 5sec, it displays the latest fault cause and the fault current or fault phase. Continuing to press DN button, you can see the current of L1(R), L2(S), L3(T), (GR) in turn. press the DN button again to check the previous fault continually. In the latest fault display, the 100% LED of bar graph lights on and two LEDs of 95%, 100% lights on for the second fault display, three LEDs of 90%, 95%, 100% lights on for the oldest fault display. When you press the ECS button in this mode, it returns to the normal current display mode. The oldest fault record is over written when the number of fault to record exceeds three.

●Setting sequence



Setting sequence and menu

No.	Menu	Parameter	Description	Default
1	Selection of phase No.		"Ph:3Ph" mode for a 3 phase load, "Ph:1Ph" mode for a 1 phase load should be selected. If you select the "Ph:1Ph", RP, PL and Ub functions will be disabled and not displayed in the menu mode	
2	Operation curve		Time-current characteristic(TCC) setting. "dE" is for definite TCC, "In" is for inverse TCC, "th" is for thermal inverse TCC. Refer to the time-current characteristic curve. If tcc=no, only overcurrent protection is disabled	
3	CT ratio		External CT ratio setting mode. This is applied to definite TCC: higher than 60A and Inverse TCC: higher than 30A. Set the primary value of the external CT. For example, 200:5 CT, setting is "ct:200". For the low-range current "ct: 2t" is for (2 loops), "ct: 5t" is for (5 loops). Select "ct: non" in case of no externel CT and single loop.	
4 #1	Frequency		Frequency setting mode. Select 50 or 60 based on the system fundamental frequency.	
5	Fail safe		Selection of fail safe(No volt release) mode for overload trip output, OL. Refer to fail-safe operation	
6	Reversed phase detection		Enable or disable reverse phase detection	
7	Over current threshold		Threshold for over current protection. this value cannot be set below a under current threshold (uc).	
8	Start delay time		Motor starting delay, OC, UC, Stall, Jam, Ub are blocked during starting but PL, RP are not blocked. For "In" TCC mode, the cold curve is appled before dt expires and, the hot curve is applied after the dt expires.	
9	Over current duration (Trip delay time / Trip class)		(tcc:dE) : the fault(over current) duration of definite overcurrent protection. (tcc:In) : the trip class for inverse overcurrent protection (refer to TCC curve) (tcc:th) : the thermal overload protection based on the thermal image by load current (refer to TCC curve).	
10	Under current threshold		Threshold for under current protection. The setting should be higher than no-load current of a motor. The current value cannot be set higher than OC.	
11	Under current duration (Trip delay time)		Fault (under current) duration for the under current operation. If the setting of "oFF" in the "uc" mode is selected, this menu is not displayed	
12 #1	Earth fault (Ground fault) threshold		Threshold for earth fault protection. The capacitance leakage current of the motor and cable should be taken into account for the setting. The threshold value corresponds to the primary current of ZCT	
13 #1	Earth fault trip delay time		Earth fault duration (Trip delay time) TCC is definite characteristic	
14 #1	EF starting delay		Blocking time of earth fault detection during motor starting. OFF, 1~30s adjustable this timer is only active during motor starting.	
15	Phase loss		Enable or disable Phase Loss(Single Phasing) detection. If the "Ph:1Ph" is selected , this menu is not displayed.	
16	Phase loss time		Fault duration for phase loss operation. The setting range is 0.5~5 sec. if "PL: oFF" is selected, this menu is not displayed.	
17	Imbalance threshold		Threshold for current imbalance operation. To disable the function, set to "oFF", the setting range is 10~50%. Imbalance factor (%) = ($I_{max\ phase}$ - I_{min_phase}) / I_{max_phase} x 100% Imbalance fault duration (trip delay time) for current imbalance operation. The setting range is 1~10 seconds.	
18	Imbalance fault duration		Threshold for locked rotor detection during motor starting. The value is the multiples of the over current threshold(oc). If the locked rotor condition is detected, the trip relay operates in 0.5s after the "dt" expires. If dt=0, this function is disabled and not displayed in the menu.	
19	Stall threshold		Setting range : oc=0.4~30A : 2~8times, oc < 40A : 2~6times, otherwise (oc<60A) : 2~4times, (with Ext. CT : ?)	
20	Jam threshold		Threshold for locked rotor detection during motor running. The value is the multiples of the over current threshold (oc). Setting : oc=0.4~50A : 1.5~5times, otherwise (oc<60A) : 4times, (with Ext. CT : ?)	

Setting sequence and menu

No.	Menu	Parameter	Description	Default
21	Jam fault duration	JL: 3.	Jam fault duration (trip delay time) Setting : 0.2~10 sec	JL: 3.
22 #2	Alert	AL: 85 ALoFF	Threshold of alert output, set by % of the over current threshold (oc). If the load current is higher than this value, alert output(07-08 contact) is energized according to the setting of "ALo:XX".	ALoFF
		ALo: A	If the load current is detected, alert output(07-08 contact) is energized. The alert threshold is no meaning for this operation. Refer to the alert operation pattern.	
		ALo: F	If the load current is higher than the alert threshold, alert output(07-08 contact) repeats open for 1s and close for 1s (flickering), The flickering starts from the motor starting. Refer to the alert operation pattern.	
		ALo: H	If the load current is higher than the alert threshold, alert output(07-08 contact) is closed (holding) and remains closed until the load current decrease under the alert threshold. The alert output is blocked during motor starting. Refer to the alert operation pattern.	
		ALo:to	If the accumulated running hour is more than the running hour threshold, the alert output repeats close for 1s and open for 1s.	
		ALo:uc	The alert output is used only for under current protection. If this mode is selected, a trip by an under current fault is signaled through alert output(07-08), instead of overload trip output(95-96 or 97-98).	
23	Reset	rtE-r	Fault reset (electrical reset) by a power cycle or by pressing the ESC button.	rtE-r
		rtH-r	Fault reset (hand reset) by only pressing the ESC button.	
		rtA-r Ar: 15. Ar:20n	Fault reset (auto reset) by a auto-reset timer, Setting range of the timer : 0.5sec~20min. Also the fault can be reset by power cycle or by ESC button.	
24	Restart limitation	rn: 3	The maximum auto-restart number during 30 minutes in auto-reset mode. The auto-restart counter (count) is stored in the non-volatile memory and is cleared by pressing ESC button when the counter (count) reaches the limitation. To disable limitation, select "oFF". Setting range : oFF~5 times.	rnoFF
25	Total running hour	-trh- 033	In this menu, toggle display, "-trh-" and the accumulated (time) value, is activated (?) The accumulation starts from the installation and the user cannot clear the accumulated value. This display unit is 1 hour.	read only
26	Running hour	--rh- 43.3	In this menu, toggle display, "--rh-" and the accumulated value, is activated (?) The user can clear the accumulated value by selecting the running hour threshold to "rh : oFF". This display unit is 0.1 hour (6 minutes). By selecting "ALo : to", the user can get the alert signal through alert output (07-08) when the accumulated value is more than the running hour threshold.	read only
	Running hour threshold	rh: 10.	Threshold for alert output when the user selects "ALo : to". The unit is 10 hours and this menu is not displayed when the motor is starting or running. Setting range : 10~9990 hours, oFF	
27	Test trip	tESt	When this menu activated, OL trip signal and enabled short or EF trip signal is generated when (3s+ot) expires. The display shows "End" when the test is done. By pressing ESC, returns to the load current display mode. This menu is not displayed when the motor is starting or running. Before (3s+ot) expires, pressing ESC or motor starting or running blocks the test trip and return to the load current display. No parameter	No parameter
28	End	End	This shows the end of test trip. Test result is stored in the fault record.	No parameter

※ #1 => These are applied to 3MZ2 & FMZ2 only.
#2 => These are applied to 3DM2 & FDM2 only.

