

Electronic Over Current Relays

DAERYUK's products have achieved the certifications from the Certified International Quality Management Authorities and we are supplying the believable and precise products by ceaseless technological innovation.

- Phase Reversal and Phase Loss protection by Voltage detection (Pass-through type 3ESS)
 - Detect phase reversal and phase loss by voltage and operate in advance, so it protects load more securely.
- Without the external CT, it is available to use up to 120A.
 - Available in combining with all MCs that are less than 120A of rated current (Max. wire size is 38mm²).
- In Phase Loss, protecting it after O-TIME without experiencing D-TIME.
 - Our 3ESS type is a 2 CT type and a separate phase loss detection circuit is adopted, so that it protects phase loss securely regardless of current setting.
- Troubleshooting for the malfunction due to noise and its cause of defect.
 - With the adoption of the high quality power circuit (licensed), it completely troubleshoots the malfunction due to strong high frequency noise and its cause of defect, which have been the defects of previous products.
- Circuit Design basically increased in reliability by using verified parts only.
 - Designed with the widely-used IC which has been verified its stability for some decades, it completely removes the cause of defects, while the usual electronic over current relays using the one-chip micom, MCU (Microprocessor Control Unit) which is integrated several hundreds of thousands of semiconductors are to be weak to noise in structure.
- Highly convenient for installation and using
 - For the Contactor mounting types, it is more convenient to work with the design of the auxiliary terminal attachment.



Instruction

■ Operation Time setting

Operation Time is based on the scale of the time adjustment dial.

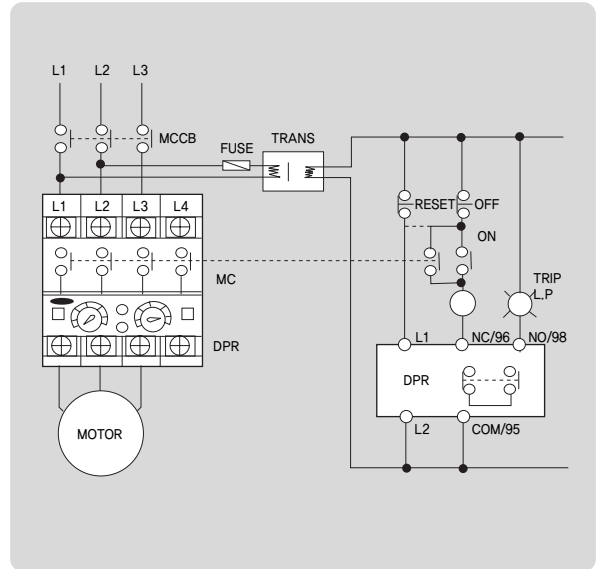
- Set the operation time adjustment dial considering starting time of motor.
- Operation time setting is possible in adjustment.
3ESS/SS3/SS: D-Time 0.2~60 sec, O-Time 0.2~12 sec.
ES2 SP/ES: 0.2~12/0.2~30 sec.

■ Rated Current Setting

- Start the motor setting the current adjustment dial at its maximum.
- Turn the adjustment dial counterclockwise at the operation state and then turn it clockwise slowly from the point where overload indication lamp(O.L) flickers and stop it at the point where the lamp is put out.

■ Operation checking

- If you push the TEST button at the state where only operation power is applied, the over current indication lamp (O.L) of motor protection relay is on and it trips putting out the power lamp after the time set.
- If you push the RESET button, the over current indication lamp is put out and the power lamp is on returning to the initial state.



Ordering Information

DPR

EP

Type	Characteristics		
EP	Contacting mounting	Definite curve	(Over Current, Locked rotor, Phase Loss protection, Single phase-available)
SP	"	"	(Over Current, Locked rotor, Phase Loss protection, Single phase-available)
ES	Terminal	Separate mounting	(Over Current, Locked rotor, Phase Loss protection, Single phase-available)
ES2	Pass-through (2 holes)	Definite curve	(Over Current, Locked rotor, Phase Loss protection, Single phase-available)
SS	Pass-through (2 holes)	Definite curve	(Over Current, Locked rotor, Phase Loss protection, Single phase-available)
SS1	Pass-through (2 holes)	Inverse curve	(Over Current, Locked rotor, Phase Loss protection, Single phase-(Not) available)
SS3	Pass-through (3 holes)	Definite curve	(Over Current, Locked rotor, Phase Loss protection, Single phase-available)
3ESS	Pass-through (3 holes)	Definite curve	(Over Current, Locked rotor, Phase Loss, Phase reversal protection, Single phase-(Not) available)
UCR	Terminal		Under Current, Phase Loss protection
GR	Ground Fault protection		Earth Leakage protection
OVR	Over Voltage protection		Over Voltage protection
UVR	Under Voltage protection		Under Voltage protection
NPR	Phase Reversal protection		Phase Reversal protection
SDDR	Shutdown Delay		Shutdown delay (0~10 sec)
SSR converter	Temperature Control(Converter)		Input(4~20mA), Used with SSR

