Electronic Over Current Relays

Electronic Over current Relays

Electronic Under current Relays

Electronic Voltage Relays

Other Protection & Monitoring Devices

Current Transformers

a company of Schneider Electric

三和EOCR株式會社
EOCR Samwha EOCR Ltd.

General Information

Company History

1981 SAMWHA Engineering Co., Ltd incorporated
1988 SAMWHA R&D Center established
1990 The 2nd factory completed in Iksan, Korea
1990 Recognized as the Advanced Technology Small& Medium Sized Company by the Korean Ministry of Trade and Industry
1993 SAMWHA Electric(Tianjin)Co., Ltd. established in Tianjin, China
1994 SAMWHA Electronics (Beijing)Co., Ltd. established in Beijing, China
1995 SAMWHA R&D Center building completed in Eumsung, Korea
1996 SAMWHA Engineering (Vietnam) Co., Ltd. established in HCMC, Vietnam
1997 Reach to 5millions of EOCR production
1997 ASIC(Application Specific Intergrated Circuit) Chip Developed
1997 Registered to KOSDAQ(Registered No. 507)
1999 Approved to New Technology by Korean Government for ASIC Chip Applicable EOCR-3D&FD Series Product(Registered No. 5)
2001 Recognized Export Leading Company by Korean Government
2002 SAMWHA EOCR Ltd. Established

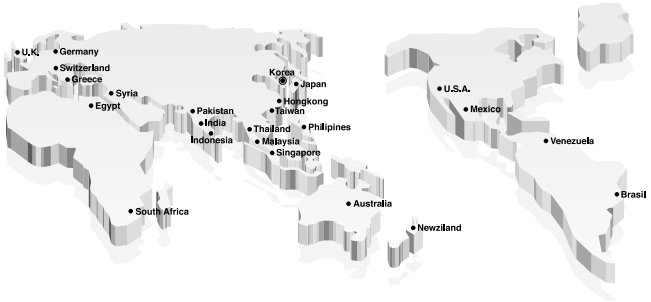
Domestic Awards

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
· The Order of Industry Service Merit
1995 · The Tower of Export
1998 · UN WIPO Prize
1999 · The Order of Industrial Service Merit

International Awards

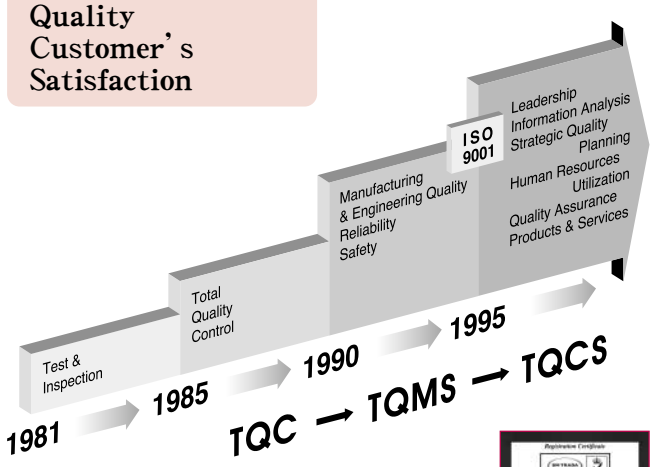
1989 · The Silver Medal of INPEX Pittsburgh
1990 · The Silver Medal of Geneva International Invention Award
1992 · The Golden Medal of De L' Invention De Paris
1993 · The Bronze Medal of Beijing International Award
1998 · The Golden Medal of IENA98. Germany

Worldwide Service Network



TQCS Quality System

Total Quality Customer's Satisfaction



Approved by BM TRADA(U.K)
Approved Date 1995. 8. 30

ISO 9001 Certificate

ISO 9001 Cerificate

Reliability & Safety

Approved			EOCR SS	EOCR SP	EOCR DS	EOCR 3D	EOCR FD	EOCR PMZ	EOCR PFZ	EVR
UL	UL	Underwriters Laboratories Inc	●	○	●	○	○	○	○	
CE	CE	Community European	●	●	●	●	●	●	●	●
ABS		American Bureau of Shipping	●				●			
SEV		Association Suisse Des Electriciens	●							
KR		Korean Register of Shipping	●			●	●			
CCS		China Classification Society	●			●				●
TÜV	TÜV Rheinland	TUV Germany				●				
CSA		Canadian Standards Association		○	○	○	○	○	○	
RINA		Registro Italiano Navale					●			

Intellectual Property

Item	Domestic			Overseas			Total
	Register	Applied for	No	Register	Applied for	No	
Patent	29	6	35	5	0	5	40
Utility Model	20	7	27	0	0	0	27
Design	25	0	25	0	0	0	25
Trade Mark	34	11	45	14	3	17	62
Total	108	24	132	19	3	22	154

Over Current Relay

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

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

	Current Setting Range(A)	Time of Passing (#)	No. of Loops (#)
05 Type	0.5 ~ 6	1	0…Fig 1
Looping Option	0.25 ~ 3	2	1…Fig 2
	0.17 ~ 2	3	2
	0.12 ~ 1.5	4	3
	0.10 ~ 1.2	5	4
	▼	▼	▼

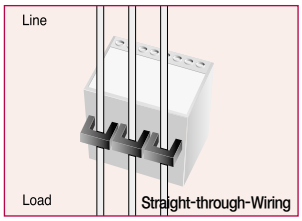


Fig 1

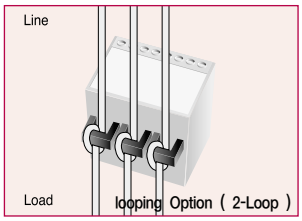
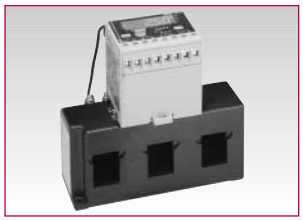


Fig 2

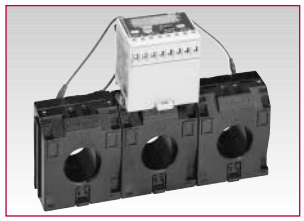
Option-2. External Current Transformer Option(Ext. CT option protect bigger current)

Ordering option - 05 type of each model fitted to an external current transformer can achieve higher ampere ranges.

	Current Setting Range(A)	Current Ratio of Ext. CT
05 Type	0.5 ~ 6	NIL
60 Type	5.0 ~ 60	NIL
Ext. CT Option	10 ~ 120	100 : 5
	15 ~ 180	150 : 5
	20 ~ 240	200 : 5
	30 ~ 360	300 : 5
	▼	▼



External 3CT Option

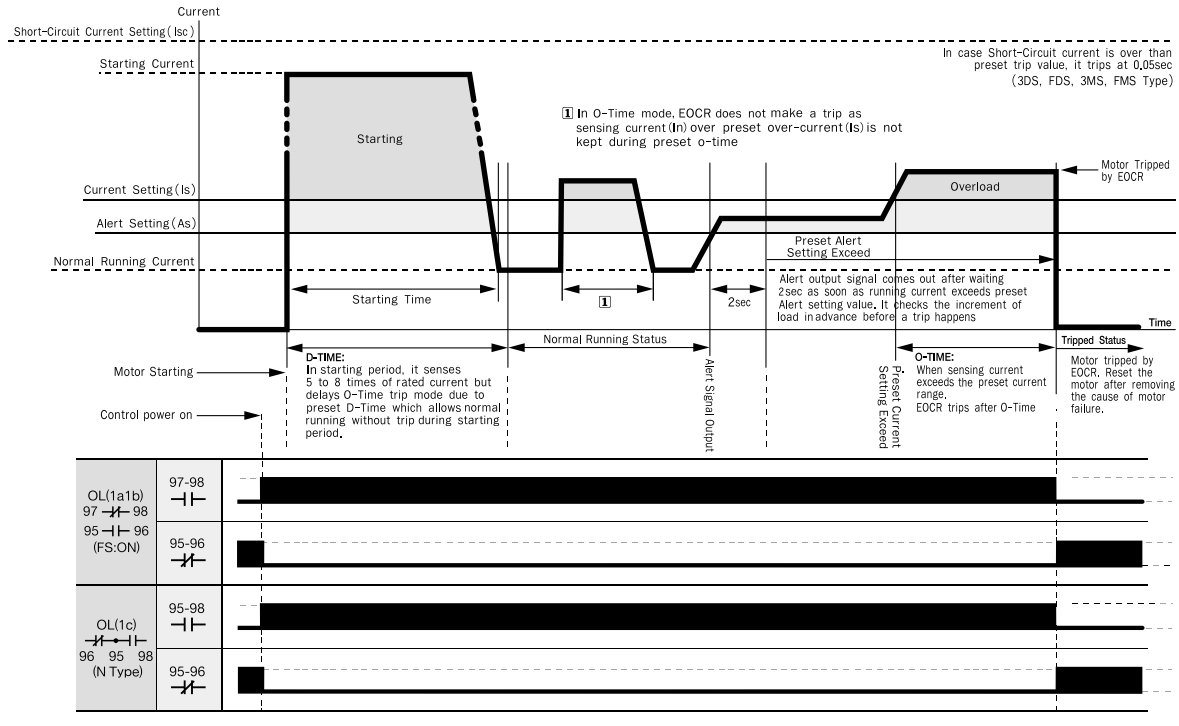


External SR-CT Option

EOCR Type Table for 3phase Motor

Current Setting Range (Adjustable) (A)	Capacity of 3 Phase Motor (kW/HP)						TYPE	Cable Size		Remark
	AC220(V)		Current (A)	AC380/440(V)		Current (A)		Thickness (㎟)	Allowable Current(A)	
	kW	HP		kW	HP					
0.5 ~ 6	0.75	1	4.8	1.5	2	4.2 / 3.6	**05**	3.5	28	
5.0 ~ 60	5.5	7.5	26	22	30	49 / 46	**60**	5.5~14	67	Built-in CT(Standard type)
10 ~ 120	22	30	93	37	50	84 / 73	100:05	38	130	Assemble with External CT
20 ~ 240	37	50	160	75	100	163 / 141	200:05	100	240	
30 ~ 360	55	75	230	132	175	263 / 227	300:05	250	430	
40 ~ 480	95	125	360	190	250	376 / 325	400:05	325	495	
50 ~ 600	110	150	440	220	300	423 / 390	500:05	400	565	
60 ~ 720	150	200	570	300	400	602 / 520	600:05	500	625	

EOCR Setting Patlem / Motor Running Current (3DD & FD Series)



Overview

■ **D-TIME(Delay Time):**

When starting the motor, it's current is increasing 5 to 8 times of rated current and its starting time is different according to the load of motors. D-Time knob(Mode) has a function to delay the trip during starting period even if starting current exceeds over preset over-current value.

■ **O-TIME (Operating Delay Time):**

When EOCR senses over-current which exceeds over preset over-current range.
O-Time knob(Mode) delays trip until EOCR trips after detecting over-current during running period.
In case of Definite type, Over-current protection is provided by the relay tripping when motor operating current(In) exceeds EOCR current setting(Is) for a period greater than preset trip time(O-Time), while Inverse type shows that Over-current protection is provided by the relay tripping according to the Time-Current Characteristic Curve.

■ **RESET**

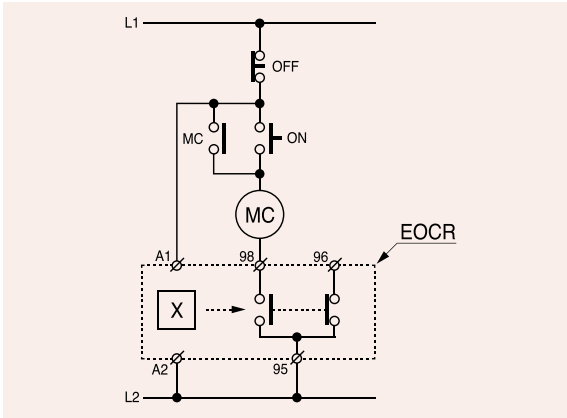
Depressing the RESET button or interrupting power supply resets the relay immediately.
Depress the RESET button on the facia for manual reset. Electrical Reset can be achieved by interrupting power supply in remote area. Auto Reset can be achieved automatically according to R-Time setting. Auto reset function is selectable by using mode switch.
EOCR with fixed auto reset time or adjustable auto reset time is applicable.

■ **TEST**

It has function to check and confirm the status of the motor by depressing the TEST button on the facia.
To keep depressing the TEST button makes relay trip after the elapse of D-Time and/or O-Time.
Once TEST is done, then reset the relay by depressing RESET button.
The test function of Digital EOCR with 7 Segment Display cannot be performed during motor running, but possible when motor is stopped.

N Type(Fail-safe Mode / No Volt Release)

NVR(No Volt Release)/On(N Type)
Fail-safe

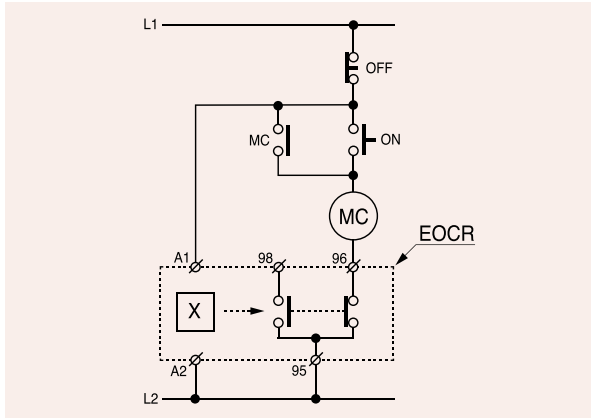


The output of relay is normally energized with control power applied.
It is called NVR (No Volt Release) function and recommended to use output mode for safe protection.
It is selectable by DIP switch or FS Mode

Caution) NVR function is designed to offer more accurate protection for motor. The motor can not start in case there is no power supply to EOCR or the span of life of motor is gone through. It is able to find the problem in its process in advance.

R type (Non-Fail-Safe Mode)

NVR(No Volt Release)/Off (R Type)
Non-Fail-safe



In all case, the failure of the control voltage may not interrupt the process. It is selectable by DIP switch or FS Mode

Caution) In case of Non-Fail-Safe mode, periodical checking is required in case there is abnormal power supply to EOCR or the span of life of motor is gone through.

Digital EOCR

Classfication			EOCR-3DE Series		EOCR-3M Series		
Model							
Model			3DE	3EZ	3DM	3MS	3MZ
Wiring	Wire-through		○	○	○	○	○
	Terminal		-	-	-	-	-
Mount	Flush Mounting		-	-	-	-	-
	Panel Mounting		○	○	○	○	○
Protection	Overcurrent	Basic Type	0.5~60A		05: 05~10A, 60: 5~70A	05: 05~10A, 20: 5~20A	05: 05~10A, 60: 5~7
		Use external CT	1~960A(10:5~800:5)		1~960A(10:5~800:5)		
	Undercurrent		0.5~less than preset O.C / OFF		0.5~less than preset O.C / OFF		
	Locked Rotor	Running	0.5, 1~10sec		1~10sec		
		Starting	Within 0.5sec after D-Time		Within 0.5sec after D-Time		
	Phase Loss		Within 3sec		Within 3sec		
	Phase Reversal		0.1~0.3sec		0.1sec		
	Phase Unbalance		Within 8sec		Within 8sec		
	Ground Fault		-	0.02~3A	-	-	A:0.03~2.5A, B:0.2~10
	Short Circuit		-	-	-	0.03sec	-
Alert Output			A/F/H/U	-	A/F/H	-	-
Trip Cause Memory			Last 3 Trip Cause		Last 1 Trip Cause		
Trip Cause Display			○	○	○	○	○
Display			4-Digit 7segment		5-Digit 7segment		
Running Time Memory & Setting			-	-	○	○	○
Bar-Graph			-	-	○	○	○
Current Signal Output			-	-	-	-	-
Setting SW. Type			Button SW.		Rotary SW & Button SW.		
Ground Fault Current Sensing			-	Zero Phase Current	-	-	Zero Phase Curren
Output Contacts	Output		O.L:2-SPST(1a1b)	O.L:1-SPST(1a)	O.L:2-SPST(1a1b)	O.L:2-SPST(1a1b)	O.L:1-SPST(1a)
			AL:1-SPST(1a)	GR:1-SPST(1a)	AL:1-SPST(1a)	S.C:1-SPST(1a)	GR:1-SPST(1a)
	Rating		3A/250VAC, Resistive		3A/250VAC, Resistive		
Control Voltage (50/60Hz)			24VAC/DC, 220VAC ±15%, 110VAC ±15%		24VAC/DC, 85~250VAC/DC		

● **Panel Mounting / Flush Mounting makes it easier for use.**
- Digital Ammeter is installed at the front cover of panel door in Flush Mounting type. It makes possible to check sensing current and finding the cause of trip with tripped current easily, to set current and O-time by simple button selection without removing unit from panel.
- Panel Mounting type with Digital Ammeter is installed inside the MCC panel and Just Operator is Possible to adjust it.

● **Following conditions should be considered in case of installing EOCR.**
- Overcurrent & Phase Loss must be included as basic protective function in the point of view for its law and regulation.
- Earth leakage current protection must be added against moisture and humidity conditions.
- In case you need to sense the overload increasing, Alert function must be added.
- If you need to confirm the current of many motors in one place , Current signal output transducer function (4~20mA) must be added.
- Short Circuit protection must be added if you protect line damage caused by Short Circuit.
- EOCR with 3CT is recommended to not only 3 Ø 3w, but also 3 Ø 4w condition.

● **Window / Terminal makes it easier for installation.**
- Wire is passing through CT without cutting, that is much easier for installation. It has also more convenient application to external CTs.
- As for Terminal type, display part is Flush Mounting type but Converter is Panel Mounting type with its application less than 60Amp.

● **The same diameter of Digital Ammeter to conventional Analogue Ammeter makes it easier for installation.**
- Ammeter Selector S/W is not necessary as 3 phase current is displayed L1, L2, L3 in order every 5 seconds.
- It is easy to install Ammeter by using cap cover and it saves install time.

