Digital Electronic Over Current Relays





by Schneider Electric

EOCR 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.)



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



- Integrated model, Improved functions
- RoHS Compliant



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Old model	Measurement method	Operation TCC	Reset	Mounting	Protect	ions fun	ction		Additional function	New model						
3DD			Manual		Panel • Din-Rail Overcurrent, Phase loss,	-			Trip cause display	3DM2						
3DE			Manual	Panel • Din-Rail		Quereurrent	Rail	Under			Trip cause display-store the latest three histories.	Or i2DM				
3DM	2CT	TCC	Manual auto			current	urrent		Bar graph, Running hour timer, Trip cause display-store the latest three histories.	ISDIM						
FD	Inverse Manual reversal TCC Panel Lock rot Manual Din-Rail Imbalan	reversal,	-	-	Alen	Bar graph, Trip cause display										
FDE		100	Manual	Din-Rail	Imbalance	Under			Bar graph, Trip cause display- store the latest three histories.	or						
FDM			Manual auto	Flush mount		current			Bar graph, Running hour timer, Trip cause display-store the latest three histories.	IFDIN						
3DZ			Manual			-		-	Trip cause display	3M73						
3EZ	- Definite TCC - 3CT • Inverse TCC	Definite	Manual	Panel Din-Rail		Under		-	Trip cause display-store the latest three histories.	or i2M7						
3MZ			2CT	2CT	2CT	2CT	2CT	TCC	Manual auto		Overcurrent, Phase loss,	current	rent Ground	-	Bar graph, Running hour timer, Trip cause display-store the latest three histories.	13142
FDZ		Inverse	Manual	Panal	Phase reversal, Lock rotor, Imbalance	Phase reversal,	Phase reversal,	-	Fault	-	Bar graph, Trip cause display	EM72				
FEZ		100	Manual	Din-Rail		Under		-	Bar graph, Trip cause display- store the latest three histories.	or iFM7						
FMZ			Manual auto	Manual current auto -	Thust mount	-	Bar graph, Running hour timer, Trip cause display-store the latest three histories.	IF MZ								
3D420			Manual			-		-	Trip cause display							
3E420		Manual Panel Din-Rail	Under current	-	Trip cause display-store the latest three histories.	i3M420										
3M420	201	TCC Manual Overcurrent,			-	Bar graph, Running hour timer, Trip cause display-store the latest three histories.										
FD420		Inverse	Manual	Panal	Phase loss, Phase reversal.	-	-	-	Bar graph, Trip cause display							
FE420		100	Manual	Din-Rail	Lock rotor, Imbalance	Under		-	Bar graph, Trip cause display- store the latest three histories.	iFM420						
FM420			Manual auto	Flush mount		CUI	current		-	Bar graph, Running hour timer, Trip cause display-store the latest three histories.						
3DS	-	Dofinito	Manual	Panel	Overcurrent	-			Bar graph, Trip cause display	10140						
3MS		TCC	Manual auto	Din-Rail	Phase loss,	n-Rail Phase loss,	Phase loss,	Din-Rail Phase loss,	Din-Rail Phase loss,	Under current	Short		Bar graph, Running hour timer, Trip cause display-store the latest three histories.	131415		
FDS	301	Inverse	Manual	Panel	reversal, Lock rotor,	-	circuit	-	Bar graph, Trip cause display							
FMS	_	_	100	Manual auto	Din-Kail Flush mount	Imbalance	Under current			Bar graph, Running hour timer, Trip cause display-store the latest three histories.	IFMS					

New digital

	250**
Model 3DM2/ FDM2 3MZ2/ FMZ2	i
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 • •	
Window hole	
CT type Bottom hole	
Terminal •	
Overcurrent	
Undercurrent	
Stall	
Jam • •	
Protection Phase loss	
function Phase reversal	
Ground fault	
Short circuit	
Thermal inverse	
4-20m∆ output	
Bar graph	
Dia graph	E D
Display 5 Digit 7 Segment 5 Digit 7 Segment	50
Additional	
function	
Trip cause display and Store	
Total running hour	
Running hour timer -	
Reset Manual/Auto/Electric Manual/Auto/Electric	Man
Comm. protocol	MO
3DD, 3DE, 3DM 3DZ, 3EZ, 3MZ	30
FD, FDE, FDM FDZ, FEZ, FMZ	FI

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New digital with Communication