EOCR-DM2 Series

Basic model : EOCR-3DM2 (Z) / FDM2 (Z)

Alert operation pattern (3DM2 & FDM2 only)

- ALo "A" : Ampere relay function (The 07-08 output contact is closed when a current is detected)
- ALo "F" : Flickering (When a current flows, the output contact is closed and repeating the close and open on it in a higher current than the AL setting.)
- ALo "H" : Holding (The output contact is closed in a higher current than the AL setting).
- ALo "uc" : Applied to "uc" (under current protection) output contact.
- ALo "to" : When a running hour time is elapsed over the "rh" set value, the output contact repeats the close - open.

Fail-safe operation

Fail-Safe	A1-A2 not powered	A1-A2 powered and under normal operation	A1-A2 powered and Tripped
ON	95 Ø 96 Close 97 Ø 98 Open	95 Ø 96 Open 97 Ø 98 Close	95 Ø 96 Close 97 Ø 98 Open
OFF	95 Ø 96 Close 97 Ø 98 Open	95 Ø 96 Close 97 Ø 98 Open	95 Ø 96 Open 97 Ø 98 Close

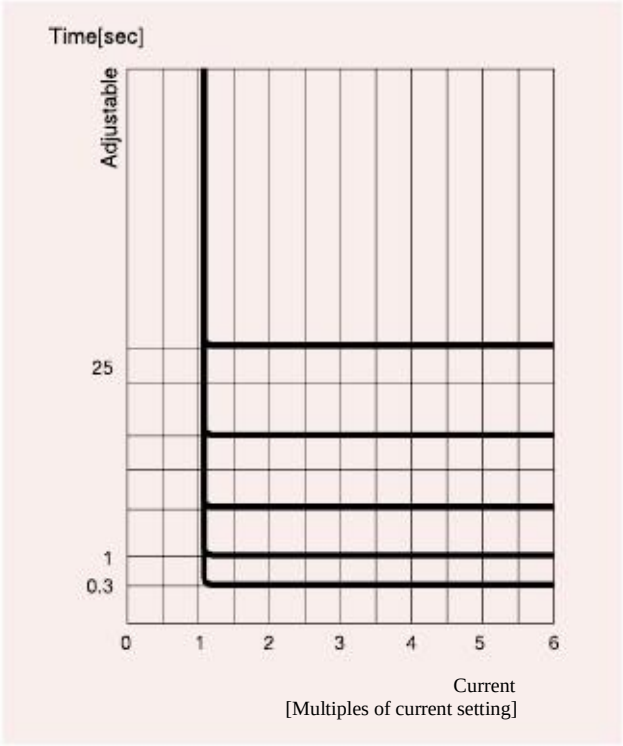
Trip cause indication and fault records

3 fault records including the trip cause and 3phase currents are stored in a non-volatile memory.
When the motor is running or stopped, trip cause can be navigated by pressing ESC button over 5seconds

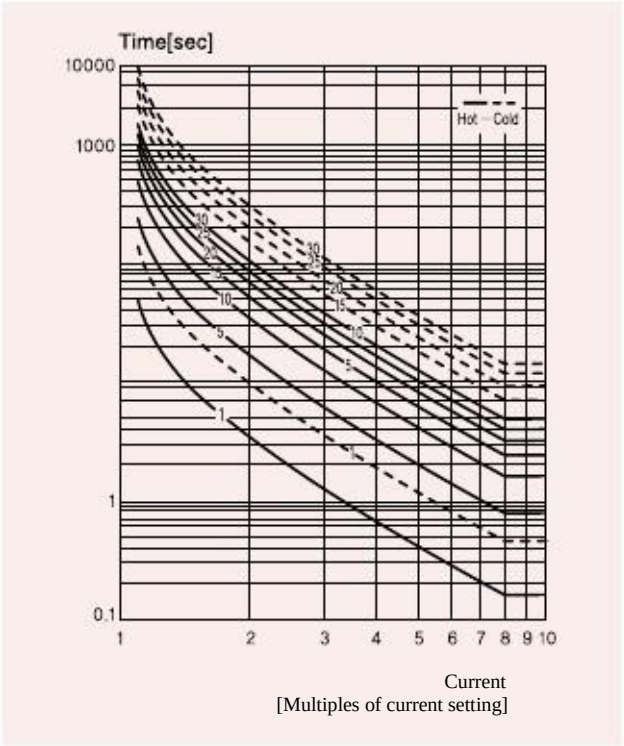
Trip indication					
Trip			Indication after trip with UP/ DN button pressing		
Trip cause	Indication	Contents of indication	L1 LED on	L2 LED on	L3 LED on
Over current	oc: 36	OC Trip caused by r(L1)-phase current	36	34	34
Phase loss	PL -r	Phase loss caused by r(L1)-phase lost	0.0	5.5	5.5
Reversed phase	-rP-	Phase reversal trip	34	34	34
Stall	Sc:350	Stall trip during motor starting caused by s(L2)-phase curren	34.0	35.0	34.0
Jam	JA: 15.0	Jam trip during motor running caused by t(L3)-phase current	15.0	15.0	15.0
Imbalance	Ub: 4.2	Imbalance trip caused by t(L3)-phase current	5.0	5.0	4.2
Under current	uc: 1.6	Under current trip caused by s(L2)-phase current	2.2	1.5	2.2
Earth fault (3MZ2/FMZ2)	EF:005	Earth fault(Earth leakage) trip with Earth fault current indication	35	34	34
Limitation of auto-restart	rn:FuL	In 30minutes, the number of auto-restar by auto-reset exceeds the setting	For emergency restart, manual reset by pressing ESC clears the restart counter to zero.		

Time-current characteristic curve

Definite characteristic



Inverse characteristic

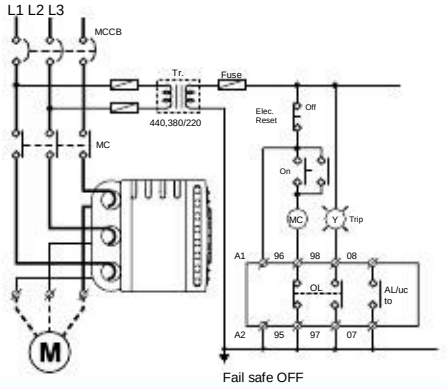


Current setting range

Setting range	Number of pass through the CT hole	External CT ratio	CT setting	Remark
0.5 ~ 60A	1	No CT combination	ct:non	
0.25 ~ 3A	2	No CT combination	ct: 2t	
0.1 ~ 1.2A	5	No CT combination	ct: 5t	
0.5 ~ 32A	1	No CT combination	ct:non	Inverse TCC
0.5 ~ 60A	1	No CT combination	ct:non	Definite TCC
10 ~100A	1	100 : 5	ct:100	Definite or inverse
20 ~200A	1	200 : 5	ct:200	Definite or inverse
30 ~ 300A	1	300 : 5	ct:300	Definite or inverse
40 ~ 400A	1	400 : 5	ct:400	Definite or inverse
50 ~ 500A	1	500 : 5	ct:500	Definite or inverse
60 ~ 600A	1	600 : 5	ct:600	Definite or inverse
70 ~ 700A	1	700 : 5	ct:700	Definite or inverse
80 ~ 800A	1	800 : 5	ct:800	Definite or inverse

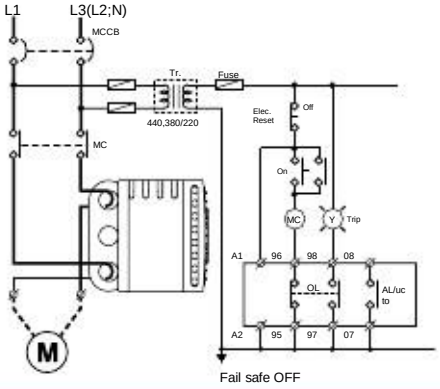
Typical wiring schematic (EOCR-3DM2/FDM2)

Three phase motor (at FS : oFF)