● **Alert Output Mode**
- "A" (Ampere Relay) : Energized when sensing current
- "H" (Holding) : ON-OFF output mode
- "F" (Flicker) : Flicker
- "U" (Under Current Mode) : "AL" oupput is transferred to UC (3DD/FD vesion "E")

		EOCR-FDE Series		EOCR-FM Series				
		 Terminal		 Terminal				
	3M420	FDE	FEZ	FDM	FMS	FMZ	FM420	
	○	○	○	○	○	○	○	
	-	○	○	○	○	○	○	
	-	○ (Display)	○ (Display)	○ (Display)	○ (Display)	○ (Display)	○ (Display)	
	○	○ (Converter)	○ (Converter)	○ (Converter)	○ (Converter)	○ (Converter)	○ (Converter)	
0A	05: 05~10A, 60: 5~70A	0.5~60A		05: 05~10A, 60: 5~70A	05: 05~10A, 20: 5~20A	05: 05~10A, 60: 5~70A	05: 05~10A, 60: 5~70A	
		1~960A(10:5~800:5)		1~960A(10:5~800:5)				
		0.5~less than preset O.C / OFF		0.5~less than preset O.C / OFF				C
		0.5, 1~10sec		1~10sec				
		Within 0.5sec after D-Time		Within 0.5sec after D-Time				
		Within 3sec		Within 3sec				
		0.1~0.3sec		0.1sec				
		Within 8sec		Within 8sec				
A	-	-	0.02~3A	-		A:0.03~2.5A, B:0.5~10A	-	Def
	-	-	-	-	0.03sec	-	-	
	-	A/F/H/U	-	A/F/H	-	-	-	
		Last 3 Trip Cause		Last 1 Trip Cause				
	○	○	○	○	○	○	○	
		4-Digit 7segment		5-Digit				
	○	-	-	○	○	○	○	
	○	○	○	○	○	○	○	
	4~20mA	-	-	-	-	-	4~20mA	
		Button SW.		Rotary SW. & Button SW.				
nt	-	-	Zero Phase Current	-	-	Zero Phase Current	-	
	O.L:2-SPST(1a1b)	O.L:2-SPST(1a1b)	O.L:1-SPST(1a1b)	O.L:2-SPST(1a1b)	O.L:2-SPST(1a)	O.L:1-SPST(1a)	O.L:2-SPST(1a1b)	
		AL:1-SPST(1a)	GR:1-SPST(1a)	AL:1-SPST(1a)	SC:1-SPST(1a)	GR:1-SPST(1a)		
		3A/250VAC, Resistive		3A/250VAC, Resistive				
		24VAC/DC, 220VAC ± 15%, 110VAC ± 15%		24VAC/DC, 85~250VAC/DC				

EOCR-3DE/FDE

- MCU Based
- Real Time Processing / Higher Precision
- Overcurrent Protection Range: 0.5~60A, Wide Range Protection (Use with external CT from 11 to 960A, Direct application without CT up to 60A)
- Undercurrent Protection Range: 0.5~59A / OFF (Use with external CT less than 960A)
- Time Characteristic for Overcurrent
  - 0.5~10A : Definite / Inverse Selectable, Over 11A : Definite(Use with external CT in case using Inverse time)
- "UC" output is used as common to "OC" output. When choosing "U" in ALo mode, "AL" mode becomes OFF(--) and AL output (07-08) is transferred into Undercurrent (UC) output mode automatically.
- Digital display / 3 Phase Current Display: Digital Ammeter (Every 5 seconds)
  / Tripped Cause Digital Display: Easy Troubleshooting
- Trip Cause Memory: Last 3 trip check function. Possible to check with tripped trip cause and current
- Manual / Electrical Reset
- The tripping relay is normally energized with control power supply. (Selectable)
- Fit to a variety of environment as Terminal & Window type.
- Resistive Strengthened against variable freguency device such as inverter : 20~400Hz.

EOCR-SSD

EOCR-P Series	

PMZ	PFZ
○	○
○	○
-	○ (Display)
○	○ (Converter)
05~60A	
1~3600A(10:5~3000:5)	
.5~less than preset O.C / OFF	
OFF/0.1~10sec/Adjustable	
Within 0.5sec after D-Time	
Within 3sec	
0.1~0.3sec	
Within 8sec	
inite: 0.03~10A, Inverse: 0.03~1A	
0.03~0.05sec	
-	-
Last 3 Trip Cause	
○	○
5-Digit	
○	○
○	○
4~20mA	
Button SW.	
Zero Phase Current	
OL/SH : 2-SPST(1a1b)	
GR : 1-SPST(1a)	
3A/250VAC, Resistive	
24VAC/DC, 85~250VAC/DC	

Protection

Protective Item	Trip Time	Description
Over-current	O-Time	Is<In
Phase Loss	3sec	[(MAX - MIN) / MAX] × 100> 90
Locked Rotor	0.5sec after elapse dt	≥ 3times OC setting value

Specification

Over-current Setting	Current	05	0.5 ~ 6A
		30	3 ~ 30A
		60	10 ~ 60A
	Starting delay time	D-Time	1 ~ 30sec
	Trip time	O-Time	0.5, 1 ~ 10sec
Reset			Manual / Electrical
Operating t-c characteristic		Over-current	Definite
Tolerance		Current	I<1A : ± 0.05A, I 1A : ± 5%
		Time	t 3S : ± 0.2s, t>3s : ± 5%
Environment	Temperature	Operation	-20℃ ~60℃
		Store	-30℃ ~80℃
	Humidity		30~85% RH non-condensing
Control Power			• 110 : 110VAC ± 15%, 50/60Hz
			• 220 : 220VAC ± 15%, 50/60Hz
			• 440 : 440VAC ± 15%, 50/60Hz
			• 24 : 240VAC/DC
Output relay		2-SPST	3A / 250VAC , Resistive
Insulation	Between casing and circuit		Over 10 MΩ, DC500V
Dielectric Strenghth	Between casing and circuit		2000VAC 60Hz, 1min
	Between open contacts		1000VAC 60Hz, 1min
	between circuit		2000VAC 60Hz, 1min
Installation			35mm Din Rail or Panel Mounting

- MCU(Micro Controller Unit) based / 2-CT Type
- Real Time Processing / Higher Preceision
- Current Setting Renge - 05Type : 0.5 ~ 6A / 30Type : 3 ~ 30A / 60Type : 10 ~ 60A
- Digital display : trip cause / easy troubleshooting
- Reset : Manual (instantaneous) / Electrical (remote)
- Load selection by DIP switch : Single phase(1P) / Three phase(3P)
- Fail safe(N) / Non-fail safe(R)

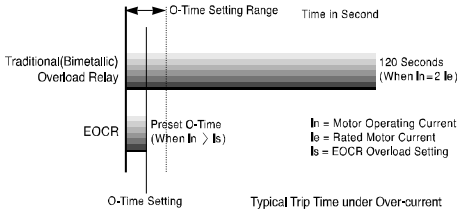
Electronic Overload Relays

Features

- Compact Design
- Multiple Protection Functions
- Wide Current Adjustment Range (10:1)
- Ammeter Function
- Trip Indication LED
- High Accuracy
- Manual Instantaneous Reset
- Electrical Remote Reset
- Test Function
- Ambient Insensitive
- Low Energy Consumption
- Fail-safe Operation (No Volt Release)

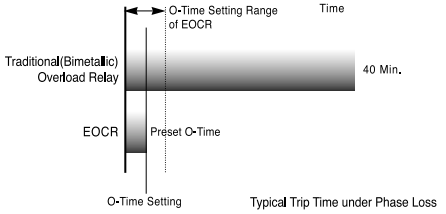
Over-current Protection

Over-current protection is provided by tripping the relay when motor operating current (In) exceeds over-current setting (Is) of EOCR for a period greater than the preset operating time (O-Time).



Phase Loss Protection

During a phase loss, the motor winding current may increase by 150% or more.
As the motor winding current increases, the winding temperature may also increase and possibly damage the winding insulation.
The quick trip time on EOCR helps to prevent over-current damage to the windings.



Ammeter Function & Trip Indication

Indication LED on the dial plate provides trip indication and ammeter functions.
The LED starts to flash at the point where motor current is equal to current setting level (Is), so user can verify motor current by reading the LOAD adjustment scale on the dial plate.
This also provides an accurate current setting.
The LED is illuminated when motor current exceeds current setting (Overload Status).
After tripping has occurred, the LED stays on until the relay is reset.
The trip indication is also an important feature of a multiple relay & contactor (starter) installation.

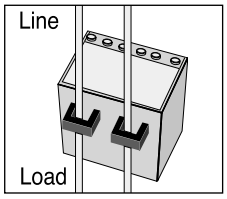
Wide Adjustment Range

EOCR has a wide current adjustment range of over 10:1. It enables three type models to cover a wide range from 0.1A up to 600A thus reducing the number and type of relays that must be inventoried for spare purposes.

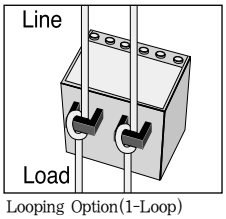
Looping Option

Some motor size may require only 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.

	No. of Loops	Time of Passing	Current Set. Range(A)
05Type	0	1	0.50 - 6.0A
Looping Option	1	2	0.25 - 3.0A
	2	3	0.17 - 2.0A
	3	4	0.12 - 1.5A
	4	5	0.10 - 1.2A



Straight-through-Wiring

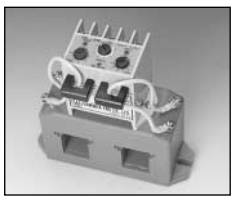


Looping Option(1-Loop)

External Current Transformer Option

Ordering option - 05 type of each model fitted to an external current transformer can achieve higher ampere ranges. (Ext. CT Option)

	Type	Current Ratio of Ext. CT	Current Setting Range
	05	-	0.5 - 6A
Ext. CT Option	100	100:5	10 - 120A
	200	200:5	20 - 240A
	300	300:5	30 - 360A
	400	400:5	40 - 480A
	500	500:5	50 - 600A
	600	600:5	60 - 720A


External CT Option

Manual Instantaneous Reset

Pushing RESET button on the dial plate or interrupting power supply provides a manual instantaneous reset.
Electrical remote reset is also provided by the panel-mounted RESET button.

Low Energy Consumption

EOCR-SS uses only 250mA of power, much less than thermal bimetallic overload relays. The result is significant cost savings over the life of relays (over 20 times cost saving).

EOCR-SS

- 2 Integral Current Transformers
- Electronic Shear-pin Function
- Independently Adjustable Starting Trip Delay (D-Time) & Operating Time (O-TIME)

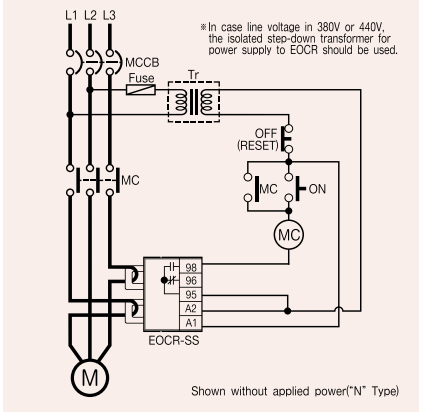
Protection

Protective Item	Operating (Trip) Time
Over-current	O-TIME
Phase Loss	O-TIME
Locked Rotor	O-TIME + D-TIME

Specification

Current Setting	Type		Range
	05		0.5 - 6A
	30		3 - 30A
	60		5 - 60A
	100~ (over 60A)		Ext. CT Option
Time	Start	D-TIME	0.2 - 30 sec
Setting	Trip	O-TIME	0.2 - 10 sec
Control Voltage	220		90 - 260VAC
(50/60Hz)	440		320 - 480VAC
Output Relay	Mode		1-SPDT(1C)
	Rating		3A/250VAC Resistive
	Status		Normally Energized
Time-Current Characteristic			Definite
Operating (Trip) Indication			2-LED
Mount			35mm Din-rail / Panel

Typical Wiring



EOCR-AR

- 2 Integral Current Transformers
- Automatic Reset and Adjustable Reset Timer

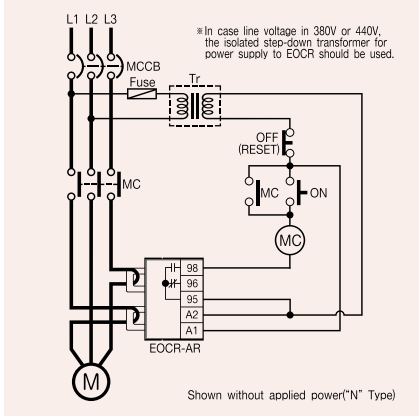
Protection

Protective Item	Operating (Trip) Time
Over-current	O-TIME
Phase Loss	O-TIME
Locked Rotor	O-TIME

Specification

Current Setting	Type	Range
	05	0.5 - 6A
	30	3 - 30A
	60	5 - 60A
	100~ (over 60A)	Ext. CT Option
Time Setting	Trip O-TIME	0.2 - 30 sec
	Reset R-TIME	0.2 - 120 sec
Control Voltage (50/60Hz)	220	90 - 260VAC
	440	320 - 480VAC
Output Relay	Mode	1-SPDT(1C)
	Rating	3A/250VAC Resistive
	Status	Normally Energized
Time-Current Characteristic		Definite
Operating (Trip) Indication		LED
Mount		35mm Din-rail / Panel

Typical Wiring



EOCR-DS

- 3 Integral Current Transformers
- Electronic Shear-pin Function
- Independently Adjustable Starting Trip Delay (D-Time) & Trip Time (O-TIME)
- EOCR-DS + Power Terminal Kit → EOCR-DST

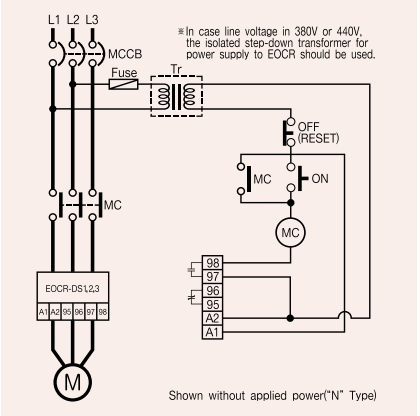
Protection

Protective Item	Operating (Trip) Time
Over-current	O-TIME
Phase Loss	O-TIME
Locked Rotor	O-TIME + D-TIME

Specification

Current Setting	Type	Range
	05	0.5 - 6A
	30	3 - 30A
	60	5 - 60A
	100~ (over 60A)	Ext. CT Option
Time Setting	Start D-TIME	0.2 - 30 sec
	Trip O-TIME	0.2 - 10 sec
Control Voltage (50/60Hz)	220	90 - 260VAC
	440	320 - 480VAC
Output Relay	Mode	2-SPST
	Rating	3A/250VAC Resistive
	Status	Normally Energized
Time-Current Characteristic		Definite
Operating (Trip) Indication		2-LED
Mount		35mm Din-rail / Panel

Typical Wiring



EOCR-SP

- 2 Integral Current Transformers
- Fit Directly into IEC or NEMA Contactor

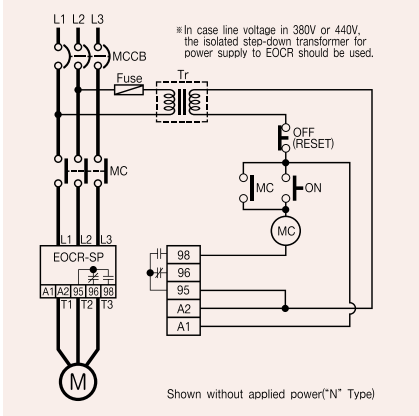
Protection

Protective Item	Operating (Trip) Time
Over-current	O-TIME
Phase Loss	O-TIME
Locked Rotor	O-TIME

Specification

Current Setting	Type	Range
	01	0.3 - 2A
	10	1 - 12A
	20	5 - 25A
Trip Time Setting	O-TIME	0.5 - 15 sec
Control Voltage (50/60Hz)	220	90 - 260VAC
	440	320 - 480VAC
Output Relay	Mode	1-SPDT(1C)
	Rating	3A/250VAC Resistive
	Status	Normally Energized
Time-Current Characteristic		Definite
Operating (Trip) Indication		2-LED
Mount		Contactor Mounted

Typical Wiring



EOCR-SS/SP/DS Series

Features

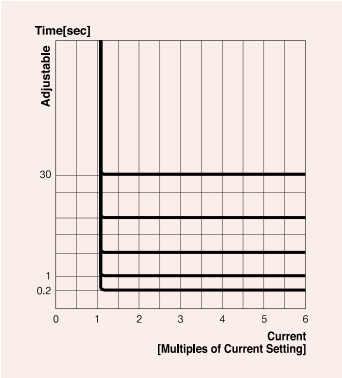
- Compact Design
- MCU Based
- Multiple Protection Functions
- Wide Current Adjustment Range (10:1)
- Ammeter Function & Trip Indication
- Easy Troubleshooting & Run Monitor
- Manual Instantaneous / Electrical Remote Reset
- Test Function
- Ambient Insensitive
- Fail-safe Operation

Run Monitor & Troubleshooting with 2-LED's

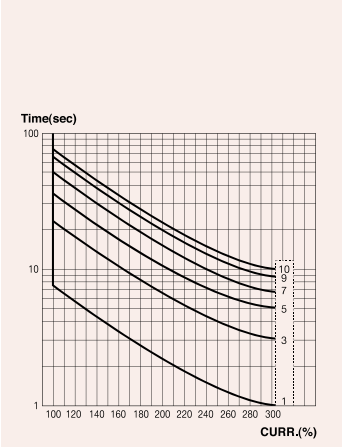
2 LED Lamps on the dial plate provide easy troubleshooting and run-monitor functions

Motor Status				LED Output / Pulse Signal	
				Green LED	Red LED
1	Stop(Power Input)			On	Off
2	Starting			Flash	Flash
3	Normal Running			On	Off
4	Overloading			On	Flash
5	Trip	Over-current		Off	Off
		Locked Rotor		Off	Flash
		Phase Loss	R	Off	Flash
			S	Off	Flash
			T	Off	Flash
	DS3(T)	Phase Reversal		2LEDs flash alternatively	

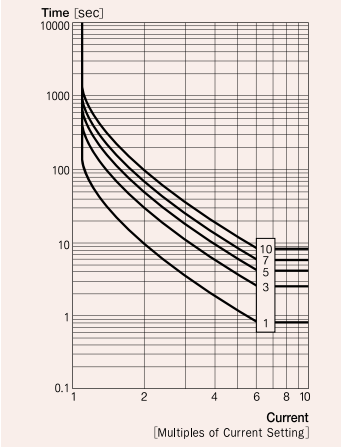
Time-Current Characteristic Curve



Definite Time Characteristic of EOCR-SP2/SS2/DS2(T)/DS3(T)



Inverse Time Characteristic of EOCR-SP1



Inverse Time Characteristic of EOCR-SS1/DS1(T)

EOCR-SS1 / SS2

- 2 Integral Current Transformers
- Independently Adjustable Starting Trip Delay & Trip Time

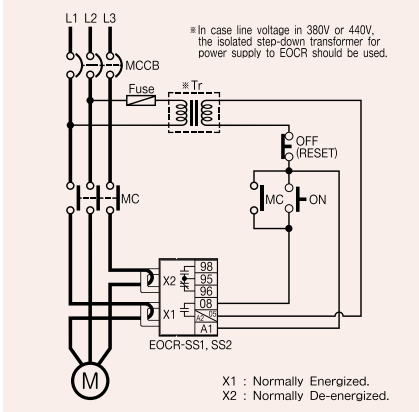
Protection

Protective Item	EOCR Operating (Trip) Time	
	SS1	SS2
Over-current	O-TIME(curve)	O-TIME
Phase Loss	4sec	4sec
Locked Rotor	D-TIME	D-TIME
Time Characteristic	Inverse	Definite

Specification

EOCR			SS1	SS2
Current Setting	05		0.5 - 6A	0.5 - 6A
	30		3 - 30A	3 - 30A
	60		-	5 - 60A
	100~ (over 60A)		External CT Option	
Time	Start	D-TIME	0 - 50 sec	1 - 50 sec
Setting	Trip	O-TIME	1 - 10	0.2 - 10 sec
Control Voltage	110		85 - 150VAC	
(50/60Hz)	220		180 - 260VAC	
Output Relay	X1	Mode & Rating	1-SPST, 3A/250VAC Resistive	
		Status	Normally Energized	
	X2	Mode & Rating	1-SPDT, 3A/250VAC Resistive	
		Status	Normally De-energized	
Time-Current Characteristic			Inverse	Definite
Trip & Trip Cause Indication			2-LED	
Mount			35mm Din-rail	

Typical Wiring



EOCR-DS1 / DS2 / DS3

- 3 Integral Current Transformers
- Independently Adjustable Starting Trip Delay & Trip Time
- EOCR-DS1/2/3 + Power Terminal Kit = EOCR-DS1T/2T/3T

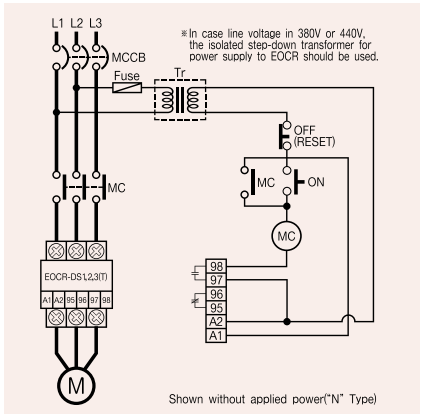
Protection

Protective Item	EOCR Operating (Trip) Time		
	DS1(T)	DS2(T)	DS3(T)
Over-current	O-TIME(curve)	O-TIME	O-TIME
Phase Loss	4sec	4sec	4sec
Locked Rotor	D-TIME	D-TIME	D-TIME
Phase Reversal	-	-	0.1sec
Time Characteristic	Inverse	Definite	Definite

