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



#### **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.

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 $\leq$ 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 (le) exceeds setting current (les) 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	selection Fail safe operation for OL trip output.			
Pre alarm selection	larm selection Pre alarm signaling by the 07-08 output contact			
Total running hour	tal 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.			

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

#### Specifications

	Model		3DM2 / FDM2	, 3MZ2 / FMZ2			
Over current Rated setting range (A)		Rated setting range (A)	Definite TCC : 0.5~60A : use external CT higher	than 60A			
overcurrent	er current		Inverse TCC : 0.5~60A : use external CT higher than 32A				
Under current	Under current Rated setting range (A)		0.5A ~ less than oc setting				
Operating time of	characteristics		Definite(Def) / Inverse(Inv)				
	Def	D-time	0~200s				
	Def	O-time	0.2~30s				
	Inv & th (cLS)		1~30 classes				
Time setting	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-res	et (A-r)			
	Voltage		100~240VAC/DC (85% ~110%, Free voltage), 24	4VAC/DC (±5%).			
Control power	Frequency		50/60Hz				
	Power consum	ption	Lower than 7VA				
	Capacity		3A/250VAC resistive.				
Output			1a1b : OC or GR				
	Composition		1a : AL				
Disalar	7 Segment LE	)	3 phase amps, Cause of trip, Setting parameters indication.				
Display Bar graph			Load factor.				
Mounting			Panel mounting (3DM2/3MZ2)				
			Flush mounting (FDM2/FMZ2)				
Insulation Between case & Circuit		Between case & Circuit	Over DC500V 10MΩ				
		Between case & Circuit	2kV, 50/60Hz, I Min.				
Dielectric streng	ıth	Between contacts	1kV, 50/60Hz, I Min.				
		Between circuit	2kV, 50/60Hz, 1 Min				
Electrostatic dis	charge (ESD)	IEC61000-4-2	Level 3 : Air discharge : ±8kV, Contact discharge : ±6kV				
Radiated disturb	ance	IEC61000-4-3	Level 3 : 10V/m, 80 ~ 1000MHz				
Conducted distu	Irbance	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)				
		Store	-40°C ~ +85°C				
Environment	Temperature	Operation	-20°C ~ +60°C				
	Humidity		30~85% RH (Non-condensate)				
<b>_</b>	-	Window type	70W × 74.5H × 83.8D				
Dimension		Bottom hole type	70W × 56.3H × 108.1D				
			3DM2 / 3MZ2	FDM2 / FMZ2			
		Window type	265g	350g			
Weight		Bottom hole type	295g	390g			
-		Terminal type	295 + 120 = 415g	390 + 120 = 510g			
		Display (W/3M cable)		125g			
Power consump	tion		Less than 7VA.				

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

#### Front face









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.