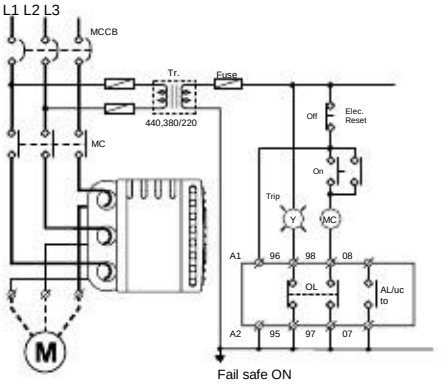
Fail safe OFF

Single phase motor (at FS : oFF)



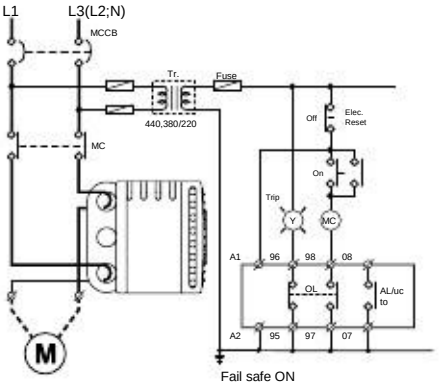
Fail safe OFF

Three phase motor (at FS : oFF)



Fail safe ON

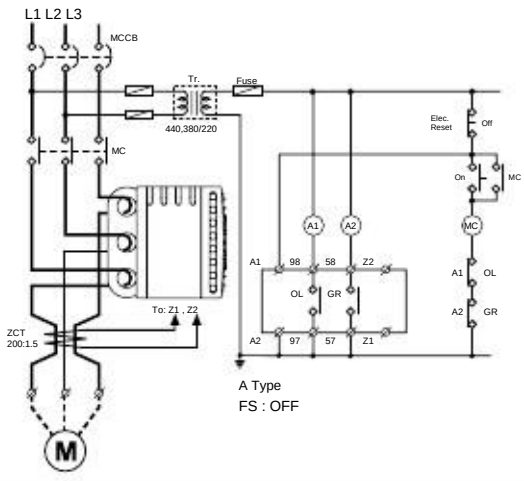
Single phase motor (at FS : oFF)



Fail safe ON

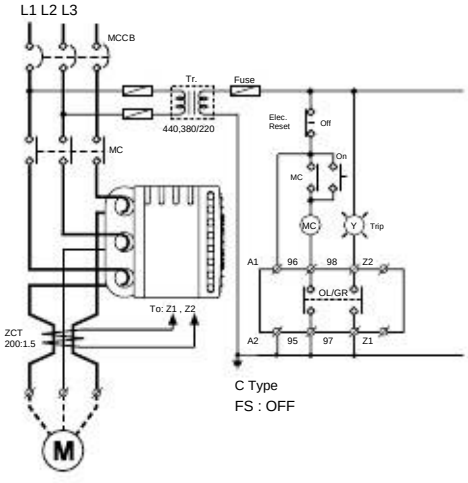
Typical wiring schematic (EOCR-3MZ2/FMZ2)

Three phase motor (A type, a-a output)



A Type
FS : OFF

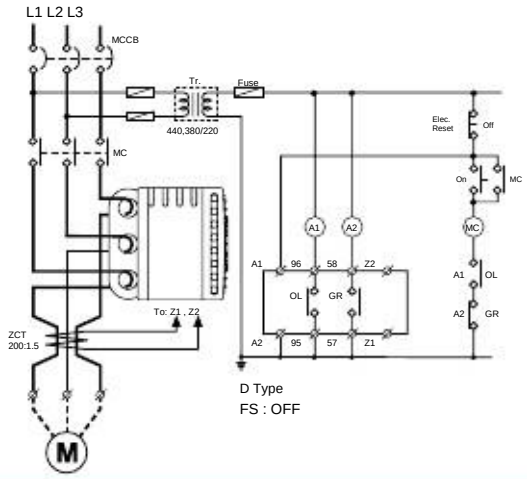
Three phase motor (C type, common output)



C Type
FS : OFF

Typical wiring schematic (EOCR-3MZ2/FMZ2)

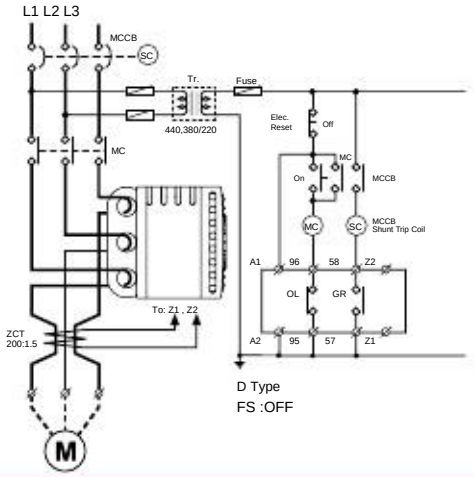
Three phase motor (D type, b-a output)



D Type
FS : OFF

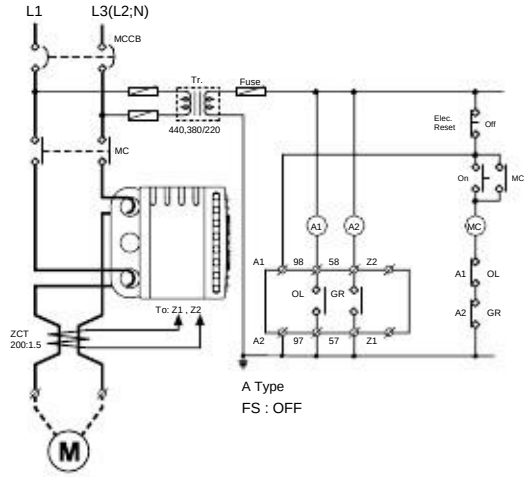
Three phase motor (D type)

※ MCCB trip for GF



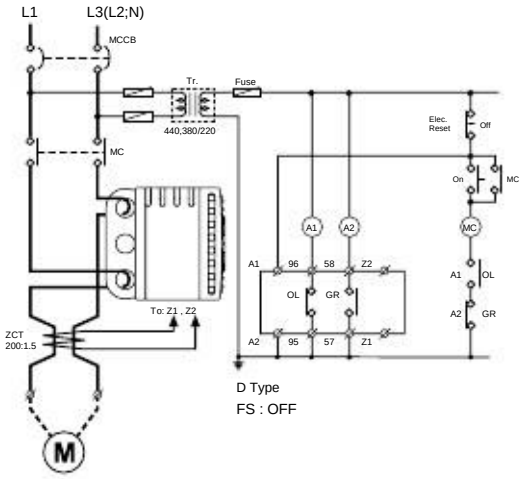
D Type
FS :OFF

Single phase motor (A type)



A Type
FS : OFF

Single phase motor (D type)