Specification

EOCR			DS1(T)	DS2(T)	DS3(T)
Current Setting	05		0.5 - 6A	0.5 - 6A	
	30		3 - 30A	3 - 30A	
	60		-	5 - 60A	
	100~ (over 60A)		External CT Option		
Time	Start	D-TIME	0 - 50 sec	1 - 50 sec	
Setting	Trip	O-TIME	1 - 10	0.2 - 10 sec	
Control Voltage	110		85 - 150VAC		
(50/60Hz)	220		180 - 260VAC		
Output Relay	Mode		2-SPST		
	Rating		3A/250VAC Resistive		
	Status		Normally Energized		
Time-Current Characteristic			Inverse	Definite	Definite
Trip & Trip Cause Indication			2-LED		
Mount			35mm Din-rail		

Typical Wiring



EOCR-SP1 / SP2

- 2 Integral Current Transformers
- Fits Directly into IEC or NEMA Contactor

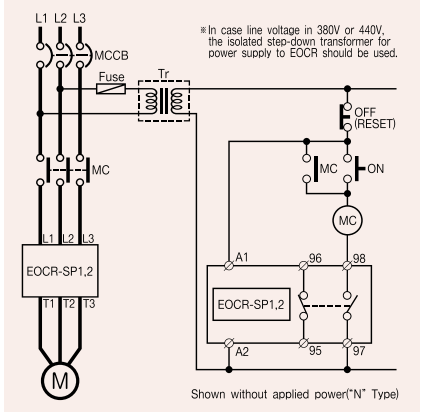
Protection

Protective Item	EOCR Operating (Trip) Time	
	SP1	SP2
Over-current	O-TIME(curve)	5sec
Phase Loss	4sec	4sec
Locked Rotor	O-TIME+10sec	D-TIME
Time Characteristic	Inverse	Definite

Specification

EOCR			SP1	SP2
Current Setting	01		0.3 - 1.2A	03 - 1.2A
	10		1 - 12A	1 - 12A
	20		5 - 25A	5 - 25A
Time	Start	D-TIME	10 sec(Fixed)	1 - 50 sec
Setting	Trip	O-TIME	1 - 10	5 sec(Fixed)
Control Voltage	110		85 - 150VAC	
(50/60Hz)	220		180 - 260VAC	
Output Relay	Mode		2-SPST	
	Rating		3A/250VAC Resistive	
	Status		Normally Energized	
Time-Current Characteristic			Inverse	Definite
Trip & Trip Cause Indication			2-LED	
Mount			Contactor Mounted	

Typical Wiring



EOCR-3DE/FDE Series

Features

- Compact Design
- 3DE/3EZ : Panel Mounting Type
- FDE/FEZ : Panel Flush Mounting Type
- MCU(Microprocessor Control Unit) Based
- 3 Integral Current Transformers
- Multiple Protection Functions
- Digital Ammeter
- Troubleshooting / Trip Cause Memory, Display
- Adjustable Operating Features by Mode switch
- Wide Current Adjustment Range
- Selectable Time-Current Characteristics (Inverse / Definite)
- Manual (Instantaneous) / Electrical (Remote) Reset
- Test Function
- Ambient Insensitive
- Selectable Fail-safe and Non-fail-safe Operation Modes

Comparison Table of Model

EOCR		3DE / FDE	3EZ / FEZ
Protection	Over - current	●	●
	Under - current	●	●
	Phase Loss	●	●
	Phase Unbalance	●	●
	Phase Reverse	●	●
	Locked Rotor	●	●
	Ground Fault	-	●
Run Monitor & Load Alert Function		●	-
Selectable Alerting Pulse		●	-

Protection Feature

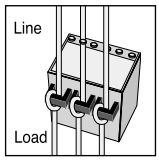
Function	mode		Description
Over-current	tc	dE (Definite T-C)	This is provided by the relay tripping when motor operating current(In) exceeds current setting value in "oc" mode for a period greater than the preset trip time(O-Time in "ot" mode)(Curve-2)
		In (Inverse T-C)	This is provided by the relay tripping when motor operating current(In) exceeds current setting value in "oc" mode according to the Time-current Characteristic Curve(Curve-1)
Under-current	Uc	Definite T-C	This is provided by the relay tripping when motor operating current(In) is lower than current setting value in "uc" mode for a perid greater than the preset trip time(Time in "ut" mode)
Phase Loss	PL	On	The relay will be operated within 3sec. When the phase failure occurs
Phase Unbalance	Ub	5~50%	This is provided by the relay tripping in phase unbalance greater than setting % difference in terms of maximum phase current : [(MAX-MIN)/MAX] × 100[%]
Phase Reversal	RP	On	In the event of phase reversal, the relay trips in 0.1sec
		Off(--)	Phase reversal protection function is disabled : this allows the relay to be used for reversing application
Ground Fault	Ec	0.03~3A	Ground fault protection is provided by the relay tripping accoding to zero sequence current sensed by ZCT
Locked Rotor	Lc	2~10 Times OC	This is a protection for locked rotor in starting state. The variable setting range is 2~10 times oc setting value, but maximum setting value is limited in case "oc" setting value is greater than 10A. The maximum setting value is calculated by [100/oc setting value]
Stall	Sc	1.5~5 Times OC	This is a protection for locked rotor while motor is working. The variable setting range is 1.5~5 times oc setting value, but the maximum setting value is limited in case "oc" setting value is greater than 20A, The maximun setting value is calculated by [100/oc seting value]

※T-C : Time-Current Characteristic

Looping Option

Smaller ampere ranges than particular EOCR current range can be covered by looping the motor wire 2 or 3 times as under described.

	No of Loops	Current Ratio of Ext. CT	Current Setting Range (A)
0.5Type	0	1	0.5 - 6
Looping Option	1	2	0.25 - 3
	2	3	0.17 - 2
	3	4	0.12 - 1.5
	4	5	0.1 - 1.2



Looping Option (1-Loop)

External CT Option

Higher ampere ranges can be achieved by setting in "CT" mode fitted to an external current transformer, and the actual motor current display is possible in any case

Type	Value in "CT" mode	Current Setting Range (A)
wide Range	OFF(--)	0.5 ~ 60A
10 : 5	10	1 ~ 12A
15 : 5	15	1.5 ~ 18A
⋮	⋮	⋮
800 : 5	800	80 ~ 960A


EOCR-3DE+External CT

Alert Function

When motor operating current (In) exceeds the alert setting (As), the alert relay outputs three kind of signal. The output can be used to warn customers/operators of possible overloading and avoid unnecessary motor shutdown.

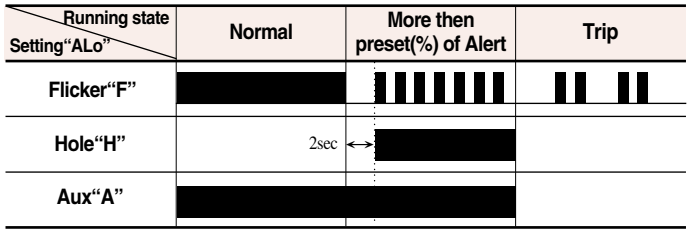
The type of output signal is decided by the selection in the "Alo" mode

"A"(Ampere relay): energized whenever CT senses a current

"F"(Flickering): character"A" and current value flashs frequently

"H"(Holding): ON-OFF

"U"(Undercurrent mode): the "AL" output(07┤ ├08) is transferred into "Uc" output



In = Motor Operating Current / Is = EOCR Over-current Setting / As = Alert Setting

Fail-safe & Non-fail-safe

The tripping relay can be operatcd in a fail-safe or non-fail-safe mode

Application of the Fail-safe (Electrically Held) Connection

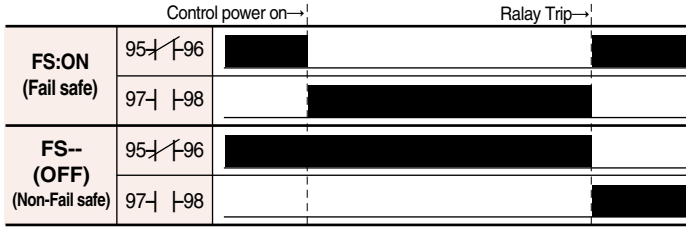
Faie safe setting in"FS" mode : ON

The tripping relay is normally energized with control power supply

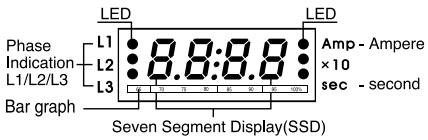
Application of the Non-fail-safe Connection

Fail safe setting in "FS" mode: OFF(--)

In all cases, the failure of the control voltage may not interrupt the process.



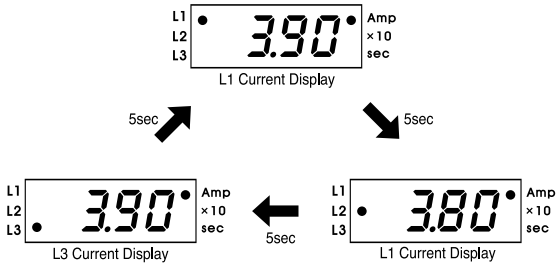
LED Display



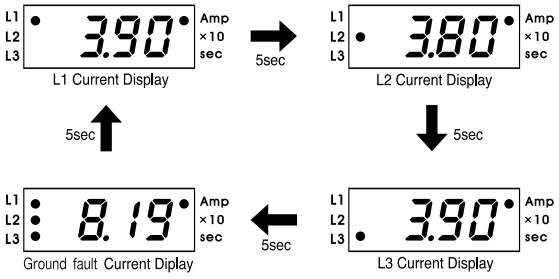
Digital Ammeter

3 phase motor currents (In) / Ground fault current are displayed in sequence on the LED display.

● **3DE/FDE**



● **3EZ/FEZ**



Rotation display of Phase current

Instead of automatic rotation, manual display rotation is possible as depressing once SET/Store button during an operation. If manual is selected, the information of phase current L1 is displayed firstly and next information is displayed continuously like a manner of →L1→L2 →L3→(GR)→L1 ⋯whenever depress SET/Strore button evey once

Digital Trip Cause Indication / Easy Troubleshooting

- Enter into "trip" mode by depressing once Set/store button, then last trip cause is showed
- Each phase current is displayed in order whenever depress UP/DN button in every once under trip mode
- The 2nd trip cause is showed after displaying 3phase current of last trip
- The 3rd trip can be checked by same manner

Test

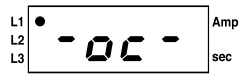
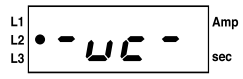
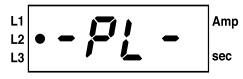
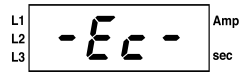
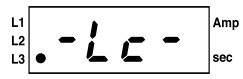
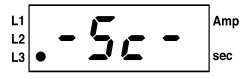
This is the self-test of this product. If the relay enters into this mode, it begins to count down preset value of O-time after waitng 3sec and becomes trip state as showing "END" message that means this relay is ready to work.

- "END" message of this test is also stored in "Fault" mode as last trip.
- Not permitted to test this function during the operation to prevent unnecessary trip

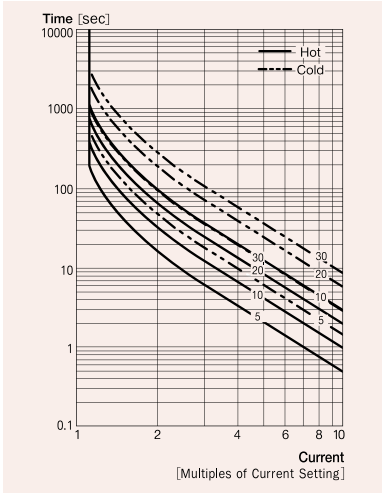
Reset

Depressing the RESET button or interrupting control power resets the relay immediately. Electrical remote reset is also available through the panel mounted reset switch.

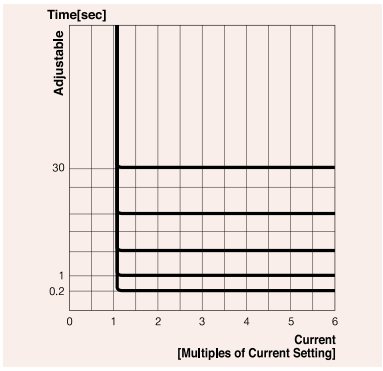
Examples of Trip Cause Indication

· **Over-current Trip** Relay displays a trip, caused by over-current. which has been detected from phase L1(R/T1).	
· **Under-current Trip** Relay displays a trip, caused by under-current. which has been detected from phase L2(S/T2).	
· **Phase Loss Trip** Relay displays a trip, caused by phase loss (Phase Failure) on Phase L2(S/T2)	
· **Phase Reversal Trip** Relay displays a trip, caused by phase reversal.	
· **Phase Unbalance Trip** Relay displays a trip, caused by phase unbalance. in phase L1(R/T1).	
· **Ground fault Trip : EOCR-3DZ/FDZ Only** Relay displays a trip, caused by ground fault current	
· **Locked Rotor Trip** Relay displays a trip, caused by locked rotor. during starting state	
· **Locked Rotor Trip** Relay displays a trip, caused by locked rotor. while motor is working	

Time-Current Characteristic Curve



Curve-1 Inverse (SW3-INV/On position)

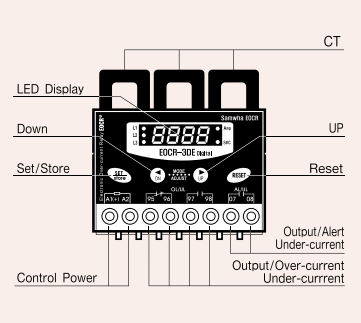


Curve-2 Definite (SW3-DEF/Off position)

O-T Setting (Curve)	IEC 947-4 (Trip Class)
1-5	10A
6-10	10
11-20	20
21-30	30

EOCR-3DE/3EZ

EOCR-3DE / 3EZ



- MCU Based
- 3 Integral Current Transformers
- Over-current, Under-Current, Phase Loss, Phase Unbalance, Phase Reversal, Locked Rotor Protection
- Digital Ammeter & Trip cause indication
- Selectable Trip Time-Current Characteristics
- Independently Adjustable Starting Trip Delay and Operating Trip Time

  + Load Alerting Function → EOCR-3DE
  + Ground Fault Protection → EOCR-3EZ

Protection

EOCR-3DE		EOCR-3EZ	
Protective Item	**Trip Time**	**Protective Item**	**Trip Time**
Over-current	O-TIME	Over-current	O-TIME
under-current	0.5~30sec	under-current	0.5~30sec
Phase Loss	3 sec	Phase Loss	3 sec
Phase Unbalance	8 sec	Phase Unbalance	8 sec
Phase Reversal	0.1~0.3 sec	Phase Reversal	0.1~0.3 sec
Locked Rotor	D-TIME	Locked Rotor	D-TIME
-	-	Ground Fault	0.05~10 sec

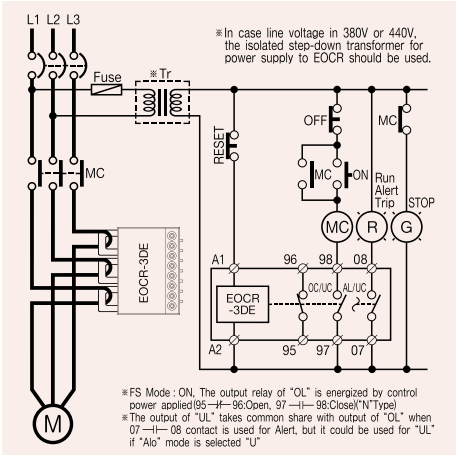
Specification

Model		EOCR-3DE	EOCR-3EZ
Over Current Setting Range		Refer Table #1	
Ground Fault Current Setting		-	0.02 ~ 3A
Alert Setting		50 ~ 100% / OFF	-
Start Delay Time Setting (D-TIME)		1 ~ 200 Sec	
Trip Delay Time Setting (O-TIME)	INV	1 ~ 30	
	DEF	0.2 ~ 30 Sec	
Control Voltage		24VAC/DC, 110VAC±15%, 220VAC±15%	
Output Relay	OL	2-SPST	1-SPST
	AL/GR	AL Relay	Ground Fault Relay
	Rating	3A/250VAC Resistive	
Time Characteristic	In/"tc"mode	Inverse (See Curve-1)	
	dE/"tc"mode	Definite (See Curve-2)	
Troubleshooting / Trip Indication		LED Display (SSD+LED)	
Current Sensing		3-CT	
Mounting		35mm Din-rail	

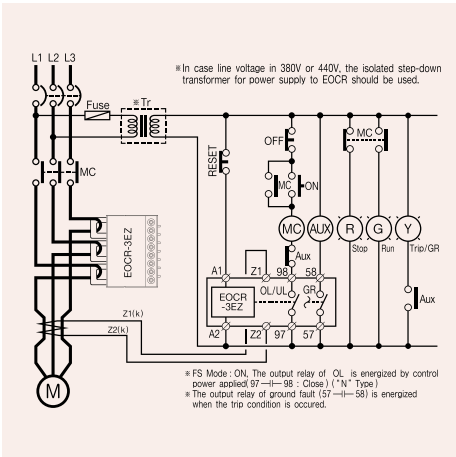
Table #1. Current Range

Current Setting Range (Amps)	Number of Conductors thru CT windows	Extermal CT Ratio	Setting of CT Ratio	Remark
0.5 ~ 60A	1	-	OFF(Mode : --)	Wide Range
0.25 ~ 3.0A	2	-	2t	
0.1 ~ 1.2A	5	-	5t	
1 ~ 12A	1	10 : 5	10	
1.5 ~ 18A	1	15 : 5	15	
2.0 ~ 24A	1	20 : 5	20	
2.5 ~ 30A	1	25 : 5	25	
3.0 ~ 36A	1	30 : 5	30	
4.0 ~ 48A	1	40 : 5	40	
5 ~ 60A	1	50 : 5	50	
6 ~ 72A	1	60 : 5	60	
7.5 ~ 90A	1	75 : 5	75	
10 ~ 120A	1	100 : 5	100	
12 ~ 144A	1	120 : 5	120	
15 ~ 180A	1	150 : 5	150	
20 ~ 240A	1	200 : 5	200	
25 ~ 300A	1	250 : 5	250	
30 ~ 360A	1	300 : 5	300	
40 ~ 480A	1	400 : 5	400	
50 ~ 600A	1	500 : 5	500	
60 ~ 720A	1	600 : 5	600	
75 ~ 900A	1	750 : 5	750	
80 ~ 960A	1	800 : 5	800	

Typical Wiring



EOCR-3DE



EOCR-3EZ

※Tolerance(3DD/ 3DZ / FD / FDZ / PMZ / SSD)

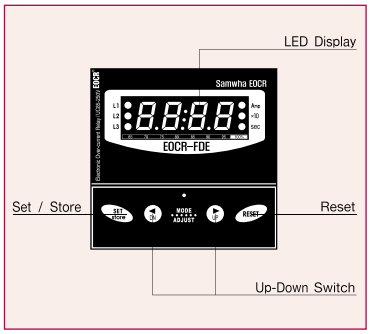
Current	I<1A : ±0.05A I≥1A : ±5%
Time	0.05s → Within 0.05s t≤3s : ±0.2S t>3s : ±5%

Caution

The extermal CT should be used in case Inverse curve(toln setting) is applied over 10Amps.