3DM / iFDM	i3MZ / iFMZ	i3M420 <mark>/ iFM420</mark>	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
•	•	•	•
•	•	•	•
•	•	•	•
•	•	•	•
•	•	•	•
•	•	•	•
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•	•	•	•
•	•	•	•
•	•	•	•
-	•	-	-
-	-	-	•
•	•	•	•
-	-	•	-
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
D, 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	Now reference	Display	Cabla	Option
Old Telefence	New relefence	Display	Cable	ZCT
	3DM2-WRDBW(T)	-	-	-
3DD-05DB, 3DD-60DB, 3DE-WRDB, 3DM-WRDB	3DM2-WRDBH(T)	-	-	-
3DD-05DZ7, 3DD-60DZ7, 3DE-WRZF7, 3DE-WRDZ7,	3DM2-WRDUW	-	-	-
3DMWRDZ7	3DM2-WRDUH	-	-	-
FD-05DBW(T), FD-60DBW(T), FDE-WRDBW(T),	FDM2-WRDBW	EOCR-PDM	CABLE-RJ45-xxx	-
FDMWRDBW(T)	FDM2-WRDBH	EOCR-PDM	CABLE-RJ45-xxx	-
FD-05DZ7W(T), FD-60DZ7W(T), FDE-WRDF7W(T),	FDM2-WRDUW	EOCR-PDM	CABLE-RJ45-xxx	-
FDMWDZ7W(T), 3DM-WDZ7W(T)	FDM2-WRDUH	EOCR-PDM	CABLE-RJ45-xxx	-
	3MZ2-WRABW	-	-	ZCT-xxx
3DZ-05ABA(B), 3DZ-60ABA(B), 3EZ-WRABA, 3MZWRABA(B)	3MZ2-WRABH	-	-	ZCT-xxx
	3MZ2-WRCBW	-	-	ZCT-xxx
3DZ-05CBA(B), 3DZ-60CBA(B), 3MZ-WRCBA(B)	3MZ2-WRCBH	-	-	ZCT-xxx
3DZ-05AZ7A(B), 3DZ-60AZ7A(B), 3EZ-WRAF7A, 3EZ-WRAM7A,	3MZ2-WRDBW	-	-	ZCT-xxx
3MZ-WRAZ7W(T)A(B)	3MZ2-WRDBH	-	-	ZCT-xxx
	3MZ2-WRAUW	-	-	ZCT-xxx
3DZ-05CZ7A(B), 3DZ-60CZ7A(B), 3MZ-WRCZ7W(T)A(B)	3MZ2-WRAUH	-	-	ZCT-xxx
	3MZ2-WRCUW	-	-	ZCT-xxx
3DZ-05DBA(B), 3DZ-60DBA(B), 3MZ-WRDBA(B)	3MZ2-WRCUH	-	-	ZCT-xxx
	3MZ2-WRDUW	-	-	ZCT-xxx
3DZ-05DZ7A(B), 3DZ-60DZ7A(B), 3MZ-WRDZ7W(T)A(B)	3MZ2-WRDUH	-	-	ZCT-xxx
FDZ-05ABW(T)A(B), FDZ-60ABW(T)A(B), FEZ-WRABW(T)A,	FMZ2-WRABW	EOCR-PDM	CABLE-RJ45-xxx	ZCT-xxx
FMZ-WRABW(T)A(B)	FMZ2-WRABH	EOCR-PDM	CABLE-RJ45-xxx	ZCT-xxx
	FMZ2-WRCBW	EOCR-PDM	CABLE-RJ45-xxx	ZCT-xxx
FDZ-05CBW(T)A(B), FDZ-60CBW(T)A(B), FMZWRCBW(T)A(B)	FMZ2-WRCBH	EOCR-PDM	CABLE-RJ45-xxx	ZCT-xxx
	FMZ2-WRDBW	EOCR-PDM	CABLE-RJ45-xxx	ZCT-xxx
FDZ-05DBW(T)A(B), FDZ-60DBW(T)A(B), FMZWRDBW(T)A(B)	FMZ2-WRDBH	EOCR-PDM	CABLE-RJ45-xxx	ZCT-xxx
FDZ-05AZ7W(T)A(B), 3DZ-60AZ7W(T)A(B), FEZWRAF7W(T)A,	FMZ2-WRAUW	EOCR-PDM	CABLE-RJ45-xxx	ZCT-xxx
3EZ-WRAM7W(T)A, 3MZ-WRABW(T)A(B)	FMZ2-WRAUH	EOCR-PDM	CABLE-RJ45-xxx	ZCT-xxx
	FMZ2-WRCUW	EOCR-PDM	CABLE-RJ45-xxx	ZCT-xxx
FDZ-05CZ7W(T)A(B), 3DZ-60CZ7W(T)A(B), FMZWRCZ7W(T)A(B)	FMZ2-WRCUH	EOCR-PDM	CABLE-RJ45-xxx	ZCT-xxx
	FMZ2-WRDUW	EOCR-PDM	CABLE-RJ45-xxx	ZCT-xxx
FDZ-05DZ7W(T)A(B), 3DZ-60DZ7W(T)A(B), FMZWRDZ7W(T)A(B)	FMZ2-WRDUH	EOCR-PDM	CABLE-RJ45-xxx	ZCT-xxx
	i3M420-WRDBW	-	-	-
3D420-059, 3D420-609, 3E420-WR9, 3M420-WR9	i3M420-WRDBH	-	-	-
3D420-053, 3D420-603, 3D420-056, 3D420-606, 3E420-WR91,	i3M420-WRDUW	-	-	-
3M320-WR3, 3M420-WR6	i3M420-WRDUH	-	-	-
FD420-0539, FD420-6039, FD420-0569, FD420-6069,	iFM420-WRDBW	EOCR-PDM	CABLE-RJ45-xxx	-
FE420-WR91(3), FM420-WR91(3)	iFM420-WRDBH	EOCR-PDM	CABLE-RJ45-xxx	-
FD420-0531(3), FD420-6031(3), FD420-0561(3), FD420-6061(3),	iFM420-WRDUW	EOCR-PDM	CABLE-RJ45-xxx	-
FE420-WR3(1), FE420-WR6(1), FM420-WR31(3), FM420-WR61(3)	iFM420-WRDUH	EOCR-PDM	CABLE-RJ45-xxx	-
	i3MS-WRDBW	-	-	-
3DS-05DB, 3DS-20DB, 3MS-05DB, 3MS-20DB	i3MS-WRDBH	-	-	-
	i3MS-WRDUW	-	-	-
3DS-05DZ7, 3DS-20DZ7, 3MS-05DZ7, 3MS-20DZ7	i3MS-WRDUH	-	-	-
FDS-05DBW(T), FDS-20DBW(T), FMS-05DBW(T).	iFMS-WRDBW	EOCR-PDM	CABLE-RJ45-xxx	-
FMS-20DBW(T)	iFMS-WRDUH	EOCR-PDM	CABLE-RJ45-xxx	-
FDS-05DZ7W(T), FDS-20DZ7W(T), FMS-05DZ7W(T),	iFMS-WRDBW	EOCR-PDM	CABLE-RJ45-xxx	-
FMS-20DZ7W(T)	iFMS-WRDUH	EOCR-PDM	CABLE-RJ45-xxx	-