30

220

B

A

Current Setting Range		Control Power		Output Relay		Reset	
01	0.1~1.4A	220	110~220V AC	-	1c (95~96 CLOSE)	-	Manual
06	0.5~6.5A	440	380~440V AC	B	1a1b (95~96 CLOSE)	A	Auto
10	0.5~10A	Others: AC24V (by order)		N	1c (95~96 OPEN)		
30	3~30A						
50	5~50A						
60	5~60A						
120	10~120A						

Electronic Over Current Relays

List of Standard Products



TYPE		Contactor mounting		Contactor mounting			Contactor mounting		Terminal			
Over Current (AC) Relay		SP 10/30		EP 01/06/30			EP 50		ES 01/06/30/50			
Characteristics		Contactor mounting							Stand-alone			
Magnetic Contactor		MC 9~22		MC 9, 12, 18, 22			MC 32, 40, 48		All common products			
Current Setting Range(A)		10	30	01	06	30	50	01	06	30	50	
		0.5~10	3~30	0.1~1.4	0.5~6.5	3~30	5~50	0.1~1.4	0.5~6.5	3~30	5~50	
Operation Characteristics		Definite Curve		Definite Curve (※Inverse Curve)								
Motor Application (kW)	230~240V	1.5	3.7	~0.05	0.12~0.75	0.55~3.7	1.5~7.5	All common products				
	380~460V	3.7	7.5	~0.15	0.25~1.5	1.5~7.5	3.7~11	06 : with CT (infinite capacity)				
Protection	Over Current	○										
	Locked rotor	○										
	Phase Loss	△										
	Phase Reversal	-										
Time setting (sec.)	Operation	0.2~12		0.2~30				0.2~30, 0.2~12, 0.2~30				
	Reset	Manual (Instantaneous) Reset (※Auto Reset 180 sec)										
Control Power	Voltage	180~260V AC		90~260V AC (※380V, 440V AC/DC)								
	Frequency	50/60Hz										
Output Relay	Contact	1C										
	Operation	Normally Closed(COM/95-NC/96-NO/98)										
	Capacity	5A/250V Resistive Load										
Insulation Resistance		Min 50M Ω at 500V DC										
Surge Endurance		2kV(6 times/min.)										
Ambient Temp.	Operation	-25°C~70°C										
	Storage	-30°C~80°C										
Humidity		45~85%RH										
Operation indication		Red LED (O.L) : Over Current Trip			Green LED (P.L) : Power on Red LED (O.L) : Over Current Trip							
Installation		Direct Contactor mounting type							Screw and DIN-Rail (35mm)			

Note. Indicated spec. is upon request.



Pass-through (3 holes)		Pass-through (2 holes)		Pass-through (2 holes)		Terminal (Under Current)							
3ESS 06/30/60/120		SS3 06/30/60/120		SS 06/30/60/120		ES2		UCR 30/50					
Voltage detection type, Phase Reversal protection		Phase Reversal, Over Current protection		Wider Pass-through		Wider Pass-through		Stand-alone, Phase Loss detection					
All common products													
All common products													
06	30	60	120	06	30	60	120	06	30	60	120	30	50
0.5~6.5	3~30	5~60	10~120	0.5~6.5	3~30	5~60	10~120	0.5~6.5	3~30	5~60	10~120	3~30	5~50
Definite Curve (*Inverse Curve)													
All common products						All common products (Up to 600A with external CT)				-			
06 : with CT (infinite capacity)										-			
○										Under Current			
○										-			
○						Δ(2CT)				○			
○						-							
D-TIME 0.2~60 / O-TIME 0.2~12						0.2~30							
Manual (Instantaneous) Reset (*Auto Reset 180 sec)													
90~260V AC (*380V, 440V AC/DC)													
50/60Hz													
1C													
Normally Open			Normally Closed(COM/95-NC/96-NO/98)										
5A/250V Resistive Load													
Min 50M Ω at 500V DC													
2kV(6 times/min.)													
-25 $^{\circ}$ C~70 $^{\circ}$ C													
-30 $^{\circ}$ C~80 $^{\circ}$ C													
45~85%RH													
Green LED (P.L) : Power on Red LED (O.L) : Over Current Trip Yellow LED (PMR) : Phase Reversal Trip			Green LED (P.L) : Power on Red LED (O.L) : Over Current Trip										
Screw and DIN-Rail (35mm)													