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

#### 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.



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

#### Setting sequence and menu

No.	Menu	Parameter	Description	Default
1	Selection of phase No.	Ph: 3Ph Ph: 1Ph	"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	Ph: 3Ph
2	Operation curve	bee:db bee: In bee:no	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	te cidt
3	CT ratio	<u>etinon eti200</u> <u>eti 2t</u> eti800 eti St	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.	ctinan
4 #1	Frequency	Fr 9:60 Fr 9:50	Frequency setting mode. Select 50 or 60 based on the system fundamental frequency.	Fr 9:60
5	Fail safe	FS: on FS:oFF	Selection of fail safe(No volt release) mode for overload trip output, OL. Refer to fail-safe operation	FS:oFF
6	Reversed phase detection	rP: on rP:oFF	Enable or disable reverse phase detection	rP:oFF
7	Over current threshold	ac: 3.5*	Threshold for over current protection. this value cannot be set below a under current threshold (uc).	ac: 3.51
8	Start delay time	<i>dt:</i> 5.	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.	<i>dt:</i> 5.
9	Over current duration (Trip delay time / Trip class )	αέ: 5.	(tcc:dE) : the fault(over current) duration of definite overcurrent protection. (tcc:ln) : 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).	ot: 5.
10	Under current threshold	uc: 0.5	Threshold for under current protection. The setting should be higher than noload current of a motor. The current value cannot be set higher than OC.	uc: 0.5
11	Under current duration (Trip delay time)	ut: 5.	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	ut: 5.
12 #1	Earth fault (Ground fault) threshold	Ec:0.05*	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	Ec: 0.51
13 #1	Earth fault trip delay time	<i>EE:0.05</i> *	Earth fault duration (Trip delay time) TCC is definite characteristic	<i>EE:1</i> .
14 #1	EF starting delay	Edt: 5.	Blocking time of earth fault detection during motor starting. OFF, 1~30s adjustable this timer is only active during motor starting.	Edt: 0.
15	Phase loss	PL: on PL:oFF	Enable or disable Phase Loss(Single Phasing) detection. If the "Ph:1Ph" is selected , this menu is not displayed.	PL: on
16	Phase loss time	PL E: 3.	Fault duration for phase loss operation. The setting range is 0.5~5 sec. if "PL: oFF" is selected, this menu is not displayed.	PL &: 3.
17	Imbalance threshold	<i>Шь: 15</i>	Threshold for current imbalance operation. To disable the function, set to "oFF", the setting range is 10~50%. Imbalance factor (%) = ( $m_{axphase} - m_{n_phase}$ ) / $m_{ax\_phase} \times 100\%$ Imbalance fault duration (trip delay time) for current imbalance operation. The setting range is 1~10 seconds.	LIB: 15
18	Imbalance fault duration	<i>Ubt:</i> 5	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.	<i>Шы</i> ы: 5
19	Stall threshold	50: 4	Setting range : oc=0.4~30A : 2~8times, oc < 40A : 2~6times, otherwise (oc<60A) : 2~4times, (with Ext. CT : ?)	50: 4
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 : ?)	_# <b>?:</b>

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

#### Setting sequence and menu

No.	Menu	Parameter	Description	Default	
21	Jam fault duration	<i>.1</i> 2: 3.	Jam fault duration (trip delay time) Setting : 0.2~10 sec	<i>:11: 3</i> .	
		RL: 85 RL:0FF	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".	RL:oFF	
		RLo: 8	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.		
22 #2	Alert	RLa: 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.		
#2		RLa: 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.		
		Resta	If the accumulated running hour is more than the running hour threshold, the alert output repeats close for 1s and open for 1s.		
		RLaiuc	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).		
		r:2:2-r	Fault reset (electrical reset) by a power cycle or by pressing the ESC button.	r::::	
23	Reset	r:::::::::::::::::::::::::::::::::::::	Fault reset (hand reset) by only pressing the ESC button.		
		rt:8-r 8r: 15. 8r: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.	rn:off	
25	Total running hour	-&rh- 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		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	E E SE	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.

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

#### Alert operation pattern (3DM2 & FDM2 only)

ALo Stage selection	Starting	Norma operation	Higher than the preset alert value	Trip
Aux ( <u>RLo; R</u> )				
Flicker ( $\beta_{L,0}; \beta$ )				
Hold ( $\begin{array}{c} RL & R \end{array}$ )				