EOCR-FDE/FEZ

Digital Over Current Relay



EOCR-FDE / FEZ

- MCU Based
- 3 Integral Current Transformers
- Over-current, Under-Current, Phase Loss, Phase Unbalance, Phase Reversal, Locked Rotor Protection
- Digital Ammeter & Trip cause indication
- Selectable Trip Time Characteristics
- Independently Adjustable Starting Trip Delay and Trip Time
  + Load Alerting Function → EOCR-FDE
  + Ground Fault Protection → EOCR-FEZ

Protection

EOCR-FDE		EOCR-FEZ	
Protective Item	**Trip Time**	**Protective Item**	**Trip Time**
Over-current	O-TIME	Over-current	O-TIME
under-current	0.5~30sec	Under-current	0.5~30
Phase Loss	3 sec	Phase Loss	3 sec
Phase Unbalancal	8 sec	Phase Unbalancal	8 sec
Phase Reverse	0.1~0.3 sec	Phase Reverse	0.1~0.3 sec
Locked Rotor	D-TIME	Locked Rotor	D-TIME
-	-	Ground Fault	0.05~10 sec

Specification

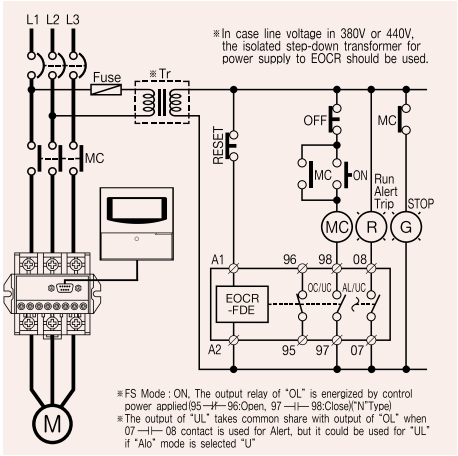
Model		EOCR-FDE	EOCR-FEZ
Over Current Setting		Refer Table #1	
Ground Fault Current Setting		-	0.02 ~ 3A
Alert Setting		50 ~ 100% / OFF	-
Start Time Setting (D-TIME)		1 ~ 200 Sec	
Trip Time Setting (O-TIME)	INV	1 ~ 30	
	DEF	0.2 ~ 30 Sec	
Control Voltage		24VAC/DC, 110VAC±15%, 220VAC±15%	
Output Relay	OL	2-SPST	1-SPST
	AL/GR	AL Relay	Ground Fault Relay
	Rating	3A/250VAC Resistive	
Time Characteristic	In/"tc"mode	Inverse (See Curve-1)	
	dE/"tc"mode	Definite (See Curve-2)	
Troubleshooting / Trip Indication		LED Display (SSD+LED)	
Current Sensing		3-CT	
Mounting		35mm Din-rail	

※**Caution** The extermal CT should be used in case Inverse curve(tc In setting) is applied over 10Amps.

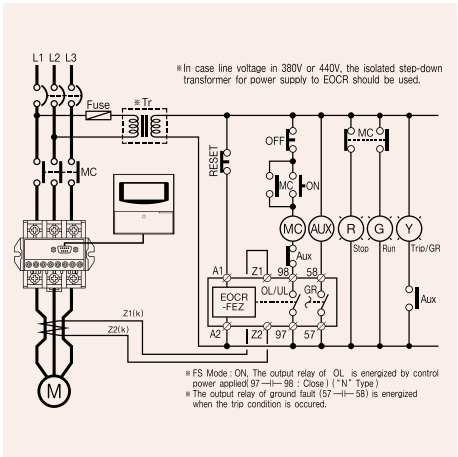
How to set

Mode	◀ DN ▶ UP	Search a mode to be adjusted by depressing UP/DN mode switch.
Set	SET / store	Selected mode and setting value start flickering which means to be ready to accept setting as pressing once Set/store button
Adjust	◀ DN ▶ UP	Select a required setting value and/or characters by pressing continuously UP/DN mode switch until reaching what want to do.
Store	SET / store	Store a selected value and/or characters by pressing once Set/store button Instantaneously the flickering is stopped.
Reset	RESET	After completing above procedure, make a reset to be ready to operate. If not made reset, it will be reset automatically after an elapse of 30sec.

Typical Wiring



EOCR-FDE



EOCR-FEZ

Features

- Compact Design
- 3DM : Panel Mounting Type
- FDM : Flush Mounting Type
- MCU(Microprocessor Control Unit) & ASIC Based
- 3 Integral Current Transformers
- Multiple Protection Functions
- Digital Ammeter
- Troubleshooting / Trip Cause Memory, Display
- Adjustable Operating Features by Pulse Rotary switch
- Wide Current Adjustment Range
- Selectable Time-Current Characteristics (Inverse / Definite)
- Manual Instantaneous / Electrical Remote Auto Reset
- Test Function
- Ambient Insensitive
- Selectable Fail-safe and Non-fail-safe Operation Modes

Comparison Table of Model

EOCR		3DM / FDM	3MZ / FMZ
Protection	Over - current	●	●
	Under - current	●	●
	Phase Loss	●	●
	Phase Unbalance	●	●
	Phase Reverse	●	●
	Locked Rotor	●	●
	Ground Fault	-	●
Run Monitor & Load Alert Function		●	-
Selectable Alerting Pulse		●	-

Protection Feature

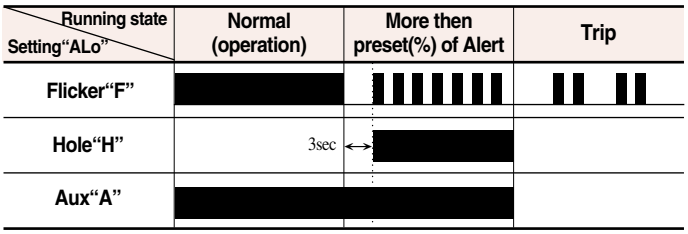
Function	DIP Switch	Description
Over current	DEF sw#3 on	When motor operating current(In) exceeds preset "oc"setting, relay will trip after preset O-Time in "ot"setting. The amperage of In(operating current) does not effct on relay trip time.
	INV sw#3 off	The tripping time of relay depends on the amperage of In(operating current) according to time-current charateristics
Under current	Definite time charateristic	This is for idle/dry running protection The relay operates when the operating current is less than preset "uc" current after preset "ut" time elapses.
Phase Loss		The relay will be operated within 3sec. when the phase failure occurs This function works during D-Time.
Phase Unbalance		The relay operates within 8sec. when the current diffenence among 3 phases is greater than 50% The calculation formula is(Max-Min)/Max current 100 〉50%
Phase Reversal	on : enable off : disable	In the event of wrong phase sequence, relay will be operated in 0.1sec. Phase reversal protection function can be disabled by DIP selection.
Ground Fault	A Type: 0.03-2.5A B Type : 0.5-10A	Ground fault protection is provided by the relay tripping sensed by Zero Phase Current Transformer (Core Balanced Current Transformer) The relay shows the leakage current during operation (3MZ & FMZ)
Locked Rotor		The setting range is 2-10 times of oc setting. If the starting current exceeds more than setting value after preset D-Time elapses, the relay will be energized within 0.5sec. This function is available on definite time characteristic.
Stall		The setting range is 1-10sec. If the operating current exceeds more than 180% of preset "oc" setting the relay will be energized after preset "st" time elapses.

Looping & External CT Option

Refer to page 10

Alert Function : 3DM & FDM

When motor operating current (In) exceeds the alert setting (As), the alert relay outputs three kind of signal. The output can be used to warn customers/operators
of possible overloading and avoid unnecessary motor shutdown.
The type of output signal is decided by the selection in the "Alo" mode
"A"(Ampere relay): energized whenever CT senses a current
"F"(Flickering): character"A" and current value flash frequently
"H"(Holding): ON-OFF



In = Motor Operating Current / Is = EOCR Over-current Setting / As = Alert Setting

Fail-safe & Non-fail-safe

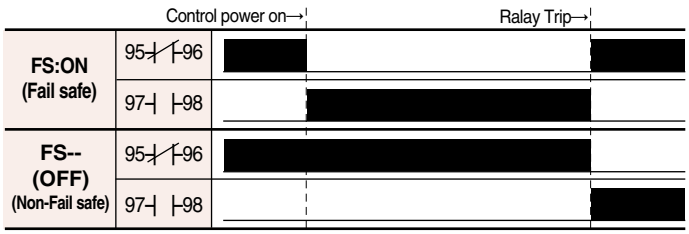
The tripping relay can be operatcd in a fail-safe or non-fail-safe mode

Application of the Fail-safe (Electrically Held) Connection

Faie safe setting in NVR mode : ON
The tripping relay is normally energized with control power supply

Application of the Non-fail-safe Connection

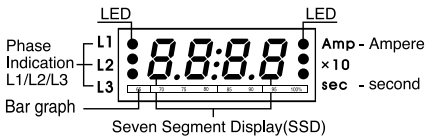
Fail safe setting in NVR mode: OFF
In all cases, the failure of the control voltage may not interrupt the process.



※ Tolerance (3DM/ FDM / EVR Series)

Current	I<1A : ±0.1A I≥1A : ±5%
Time	0.05s → Within 0.05s t<1s : ±0.1s t≥1s : ±5%

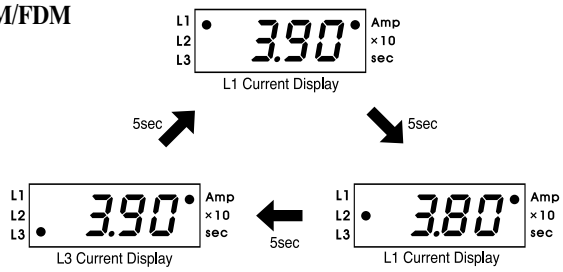
LED Display



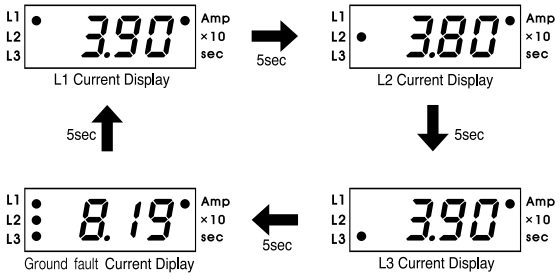
Digital Ammeter

3 phase motor currents (In) are displayed in sequence on the LED display.

● **3DM/FDM**



● **3MZ/FMZ**



Digital Trip Cause Indication / Easy Troubleshooting

- Enter into "FAULT" mode with mode switch by depressing once Set/store button, then last trip cause is shown
- Each phase current is displayed in order whenever turn mode switch right or left

Test

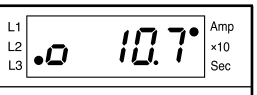
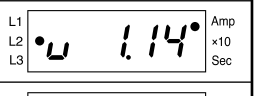
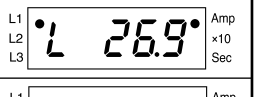
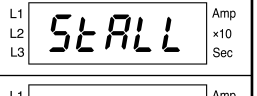
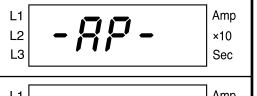
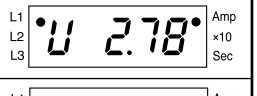
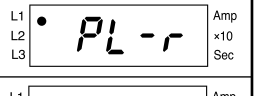
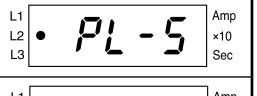
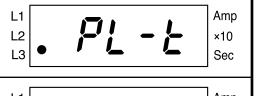
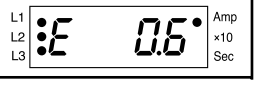
This is the self-test of this product. If the relay enters into this mode, it begins its count down preset value of O-time of "Ot" mode after waiting 3sec and becomes trip state as showing "END" message that means this relay is ready to work.

- "END" message of a result of this test is also stored in "Fault" mode as last trip.
- Not permitted to test this function during the operation to prevent unnecessary trip

Reset

Pushing the RESET button or interrupting power resets the relay immediately. Electrical remote reset is also available through the panel mounted reset switch. The relay cannot be reset by control power interruption when the hand reset (H-r) selected in mode.
In this case, it is possible to press the reset button on the relay facia. Automatic reset is also available if enter into reset mode (rt:A-r) and reset delay time is adjustable from 0.3sec to 20min

Examples of Trip Cause Indication

· **Over-current Trip** Relay displays a trip, caused by maximun over-current. 10.7A which has been detected from phase L3(T/T3)	
· **Under-current Trip** Relay displays a trip, caused by minimum Under-current. 1.14A which has been detected from pfase L2(S/T3)	
· **Locked Rotor Trip** Relay displays a trip, caused by locked rotor and maximum current. 26.9A which has been detected from pfase L1(R/T1)	
· **Locked Rotor Trip** Relay displays a trip, caused by locked rotor while motor is working	
· **Phase reversal Trip** Relay displays a trip, caused by phase reversal	
· **Phase Unbalance Trip** Relay displays a trip, caused by Phase unbalance and maximum current 2.78A which has been detected from phase L1(R/T1)	
· **Phase Loss Trip** Relay displays a trip, caused by phase loss which has been detected from phase L1(R/T1)	
· **Phase Loss Trip** Relay displays a trip, caused by phase loss which has been detected from phase L2(S/T2)	
· **Phase Loss Trip** Relay displays a trip, caused by phase loss which has been detected from phase L3(T/T3)	
· **Ground Fault Trip** Relay displays a trip, caused by ground fault current 0.6A which has been detected from ZCT	

Time-Current Characteristic Curve

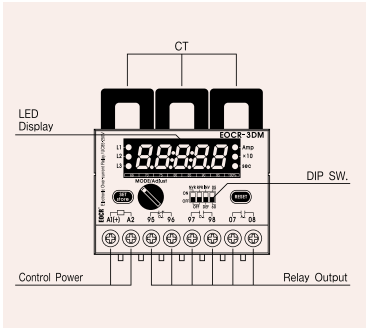
Refer to Curve-1 and Curve-2 on page 11

Setting Step of 3DM & FDM

MODE		Select the mode to adjust with turning the MODE/Adjust swith CW or CCW.
Set		Depress the SET/store button once to start the setting
Adjust		Adjust the required amount with MODE/Adjust switch
Store		Depress the SET/store button once to memorize the setting

EOCR-3DM/3MS/3MZ/3M420

MCU & ASIC Based Overload Relay



- Over-current, Under-current, Phase Loss, Phase reversal, Phase Unbalance, Locked rotor protection
- Short current protection ← 3MS
- Ground Fault Protection ← 3MZ
- Current Loop Commeunication ← 3M420
- Including Current Tranducer : 4~20mA output
- Accummulation to Running time

EOCR-3DM / 3MS / 3MZ / 3M420

Protection

		Trip Time			
Protective Item		**3DM**	**3MS**	**3MZ**	**3M420**
Over-current		DEF: 0.2 ~ 30sec, INV: 1 ~ 30	DEF: 0.2 ~ 30sec, INV: 1 ~ 30	DEF: 0.2 ~ 30sec, INV: 1 ~ 30	DEF: 0.2 ~ 30sec, INV: 1 ~ 30
Under-Current		0.5 ~ 30sec(DEF)	0.5 ~ 30sec(DEF)	0.5 ~ 30sec(DEF)	0.5 ~ 30sec(DEF)
Phase loss		3sec	3sec	3sec	3sec
Phase reversal		0.1sec	0.1sec	0.1sec	0.1sec
Phase Unbalance		8sec	8sec	8sec	8sec
Locked Roter	Lock	0.5sec after dt	0.5sec after dt	0.5sec after dt	0.5sec after dt
	stall	1 ~ 10sec	1 ~ 10sec	1 ~ 10sec	1 ~ 10sec
Ground fault		-	-	0.1 ~ 10sec	-

Specification

Model			**3DM**	**3MS**	**3MZ**	**3M420**
Current Setting Range	Over-Current(oc)		Refer to, Table #1	Refer to, Table #1	Refer to, Table #1	Refer to, Table #1
	Under-Current(uc)		0.5 ~ under OC setting	0.5 ~ under OC setting	0.5 ~ under OC setting	0.5 ~ under OC setting
	Ground Fault Current(Ec)		-	-	A : 0.03 ~ 2.5A / B : 0.5 ~ 10A	-
Time Setting	Starting Delay Time(dt)		OFF ~ 200sec	OFF ~ 200sec	OFF ~ 200sec	OFF ~ 200sec
	Over-Current Trip Delay(ot)		DEF : 0.2 ~ 30sec / INV : 1 ~ 30	DEF : 0.2 ~ 30sec / INV : 1 ~ 30	DEF : 0.2 ~ 30sec / INV : 1 ~ 30	DEF : 0.2 ~ 30sec / INV : 1 ~ 30
	Under-Current Trip Delay(ut)		0.5 ~ 30sec(DEF)	0.5 ~ 30sec(DEF)	0.5 ~ 30sec(DEF)	0.5 ~ 30sec(DEF)
	Ground Fault Trip Delay(Et)		-	-	0.1 ~ 10sec	-
Control Power	220		85 ~ 250VAC/DC, 50/60Hz	85 ~ 250VAC/DC, 50/60Hz	85 ~ 250VAC/DC, 50/60Hz	85 ~ 250VAC/DC, 50/60Hz
Output Relay	OL		2-SPST, 3A/250VAC, Resistive	2-SPST, 3A/250VAC, Resistive	1-SPST, 3A/250VAC, Resistive	2-SPST, 3A/250VAC, Resistive
	AL(GR/SC)		1-SPST(AL)	1-SPST(S.C)	1-SPST(GR)	-
Environment	Temperature	Store	-30℃ ~ 80℃	-30℃ ~ 80℃	-30℃ ~ 80℃	-30℃ ~ 80℃
		Operation	-20℃ ~ 60℃	-20℃ ~ 60℃	-20℃ ~ 60℃	-20℃ ~ 60℃
	Humidity		30 ~ 85RH, Without condensation	30 ~ 85RH, Without condensation	30 ~ 85RH, Without condensation	30 ~ 85RH, Without condensation
Display	7-Segment LEDs		○	○	○	○
	Bar-Graph		○	○	○	○
Mounting			35mm Din-rail	35mm Din-rail	35mm Din-rail	35mm Din-rail

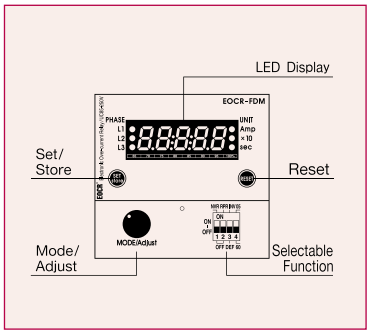
Table #1. Current Range

Type	Current Setting range	Naumber of Conductord thru CT windows	Position of DIP S/W4	External CT ratio	Setting of CT Mode Remark
05	0.1 ~ 2.0A	5	05	NIL	5t
05	0.25 ~ 5.0A	2	05	NIL	5t
05	0.5 ~ 10A	1	05	NIL	05
※60	5 ~ 70A	1	60	NIL	60
※※20	5 ~ 20A	1	20	NIL	20
10	1.0 ~ 12A	1	05	10 : 5	10
15	1.5 ~ 18A	1	05	15 : 5	15
20	2.0 ~ 24A	1	05	20 : 5	20
25	2.5 ~ 30A	1	05	25 : 5	25
30	3.0 ~ 36A	1	05	30 : 5	30
40	4.0 ~ 48A	1	05	40 : 5	40
50	5.0 ~ 60A	1	05	50 : 5	50
60	6.0 ~ 72A	1	05	60 : 5	60
75	7.5 ~ 90A	1	05	75 : 5	75
100	10 ~ 120A	1	05	100 : 5	100
120	12 ~ 144A	1	05	120 : 5	120
150	15 ~ 180A	1	05	150 : 5	150
200	20 ~ 240A	1	05	200 : 5	200
250	25 ~ 300A	1	05	250 : 5	250
300	30 ~ 360A	1	05	300 : 5	300
400	40 ~ 480A	1	05	400 : 5	400
500	50 ~ 600A	1	05	500 : 5	500
600	60 ~ 720A	1	05	600 : 5	600
750	75 ~ 900A	1	05	750 : 5	750
800	80 ~ 960A	1	05	800 : 5	800