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



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.

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

Protection functions

Protection item	Condition & Setting range	Operation time	
Over everent (e.e)	Condition : Load current (In) exceeds setting current (Is)	Definite (Def) : 0.2~30s Adjust.	
	Setting range : 0.5~60A (Def), 0.5~32A (Inv & th)	Inverse (Inv) & Thermal (th) : 1~30 class	
	Condition : Load current (In) less than setting currentIn \leq uc		
Under current (uc)	uc should be less than oc setting	OFF, I~IUS Adjustable	
Dhees less (DL)	Condition : max imbalance is more than 85% among 3 phase current,		
Phase loss (PL)	Enable or disable : Selectable	OFF, 0.5~55 Adjustable	
Deverse shees (DD)	Condition : Reversed phase sequence input on EOCR.		
Reverse phase (RP)	Enable or disable : Selectable	Within 0.15S	
	Condition : In \geq Stall current setting (Sc). Active only in motor starting		
Stall (Sa)	0.5~30A : 2~8 times of oc setting	Right after D-time elapsed	
Stall (SC)	~40A : 2~6 times,		
	~60A : 2~4 times.		
	Condition : In \geq Jam current setting (JA). Active only in motor running		
Jam (JA)	0.5~50A : 1.5~5 times of oc setting	0.2~5s Adjustable	
	~60A : 1.5~4 times of oc setting		
Imbolones (IM)	Condition : Current imbalance \geq Setting imbalance %	1 100 Adjustable	
	Setting range : 10~50% of imbalance	I~IUS Adjustable	
Forth foult (FF)	Condition : EF current (Ie) exceeds setting current (Ies)	0.05~5s Adjustable	
	OFF, 0.03~10A	i3MZ/iFMZ only	
	Condition : SC current (Is) exceeds setting current (Iss)	0.05000	
Short circuit (SH)	0.5~10A : 2~22 times of oc setting,		
	~20A : 2~11 times of oc setting	13MS/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	on 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.			

Specifications

Model			i3DM / iFDM, i3MZ/iFMZ, i3MS/iFMS, i3M42	20/iFM420	
Over current		Rated setting range (A)	Definite TCC : 0.5~60A. : use external CT hig	pher than 60A	
			i3MS/iFMS : 0.5~20A : use external CT higher	er 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 ch	aracteristics		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 consum	ption	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 parame	ters 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 10MQ		
Dielectric strength	1	Between case & Circuit	2kV, 50/60Hz, I Min.		
		Between contacts	1kV, 50/60Hz, I Min.		
		Between circuit	2kV, 50/60Hz, 1 Min		
Electrostatic disch	narge (ESD)	IEC61000-4-2	Level 3 : Air discharge : ±8KV, Contact discharge : ±6KV		
Radiated disturba	nce	IEC61000-4-3	Level 3 : 10V/m, 80 ~ 1000MHz		
Conducted disturb	bance	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°, 27	0°)	
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	/UW × 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	on		Less than 7VA.		

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

Front face

in San

V DN

Mode selection

switch



7 segment LED Display

SET .

Reset

Set / Store



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

Bar graph

- \bullet 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-i3DM (Z, S, 420) / iFDM (Z, S, 420)

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

	Γ
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



EOCR Samwha EOCR

by Schneider Electric

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

Setting sequence and menu

No.	Menu	Parameter	Description	Default
1	Pass word	Patala	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.	Pa:000
2	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
3	Operation curve	<u>te c:d£ te c: In</u> te c:th te c: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	tecide
4	CT ratio	ct:nan ct:200 ct: 2t ct:800 ct: 5t	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.	ctinan
5 #1, #2	Frequency	Fr 9:60 Fr 9:50	Frequency setting mode. Select 50 or 60 based on the system fundamental frequency.	Fr 9:6.[]
6	Fail safe	FS: on FS:oFF	Selection of fail safe(No volt release) mode for overload trip output, OL. Refer to fail-safe operation	FSiaFF
7	Reversed phase detection	_rP: on rP:off	Enable or disable reverse phase detection	rP:cFF
8	Over current threshold	ac: 35'	Threshold for over current protection . this value cannot be set below the under current threshold (uc).	: <u>5</u> ,7,•
9	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 dt expires.	<i>dt: 5</i> .
10	Over current duration (Trip delay time / Trip class)	at: 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).	at: 5.
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)	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.
13 #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: 0.5
14 #1	Earth fault trip delay time	<i>EE:0.05</i> *	Earth fault duration (Trip delay time) TCC is definite characteristic	Et:1 .
15 #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.
16 #2	Short circuit current threshold	<u>5H: 12</u>	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.	5 <i>H: 10</i>