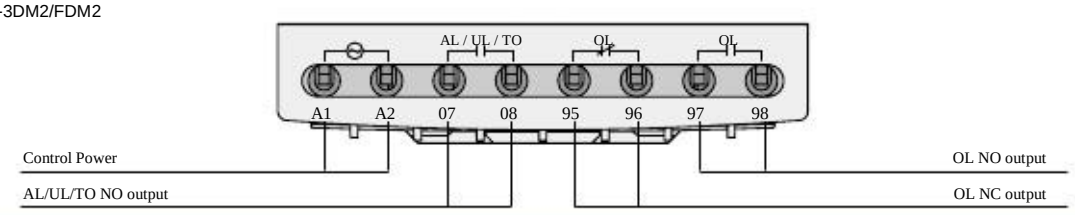
D Type
FS : OFF

Cabling for a three phase motor

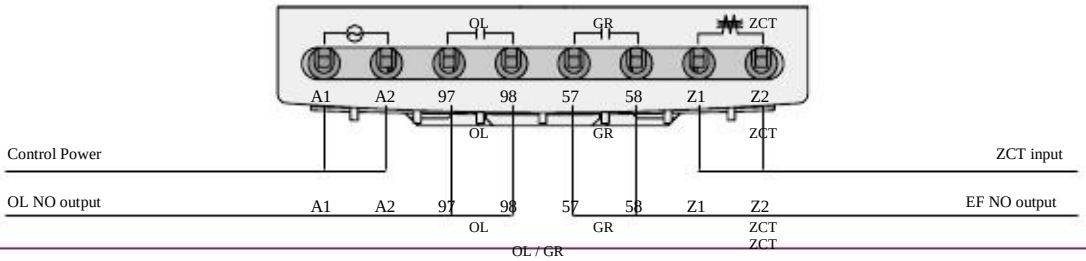
Cabling for a single phase motor

Control terminals

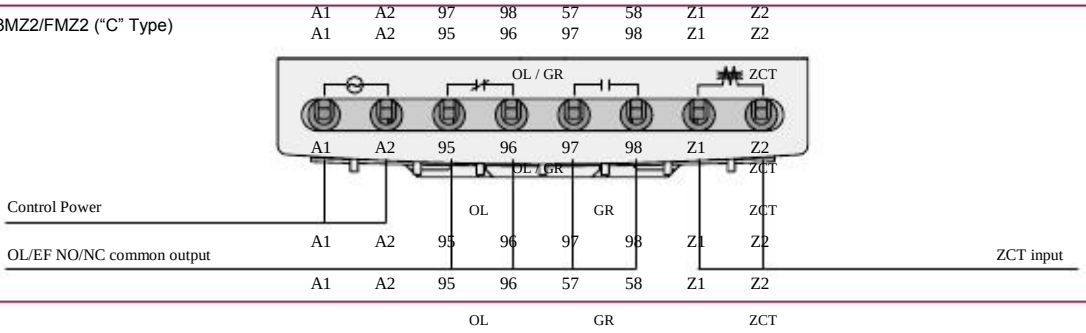
EOCR-3DM2/FDM2



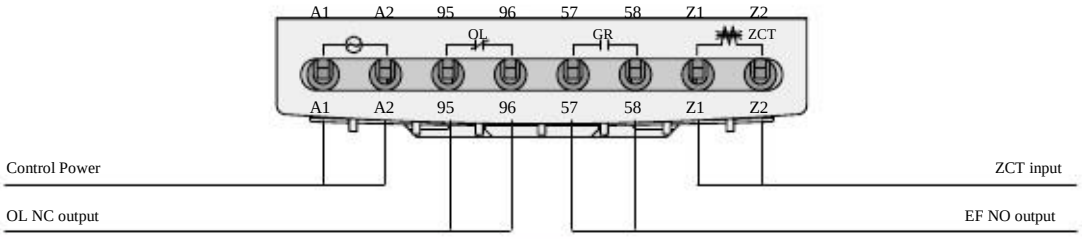
EOCR-3MZ2/FMZ2 (“A” Type)



EOCR-3MZ2/FMZ2 (“C” Type)



EOCR-3MZ2/FMZ2 (“D” Type)

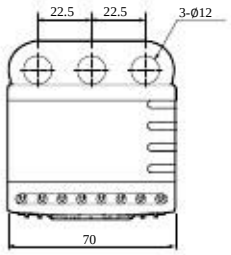


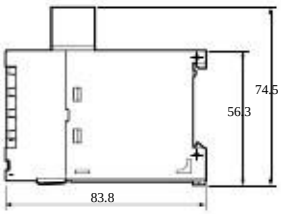
EOCR-DM2 Series

Basic model : EOCR-3DM2 (Z) / FDM2 (Z)

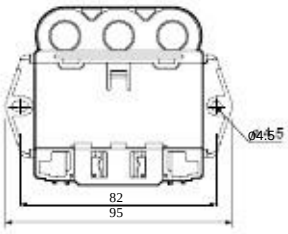
Dimension of 3XX2

Window type
EOCR-3DM2
EOCR-3MZ2



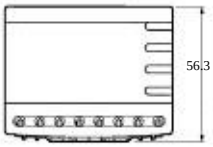


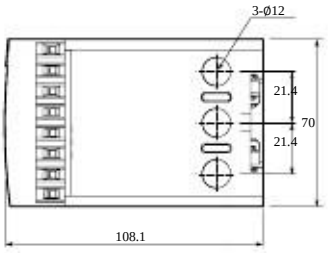
PANEL & DIN RAIL TYPE



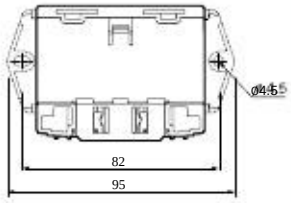
MOUNTING HOLE SIZE

Bottom hole
EOCR-3DM2
EOCR-3MZ2



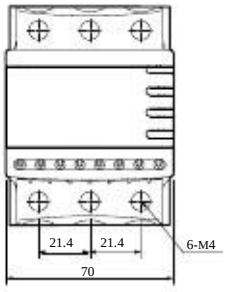


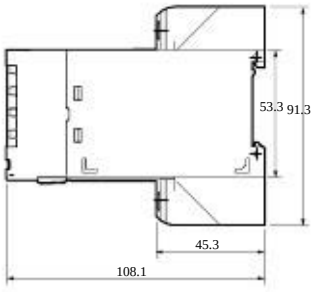
PANEL & DIN RAIL TYPE



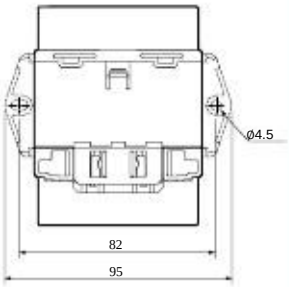
MOUNTING HOLE SIZE

Terminal hole
EOCR-3DM2
EOCR-3MZ2





PANEL & DIN RAIL TYPE



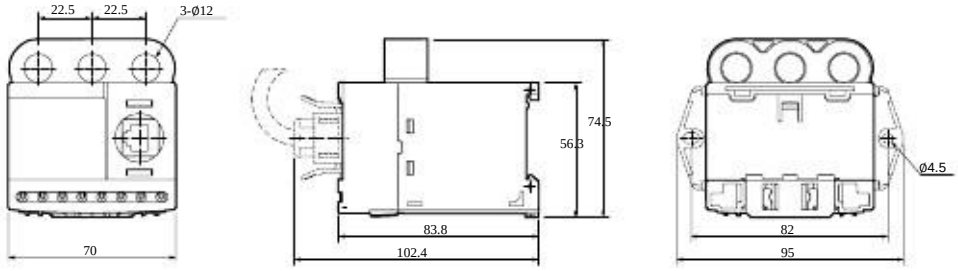
MOUNTING HOLE SIZE

EOCR-DM2 Series

Basic model : EOCR-i3DM(Z, S, 420) / iFDM (Z, S, 420)