- 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
	95 Ø 🕂 Ø 96 Close	95 Ø Ø 96 Open	95 Ø / Ø 96 Close
ON	97 Ø— 🖂 Ø 98 Open	97 Ø 🕂 Ø 98 Close	97 Ø— 🔶 98 Open
	95 Ø / Ø 96 Close	95 Ø / Ø 96 Close	95 Ø──
OFF	97 ØØ 98 Open	97 Ø—   - Ø 98 Open	97 Ø / 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	iac: 35	OC Trip caused by r(L1)- phase current	· 35	· 3.4.	. 3.4		
Phase loss	*PL -r	Phase loss caused by r(L1)- phase lost	• 001	· <u>5</u> .5*	. 5.5		
Reversed phase	- ,- / <sup>2</sup> - Phase reversal trip		· 3.4*	· <u>3</u> .4*	• 34		
Stall	• Sc: 39.21	Stall trip during motor starting caused by s(L2)-phase curren	· 348.	• 35.7*	. 34.81		
Jam	. <i>18: 15.8</i> °	Jam trip during motor running caused by t(L3)-phase current	· "[]^*	· /5,/7 *	. 15.8		
Imbalance	.!!:: 4.21	Imbalance trip caused by t(L3)- phase current	: <i>5.8</i> .	· 5.8°	. 4.57		
Under current	·uc: 1.6	Under current trip caused by s(L2)-phase current	· 2.2·	· /£*	. 2.2		
Earth fault (3MZ2/FMZ2)	:::::::::::::::::::::::::::::::::::::::	Earth fault(Earth leakage) trip with Earth fault current indication	· 3.5*	· 3.4	. 3.4		
Limitation of auto-restart	rn:Ful	In 30minutes, the number of auto-restar by auto-reset exceeds the setting		nual reset by pressing ESC	clears the restart		

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

#### Time-current characteristic curve

#### Definite characteristic



#### Inverse characteristic



Setting range	Number of pass through the CT hole	External CT ratio	CT setting	Remark
0.5 ~ 60A	1	No CT combination	ctinan	
0.25 ~ 3A	2	No CT combination		
0.1 ~ 1.2A	5	No CT combination	ct: 55	
0.5 ~ 32A	1	No CT combination	ctinan	Inverse TCC
0.5 ~ 60A	1	No CT combination	ctinan	Definite TCC
10~100A	1	100 : 5	cE: 188	Definite or inver
20 ~200A	1	200 : 5	ct:200	Definite or inver
30 ~ 300A	1	300 : 5	<i>cE:300</i>	Definite or inver
40 ~ 400A	1	400:5		Definite or inver
50 ~ 500A	1	500:5 <b>EESSO</b>		Definite or inver
60 ~ 600A	1	600 : 5	ct:588	Definite or inver
70 ~ 700A	1	700 : 5	cE:750	Definite or inver
80 ~ 800A	1	800 : 5	ct:800	Definite or inver

#### **Current setting range**

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

#### Typical wiring schematic (EOCR-3DM2/FDM2)



#### Typical wiring schematic (EOCR-3MZ2/FMZ2)



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

#### Typical wiring schematic (EOCR-3MZ2/FMZ2)











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

#### **Control terminals**



#### EOCR-3MZ2/FMZ2 ("A" Type)



#### EOCR-3MZ2/FMZ2 ("C" Type)



#### EOCR-3MZ2/FMZ2 ("D" Type) ₩ ZCT QĻ GR 96 Z1 A1 A2 95 57 58 Z2 1 বা ₹ 4 T Control Power ZCT input OL NC output EF NO output

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

#### **Dimension of 3XX2**



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

#### **Dimension of FXX2**



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

#### Ordering



	0	Model name iFDM			Basic model
	U	wodername	iFMZ		GF model
Window CT		WR 0.			0.5~60A
WINDOW OT			H1		100:5 3CT combination type
	0	Current Range	HH		150:5 3CT combination type
250	G	ourient hange	H2		200:5 3CT combination type
			H3		300:5 3CT combination type
Bottom CT			H4		400:5 3CT combination type
denomination of the second				Α	a(97-98) : OC, a(57-58) : GR
A REAL PROPERTY.	0	Output contact type	FMZ2	С	b(95-96), a(97-98) : OC.GR common
A Martin				D	b(95-96) : OC, a(57-58) : GR
Contract of the local data			FDM2	D	b(95-96), a(97-98)
Terminal	0	Control voltage	В		24VAC/DC
-		Control voltage	U		100~240VAC/DC
			W		Window type
	6	CT type	Н		Bottom hole type
			Т		Terminal type
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	6	Export code	Q		

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