※EOCR-3DM, 3MZ, 3M420, FDM, FMZ, FM420　　※※EOCR-3MS, FMS

EOCR-FDM/FMS/FMZ/FM420

MCU & ASIC Based Overload Relay



- Over-current, Under-current, Phase Loss, Phase reversal, Phase Unbalance, Locked rotor protection
- Short current protection ← FMS
- Ground Fault Protection ← FMZ
- Current Loop Commeunication ← FM420
- Including Current Tranducer : 4~20mA output
- Accummulation to Running time

EOCR-FDM / FMS / FMZ / FM420

Protection

		Trip Time			
Protective Item		**FDM**	**FMS**	**FMZ**	**FM420**
Over-current		DEF: 0.2 ~ 30sec, INV: 1 ~ 30	DEF: 0.2 ~ 30sec, INV: 1 ~ 30	DEF: 0.2 ~ 30sec, INV: 1 ~ 30	DEF: 0.2 ~ 30sec, INV: 1 ~ 30
Under-Current		0.5 ~ 30sec(DEF)	0.5 ~ 30sec(DEF)	0.5 ~ 30sec(DEF)	0.5 ~ 30sec(DEF)
Phase loss		3sec	3sec	3sec	3sec
Phase reversal		0.1sec	0.1sec	0.1sec	0.1sec
Phase Unbalance		8sec	8sec	8sec	8sec
Locked Roter	Lock	0.5sec after dt	0.5sec after dt	0.5sec after dt	0.5sec after dt
	stall	1 ~ 10sec	1 ~ 10sec	1 ~ 10sec	1 ~ 10sec
Ground fault		-	-	0.1 ~ 10sec	-

Specification

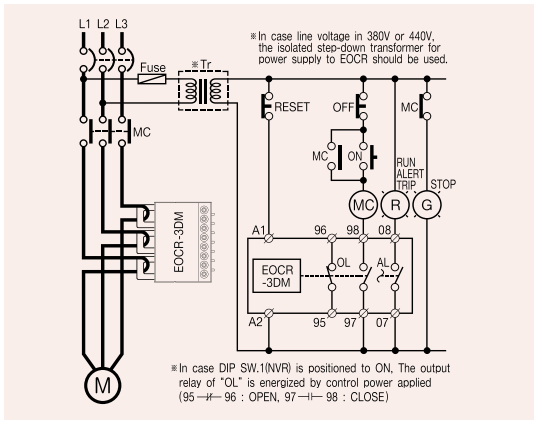
Model			**FDM**	**FMS**	**FMZ**	**FM420**
Current Setting Range	Over-Current(oc)		Refer to, Table #1	Refer to, Table #1	Refer to, Table #1	Refer to, Table #1
	Under-Current(uc)		0.5 ~ under OC setting	0.5 ~ under OC setting	0.5 ~ under OC setting	0.5 ~ under OC setting
	Ground Fault Current(Ec)		-	-	A : 0.03 ~ 2.5A / B : 0.5 ~ 10A	-
Time Setting	Starting Delay Time(dt)		OFF ~ 200sec	OFF ~ 200sec	OFF ~ 200sec	OFF ~ 200sec
	Over-Current Trip Delay(ot)		DEF : 0.2 ~ 30sec / INV : 1 ~ 30	DEF : 0.2 ~ 30sec / INV : 1 ~ 30	DEF : 0.2 ~ 30sec / INV : 1 ~ 30	DEF : 0.2 ~ 30sec / INV : 1 ~ 30
	Under-Current Trip Delay(ut)		0.5 ~ 30sec(DEF)	0.5 ~ 30sec(DEF)	0.5 ~ 30sec(DEF)	0.5 ~ 30sec(DEF)
	Ground Fault Trip Delay(Et)		-	-	0.1 ~ 10sec	-
Control Power	220		85 ~ 250VAC/ DC, 50/60Hz	85 ~ 250VAC/ DC, 50/60Hz	85 ~ 250VAC/ DC, 50/60Hz	85 ~ 250VAC/ DC, 50/60Hz
Output Relay	OL		2-SPST, 3A/250VAC, Resistive	2-SPST, 3A/250VAC, Resistive	1-SPST, 3A/250VAC, Resistive	2-SPST, 3A/250VAC, Resistive
	AL(GR/SC)		1-SPST(AL)	1-SPST(S.C)	1-SPST(GR)	-
Environment	Temperature	Store	-30℃ ~ 80℃	-30℃ ~ 80℃	-30℃ ~ 80℃	-30℃ ~ 80℃
		Operation	-20℃ ~ 60℃	-20℃ ~ 60℃	-20℃ ~ 60℃	-20℃ ~ 60℃
	Humidity		30 ~ 85RH, Without condensation	30 ~ 85RH, Without condensation	30 ~ 85RH, Without condensation	30 ~ 85RH, Without condensation
Display	7-Segment LEDs		○	○	○	○
	Bar-Graph		○	○	○	○
Mounting			35mm Din-rail	35mm Din-rail	35mm Din-rail	35mm Din-rail

Table #1. Current Range : Same as Table#1 on page 16

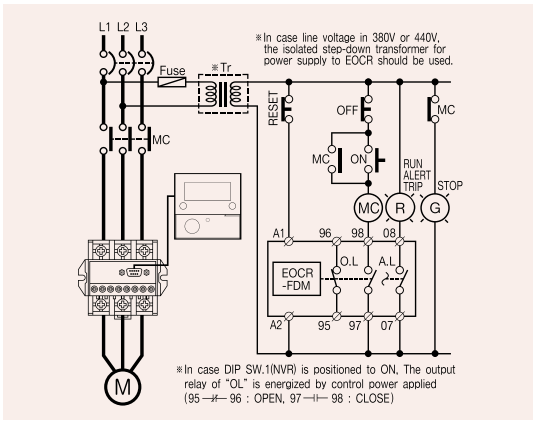
Caution : The extermal CT should be used in case Inverse curve(toln setting) is applied over 10Amps.

EOCR-FDM/FMS/FMZ/FM420

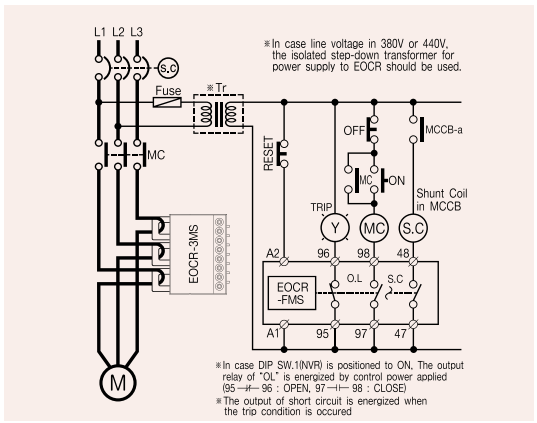
Typical Wiring



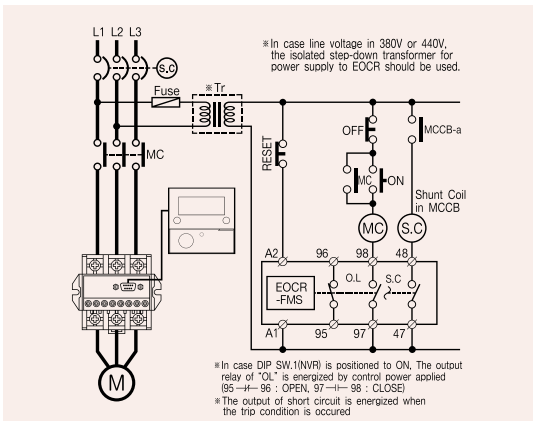
EOCR-3DM



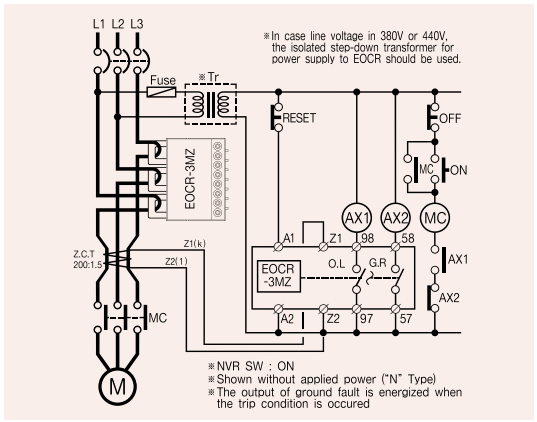
EOCR-FDM



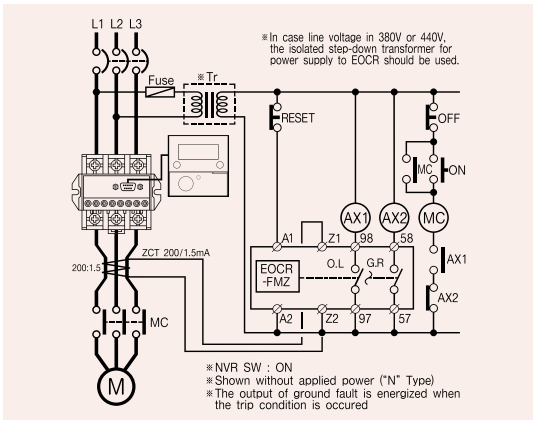
EOCR-3MS



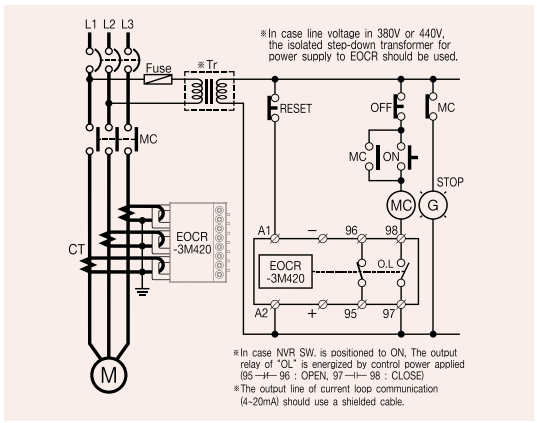
EOCR-FMS



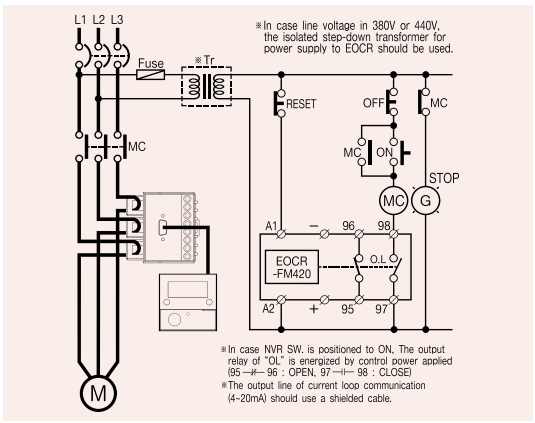
EOCR-3MZ



EOCR-FMZ



EOCR-3M420



EOCR-FM420

Features

- MCU(Microprocessor Control Unit) Based
- Convenient installation
  - PMZ : Panel Mounting Type
  - PFZ : Panel Flush Mounting Type
- Easy to set
- 3 Integral Current Transformers
- Multiple Protection Functions
- Wide range protection from 0.1A to 3600A by just 1 model
- Built-in digital ammeter
- Total running time display
- Current display like L1→L2→L3→GF…
- Bar-Graph monitoring on impending overload trip
- Selectable time-current characteristics [Inverse / Inverse based on thermal Memory(Thermal Inverse) / Definite]
- 4~20mA current loop communcations
- Test function
- Selectable Fail-safe operation / No volt Release (FS : ON)
- Operates in wide ambient temperature range

Comparison Table of Model

EOCR		PMZ	FMZ
Protection	Over - current	●	●
	Under - current	●	●
	Short - current	●	●
	Phase Loss	●	●
	Phase Unbalance	●	●
	Phase Reverse	●	●
	Locked Rotor	●	●
	Ground Fault	●	●
Current output 4~20mA		●	●

External CT Option

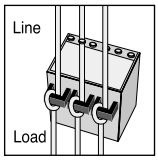
Higher ampere ranges can be achieved by setting CT Ratio in "ct" mode to take an external current transformer, and the actual motor current display can be provided

Current Setting Range (Amps)	Number of Conductors thru CT windows	External CT Ratio	Setting of CT Ratio	Remark
0.5 ~ 60A	1	-	OFF	Wide Range
0.25 ~ 3.0A	2	-	2t	
0.1 ~ 1.2A	5	-	5t	
1 ~ 12A	1	10 : 5	10	
1.5 ~ 18A	1	15 : 5	15	
2.0 ~ 24A	1	20 : 5	20	
2.5 ~ 30A	1	25 : 5	25	
3.0 ~ 36A	1	30 : 5	30	
4.0 ~ 48A	1	40 : 5	40	
5 ~ 60A	1	50 : 5	50	
6 ~ 72A	1	60 : 5	60	
7.5 ~ 90A	1	75 : 5	75	
10 ~ 120A	1	100 : 5	100	
12 ~ 144A	1	120 : 5	120	
15 ~ 180A	1	150 : 5	150	
20 ~ 240A	1	200 : 5	200	
25 ~ 300A	1	250 : 5	250	
30 ~ 360A	1	300 : 5	300	
40 ~ 480A	1	400 : 5	400	
50 ~ 600A	1	500 : 5	500	
60 ~ 720A	1	600 : 5	600	
75 ~ 900A	1	750 : 5	750	
80 ~ 960A	1	800 : 5	800	
100 ~ 1200A	1	1000 : 5	1000	
120 ~ 1800A	1	1500 : 5	1500	
200 ~ 3000A	1	2000 : 5	2000	
250 ~ 3000A	1	2500 : 5	2500	
300 ~ 3600A	1	3000 : 5	3000	

Looping Option

Smaller ampere ranges than particular EOCR current range can be covered by looping the motor wire 2 or 3 times as under described.

	No of Loops	Current Ratio of Ext. CT	Current Setting Range (A)
0.5Type	0	1	0.5 - 10
Looping Option	1	2	0.25 - 6
	2	3	0.17 - 3.3
	3	4	0.12 - 2.5
	4	5	0.1 - 2

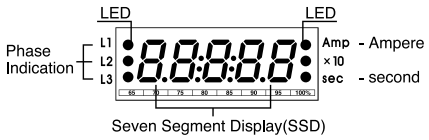


Looping Option (1-Loop)

Protection Feature

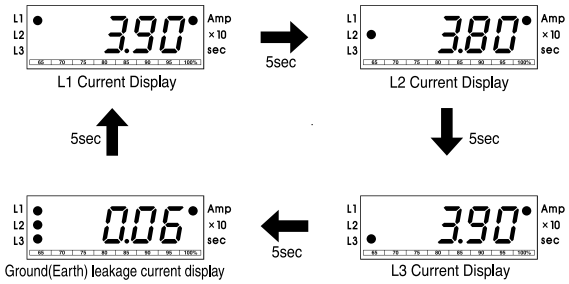
Function	Description	Selection
Over-Current	When the motor operating current(In) exceeds preset "oc" setting, the relay will trip after preset O-Time in "ot" setting The amperage of In(operating current) will not effoet relay trip time.	Otc:dE Selection Curve-2
	The tripping time of relay depends on the amperage of In (operating current) according to time-current charateristics	Otc:In Selection Curve-1
	Thermal Inverse characteristics is adopted inverse time-current charateristics based on thermal memory. If Otc:dE or Otc:In is selected, accumulated thermal memory is cleared (Automatically reset)	Otc:th
Under-Current	This is for idle/dry running protection. The relay operates when the operating current is less than preset "uc" current after preset "ut" time elapses.	Definite time
Phase Loss	The relay will be operated within 3sec. when the phase failure occurs. This function works during D-Time. If this function is not necessary, it can be deleted by selected PL:oFF	PL:on Selection
Phase Unbalance	The relay operates within 8sec. when the current diffenence among 3phases is greater than preset % of unbalance. The calculation formula is (Max-Min)/Max current × 100	Ub:6 shows 6% selected
Phase Reversal	In the event of wrong phase sequence, relay will be operated in 0.1sec. Phase reversal protection function can be disabled by setting RP:oFF	RP:on Selection
Ground Fault	Ground fault protection is provided by the relay tripping sensed by Zero. Phase Current Trasformer (Core Balanced Current Transformer) The relay shows the leakage current during operation. The characteristic of operating time can be selected for Etc:dE or In.	Definite 0.03-10A inverse 0.03-1.0A
Locked Rotor	The setting range is 2-10 times of oc setting. If the starting current exceeds more than setting value after preset D-Time elapses, the relay will be energized within 0.5sec. This function is available on definite time characteristic It can be deleted by setting Lc:oFF	Disable on inverse charateristic During D-Time
Stall	The setting range is 1-10sec. If the operating current exceeds more than 180% of preset "oc" setting, the relay will be energized after the preset "st" time elapses. It can be deleted by setting Sc:oFF which makes St:oFF automatically(operating time of stall)	Disable on inverse charateristic After D-Time

LED Display



Digital Ammeter

3 phase motor currents (In) and ground(earth) leakage current are displayed in sequence on the LED display.



Digital Trip Cause Indication / Easy Troubleshooting

When EOCR-M1 series relay trips, the cause of trip is displayed on the LED display. The displayed trip cause assures easy troubleshooting

Fail-safe & Non-fail-safe

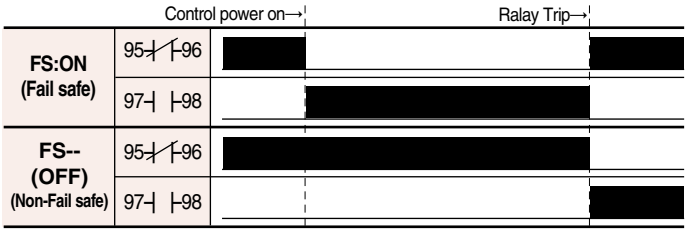
The tripping relay can be operated in a fail-safe or non-fail-safe mode

Application of the Fail-safe Connection

Fail safe setting in"FS" mode : ON
The tripping relay is normally energized with control power supply

Application of the Non-fail-safe Connection

In all cases, the failure of the control voltage may not interrupt the process.