Dimension of FXX2

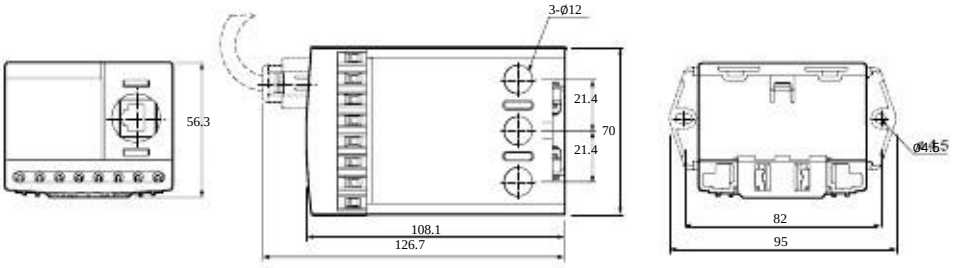
Window type
EOCR-FDM2
EOCR-FMZ2



PANEL & DIN RAIL TYPE

MOUNTING HOLE SIZE

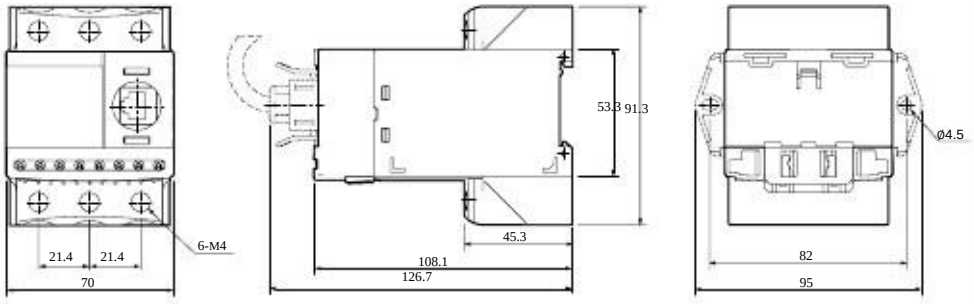
Bottom hole type
EOCR-FDM2
EOCR-FMZ2



PANEL & DIN RAIL TYPE

MOUNTING HOLE SIZE

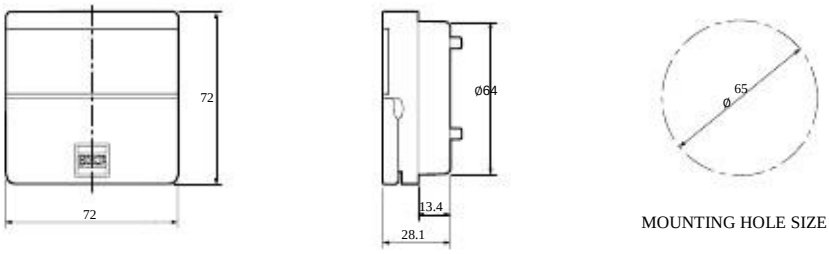
Terminal type
EOCR-FDM2
EOCR-FMZ2



PANEL & DIN RAIL TYPE

MOUNTING HOLE SIZE

Display
EOCR-PDM



MOUNTING HOLE SIZE

EOCR-DM2 Series

Basic model : EOCR-i3DM(Z, S, 420) / iFDM (Z, S, 420)

Ordering

EOCR-3XX2

Window CT

Bottom CT

Terminal

External CT
combination type

3DM2 - WR D U W Q

①	Model name	3DM2		Basic model
		3MZ2		GF model
②	Current range	WR		0.5~60A
		H1		100:5 3CT combination type
		HH		150:5 3CT combination type
		H2		200:5 3CT combination type
		H3		300:5 3CT combination type
		H4		400:5 3CT combination type
③	Output contact type	3MZ2	A	a(97-98) : OC, a(57-58) : GR
			C	b(95-96), a(97-98) : OC.GR common
			D	b(95-96) : OC, a(57-58) : GR
		3DM2	D	b(95-96), a(97-98)
④	Control voltage	B		24VAC/DC
		U		100~240VAC/DC
⑤	CT type	W		Window type
		H		Bottom hole type
		T		Terminal type
⑥	Export code	Q		

EOCR-FXX2

Window CT

Bottom CT

Terminal

External CT
combination type

FDM2 - WR D U W Q

①	Model name	iFDM		Basic model
		iFMZ		GF model
②	Current range	WR		0.5~60A
		H1		100:5 3CT combination type
		HH		150:5 3CT combination type
		H2		200:5 3CT combination type
		H3		300:5 3CT combination type
		H4		400:5 3CT combination type
③	Output contact type	FMZ2	A	a(97-98) : OC, a(57-58) : GR
			C	b(95-96), a(97-98) : OC.GR common
			D	b(95-96) : OC, a(57-58) : GR
		FDM2	D	b(95-96), a(97-98)
④	Control voltage	B		24VAC/DC
		U		100~240VAC/DC
⑤	CT type	W		Window type
		H		Bottom Hole type
		T		Terminal type
		Q		
⑥	Export code			

EOCR-DM2 Series

Basic model : EOCR-i3DM(Z, S, 420) / iFDM (Z, S, 420)

Ordering

Display

EOCR-PDMQ

Cable connector

CABLE - RJ45 - 001

◆	Connector type	RJ45	
◆	Cable length	00H	0.5 m
		001	1m
		~~01H~~	~~1.5 m~~
		002	2m
		003	3m
		~~Others~~	~~Custom made~~

Square 3 CT

3CT - H1 - 100 - C

◆	CT ratio	H1-100-C	Square 3CT 100:5
		HH-150-C	Square 3CT 150:5
		H2-200-C	Square 3CT 200:5
		~~H3-300-C~~	~~Square 3CT 300:5~~
		H4-400-C	Square 3CT 400:5

SR-3CT

SR-3CT - 100

◆	CT ratio	S1	100	100:5
		SH	150	150:5
		S2	200	200:5
		S3	300	300:5
		S4	400	400:5

ZCT

ZCT - 035

◆	Inner-diameter	035	35mm
		080	80mm
		120	120mm

Memo

General information

Domestic awards

■ Korea
1985The Presidential Prize of '85 National Invention Awards
1986The Ministerial Prize of National Invention Promotion Awards
The KYUNGHYANG Energy Prize
The Ministerial Prize of Korea Electronics Exhibition
The Golden Prize of '86 National Invention Awards
1989The Order of Industrial Service Merit
The Grand Prix of '89 National Invention Awards
1990The Bronze Prize of '91 National Invention Awards
1991The Venture Company of 1991
1994The Electric Industry Development Prize of KOMA
The Order of Industry Service Merit
1995The Tower of Export
1998UN WIPO Prize
1999The Order of Industrial Service Merit
2003. 11 The Premier Prize of SIEF
2004. 11 The Premier Prize of Electrical Engineering Awards
2006. 05 The Ministerial Prize of 41th National Invention Awards
2007. 05 The Tower Prize of 42th National Invention Awards

■ International Awards
1989The Silver Medal of INPEX Pittsburgh
1990The Silver Medal of Geneva International Invention Award
1992The Golden Medal of De L'Invention De Paris
1993The Bronze Medal of Beijing International Award
1998The Golden Medal of IENA98. Germany

Worldwide service network

ASIA
- Korea
- China
- Japan
- Taiwan
- Hongkong
- Vietnam
- Philippines
- Thailand
- Singapore
- Malaysia
- Indonesia
- Sri Lanka
- India
- Pakistan
- U.A.E
- Bahrain
- Syria
- Iran

OCEANIA
- Australia
- New Zealand

EUROPE
- Switzerland
- Turkey
- Greece
- Spain

AFRICA
- Egypt
- South Africa

AMERICA
- Mexico
- Brasil
- USA
- Peru

제품 인증 현황표

Approved		SS	AR	ST	SP	SE	SE2	DS	DS1 DS2 DS3	DZ	EGRFM PMZ EVRPMR SDDR420	3DD	FD	3DZ	FDZ	3DM	FDM	3DE	FDE	SSD	CT	ZCT
CE	CE	● ●			● ●	● ●	● ●	● ●	● ●	● ●	● ●	● ●	● ●	● ●	● ●							
UL	UL	●								●										● ●		
KR	KR	●		●		●										● ●	● ●	● ●				
ABS	ABS	●															●		●		●	
SEV	SEV																					
CCS	CCS											●				●						
¨TUV	TÜV																			●		
CSA	CSA																					
RINA	RINA																●		●		●	
CCC	CCC	●				● ●	● ●							● ●	● ●	● ●	● ●	● ●	● ●	●		

Technical information

Option-1. Looping (Protect smaller current by looping option)

Some motor size may require one-third or one-fourth of particular EOCR current range. These installations can be accommodated by looping the motor wire 2 or 3 times through the integral current transformers of the EOCR. This reduces the number and type of relays inventoried for spare purposes. Each additional loop will increase the current measured as indicated by the following chart.