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

Setting sequence and menu

No.	Menu	Parameter	Description	Default
17 #2	SC starting delay	5 <i>Hd</i> : 7.	Blocking time of short circuit detection during motor starting. This timer is only active during motor starting.	5 <i>84: 0</i> .
18	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
19	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	PLE: 3.
20	Imbalance threshold	<i>Lib:</i> 15	Threshold for current imbalance operation. To disable the function, set to "oFF", the setting range is 10~50%. Imbalance factor (%) = (Imax phase - Imin_phase) / Imax_phase x 100%	<i>LIE: 15</i>
21	Imbalance fault duration	Ubt: 5	Imbalance fault duration (trip delay time) for current imbalance operation. The setting range is 1~10 seconds.	<i>Libt:</i> 5
22	Stall threshold	<u>5</u> c: 4	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)	55: 4
23	Jam threshold	Y	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)	_ <i>11</i> 7: 4
24	Jam fault duration	<u>_://:</u> _].	Jam fault duration (trip delay time) Setting : 0.2~10 sec	JE: 3.
25 #3	420 Output range	<u>r 5: 5,0</u> *	Reference value for max analog output (20mA) If the load current is equal or greater than this value, analog output is fixed to 20mA	r 5: 5./] [*]
		AL: 85 AL:oFF	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: R	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.	
26 #4	Alert	RLo: 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.	
		RLo: 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.	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
		RL a:t a	If the accumulated running hour is more than the running hour threshold, the alert output repeats close for 1s and open for 1s.	
		RLaure	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).	

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

Setting sequence and menu

No.	Menu	Parameter	Description	Default
		r:::::::::::::::::::::::::::::::::::::	Fault reset (Electrical reset) by a power cycle or by pressing the ESC button.	r:::
27	Reset	r::::::	Fault reset (Hand reset) by only pressing the ESC button.	
		<u>rt:8-r</u> <u>Ar: 15.</u> 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), Stall(Sc) and Jam(JA)	r nia F F
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.	
30	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
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	
		Rd:1	Modbus slave (ID) address. Range : 1 ~ 247.	Rd:1
32	Communication	<u>68: 192</u> 68:38.9	Setting for communication speed Range : 1.2kbps, 2.4Kbps, 4.8Kbps, 9.6Kbps,19.2Kbps, 38.4Kbps.	60:192
		Pr:Eun Pr:nen	Parity setting Range : odd, even, non.	Pr:Euri
		<u>LE:0FF</u> <u>LE:999</u>	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	<u> </u>	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.

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

Alert operation pattern (i3DM & iFDM only)

Running ALo Stage Selection	Starting	Norma Operation	Higher than the preset Alert value	Trip
Aux (<u>RLo: R</u>)				
Flicker ($\frac{122}{100}$; $\frac{1}{5}$)				
Hold (<u> </u>				

- 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 / Ø 96 Close	95 Ø— - Ø 96 Open	95 Ø / Ø 96 Close
	97 Ø— – Ø 98 Open	97 Ø / Ø 98 Close	97 Ø— – Ø 98 Open
OFF	95 Ø / Ø 96 Close	95 Ø / Ø 96 Close	95 ØØ 96 Open
	97 Ø— - Ø 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	'ac: 35'	OC Trip caused by r(L1)- phase current	· 36.	• 34	. 3.4	
Phase loss	· PL - r	Phase Loss caused by r(L1)- phase lost	· []]]	· <u>5</u> 5	. <u> </u>	
Reversed phase	- r P -	Phase reversal trip	· <u>3</u> 4.	· <u>3</u> 4.	· <u>34</u> .	
Stall	•Sc:35,2*	Stall trip during motor starting caused by s(L2)-phase curren	· 34.8*	• 35,27*	. 34.8*	
Jam	<i>18: 15,8</i> *	Jam trip during motor running caused by t(L3)-phase current	• <u> </u>	· /5_7*	. 15.81	
Imbalance		Imbalance trip caused by t(L3)- phase current	· <i>5.8</i> ·	· 5.8*	. 4.5	
Under current	·uc: 1.5	Under current trip caused by s(L2)-phase current	·	· 7.5°	. <i>c</i> ² . <i>c</i> ² .	
Earth fault (i3MZ/iFMZ)	: <i>er:00.</i> 51	Earth fault(Earth leakage) trip with Earth fault current indication	3.5	• 34	. 3.4	
Short circuit (i3MS/iFMS)	• <i>58:128</i> 1	Short Circuit trip caused by s(L2)-phase current	<u>וכנז</u>	· 128*	. 120	
Limitation of auto-restart	rn:Ful	In 30minutes, the number of auto-restar by auto-reset exceeds the setting	For emergency restart, m counter to zero.	anual reset by pressing ES	C clears the restart	

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

Time-current characteristic curve



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Definite characteristic



Thermal inverse characteristic



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	chan an	
0.25 ~ 3A	2	No CT combination	ct: 25	
0.1 ~ 1.2A	5	No CT combination	et: St	
0.5 ~ 32A	1	No CT combination	chinan	Inverse TCC or thermal Inverse TCC
0.5 ~ 60A	1	No CT combination	chinan	Definite TCC
10 ~100A	1	100 : 5	<u>ct:/88</u>	Definite or inverse (th)
20 ~200A	1	200 : 5	<u>et:200</u>	Definite or inverse (th)
30 ~ 300A	1	300 : 5	cE:300	Definite or inverse (th)
40 ~ 400A	1	400 : 5	cE:400	Definite or inverse (th)
50 ~ 500A	1	500 : 5	ct:500	Definite or inverse (th)
60 ~ 600A	1	600 : 5	<u>ct:5000</u>	Definite or inverse (th)
70 ~ 700A	1	700 : 5	<u>ct:700</u>	Definite or inverse (th)
80 ~ 800A	1	800 : 5	ct:800	Definite or inverse (th)