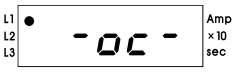
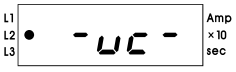
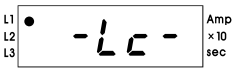
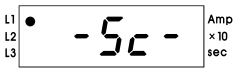
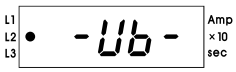
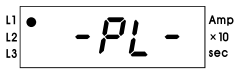
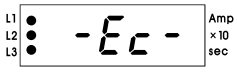
Test

This is the self-test of this product, checking function of sequence after the installation. If the relay enters into this mode, it begins its count down preset value of O-Time after waiting 3sec and becomes trip state as showing "END" message that means this relay is ready to work "END" message of this test is also stored in "Fault" mode as last trip. While motor is running, output relay contact is not switched to prevent unnecessary trip

Reset

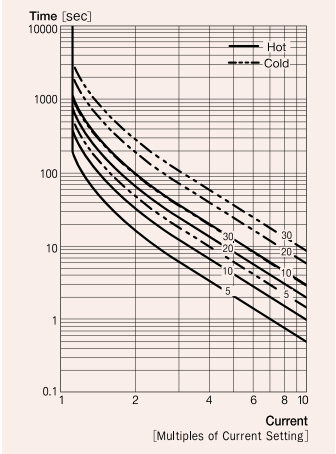
It can be selected by rt:H-r, rt:E-r or rt:A-r in rt mode.
The rt means reset type and the meaning of H-r, E-r and A-r are hand, electrical and auto reset respectively.
The relay can be reseted by depressing the reset button on relay facia -rt:H-r, interruption of control power on A1, A2-rt:E-r and by setting of automatic reset time from 0.2sec to 20min(indication : 20n) -rt:A-r and A:0.3

Examples of Trip Cause Indication

· **Over-current Trip** Operated by max.current among 3 phases	
· **Under-current Trip** Operated by min.current among 3 phases	
· **Locked Rotor Trip** Operated by Locked Rotor in starting state The highest current is L1 phase	
· **Stall Trip** Operated by Locked Rotor in operating state L1 phase current reachis stall setting volue	
· **Phase Reversal Trip** Operated by Reversal Trip	
· **Phase Unbalance Trip** Operated by Phase Unbalance Trip The Lowest current in L2 phase	
· **Phase Loss Trip** Phase Loss Trip The indication Shows L1 phase loss.	
· **Ground Fault Trip** Operated by Ground fault current	

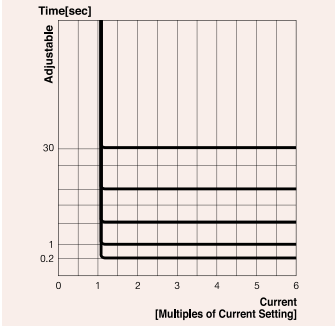
Each phase current is displayed in order whenever depress UP/DN switch every once after entering into "trip" mode

Time-Current Characteristic Curve

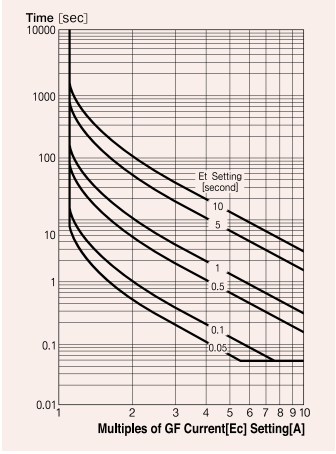


Curve-1 Inverse

O-T Setting	IEC 947-4(Trip Class)
1-5	10A
6-10	10
11-20	20
21-30	30



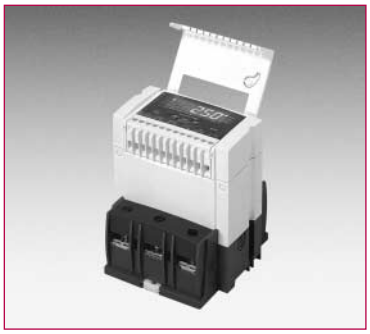
Curve-2 Definite



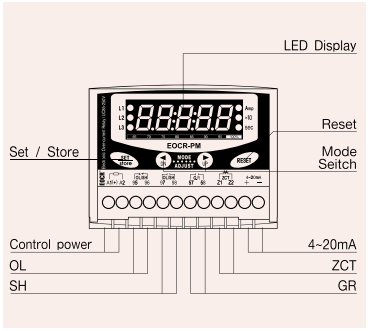
Curve-3
Inverse time characteristics of EC (Ground current range : 0.03~1A)

EOCR-PMZ

Digital Over Current Relay



EOCR-PMZ



- MCU Based / Panel Mounting Type
- 3 Integral Current Transformers
- Over-current, Under courrent, Phase Loss, Phase Unbalance, Phase Reversal, Ground Fault.
  Locked Rotor Protection and current output(4~20mA)
- Digital Ammeter & Easy Troubleshooting
- Bar-graph Type LED Display
- Selectable Trip Time-Current Characteristics
- Independently Adjustable Starting Trip Delay and Operating Time

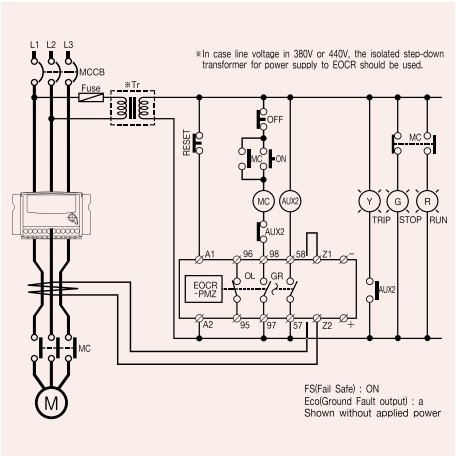
Protection

EOCR-PMZ			
Protective Item	**Trip Time**	**Protective Item**	**Trip Time**
Over-current	O-TIME	Ground fault	Preset Et time
Under-Current	Preset Ut time	Locked Rotor	0.5sec after d-time
Phase reversal	0.1~0.3sec	Stall	0.05~10sec
Phase Unbalance	8sec		

Specification

Model			**PMZ**	
Current Setting Range	Over-Current(oc)		Refer to current setting range(page 19)	
	Under-Current(uc)		Off / 0.5 ~ less than “oc” setting	
	Ground Fault Current(Ec)		Off	
			0.3 ~ 10A : definite time characteristics	
			0.3 ~ 1A definite / inverse time characteristics, selectable	
Time Setting	Starting Delay Time(dt)		Off ~ 200sec, Adjustable	
	Over-Current Trip Delay(ot)		Definite Time	0.2 ~30sec
			Inverse Time	1.0 ~ 30class(30curves)
	Under-Current Trip Delay(ut)		0.5 ~ 30sec, definite time characteristics, if “uc” mode is OFF, then OFF is displayed automatically in “ut” mode	
	Ground Fault Trip Delay(Et)		Definite / Inverse : 0.05, 0.1 ~ 1 ~ 10sec(curve-3)	
	Ground Failt Starting Delay(Ed)		OFF / 1~ 10sec	
Tolerance	Current		±5%	
	Time		±5%	
Control Power	220		85 ~ 250VAC/DC, 50/60Hz	
Output Relay	OL		2-SPST	3A / 250VAC Resistive
	GR		1-SPST	3A / 250VAC Resistive
Environment	Temperature	Store	-30 ~ 80℃	
		Operation	-20 ~ 60℃	
	Humidity		30 ~ 85% RH Non-Condensing	
Display	7-Segment LEDs		3 Phase current, Trip cause, Operating hour	
	Bar-Graph		Load factor for current setting(50 ~ 100%)	
Insulation			Between casing and circuit : over 10㏁, DC500V	
Dielectric Strength	Between casing and circuit		Between casing and circuit	2000VAC, 60Hz, 1min
	Between open contacts		Between open contacts	1000VAC, 60Hz, 1min
	Between circuit		Between circuit	2000VAC, 60Hz, 1min
Electrostatic Discharge		IEC61000-4-2	Lever 3 : Air Discharge : ±8kV, Contact Discharge : ±6kV	
Radiated Electromagnetic Field Disturbance		IEC61000-4-3	Lever 3 : 10V/m, 150MHz & 450MHz Portable transceiver	
EFT / Burst		IEC61000-4-4	Lever 3 : ±2kV, 1min	
Surge		IEC61000-4-5	Lever 3 : 1.×50㎲, ±4kV(0°, 90°, 180°, 270°)	
1MHz Burst disturbance		IEC61000-4-12	Lever 3 : 2.5kV, 1MHz	
Conducted Emission		EN55011	Class B	

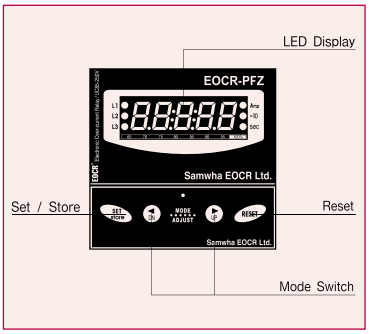
Typical Wiring



EOCR-PMZ (Terminal Type)

EOCR-PFZ

Digital Over Current Relay



EOCR-PFZ

- MCU Based / Panel Mounting Type
- 3 Integral Current Transformers
- Over-current, Under courrent, Phase Loss, Phase Unbalance, Phase Reversal, Ground Fault.
  Locked Rotor Protection and current output(4~20mA)
- Digital Ammeter & Easy Troubleshooting
- Bar-graph Type LED Display
- Selectable Trip Time-Current Characteristics
- Independently Adjustable Starting Trip Delay and Trip Time

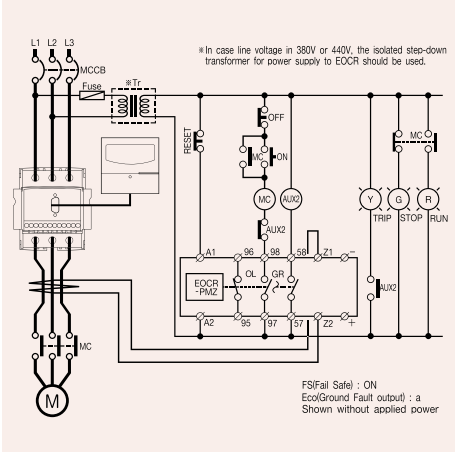
Protection

EOCR-PFZ			
Protective Item	**Trip Time**	**Protective Item**	**Trip Time**
Over-current	O-TIME	Short Circuit	0.03~0.05sec
Under-Current	Preset Ut time	Ground fault	Preset Et time
Phase reversal	3sec	Locked Rotor	0.5sec after d-time
Phase Unbalance	8sec	Stall	0.05~10sec

Specification

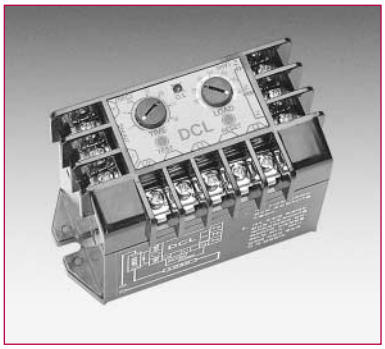
Model			**PFZ**	
Current Setting Range	Over-Current(oc)		Refer to current setting range(page 19)	
	Under-Current(uc)		Off / 0.5 ~ less than “oc” setting	
	Ground Fault Current(Ec)		Off	
			0.3 ~ 10A : definite time characteristics	
			0.3 ~ 1A definite / inverse time characteristics, selectable	
Time Setting	Starting Delay Time(dt)		Off ~ 200sec, Adjustable	
	Over-Current Trip Delay(ot)		Definite Time	0.2 ~30sec
			Inverse Time	1.0 ~ 30class(30curves)
	Under-Current Trip Delay(ut)		0.5 ~ 30sec, definite time characteristics, if “uc” mode is OFF, then OFF is displayed automatically in “ut” mode	
	Ground Fault Trip Delay(Et)		Definite / Inverse : 0.05, 0.1 ~ 1 ~ 10sec(curve-3)	
	Ground Failt Starting Delay(Ed)		OFF / 1~ 10sec	
Tolerance	Current		±5%	
	Time		±5%	
Control Power	220		85 ~ 250VAC/DC, 50/60Hz	
Output Relay	OL		2-SPST	3A/250VAC Resistive
	GR		1-SPST	3A/250VAC Resistive
Environment	Temperature	Store	-30 ~ 80℃	
		Operation	-20 ~ 60℃	
	Humidity		30 ~ 85% RH Non-Condensing	
Display	7-Segment LEDs		3 Phase current, Trip cause, Operating hour	
	Bar-Graph		Load factor for current setting(50 ~ 100%)	
Insulation			Between casing and circuit : over 10㏁, DC500V	
Dielectric Strength	Between casing and circuit		Between casing and circuit	2000VAC, 60Hz, 1min
	Between open contacts		Between open contacts	1000VAC, 60Hz, 1min
	Between circuit		Between circuit	2000VAC, 60Hz, 1min
Electrostatic Discharge		IEC61000-4-2	Lever 3 : Air Discharge : ±8kV, Contact Discharge : ±6kV	
Radiated Electromagnetic Field Disturbance		IEC61000-4-3	Lever 3 : 10V/m, 150MHz & 450MHz Portable transceiver	
EFT / Burst		IEC61000-4-4	Lever 3 : ±2kV, 1min	
Surge		IEC61000-4-5	Lever 3 : 1.×50㎲, ±4kV(0°, 90°, 180°, 270°)	
1MHz Burst disturbance		IEC61000-4-12	Lever 3 : 2.5kV, 1MHz	
Conducted Emission		EN55011	Class B	

Typical Wiring



EOCR-PFZ (Terminal Type)

DCL/DUCR *Electronic DC Current*



Features

- DC Overcurrent Relay for DC Motor
- The milli-volt(㎷) signals generated from the Shunt and power supply are sensed by solid state circuitry and compared with preset overload setting. In case sensing overload condition, the internal relay switches contact after the preset delay. It has easier control operation. It has DC Overload and DC Underload protection relays.
- It has wide DC current protection range from 1A to hundreds Amps.
- DC Ammeter maybe used instead of Shunt (DC Ammeter has its own shunt inside and keep 50mV maintained.)

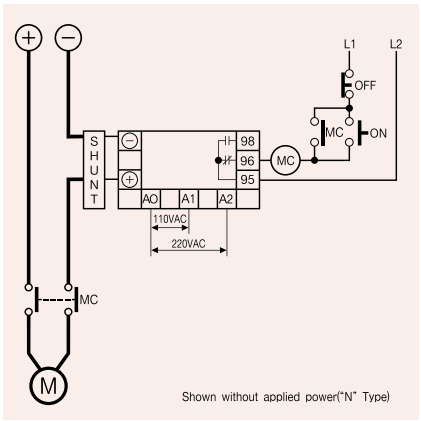
Protection

Protective Item	Trip Time	
	DCL	DUCR
Over-current	O-TIME	-
Undercurrent (Dry-run)	-	O-TIME

Specification

Current Setting		Type	Setting Range(DCL)	Setting Range(DUCR)
			DC Over-current Relay	DC Under-current Relay
		70	Secondary Voltage of Shunt (10~70m VCD)	
Trip Time Setting		O-TIME	30sec(Adjustable)	
Reset		M	Manual(Instantaneous) / Electrical(Remote)	
		A	Auto(Instantaneous) Reset(Option)	
Indication			LED	
Power Supply	Voltage	220	110 / 220VAC	Other Voltage(Option)
		440	380 / 440VAC	
	Frequency		50 / 60Hz	
Auxiliary Relay		N	Normally Energized	
		R	Normally De-energized	
Mounting			Panel	

Typical Wiring



Shown without applied power("N" Type)

DOCR-S/H *Electronic DC Current*

Features

- MCU (Microprocessor Control Unit) Based
- DC Motor / DC Device Protection
- Sensing by Shunt (DOCR-S) / by Hall Sensor (DOCR-H)
- Actual primary current is displayed after Shunt / Hall Sensor setting. (Indication)
- Digital Setting / Tripped Current digital DATA displayed. (Indication)
- Auto Reset / Reset Time Setting
- Confirm Setting Current / Test Function
- No Volt Release function (Fail-safe Operation) Setting (→ NVR Setting)

Protection

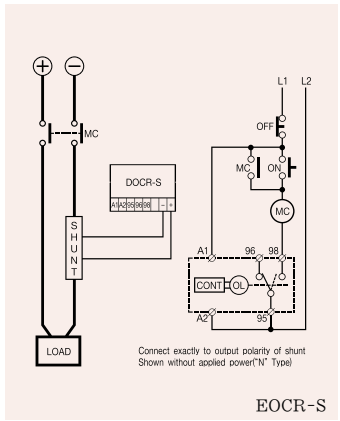
Protective Item	Trip Time
Over-current	O-TIME(Definite)

※In case the line voltage is same voltage with control voltage of DOCR-S type, Contact our representative or our head office.

Specification

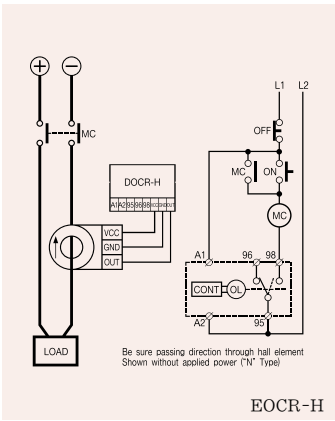
Current Setting			Setting Range (DOCR/DUCR-S)	Setting Range (DOCR/DUCR-H)
			0.1 ~ 240A	5 ~ 360A
O-TIME			0.5 ~ 25sec	0.5 ~ 25sec
Reset Time			0.5 ~ 25sec	0.5 ~ 25sec
Rated Shunt			1A, 2A, 5A, 10A, 20A, 50A, 110A, 200A	
Rated Hall Sensor			-	50A, 100A, 200A, 300A
Power Supply	Voltage	24	24VAC/DC	24VAC/DC
		220	85 - 250VAC/DC	85 - 250VAC/DC
	Frequency		50/60Hz	50/60Hz
Reset			Manual / Electrical / Auto Reset	
Output Relay		Mode	1-SPDT(1C)	
		Rating	3A/ 250VAC Resistive	
Indication			7Segment LED	
Mounting			Panel	

Typical Wiring



Connect exactly to output polarity of shunt
Shown without applied power("N" Type)

EOCR-S



Be sure passing direction through hall element
Shown without applied power ("N" Type)

EOCR-H

EUCR *Electronic Undercurrent Relay*

Features

- Compact Design
- Two Integral Current Transformers
- Under-load Protection (Dry-run Protector)
- Wide Current Adjustment Range
- Definite Trip Time Characteristic
- Manual (instantaneous) / Electrical (Remote) Reset
- Ambient Insensitive
- Non-fail-safe Operation

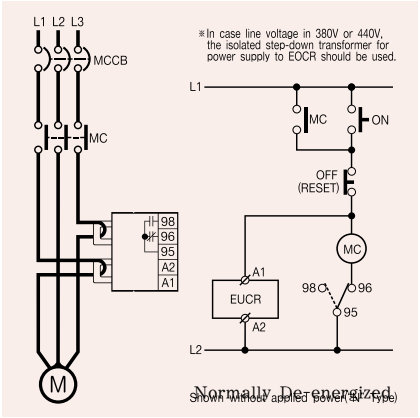
Protection

Protective Item	Trip Time
Undercurrent (Dry-run)	O-TIME

Specification

Current Setting		Type	Setting Range
		05	0.5 - 6A
		30	3.0 - 30A
		60	5.0 - 60A
		100 - 600	05 Type fitted to External CT (Current Ratio: 100/5A - 600/5A)
Trip Time Setting		O-TIME	0.2 - 30 sec
Reset			Manual (Instantaneous) / Electrical (Remote)
Time-current Characteristics			Definite
Power Supply	Voltage	24	24VAC/DC
		110	110VAC
		220	220VAC
	Frequency		50/60Hz
Output Relay	Mode		1-SPDT (1C)
	Rating		3A/250VAC Resistive
	Status		Normally De-energized
Mounting			35mm DIN-rail / Panel

Typical Wiring



EUCR-3C *Electronic Undercurrent Relay*

Features

- Compact Design
- Three Integral Current Transformers
- Under-load Protection / Dry-run Protector
- Wide Current Adjustment Range
- Definite Trip Time Characteristic
- Manual (instantaneous) / Electrical (Remote) Reset
- Ambient Insensitive
- Fail-safe Operation