	Current setting range (A)	No. of passing (#)	No. of loops (#)
05 Type	0.5 ~ 6	1	0…
	0.25 ~ 3	2	1…
	0.17 ~ 2	3	2
	0.12 ~ 1.5	4	3
Looping Option	0.10 ~ 1.2	5	4
	▼	▼	▼

Single pass

Double pass

Option-2. External current transformer option

(Ext. CT option protect bigger current)

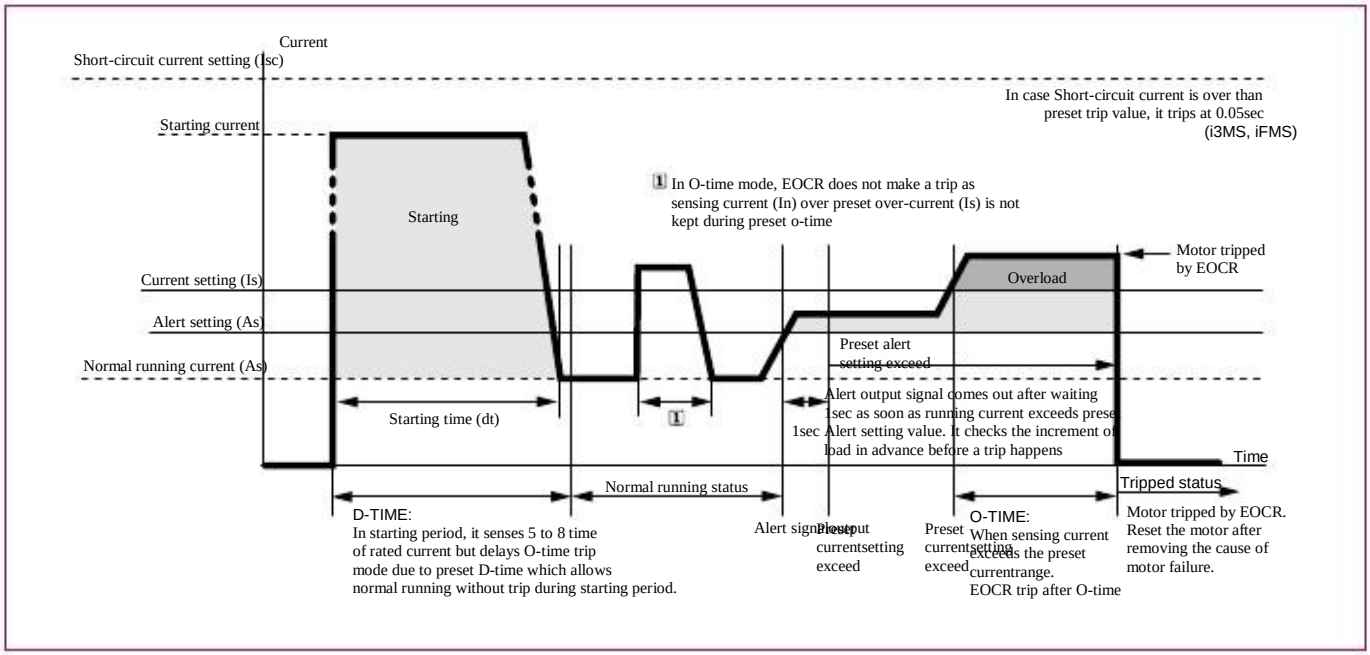
Ordering option - 05 type of each model fitted to an external current transformer can achieve higher ampere ranges.
(EOCR-3DM/3MZ/3M420/FDM/FMZ/FM420)

	DIP SW setting	Current setting range (A)	Current ratio of Ext. CT
05 type	05	0.5 ~ 10	NIL
60 type	60	5.0 ~ 60	NIL
	05	10 ~ 120	100 : 5
	05	15 ~ 180	150 : 5
Ext. CT option	05	20 ~ 240	200 : 5
	05	30 ~ 360	300 : 5
	▼	▼	▼

EOCR type table for 3 phase motor

EOCR type and CT	Current setting range (Adjustable) [A]	Capacity of 3 phase motor AC220 [V] kW HP	AC380/440 [V] kW HP	Motor current [A] AC220V	AC380V	AC440V	Cable size IEC [㎟] AC220V	AC380V	AC440V
05	0.5~10	1 1	1.5 2	4.8	4.2	3.6	4	4	4
60	5~60	2 2	3 5	48	49	42	16	25	25
100:5	10~120	3 3	5 7.5	93	84	73	50	50	50
150:5	15~180	3 5	7.5 10	125	121	105	70	70	70
200:5	20~240	5 7.5	10 15	160	163	141	95	120	120
300:5	30~360	7.5 10	15 20	310	263	227	300	240	240
400:5	40~480	10 15	20 25	440	376	325	-	400	400
500:5	50~600	15 20	25 30	572	424	390	-	-	400

EOCR setting platform / Motor running current



Over current and time setting tips.

▪ Setting tips in definite TCC mode

1. Over current threshold (OC) : Set the OC at the rating current of a motor. To protect machine together, it is recommended to set at 110~120% of the actual normal operating current.

2. Starting delay time (D-time) : Set an expected start-up time to reach the normal speed of load. If you do not know it, set to 15sec at first and start-up the motor to measure the time to reach the normal operation speed by monitoring the displayed current and then change the time into 2 sec longer than the time measured. For a Y-D start, it's better to set time longer than the preset time of the timer by 2sec minimum normally.

3. Operation time (O-time) : Set the trip delay time which activates and counts down under a fault condition.

▪ Setting tips in inverse or thermal inverse TCC mode

1. Over current (OC) : Set the OC at the rating current of a motor.

2. Starting delay time (D-time) : Usually, set D-time to zero. With zero D-time, the cold curve is applied before the load current cross down the OC, and then the hot curve is applied.
If the start-up time is long and fast trip is required during motor running, set D-time to start-up time or longer. In this case, over current protection is blocked during the start-up, and the hot curve is applied when D-time expires.
Since thermal inverse has no relation with D-time, set D-time to zero when the thermal inverse is selected.

3. Operation time (O-time) : It has 30 curves of 1~30 which conforms to the IEC947-4-1 standard.
The class value approximately equals to the time to trip under 550% of overload by the cold curve characteristic.

EOCR Setting Guide

This is a setting guide and advice for user's reference only .

Conditions to be checked for the normal operation of EOCR .

1. Check the status of correct settings by pressing the UP/DN button in sequence.
2. When you enter themenu and wait for 3 sec, it starts countdown during the O-timesetting. and display with a trip to the output. This means EOCR is operating well.
3. Check all the sequence wiring if it issafe and correct .
4. After completion of the motor starting, check if the current display is fine, When the %LED in the bar graph doesn't show, it needs to check if the operation current is too lower than the Oc setting value by 65% and on the contrary, the %LED shows 100% (red LED lights on), It is advised to check the Oc setting if the re-adjustment is necessary.
5. If the motor starting isn't completed but EOCR operates, refer to the Troubleshooting guide first and contact customer care center if the trouble isn't cleared.

Basic model (3DM / FDM)

Pd:000 Password input is necessary to chage the setting value of EOCR, if a password is memorized except 000.
If the password is set to 000, no password input is necessary in "000" to enter the setting change mode. Please take caution not to forget the password.No password function is provided in 3DM2/FDM2, 3MZ2/FMZ2.