Typical wiring schematic

(M)



Bottomhole type

Wiring at F Storf Setting

M

Wiring at FS: on Setting

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

Typical wiring schematic











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

Control terminals











EOCR-i3MS/iFMS		
	A1 A2 47 48 95 96 97 98 V- D1 D0 S	Modbus
Control power		OL NO output
SH NO output		OL NC output

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



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



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





External CT combination type

i3DN	1 - WR D	U	W	Q	
0	0 8	4	6	0	
		i3DM i3MZ i3M420		Basic model	
•	Model name			GF model	
U	Model fiame			4~20mA output model	
		i3MS		SC model	
		wb	,	0.5~60A	
				0.5~20A (i3MS)	
		H1		100:5 3CT combination type	
0	Current Range	HH		150:5 3CT combination type	
		H2		200:5 3CT combination type	
		H3		300:5 3CT combination type	
		H4		400:5 3CT combination type	
			Α	a(97-98) :OC, a(57-58) : GR	
B	Output contact type	i3MZ	С	b(95-96), a(97-98) : OC.GR common	
v	output contact type		D	b(95-96) :OC, a(57-58) : GR	
		D		b(95-96), a(97-98)	
A	Control voltage	В		24VAC/DC	
	Control Voltage	U		100~240VAC/DC	
		W		Window type	
6	CT type	Н		Bottom hole type	
		Т		Terminal type	
6	Export code	Q			

EOCR-iFXX	iFDN	1 - WR D	U	W	Q
	0	2 8	4	6	0
			iFDN	Л	Basic model
250	•		iFMZ	Z	GF model
	U	Model name	iFM42	20	4~20mA output model
Window CT			iFMS	S	SC model
					0.5~60A
		Current Range	WR		0.5~20A (iFMS)
R.			H1		100:5 3CT combination type
Bottom CT	0		HH		150:5 3CT combination type
Bottom of			H2		200:5 3CT combination type
			H3		300:5 3CT combination type
250			H4		400:5 3CT combination type
			Α	Α	a(97-98) :OC, a(57-58) : GR
Terminal		0	iFMZ	С	b(95-96), a(97-98) : OC.GR common
	ଷ	Output contact type		D	b(95-96) :OC, a(57-58) : GR
			D		b(95-96), a(97-98)
	•	Control voltors	В		24VAC/DC
	0	Control voltage	U		100~240VAC/DC
(a) (a) (b)			W		Window type
O C A	6	CT type	H		Bottom hole type
External CT			Т		Terminal type
combination type	6	Export code	Q		
combination type	•	P			1

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

Ordering					
Display	EOCR-PDMQ				
250**					
Cable connector	CAB	LE - RJ45	- 00	1	
	•	U	U	_	
		Connector type		R	J45
			00		0.5 m
s#().	9	Cable length			1m 15m
	Ø	Cable length	0		1.5 m
				12 13	2 m
			Oth	ers	Custom made
			01		
Square 3 CT	<u>3CT</u>	[H1] - [100 - H1- HH- H2- H3- H4-	C 100-C 150-C 200-C 300-C 400-C	Square 3CT 100:5 Square 3CT 150:5 Square 3CT 200:5 Square 3CT 300:5 Square 3CT 400:5
SR-CT	SR-3	BCT - 100			
AND REPORTED IN			S1	100	100:5
			SH	150	150:5
	0	CT ratio	S2	200	200:5
			S3	300	300:5
			54	400	400:5
ZCT	ZCT	- 035 •			
			0	35	35mm
	0	Inner-diameter	0	80	80mm
			1:	20	120mm



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.

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

Protection functions

Protection item	Condition & Setting range	Operation time	
Over everent (co)	Condition : Load current (In) exceeds setting current (Is)	Definite (Def) : 0.2~30s adjust.	
Over current (oc)	Setting range : 0.5~60A (Def), 0.5~32A (Inv)	Inverse (Inv) : 1~30 class	
	Condition : Load current (In) less than setting currentIn \leq uc		
Under current (uc)	uc should be less than oc setting	OFF, I~IUS adjustable	
Dhase less (DL)	Condition : max imbalance is more than 85% among 3 phase current,		
Phase loss (PL)	Enable or disable : Selectable	OFF, U.5~5S adjustable	
Devenue altress (DD)	Condition : Reversed phase sequence input on EOCR.		
Reverse phase (RP)	Enable or disable : Selectable		
	Condition : In \geq Stall current setting (Sc). Active only in motor starting		
	0.5~30A : 2~8 times of oc setting	Digitation D time classed	
Stall (SC)	~40A : 2~6 times,	Right after D-time elapsed	
	~60A : 2~4 times.		
	Condition : In \geq Jam current setting (JA). Active only in motor running		
Jam (JA)	0.5~50A : 1.5~5 times of oc setting	0.3~5s adjustable	
	~60A : 1.5~4 times of oc setting		
Imbolones (IM)	Condition : Current imbalance \geq Setting imbalance %		
Impalance (IM)	Setting range : 10~50% of imbalance		
	Condition : EF current (Ie) exceeds setting current (Ies)	0.05~5s adjustable	
Earth fault (EF)	OFF, 0.03~10A	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.