Electronic Over Current Relays

List of Standard Products



TYPE		Ground Fault Protection Relay	Over Voltage Protection Relay	Under Voltage Protection Relay	Phase Reversal Protection Relay	SDDR		
Over Current (AC) Relay		GR	OVR	UVR	NPR	SDDR		
Characteristics		CT 100: 5, ZCT 200mA: 1.5mA	Terminal type		R(Right) phase: Relay 1 output L(Left) phase : Relay 2 output	Solution for the problem that all the related production equipment should be restarted when an instantaneous voltage reduction/power outage happens. (The Wiring method in case that ON S/W is on the Power.)		
CT		Normal CT 100:5 used, not using expensive ZCT(200mA: 1.5mA)	110V TYPE	110~150V	110V TYPE	70~110V	-	
Current Setting Range(A)			-	220V TYPE	220~300V	220V TYPE	160~200V	-
Operation Characteristics			Definite Curve		380V TYPE	380~460V	380V TYPE	300~380V
Application								
Setting Range								
Protection	Ground Fault	○	-		○	-		
	Over Voltage	-	○	-	-	○		
	Under Voltage	-	-	○	-	-		
	Over Current							
	Phase Loss/ Locked rotor							
	Auxiliary Current							
Time setting (sec.)	Operation	0.2~3	0.2~12		0.1	0.2~5 + 0.2~5 = 10		
	Reset	Manual(Instantaneous) Reset			-			
Control Power	Voltage	L1-L2 90~260V AC	110V/220V/380V/440V		220V/380V	90~260V		
	Frequency	50/60Hz						
Output Relay	Contact	1C						
	Operation	Normally Closed(COM/95-NC/96-NO/98)						
	Capacity	5A/250V Resistive Load						
Insulation Resistance		Min 50M Ω at 500V DC						
Surge Endurance		2kV(6 times/min.)						
Ambient Temp.	Operation	-25 $^{\circ}$ C~70 $^{\circ}$ C						
	Storage	-30 $^{\circ}$ C~80 $^{\circ}$ C						
Humidity		45~85%RH						
Operation indication		Green LED (P,L) : Power on Red LED (O,L) : Over Current Trip		R phase \rightarrow Red LED(R,L) L phase \rightarrow Green LED(L,L)		Green LED (P,L) : Power on Red LED (O,L) : Over Current Trip		
Installation		Screw and DIN-Rail (35mm)						