Ph:3Ph The default setting is a 3phase motor. The setting change tois necessary for 1 phase motor.

tcc:dE Time current characteristic (TCC). the defaut setting is tcc : dE (definite TCC).

ct:non The default setting is "non", setting value is the primary current with an external CT combination in this mode.
(Ex: in case of 200; 5, the setting is 200)

FS: on If the control power or EOCR itself has a problem, the motor stops with the output relay trip in the "FS: on" mode. The default setting is. **FS:oFF**

rP: on For the application which motor rotation direction is important , "rP: on" should be set .
"rP:oFF" setting doesn't make a problem after completion of the installation for the permanent stable application.
The default setting is "rP:oFF".

oc: 35 It is recommended for "oc" to set at the rating current of motor. Default setting is oc:5.0A .

dt: 5 It means a starting delay time setting for a motor start up duration from the start of motor to the normal running current. The start up duration depends on the inertia of load. Therefore, it is recommended to set the time after measuring the time and current by EOCR with the initial set of D-time at 20 sec. For a Star-delta start, the longer time by 2sec than the setting of Star-delta timer is recommended. Default setting is 5 sec.

ot: 5 It means the overcurrent trip time in definite TCC, when motor operating current (In) exceeds over current setting (Is) during the ot setting time, EOCR trips. Default setting is 5 sec. The advantage of definite TCC is that user is able to set accurate time and current and lead a mechanical protection of load together with motor protection.

cLS: 5 This is a trip class(curve) setting in Inverse TCC or Thermal inverse TCC. The trip time changes according to the operating current inverse proportionally. Thermal inverse TCC reflects the Heat capacity of motor based on the current measurement.

uc:oFF It means under current (Dry Run) protection, If a level switch has a problem in a submersible pump, It backs up the level switch function from no water running of pump and protect the motor from overheating. For the machinery running with a belt (including conveyer), It candetect a broken belt. The current setting should be higher than rating no load current of motor for this function. The default setting is "oFF" .

ut: 5 It is "uc" trip delay time setting . If you don't set the "uc" function (uc:oFF), "ut" setting doesn't appear at the menu.

PL: on This memu is to determine "enable/disable" of PL (Phase loss) funnction. If you set "Ph:1Ph" at the power phase selection menu for a single phase power supply line, this menu doesn't appear automatically.

PLt: 3 It is trip delay time setting for PL. The default setting is 2 sec. For single phase power line setting, it doesn't appear at the munu.

Ub: 15 EOCR calculates the unbalance rate among three phase currents. It trips after "Ubt" setting time under a unbalanced condition. The default setting is "oFF".

Sc: 4 Locked Rotor protection during starting up a motor (Stall). If a rotor of motor is locked during starting and keep the current at higher than the "Sc" setting during D-time, EOCR trips in 0.5sec after D-time. The default setting is "Sc: 4".
The setting value is a multiple of "oc" setting value. This function operates under the Definite TCC condition.
It is disabled under the Inverse TCC setting generally. But if you set D-time greater than zero in Inverse setting, Stall operates when d-time expires.

EOCR Setting Guide

Locked rotor protection during normal running of motor (Jam). It is used to prevent a problem caused by rapid load increae. The setting value is a multiple of "oc" setting value. The trip delay time setting range is 0.2~10 sec.

Alarm setting by % of the overcurrent threshold (oc). The output contact 07-08 makes a signal of A,F,H according to the ALo setting.

Reset type setting mode. Reset method shows below.

Electrical Reset . EOCR resets by power cycle of control power or ESC button. It can be used for a remote reset which enables EOCR to reset from a remote site.

Hand Reset (Manual Reset). EOCR can be reset by ESC button only.

Auto Reset . The time setting range is up to 20 minutes (20n). The auto reset number. of times is connected to the restart limitation setting menu. If the number of restrat over the restart limitation number. in the "rn" setting menu during 30 minutes, EOCR doesn't reset anymore.

Restart limitation number. It prevent a motor from a burning fail caused by many restarts during 30 minutes. In case an emergency restart is necessary, put the setting at "OFF" This function activates in Auto-Reset mode only.

Modbus slave (ID) address. It can be set at No. 1 ~ 247.

Setting for communication speed. Select one among 1.2kbps, 2.4kbps, 4.8kbps, 9.6kbps,19.2kbps, 38.4kbps.

Parity setting. Select one among odd, even, non. even parity is displayed as "Eun".

Communication loss checking menu. If EOCR does not receive a data frame during "Lt" setting time, it displays an error message. The setting range is OFF, 1~999 sec.

Total running hour. Time accumulation starts if there is a minimum sensing current in the line up to 99,999 hours. User can check it anytime but not allowed to erase it. Display unit is 1 hour.

Running hour which user can set and erase the setting value. If you set the Alert output type at the "ALo: to", the output contact 07-08 repeats close and open to give a signal after the preset accumlated time elapsed.

Self EOCR Check. If you push SET button in this menu, EOCR count time up 3sec and "ot" setting time and displays "End" with the output contact trip. This means EOCR is operating well. This function is blocked during motor running.

Additional menu (i3MS/iFMS)

Short Circuit protection. Setting value is a multiple of "oc" set value.
Default setting is 10 times of "oc" setting.

Short Circuit trip delay time during motor starting to prevent a trip caused by starting current."OFF" setting is possible .

Additional Menu (i3MZ/iFMZ, 3MZ2/FMZ2)

Earth leakage protection current setting. The default setting is 0.5A. Minimum setting value is recommeded, if there is no leakage current in the motor by the current display. If the display shows a leakage current more than 50mA, user must check the insulation of motor and line. In the case of installing EOCR at the secondary side of Inverter, it's better to take care of EOCR opreration error due to harmonics of Inverter.

Earth leakage trip time. The default setting is "0.05sec". It is recommended to set the faster time and lower current than the earth fault protection relay in the upper power system.

Earth leakage trip delay time during motor starting to prevent a trip caused by a stray current and harmonics of the starting current in motor.

Additional menu (i3M420/iFM420)

Current range setting menu of 4~20mA analog output signal. The setting value corresponds to the max analog output (20mA). The setting value can be made independently from "oc" setting .
Analog output current formula :

$$mA = \frac{I}{rS} \times 16 + 4$$

Where, CTR is the parameter for CT, i.e. in case of CI : non, it is 1. I is the measured average lond current.
If the load current is equal or greater than this value, analog output is fixed to 20mA . For the current lower than minimun sensing current of EOCR(0.4A), the analog output signal gives 4 mA .

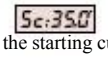
Troubleshooting Guide

1. Reversed phase :

It trips instantly within 0.15sec from the motor starting. Check the phase sequence and cable direction of the power line going to the motor first. The sequence of EOCR internal CT is A(L1), B(L2), C(L3) from the left side. If the passing order of motor line to the EOCR doesn't coincide with the order of EOCR CT or not same all the direction of cables, It trips by RP. In this case, change the order of the two cables among three. When the sequence of cables to the motor changes in the downstrenm side of EOCR , EOCR isn't able to check the RP. The sequence of cables should be coincided from the power mains to the motor. If the RP is not an indispensable function or only necessary for the first installation and fixed in the site, Thesetting is recommended for normal operation.

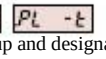
2. Overcurrent :

Overcurrent trip displays the biggest current among three phases and the small LED in the left side shows the phase.
If the trip current is lower than the rating current of motor, check the "oc" setting if it is too low. The recommended "oc" setting is 110%~120% of actual running current in the definite TCC.

3. Stall : 

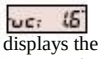
When the starting current doesn't go down below the "Sc" setting during D-time. EOCR trips by Stall within 0.5se when D-time expires. Check the status of load and D-time, whether the D-time is too short or not. The recommended D-time is longer by 1sec than a time that the motor come to the normal running current .

4. Phase loss :



The small LED in the left side lights up and designates which phase is lost in the display like as PL - r, PL - S, PL - t,
To check the PL status, put the PL trip time at the maximum and measure the lost phase current by a clamp meter after a test start, whether there is a current in the motor line or not. The minimum operating current (min setting current) of motor sensed by EOCR can make trip due to hunting current. Need to check load operation condition of the application in this case. If the clamp meter shows a normal current in the lost phase line, Check the EOCR status.

5. Unable to starting :
Even though the sequence wiring is O.K. If the motor is not able to be started with no magnetic contactor energized, Check the Fail Safe menu ofwith the output contact status (NO, NC) of EOCR

6. Undercurrent : 

Undercurrent trip displays the lowest current among three phases and the small LED in the left side shows the phase.
The example shows the sensing current of 1.6A in L2(S) phase. For the heater line broken detection in a heater application. EOCR trips by undercurrent according to the setting in delta connection, and trips by phase loss in Star connection.