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 hig	her than 60A		
			Inverse TCC : 0.5~60A : use external CT high	her than 32A		
Under current		Rated setting range (A)	0.5A ~ less than oc setting			
Operating time char	acteristics		Definite(Def) / Inverse(Inv)			
Time setting	Def	D-time	0~200s			
		O-time	0.2~30s			
	Inv (cLS)		1~30 classes			
	GF delay time (E	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 consump	tion	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 contact	ts	1kV, 50/60Hz, I Min.			
	Between circuit		2kV, 50/60Hz, 1 Min			
Electrostatic discha	rge (ESD)	IEC61000-4-2	Level 3 : Air discharge : ±8kV, Contact discha	arge : ±6kV		
Radiated disturbance	e	IEC61000-4-3	Level 3 : 10V/m, 80 ~ 1000MHz			
Conducted disturba	nce	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		$70W \times 74.5H \times 83.8D$				
		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	l		Less than 7VA.			

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.



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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	tec:dt tec:In tec: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	
3	CT ratio	<u>ct:nan</u> <u>ct:200</u> <u>ct: 2t</u> <u>ct:800</u> ct: 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 9:67
5	Fail safe	FS: an FS:aFF	Selection of fail safe(No volt release) mode for overload trip output, OL. Refer to fail-safe operation	FSiaFF
6	Reversed phase detection	rP: on rP:off	Enable or disable reverse phase detection	rP:oFF
7	Over current threshold	ac: 3.51	Threshold for over current protection. this value cannot be set below a under current threshold (uc).	ac: 3.5°
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>d</i> : 5.
9	Over current duration (Trip delay time / Trip class)	at: 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). 	<u>at: 5</u> .
10	Under current threshold	ue: 0.51	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.	uc: 05.
11	Under current duration (Trip delay time)	<i>ut: 5</i> .	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	EE:1 .
14 #1	EF starting delay	Edt: 6.	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.	PLE: 3.
17	Imbalance threshold	<i>LIE:</i> 15	Threshold for current imbalance operation. To disable the function, set to "oFF", the setting range is $10 \sim 50\%$. 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 $1 \sim 10$ seconds.	<u>LIA: 15</u>
18	Imbalance fault duration	<i>U6E:</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>U66: 5</i>
19	Stall threshold	5c: 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	_ <i>1</i> 8: 4	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 : ?)	_ <i> </i> ?: 4

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

Setting sequence and menu

No.	Menu	Parameter	Description	Default
21	Jam fault duration	<u>_!!::</u> 3.	Jam fault duration (trip delay time) Setting : 0.2~10 sec	<i>_!!:: 3</i> .
		RL: 85 RL:oFF	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::::FF
		RLa: R	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	RLo: 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.	
		RLo: 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.	
		AL ast a	If the accumulated running hour is more than the running hour threshold, the alert output repeats close for 1s and open for 1s.	
		RLauc	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).	
		rt:E-r	Fault reset (electrical reset) by a power cycle or by pressing the ESC button.	$r_{L}^{I} = r$
23	Reset	- <u></u>	Fault reset (hand reset) by only pressing the ESC button.	
		rt:R-r Ar: 15. Rr: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	<u>rn: 3</u>	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:nFF
25	Total running hour	-Ech- 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	<u> </u>	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.

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Alert operation pattern (3DM2 & FDM2 only)

Running ALo stage selection	Starting	Norma operation	Higher than the preset alert value	Trip
Aux $(\begin{array}{cc} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \end{array} \end{array} \\ \begin{array}{c} \begin{array}{c} \end{array} \end{array} \end{array})$				
Flicker (1712				
Hold ($\exists l a: \exists l b b$)				

- 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 Tripped	
ON	95 Ø / Ø 96 Close	95 Ø— 🔶 Ø6 Open	95 Ø / Ø 96 Close
ON	97 Ø— – Ø 98 Open	97 Ø	97 Ø— – Ø 98 Open
055	95 Ø / Ø 96 Close	95 Ø / Ø 96 Close	95 ØØ 96 Open
OFF	97 Ø Ø 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 a	after trip with UP/ DN butt	on pressing						
Trip cause	Indication	Contents of indication	L1 LED on	L2 LED on	L3 LED on						
Over current	'ac: 35'	OC Trip caused by r(L1)- phase current	· 35.	· <u>-</u> ,,,,,,	. <u>-</u> ,,,,,						
Phase loss	• <i>PL</i> - r	Phase loss caused by r(L1)- phase lost	· [][]	· <u><u> </u></u>	. <u> </u>						
Reversed phase	- r ⁻ / ² -	Phase reversal trip	· <u>-</u> ,4.	· <u>3</u> .4.	· <u>-</u> ;						
Stall	·5c:35,7*	Stall trip during motor starting caused by s(L2)-phase curren	· 34.8	· 35,7°	. 34.81						
Jam	. <i>18: 15,8</i> 1	Jam trip during motor running caused by t(L3)-phase current	• <u> </u>	· "[. "5.5"						
Imbalance		Imbalance trip caused by t(L3)- phase current	· <i>5.8</i> ·	• 5.8*	. <u>4</u> .c ⁷⁺						
Under current	·uc: 1.5	Under current trip caused by s(L2)-phase current	··	· /,£	. <i>c</i> ² . <i>c</i> ² .						
Earth fault (3MZ2/FMZ2)		Earth fault(Earth leakage) trip with Earth fault current indication	3.5	•	. <u>3</u> .4°						
Limitation of auto-restart	rn:Ful	In 30minutes, the number of auto-restar by auto-reset exceeds the setting	For emergency restart, m counter to zero.	C clears the restart							