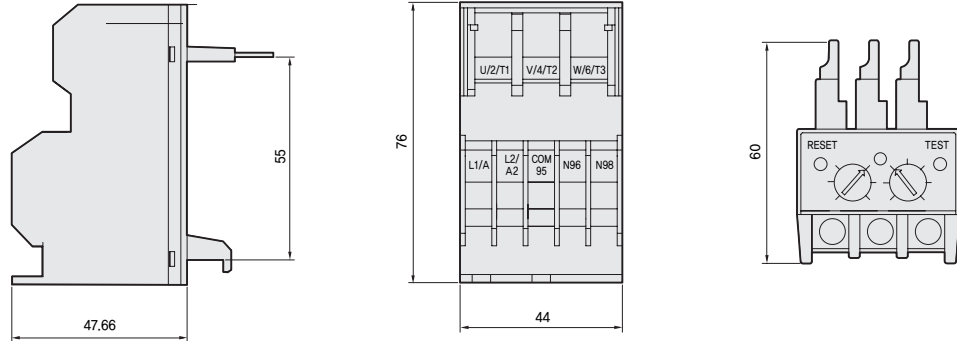


	Ground Fault-Phase Loss Protection Relay	Under Current-Ground Fault Protection Relay	Under Current-Ground Fault-Phase Loss Protection Relay
	3ESSG(06/30/60/120)	UCRG(SS3)(06/30/60/120)	UCR(ES2)
	Over Current/Groud Fault/Phase Loss/Locked rotor protection, Delay times for Starting and Over Current can be set separately. Operating Voltage Range : AC90~260V	Delay times for Ground Fault Current can be set separately. Current Setting Range : 0.5~120A	Under Current/Phase Loss protection Rated Current : 0.5~120A Operating Voltage Range : AC90~260V
	Shock Relay of special machines for low voltage induction motor protection	Disconnection in Heater and Ground Fault protection, Under Current and Ground Fault protection, Trouble Monitoring, Alarm	Disconnection in Heater and Under Current protection Trouble Monitoring (2CT)
	06 30 60 120	06 30 60 120	06 30 60 120
	0.5~6.5 3~30 5~60 10~120	0.5~6.5 3~30 5~60 10~120	0.5~6.5 3~30 5~60 10~120
		○	
		○	
		○	
		-	
	Starting Delay : 0.2~60		0.2~30
	Operation Time : 0.2~12		
	Manual(Instantaneous)/Electrical(Remote)		
	AC90V~260V		
	50/60Hz		
	1C		
	Normally Open(COM/95-NC/96-NO/98)		
	3A/250V(Resistive Load)		
	Min 50M ₂ at 500V DC		
	2kV(6 times/min.)		
	-25°C~70°C		
	-30°C~80°C		
	45~85%RH		
	Green LED (P.L) : Power on Red LED (O.L) : Trip Yellow LED (G.L) : Ground Fault Trip	Green LED (P.L) : Power on Red LED (O.L) : Under Current Trip Yellow LED (G.L) : Ground Fault Trip	Green LED (P.L) : Power on Red LED (O.L) : Under Current Trip
	Screw and DIN Rail(35mm)		