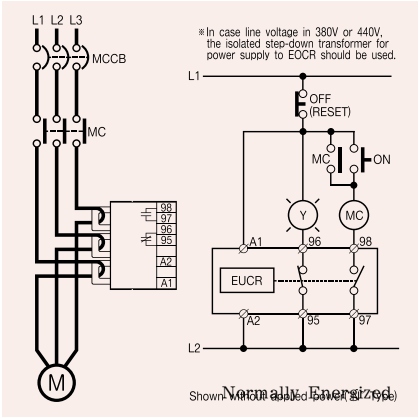
Protection

Protective Item	Trip Time
Undercurrent (Dry-run)	O-TIME

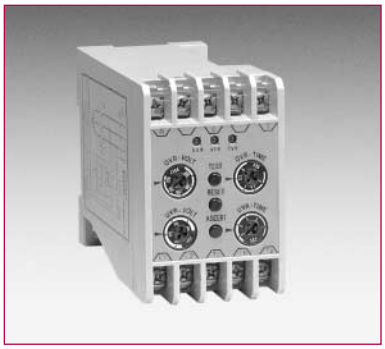
Specification

Current Setting		Type	Setting Range
		05	0.5 - 6A
		30	3.0 - 30A
		60	5.0 - 60A
		100 - 600	05 Type fitted to External CT (Current Ratio: 100/5A - 600/5A)
Trip Time Setting		O-TIME	0.2 - 30 sec
Reset			Manual (Instantaneous) / Electrical (Remote)
Time-current Characteristics			Definite
Power Supply	Voltage	24	24VAC/DC
		110	110VAC
		220	220VAC
	Frequency		50/60Hz
Output Relay	Mode		2-SPST (1a1b)
	Rating		3A/250VAC Resistive
	Status		Normally Energized
Mounting			35mm DIN-rail / Panel

Typical Wiring



EVR *Electronic AC Voltage Relay*



Features

- Compact Design
- Multiple Protection Functions
- 24 Hours Trip Cause Memory
- Trip Indication & Troubleshooting ⟶ Ascertain Button
- Manual / Electrical Reset
- Ambient Insensitive

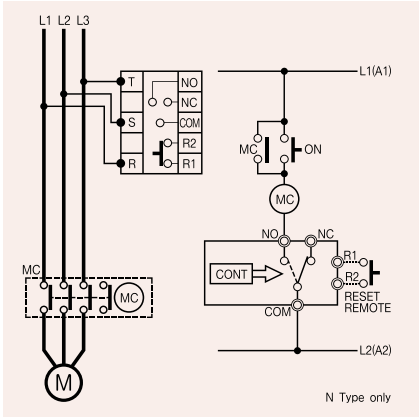
Protection

Protective Item	Trip Time
Over-voltage	OVR-TIME
Under-voltage	UVR-TIME
Phase Loss	0.5 sec
Phase Reversal	0.5 sec

Specification

Rated Voltage		EVR - 220	EVR - 380	EVR - 415
		220V	380V	415V
Voltage Setting	OVR-VOLT	220 - 300V	380 - 460V	415 - 500V
	UVR-VOLT	160 - 220V	300 - 380V	340 - 415V
Trip Time Setting	OVR-TIME	0.5 - 2 sec		
	UVR-TIME	1 - 5 sec		
Phase Loss Trip Time		within 0.5 sec		
Phase Reversal Trip Time		within 0.5 sec (after Supply Power)		
Time-current Characteristic		Definite		
Output Relay		1-SPDT(1C), 5A/250VAC Resistive		
Reset	M	Manual Reset		
	A	Automatic Reset (Reset Time = 5 sec)		
TEST		Trip in 1 sec (after Pushing TEST Button)		
ASCERTAIN S/W (Trip Cause Indication)		Trip Cause is memorized for 24 hours and Trip Cause will be indicated via LED by pushing Ascertain S/W.		
Allowable Tolerance	Voltage	±5%		
	Time	±15%		

Typical Wiring



EVR-PD/FD *Digital AC Voltage Relays*

Features

- MCU & ASIC Based Compact Design
- Multiple Protection Functions
- Wide Voltage Adjustment Range
- Digital Volt Meter and Digital Setting
- Trip Cause Display & Easy Troubleshooting
- Manual / Electrical / Automatic Reset
- Adjustable Reset Timer
- Ambient Insensitive

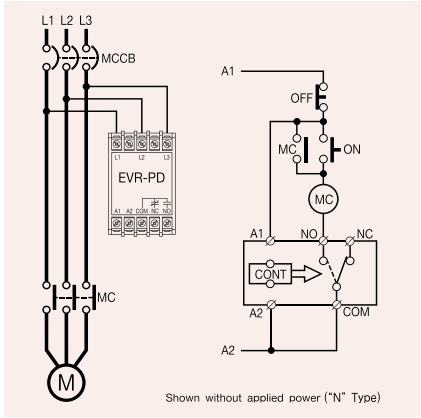
Protection

Protective Item	Trip Time (EVR-PD/FD)
Over-voltage	OVR-TIME
Under-voltage	UVR-TIME
Phase Loss	2 sec
Phase Reversal	0.1 sec
Voltage Unbalance	3 sec

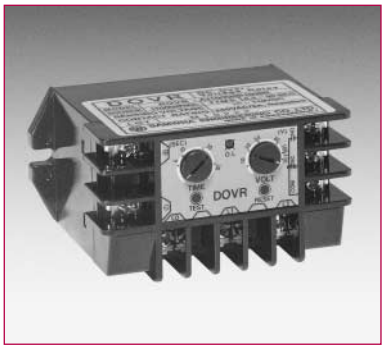
Specification

Voltage Setting		Type	Over-voltage (O-VOLT)	Under-voltage (U-VOLT)
		110	110 - 150V	80 - 120V
		220	220 - 300V	160 - 240V
		440	380 - 500V	300 - 440V
Trip Time Setting		O-TIME	0.5 - 10 sec	
		U-TIME	0.5 - 10 sec	
Control Voltage		220	AC/DC85 - 250V	
		Others	AC/DC24, 48V (Optional Order)	
Output Relay		Mode	1-SPDT(1C)	
		Rating	3A/250VAC Resistive	
		Status	Normally Energized	
Reset		SW3=AUTO	Reset Time: 1 or 5 sec (DIP-SW4)	
		SW3=MAN	RESET Button	
Mounting	PD		35mm Din-Rail / Panel	
	FD	DCU	Flush	
		PCU	35mm DIN-Rail / Panel	

Typical Wiring



DOVR/DUVR *Electronic DC Voltage Relay*



Features

- Compact Design
- Definite Trip Time-current Characteristic
- Trip & Run Indication (LED)
- Confirm actual current and precise setting possible as it has Voltage Meter.
- Solid State DC Over-voltage / Undervoltage Protection.

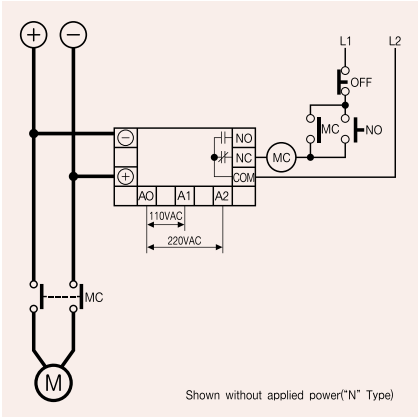
Protection

Protective Item	Trip Time	
	DOVR	DUVR
Over-voltage	O-TIME	-
Undervoltage	-	O-TIME

Specification

Model			DC Over-voltage	DC Undervoltage
Voltage Setting		Type	Voltage Setting Range	
		10	1 ~ 10V	-
		30	3 ~ 30V	3 ~ 30V
		110	10 ~ 110V	20 ~ 110V
		220	20 ~ 220V	30 ~ 220V
		Others	Option	
Trip Time Setting	Trip Delay	O-TIME	0.2 ~ 30sec	
Reset		M	Manual(Instantaneous) / Electrical Reset	
		A	Auto (Option)	
Control Voltage		220	110/220VAC, 50/60Hz	
		Others	Other Voltage Option	
Auxiliary Relay	Mode/Rating	1-SPDT(1C)	3A/250VAC Resistive	
	Status	R Type	Normally De-energized	
Mounting			Panel	

Typical Wiring



DVR *Electronic DC Voltage Relay*

Features

- MCU (Microprocessor Control Unit) Based
- DC Motor / DC Device Protection
- Separate Setting for Over-voltage and Undervoltage
- Line Voltage Indicative Function (FND)
- Digital Setting / Trip Cause Indication
- Auto Reset / Reset Time Setting
- Confirm Setting Value / TEST Function
- No Volt Release Function (Fail-safe Operation) Setting (→NVR Setting)

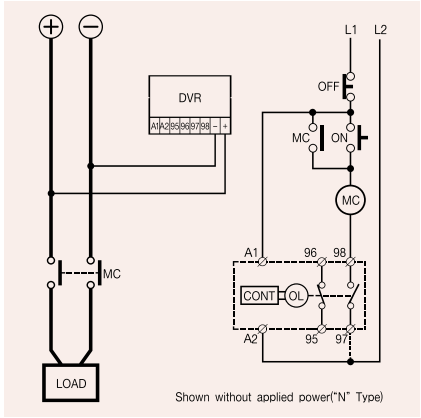
Protection

Protective Item	Trip Time
Over-voltage	O-TIME
Undervoltage	O-TIME

Specification

Model			Setting Range
Over-voltage		OVR	100 ~ 160VDC
Undervoltage		UVR	60 ~ 110VDC
Trip Time		O-TIME	0.5 ~ 25sec
Reset Time		R-TIME	0.5 ~ 25sec
Power Supply	Voltage	24	24VAC/DC
		220	85 ~ 250VAC/DC
	Frequency		50/60Hz
Reset			Manual / Electrical / Auto Reset
Mounting			35mm DIN-Rail / Panel

Typical Wiring



ELR *Earth Leakage Relay*

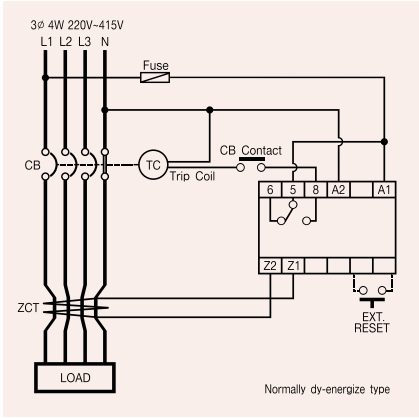
Features

- MCU Based Compact Design
- Ground (Earth) Fault Protection for Motor and Power Distribution Systems
- Zero Phase Current Detection Method
- Test Button Provides a Manual Self-testing Function
- Independently Adjustable Ground (Earth) Current and Trip (Operating) Delay Time
- Built-in Power Indication LED and Trip Indication LED

Specification

Current Setting	0.03 ~ 3A (0.03, 0.07, 0.1, 0.3, 0.5, 1, 1.5, 2, 2.5 and 3A Tap)	
Time Setting	0.2 ~ 2.0sec (0.2, 0.4, 0.6, 0.8, 1.0, 1.2, 1.4, 1.6, 1.8 and 2.0 sec Tap)	
Operating Characteristic	Definite Time	
Current Sensing	ZCT(CBCT) - Zero Phase Current Detection	
Control Voltage	240VAC ±10%	
Frequency	50/60Hz	
Current Tolerance	±5%	
Time Tolerance	±5%	
Output Contact	5A/250VAC Resistive	
	1-SPDT / Normally De-energized	
Rated Insulation Voltage	600VAC, 50/60Hz	
Expected Mechanical Life	10,000,000 Operation	
Expected Electrical Life	100,000 Operation	
Ambient Temperature	-20 ~ 60℃	
Ambient Humidity	10 ~ 85% without Condensation	
Dielectric Strength	Casing-Circuit	2kV, 50/60Hz, 1min
	Contact-Contact	1kV, 50/60Hz, 1min
	Circuit-Circuit	2kV, 50/60Hz, 1min
Electrostatic Discharge	IEC61000-4-2 Level-3	
EFT / Burst	IEC61000-4-4 Level-3	
Surge	IEC61000-4-5 Level-3	
Voltage Dip & Interruption	IEC61000-4-11	
Mounting	Flush Mount (Panel Door Mount)	

Typical Wiring



EFR2.5 *Ground(Earth) Fault Relay*

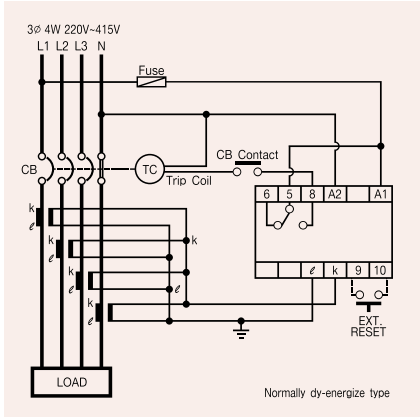
Features

- MCU Based Compact Design
- Ground (Earth) Fault Protection for Motor and Power Distribution Systems
- Residual Current Detection Method
- Test Button Provides a Manual Self-testing Function
- Independently Adjustable Ground (Earth) Current and Trip (Operating) Delay Time
- Built-in Power Indication LED and Trip Indication LED

Specification

Current Setting	0.1 ~ 2.5A (0.1, 0.3, 0.5, 0.7, 1.0 , 1.3, 1.5, 1.7, 2.0 and 2.5A Tap)	
Time Setting	0.2 ~ 2.0sec (0.2, 0.4, 0.6, 0.8, 1.0, 1.2, 1.4, 1.6, 1.8 and 2.0 sec Tap)	
Operating Characteristic	Definite Time	
Current Sensing	Residual Current Detection	
Control Voltage	240VAC ±10%	
Frequency	50/60Hz	
Current Tolerance	±5%	
Time Tolerance	±5%	
Output Contact	5A/250VAC Resistive	
	1-SPDT / Normally De-energized	
Rated Insulation Voltage	600VAC, 50/60Hz	
Expected Mechanical Life	10,000,000 Operation	
Expected Electrical Life	100,000 Operation	
Ambient Temperature	-20 ~ 60℃	
Ambient Humidity	10 ~ 85% without Condensation	
Dielectric Strength	Casing-Circuit	2kV, 50/60Hz, 1min
	Contact-Contact	1kV, 50/60Hz, 1min
	Circuit-Circuit	2kV, 50/60Hz, 1min
Electrostatic Discharge	IEC61000-4-2 Level-3	
EFT / Burst	IEC61000-4-4 Level-3	
Surge	IEC61000-4-5 Level-3	
Voltage Dip & Interruption	IEC61000-4-11	
Mounting	Flush Mount (Panel Door Mount)	

Typical Wiring



EGR *Electronic Ground Fault Relay*

Features

- MCU Based Compact Design
- Ground Fault Protection with ZCT
- Trip & Run Indication LED
- Manual / Electrical Reset

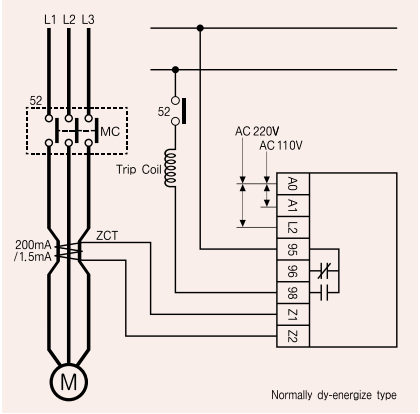
Protection

Protective Item	Trip Time
Ground Fault	O-Time

Specification

Ground Fault (GF)	Type	Range
Current Setting	05	50 - 500mA
	10	100 - 1,000mA
	20	200 - 2,500mA
Trip Time Setting	O-TIME	0.2 - 2.0 sec
Reset		Manual / Electrical (Push RESET Button or Interrupt Supply Power)
Power Suppy		110 / 220VAC, 50/60Hz
Output Relay	Mode/Rating	1-SPDT(1C), 3A/250VAC Resistive
	Status	Normally De-energized
Mounting		35mm DIN-Rail / Panel

Typical Wiring



PMR *Electronic Phase Monitoring Relay*

Features

- MCU Based Compact Design
- Multiple Protection Functions
- 2 - 15% Voltage Unbalance Setting
- Trip Cause Indication & Troubleshooting
- Manual / Electrical / Automatic Reset
- Ambient Insensitive
- Fail-safe Operation

Protection

Protective Item	Trip Time
Phase Reversal	0.1 sec
Phase Loss	1 sec
Voltage Unbalance	5 sec

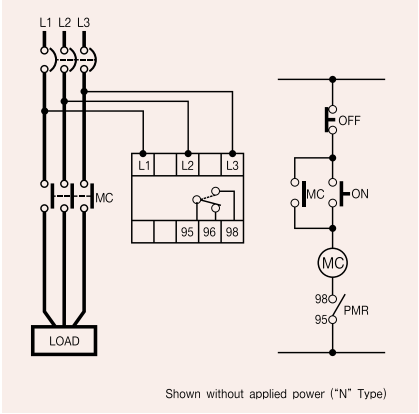
Specification

Control Voltage	Type	Range
	220	3Ø 160 - 300VAC, 50/60Hz
	440	3Ø 340 - 480VAC, 50/60Hz
Reset		Manual (Instantaneous) / Electrical Automatically reset with 5 sec delay when supply power comes to normal.
Output Relay	Mode	1 - SPDT (1C)
	Rating	5A/250VAC Resistive
	Status	Normally Energized
Mounting		35mm DIN-rail/Rail

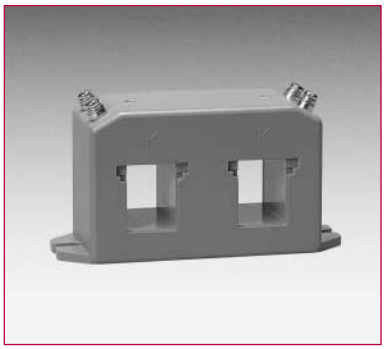
Troubleshooting

Condition			LED Signal (Pulse Chart)			
			Green LED		Red LED	
Normal Run			On		Off	
Voltage Unbalancing			On		On	
Trip	Voltage Unbalance		Off		On	
	Phase Loss	R	Off		Flickering	
		S	Off		Flickering	
		T	Off		Flickering	
	Phase Reversal		Flickering alternatively			

Typical Wiring



2CT *Current Transformer*

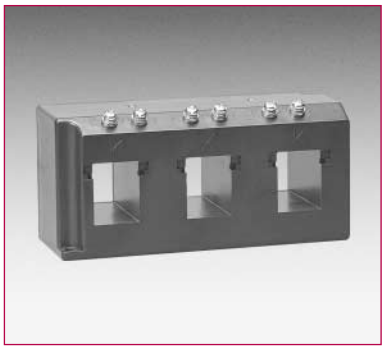


Features
- Fitted to EOCR relays for Large Amp Motor Protection
- 1.0 Measuring Class
- For EOCR Only

Specification

Model	2CT-100	2CT-150	2CT-200	2CT-300	2CT-400
Current Ratio	100 : 5A	150 : 5A	200 : 5A	300 : 5A	400 : 5A
Class	1.0	1.0	1.0	1.0	1.0
Budden	5VA	5VA	5VA	5VA	5VA
Insulation Voltage	600VAC				
Dielectric Strength	2kV				
Insulation	10MΩ(500VDC Megger)				
Mounting	Panel				

3CT *Current Transformer*

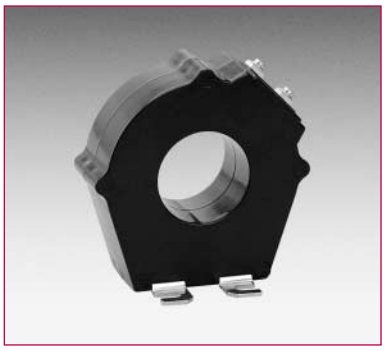


Features
- Fitted to EOCR relays for Large Amp Motor Protection
- 1.0 Measuring Class
- For EOCR Only

Specification

Model	3CT-100	3CT-150	3CT-200	3CT-300	3CT-400
Current Ratio	100 : 5A	150 : 5A	200 : 5A	300 : 5A	400 : 5A
Class	1.0	1.0	1.0	1.0	1.0
Budden	5VA	5VA	5VA	5VA	5VA
Insulation Voltage	600VAC				
Dielectric Strength	2kV				
Insulation	10MΩ(500VDC Megger)				
Mounting	Panel				

ZCT *Zero Phase Current Transformer*



Features
- Applicable for Ground Fault Protection Devices (EGR)
- Detect Zero Phase Current
- For EOCR Only