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

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	chinan	
0.25 ~ 3A	2	No CT combination	ct: c ⁷ t	
0.1 ~ 1.2A	5	No CT combination	et: St	
0.5 ~ 32A	1	No CT combination	ct:non	Inverse TCC
0.5 ~ 60A	1	No CT combination	chinan	Definite TCC
10 ~100A	1	100 : 5	-E:100	Definite or inverse
20 ~200A	1	200 : 5	<u>et:200</u>	Definite or inverse
30 ~ 300A	1	300 : 5	cE:300	Definite or inverse
40 ~ 400A	1	400 : 5	cE:400	Definite or inverse
50 ~ 500A	1	500 : 5	<i>c E</i> :5 <i>D D</i>	Definite or inverse
60 ~ 600A	1	600 : 5	<u>ct:588</u>	Definite or inverse
70 ~ 700A	1	700 : 5	<u>EE:700</u>	Definite or inverse
80 ~ 800A	1	800 : 5	- <i>E:800</i>	Definite or inverse

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 GR ٥Ļ $(\square$ (U)58 Z1 A2 95 96 57 A1 72 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)





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

EOCR-3XX2

Window CT

Bottom CT

Terminal

External CT combination type

0	0 0	4	6	6		
-		3DM	2	Basic model		
D	Model name	3MZ	2	GF model		
		WR	1	0.5~60A		
		H1		100:5 3CT combination type		
	Current range	HH		150:5 3CT combination type		
	-	H2		200:5 3CT combination type		
		H3		300:5 3CT combination type		
		H4		400:5 3CT combination type		
			Α	a(97-98) : OC, a(57-58) : GR		
<u> </u>	Output contact turns	3MZ2	С	b(95-96), a(97-98) : OC.GR common		
67	Output contact type		D	b(95-96) : OC, a(57-58) : GR		
		3DM2	D	b(95-96), a(97-98)		
	Control voltage	В		24VAC/DC		
9	Control voltage	U		100~240VAC/DC		
		W		Window type		
5	CT type	Н		Bottom hole type		
		Т		Terminal type		
6	Export code	Q				

R-FXX2		2 - WR D	U 4	W	Q 6		
	•	Model name	iFDN	Λ	Basic model		
250	U	wodername	iFMZ	Z	GF model		
			WR		0.5~60A		
dow CT			H1		100:5 3CT combination type		
	0	Current range	HH		150:5 3CT combination type		
±250±			H2		200:5 3CT combination type		
			H3		300:5 3CT combination type		
tom CT			H4		400:5 3CT combination type		
				Α	a(97-98) : OC, a(57-58) : GR		
And the second second	A	Output contact type	FMZ2	С	b(95-96), a(97-98) : OC.GR common		
250	•			D	b(95-96) : OC, a(57-58) : GR		
			FDM2	D	b(95-96), a(97-98)		
rminal	•	Control voltago	В		24VAC/DC		
-	U	Control voltage	U		100~240VAC/DC		
			W		Window type		
	6	CT type	Н		Bottom Hole type		
			Т		Terminal type		
-	6	Export code	Q				

combination type

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

Ordering					
Display	EOC	R-PDMQ			
Cable connector	CAB	LE - RJ45	- 00	1	
	•	Connector type		P	145
	U	Connector type	0	<u>п</u> .	0.5 m
				01	1 m
* ()	A	Cable length	0	111	15 m
	ø	Cable length	0	n2	2 m
			0	02	3 m
			Oth	ners	Custom made
			01		Ousion made
0000	0	CT ratio	H1- HH- H2- H3- H4-	100-C 150-C 200-C 300-C 400-C	Square 3CT 100:5Square 3CT 150:5Square 3CT 200:5Square 3CT 300:5Square 3CT 400:5
SR-3CT	SR-3	BCT - 100			
CONTRACTOR OF THE OWNER.			S1	100	100:5
			SH	150	150:5
	0	CT ratio	S2	200	200:5
			S3	300	300:5
			S4	400	400:5
ZCT	ZCT	- 0 <u>35</u>			
			0	35	35mm
	0	Inner-diameter	0	80	80mm
			1:	20	120mm

Domestic awards Korea 1985 The Presidential Prize of '85 National Invention Awards 1986 The 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 1989 The Order of Industrial Service Merit The Grand Prix of '89 National Invention Awards 1990 The Bronze Prize of '91 National Invention Awards 1991 The Venture Company of 1991 1994 The Electric Industry Development Prize of KOMA ASIA **OCEANIA** B Australia Korea The Order of Industry Service Merit New Zealand China 1995 The Tower of Export 1998 **UN WIPO Prize** 2 Japan EUROPE 8 Taiwan Switzerland The Order of Industrial Service Merit 1999 Turkev Hongkong 2003. 11 The Premier Prize of SIEF Ø Greece 6 Vietnam 2004. 11 The Premier Prize of Electrical Engineering Awards 6 Philippines Spain 2006. 05 The Ministerial Prize of 41th National Invention Awards Thailand 2007. 05 The Tower Prize of 42th National Invention Awards **AFRICA** Egypt 8 Singapore South Africa International Awards Malaysia Indonesia 1989 The Silver Medal of INPEX Pittsburgh **AMERICA** Mexico Sri Lanka 1990 The Silver Medal of Geneva International Invention Award Brasil 1992 India The Golden Medal of De L'Invention De Paris 🕲 USA B Pakistan 1993 The Bronze Medal of Beijing International Award Peru 🕼 U.A.E 1998 The Golden Medal of IENA98. Germany Bahrain Syria 🕼 Iran