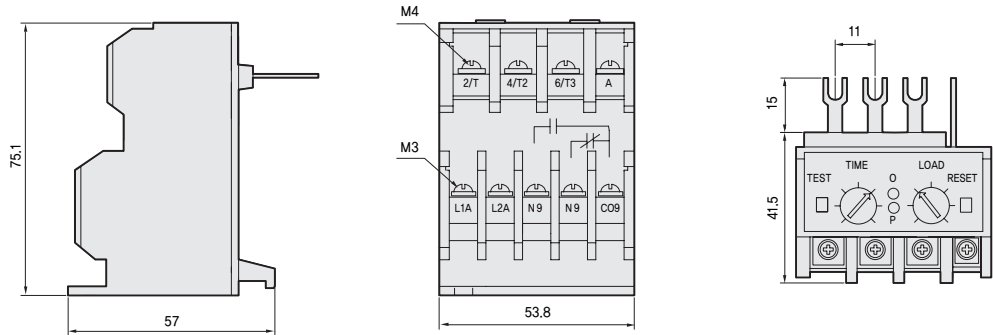
Electronic Over Current Relays

External Dimensions and Contact Configurations

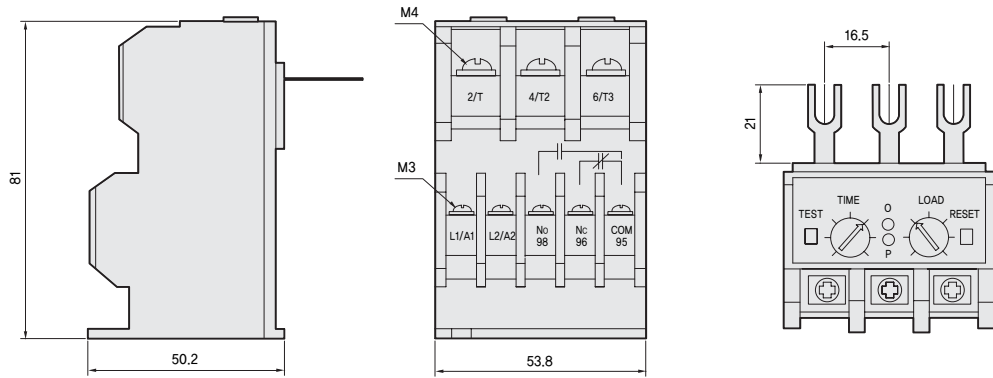
DPR SP
10/30



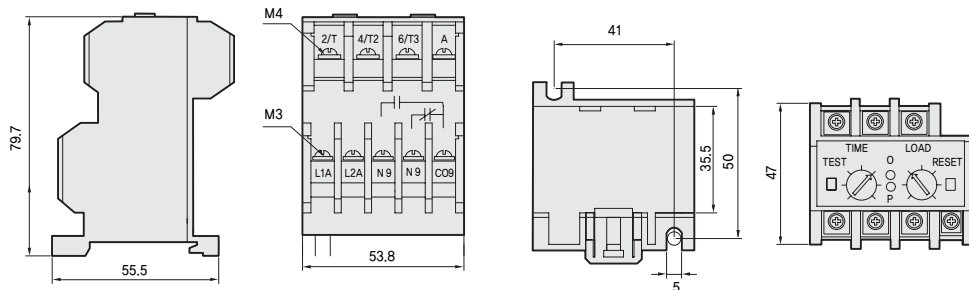
DPR EP
01/06/30



DPR EP 50

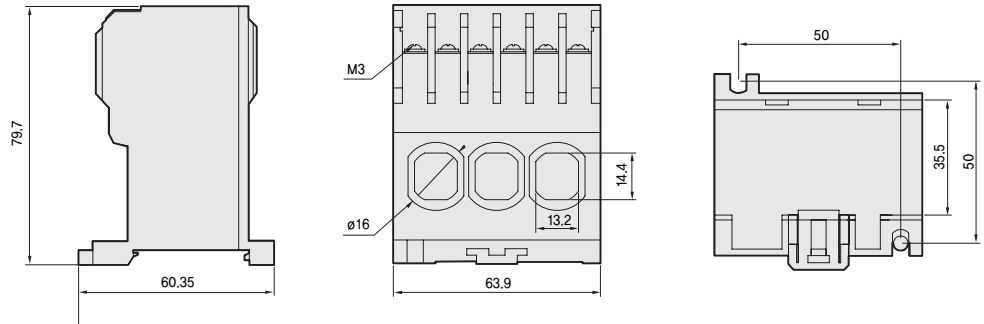


DPR ES
01/06/30/50

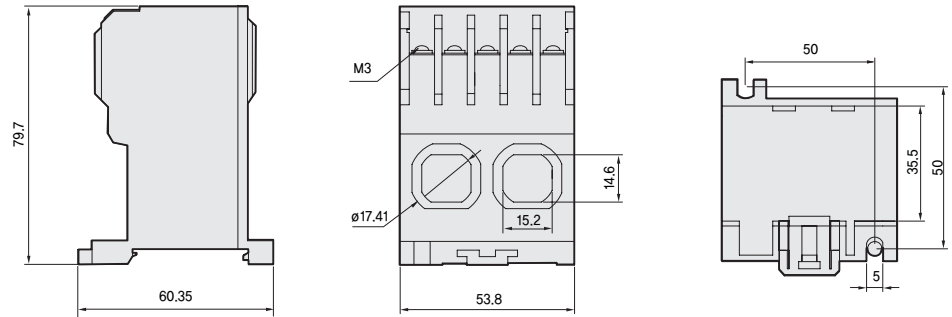




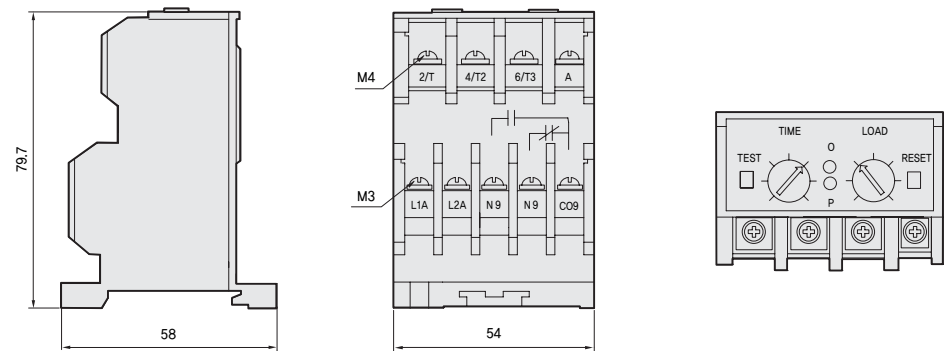
DPR 3ESS
SS3 3ESSG
UCRG(SS3)
UCR(SS3)