7. Current unbalance :

Ideally, the motor currents of three phases are balanced. If a current unbalance is high, the motor need to be checked.
The formula is as follows.
Unbalance factor (%) = ($I_{max\ phase}$ - I_{min_phase}) / I_{max_phase} × 100%

8. Jam :

Rapid overload protection during motor running, Check the load which cause impacts it. If you find no problem in the load and motor, try to chage the setting value higher of the time and current to be appropriate for the application.

9. Unable to reset :

If you cannot reset EOCR by control power interruption, Check the reset type setting first. In the setting of
User can reset EOCR by ECS button only. If you want to reset EOCR by both control power cycle and ECS button, Put the setting at

Modbus network setting

Communication setting value
Please set the Modbus communication parameters by PCON or HMI for the communication.
- Slave address
- Baud rate
- Parity
- Communication loss timeout

Slave address
The EOCR has slave addresses from 1 to 247.
The factory default setting is 1.

Baud rate
The Communication speed provided is like below.
- 1.2kbps
- 2.4kbps
- 4.8kbps
- 9.6kbps
- 19.2kbps
- 38.4kbps

The factory default setting is 19.2kbps

Parity setting
- Even
- Odd
- None

The factory default setting is even. Please refer to the table for the stop bit setting.

Parity setting	Stop bit
Even or Odd	1
None	2

Communication loss timeout
It is the criteria to confirm the communication disconnection with a master like as PLC. EOCR judges it as a communication disconnection error, if there is no call from the master during a certain preset time.
The time setting range is 1~999sec the factory default setting is OFF. The OFF means no communication error check. It is advised to set it at OFF, if there is no concern of communication disconnection or no needs of communication error check at ordinary times.

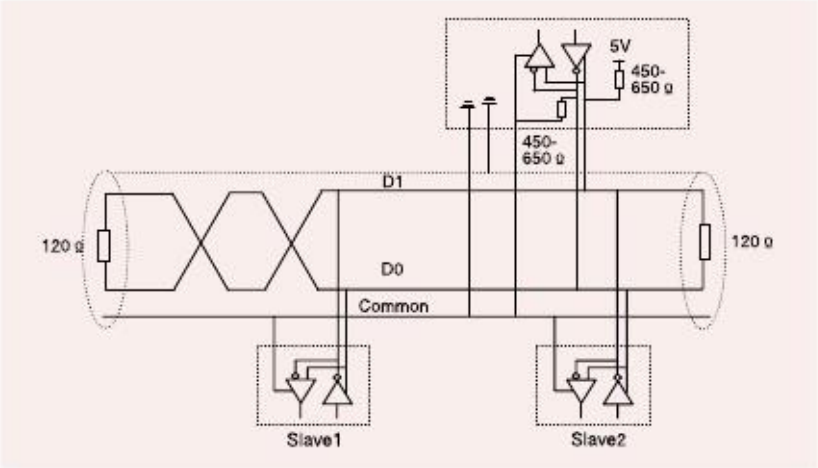
RS485 bus connection

RS485 standard allows several different characteristics.
- Polarization
- Line terminator
- Number of slaves
- Length of the bus

There is a definition of Modbus presented in detail at the website of Modbus.org in 2002.
Standard connection

Standard connection

The standard connection conforms to the Modbus specifications, sepecially 2 wire multidrop serial bus diagram, presented at the website of Modbus.org in 2002 (Modbus_over_serial_line_V1.pdf, Nov.2002). Simple wiring diagram is like below.

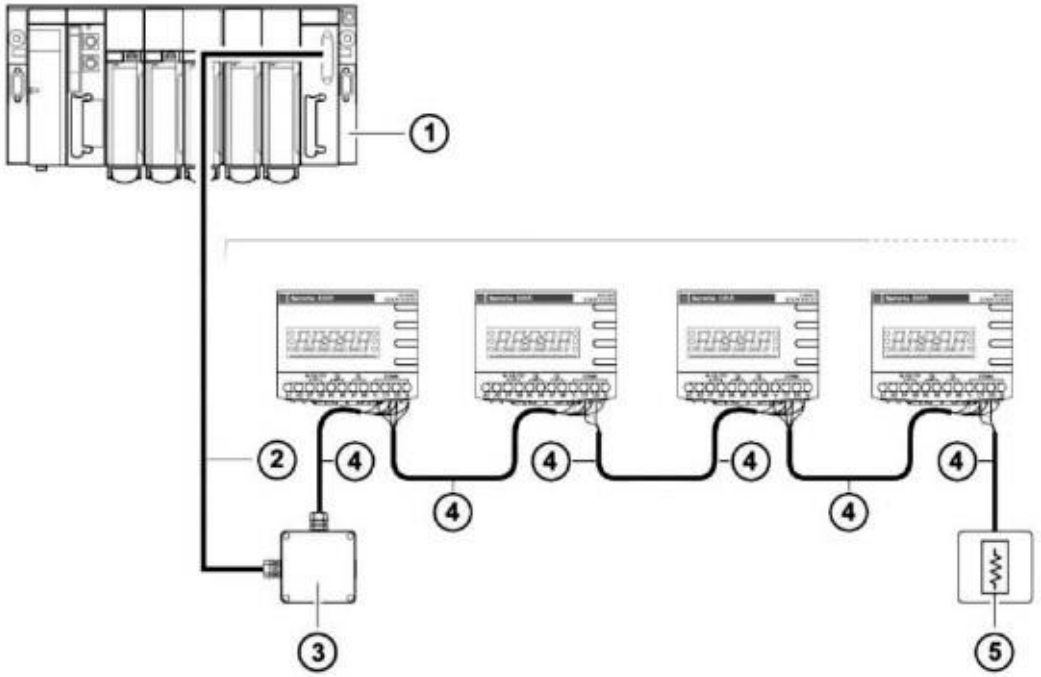


The characteristics is like below in case of a direct connection to the bus.

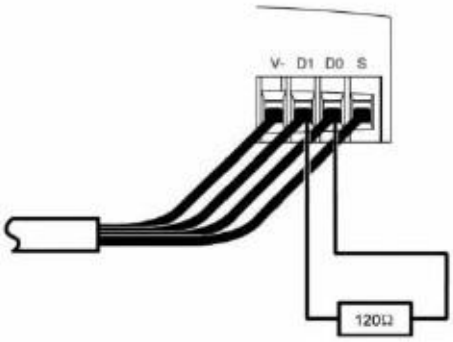
Items	Contents
Type of trunk cable	single, shielded, twisted pair cable. Min 3rd cable
Maximum length of the bus	1000m (3,2181 ft) (at 19.2kbps)
Maximum number of stations without repeater	32 stations (31 slaves)
Maximum length of tapoffs	◆20m (66ft, at 1 tapoff) ◆40m (131ft, divided by tapoff no. in Multi-Junction Box)
Bus polarization	◆450 - 650Ω Pullup resistor, 5V basis ◆450 - 650Ω Pulldown resistor, Recommend the polarization to Master at Common. There is no polarization at RS485 of EOCR .
Line terminator	120Ω Resistor, + /- 5%
Common polarity	YES (connect 1 protection ground minimum to the bus)

Communication Guide

Bus connection through a SCA type junction box



1. Master (PLC, PC or communication module)
2. Modbus cable (It is different according to the master side or a master having polarization combined to the other part of Bus)
3. Junction box
4. Modbus cable
5. Line terminators : 120Ω - 0.25W



Please use a cable with 2pair shieded twisted conductors for Interface protection.
It is adviced to isolate the Modbus cable 30cm(11.8in) at least from a power cable.
If necessary, intersect the Modbus cable to a power cable perpendicularly.
Refer to the diagram in the left side for the line terminator wiring.

EOCR de Mexico S.A. de C.V.

PROTECCION TOTAL DE MOTORES

Sensores - Controladores - Equipo Neumático

DIRECCIÓN SUCURSAL: BOULEVARD AEROPUERTO,
MIGUEL ALEMÁN VALDEZ
TOLUCA, ESTADO DE MÉXICO
TEL: (722) 280 35 71
(722) 327 81 57