에 古																										
Арр	roved	SS	AR	ST	SP	SE	SE2	DS	DS1 DS2 DS3	DZ	EVR	egr Sddr	PMR	3DD	FD	3DZ	FDZ	3DM	FDM	3DE	FDE	FM 420	PMZ PFZ	SSD	ст	zст
CE	Œ	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
UL		•							•									•	•		•	•		•		•
KR		•		•		•								•	•	•	•	•	•							
ABS	A	•													•		•		•							
SEV	(*)																									
ccs											•			•												
тüv	TÜV Rheinland																	•								
CSA																										
RINA															•		•		•							
CCC		•				•	•	•	•				•	•	•	•	•	•	•	•	•	•	•	•		

Worldwide service network

제프 이즈 허화고

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



EOCR type table for 3 phase motor

EOCR type	Current setting range	Capacity of 3 phase motor				Motor current [A]		Cable size IEC [mt]			
		AC220 [V]		AC380/440 [V]							
	(Adjustable) [A]	kW	HP	kW	HP	AC220V	AC380V	AC440V	AC220V	AC380V	AC440V
05	0.5~10	0.75	1	1.5	2	4.8	4.2	3.6	4	4	4
60	5~60	11	15	22	30	48	49	42	16	25	25
100:5	10~120	22	30	37	50	93	84	73	50	50	50
150:5	15~180	30	40	55	75	125	121	105	70	70	70
200:5	20~240	37	50	75	100	160	163	141	95	120	120
300:5	30~360	75	100	132	175	310	263	227	300	240	240
400:5	40~480	-	-	190	250	440	376	325	-	400	400
500:5	50~600	-	-	220	300	572	424	390	-	-	400

EOCR setting platform / Motor running current



EOCR Samwha EOCR

by Schneider Electric

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



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 Dtime 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.
- When you enter the <u>LESE</u> menu and wait for 3 sec, it starts countdown during the O-time <u>at</u>. <u>5</u>, setting, and display <u>End</u> with a trip to the output. This means EOCR is operating well.
- 3. Check all the sequence wiring if it is safe 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.
- 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)

- **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: 3PhThe default setting is a 3phase motor. The setting changetoPh: (Ph) is necessary for 1 phase motor.
- **Ecc:***dE* Time current characteristic (TCC). the defaut setting is tcc : dE (definite TCC).
- **Change** 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)
- **F5:** 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. $F_{5:a}F_{F}$
- 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".

- **bc:** <u>35</u> It is recommended for "oc" to set at the rating current of motor. Default setting is oc:5.0A .
- *ct*: 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.

- at: 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.
- *ct* 5: 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.
- **L***uc*:*aFF* 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) function. If you set "Ph:1Ph" at the power phase selection menu for a single phase power supply line, this menu doesn't appear automatically.
- **PLE: 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.
- **Lib: 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".
- **5***c*: **Y** 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 <u> 1</u>Я: Ч (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.

RL: 85 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.

- *r* <u>E</u>:<u>R</u> <u>r</u> 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.
- rn: 3 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.
- Rd: 1 Modbus slave (ID) address. It can be set at No. 1 ~ 247.
- 6P: 192 Setting for communication speed. Select one among 1.2kbps, 2.4kbps, 4.8kbps, 9.6kbps, 19.2kbps, 38.4kbps.
- Pr:Eun Parity setting. Select one among odd, even, non. even parity is displayed as "Eun".
- Communication loss checking menu. If EOCR does not LE: 10 receive a data frame during "Lt" setting time, it displays an error message. The setting range is OFF, 1~999 sec.
- -trh-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 -*r*hvalue. 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.

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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)

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

SHd: 7. 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)

- Ec: 0.5. 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.
- EE:00.5. 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.
- Евс: Б. 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)

r 5: 5.01 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 :



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, The $rP_{:o}FF$ setting is recommended for normal operation.

2. Overcurrent : oc: 35

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 : 5c:350

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 : *PL - - PL - 5 PL - E*

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 of $F_{5:aFF}$ with the output contact status (NO, NC) of EOCR.

6. Undercurrent : ωc : \mathcal{L}

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 : 116: 42

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 (%) = (Imax phase - Imin_phase) / Imax_phase \times 100%

8. Jam : 🛄 (<u>8. 15.8</u>)

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 : re:H-r

If you cannot reset EOCR by control power interruption, Check the reset type setting first. In the setting of $r \not : \not : \not : \neg r$

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 $r t \cdot t \cdot r$

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	32 stations (31 slaves)		
stations without repeater			
	• 20m (66ft, at 1 tapoff)		
Maximum length of tapoffs	 40m (131ft, divided by tapoff no. 		
	in Multi-Junction Box)		
	• 450 - 650 Ω Pullup resistor, 5V basis		
	 450 - 650Ω Pulldown resistor, 		
Bus polarization	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)		

Bus connection through a SCA type junction box





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.