Specification

Hole Dimension	Type	Hole
	ZCT - 35	35mm
	ZCT - 80	80mm
	ZCT - 120	120mm
Primary GF Current		200mA
Secondary GF Current		1.5mA
Tolerance		±10%
Budden		10VA
Rated Voltage		600VAC
Dielectric Strength		2kV
Insulation		10MΩ(500VAC Megger)
Mounting		Panel

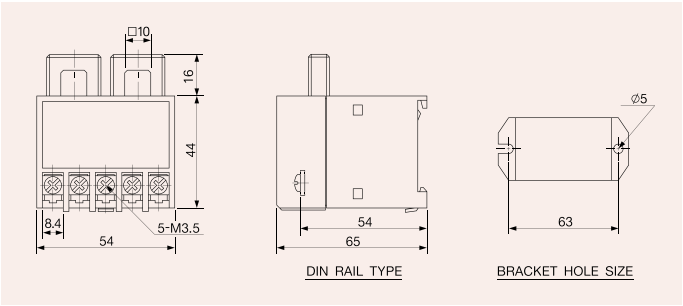
SR-CT *Current Transformer*

Features
- Fitted to EOCR relays for Large Amp Motor Protection
- Satisfied with IEC Inverse Trip Characteristic
- Protection Class
- For EOCR Only

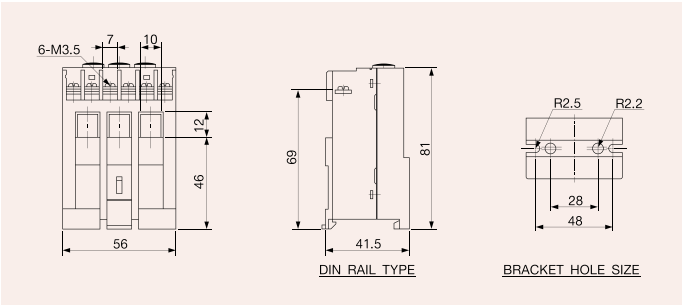
Specification

Current Ratio	Type	Current Ratio (SR-CT)
	SR-CT-100	100 : 5A
	SR-CT-150	150 : 5A
	SR-CT-200	200 : 5A
	SR-CT-300	300 : 5A
	SR-CT-400	400 : 5A
Tolerance (Protection Class)		±3%(10P10 / IF=10)
Budden		1.25VA (5VA: Measuring Class)
Secondary Current		5A
Insulation Voltage		600VAC
Dielectric Strength		3kV
Insulation		10MΩ(500VDC Megger)
Mounting		35mm DIN-Rail / Panel

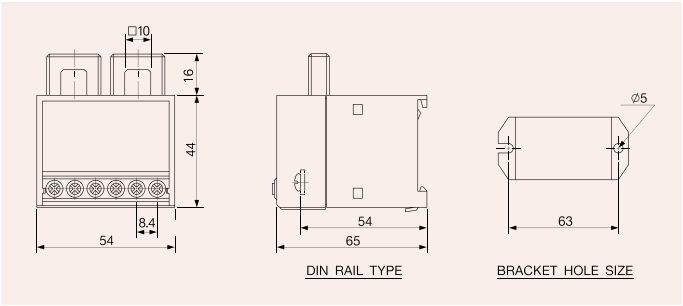
Dimension



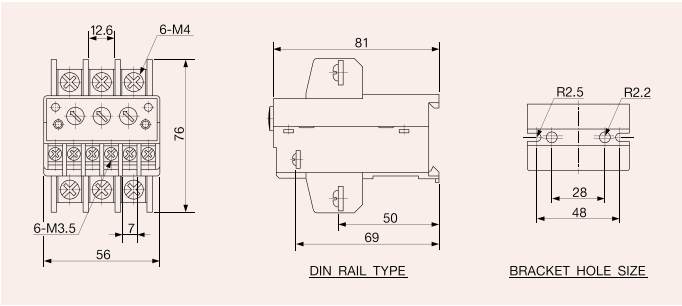
EOCR-SS / AR / EUCR



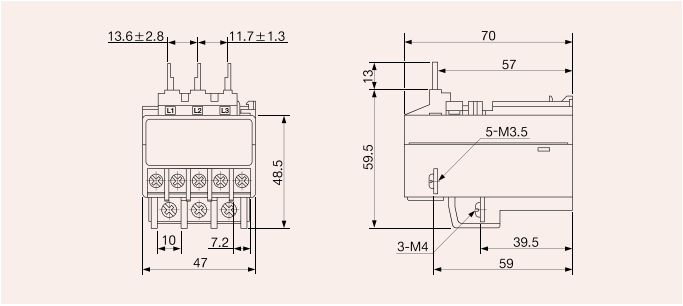
EOCR-DS / DS1 / DS2 / DS3



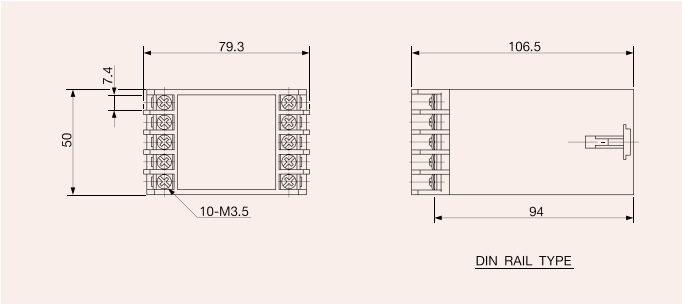
EOCR-SS1 / SS2



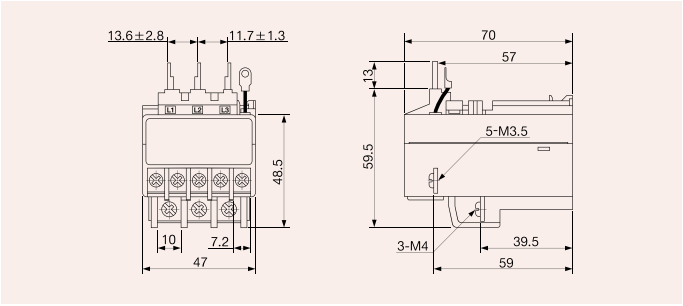
EOCR-DST / DS1T / DS2T / DS3T



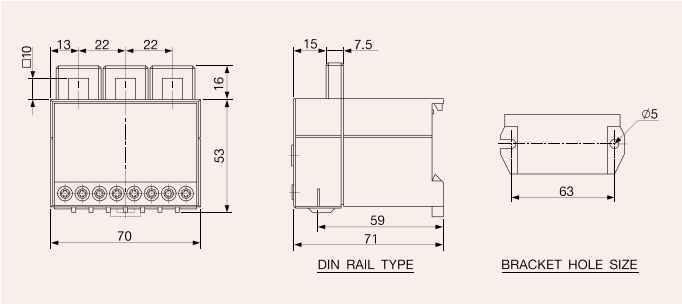
EOCR-SP / SP1 / SP2-01 / 10Type



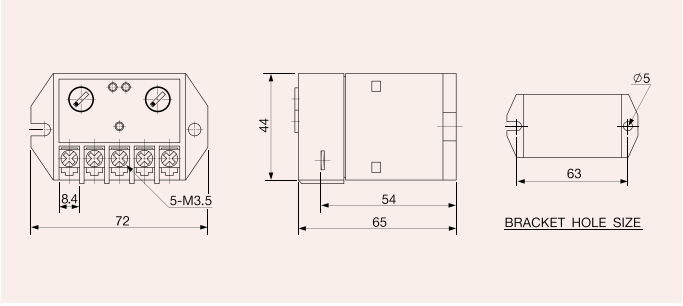
PMR / EVR / EVR-PD



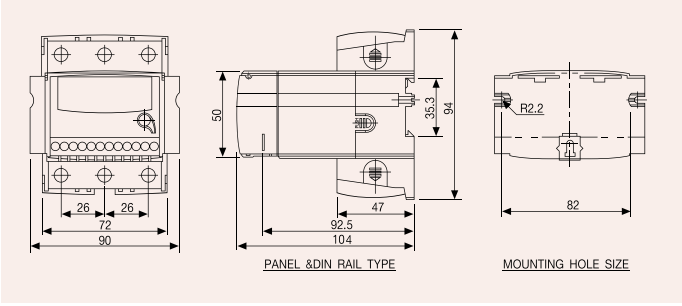
EOCR-SP / SP1 / SP2-20Type



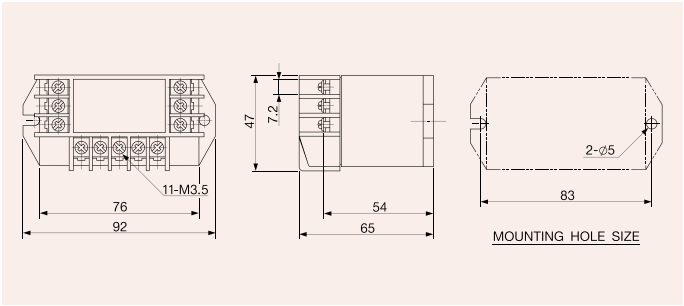
EOCR-3DD(E) / 3DZ(E) / EUCR-3C / 3DM / 3MS / 3MZ



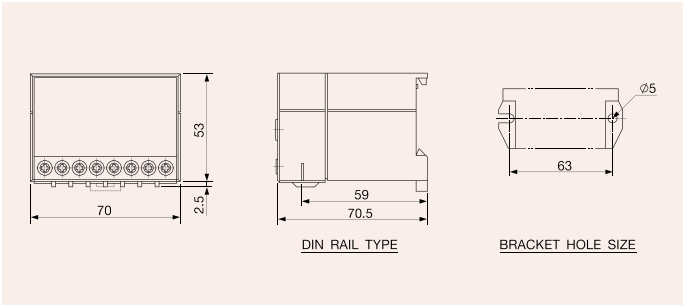
SDDR



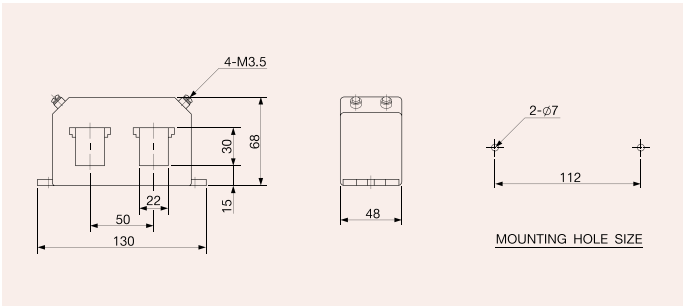
EOCR-PMZ



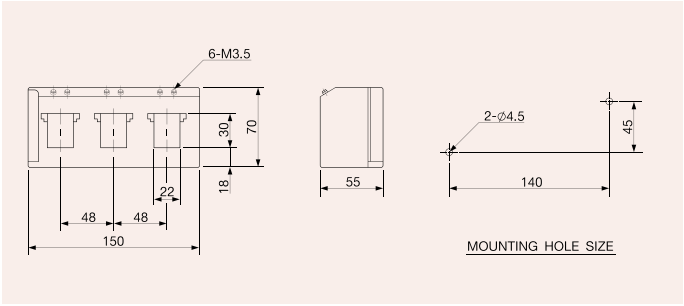
DCL / DCUR / DOVR / DUVR



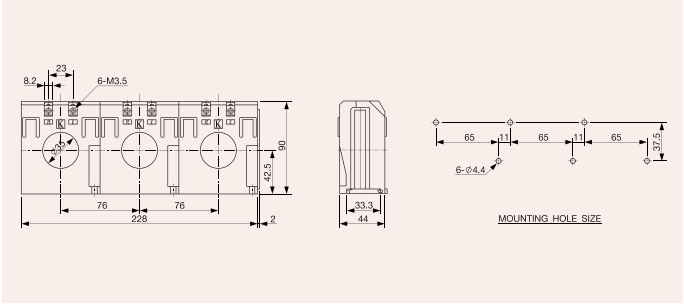
ECOR-S,H / DVR / EGR



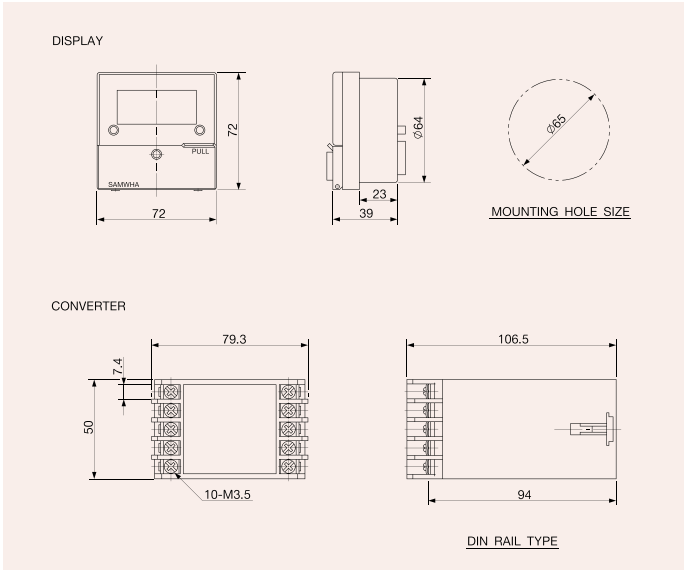
2CT



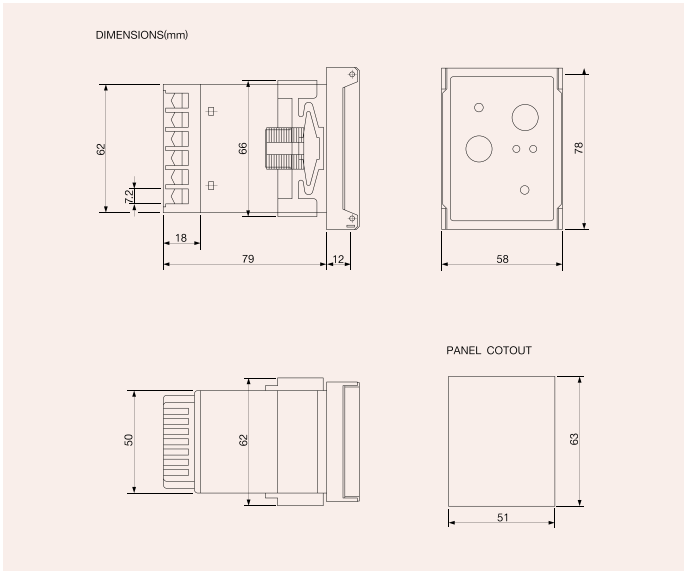
3CT



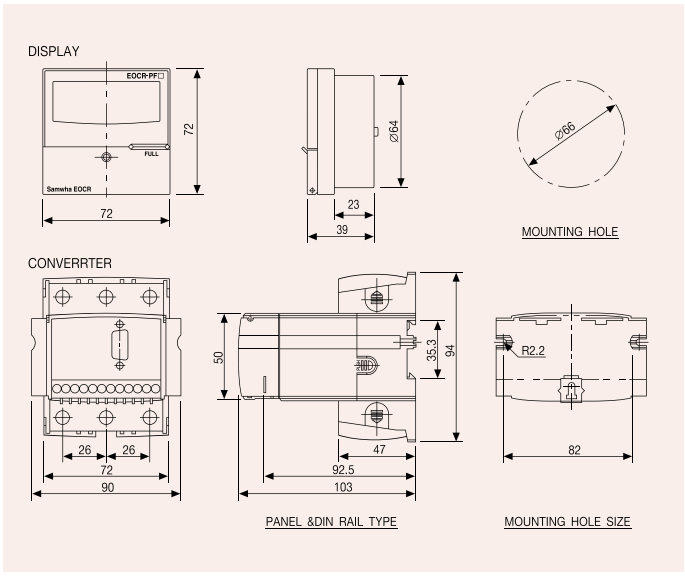
SR-CT



EVR-FD

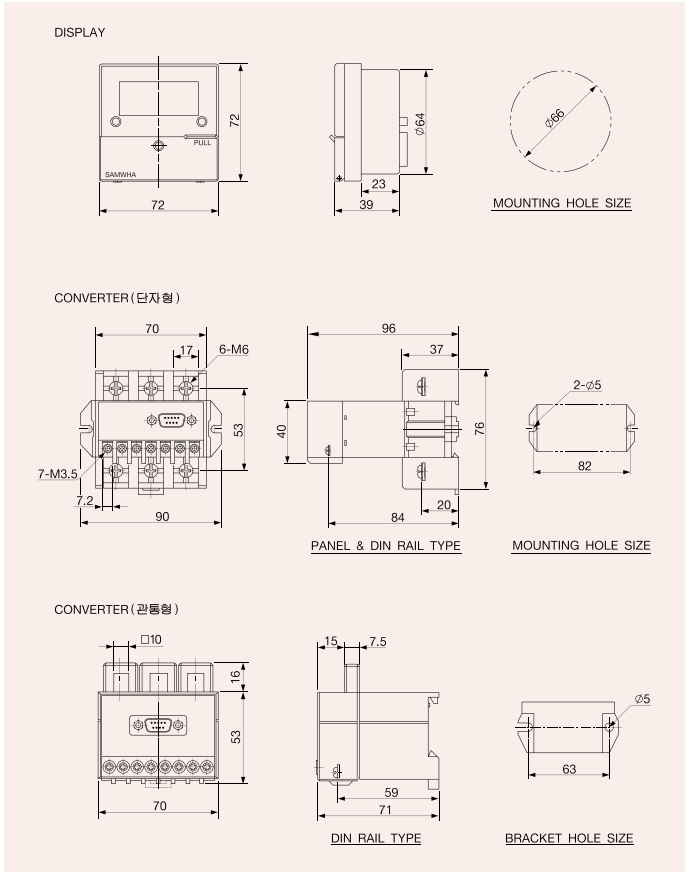


ELR / EFR2.5

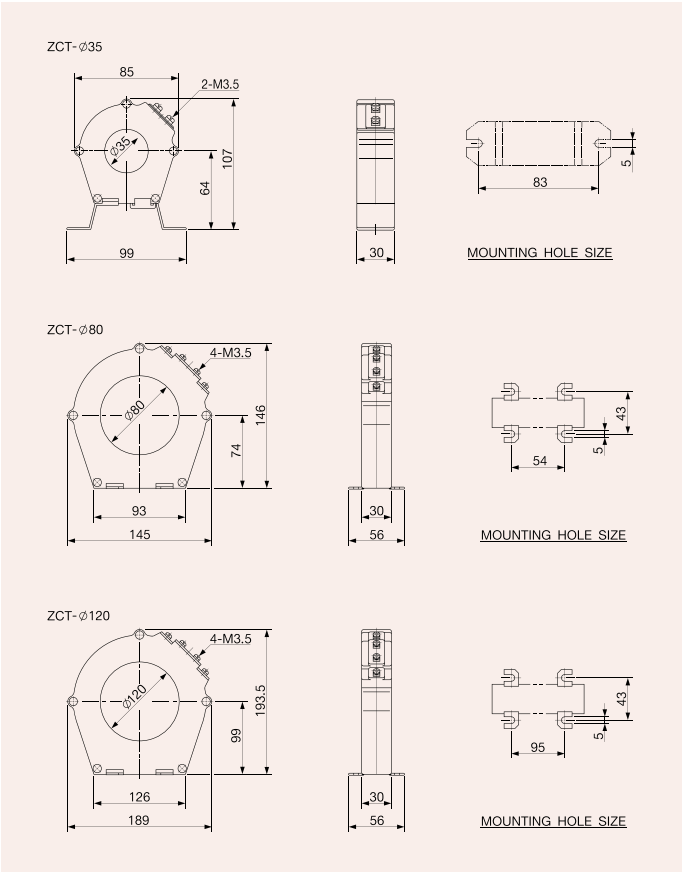


EOCR-PFZ

Dimension



EOCR-FD(E) / FDZ(E) / FDM / FMS / FDZ



ZCT

MEMO

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