DPR SS
ES2
UCR(ES2)



DPR UCR
GR OVR
UVR NPR
SDDR

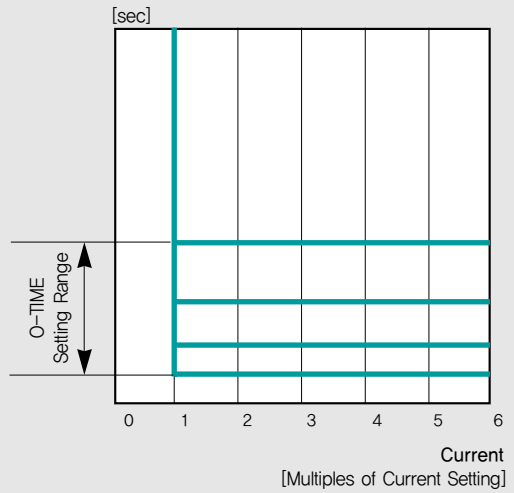


Technical Information

DPR Current-Operating Time Characteristics (Motor Operating Current > DPR Setting Current)

Definite Curve

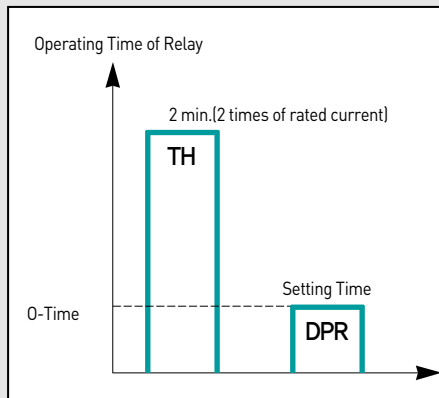
If Constant Overload state (Operating Current > Setting Current) is detected, DPR operates immediately after the delay time set by the O-TIME dial elapses.



Comparison between Thermal Overload Relay (TH) and Electronic Over Current Relay (DPR)

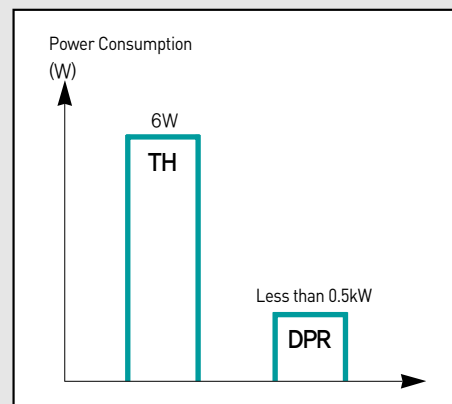
Over Current Protection

Operates after the O-TIME set by the user



※ In case Over Current which is higher than the current setting is flows, DPR operates immediately after the O-TIME set by the user and protects the burnout of motor (Definite Curve).

Super Power-Saving type

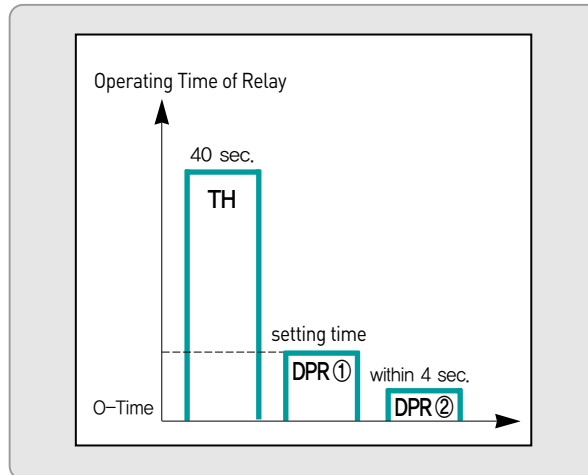


※ DPR is the Super Power-Saving type Protection Relay having the power consumption rate of 5~10% of general TH by the types.

Comparison between Thermal Overload Relay (TH) and Electronic Over Current Relay (DPR)

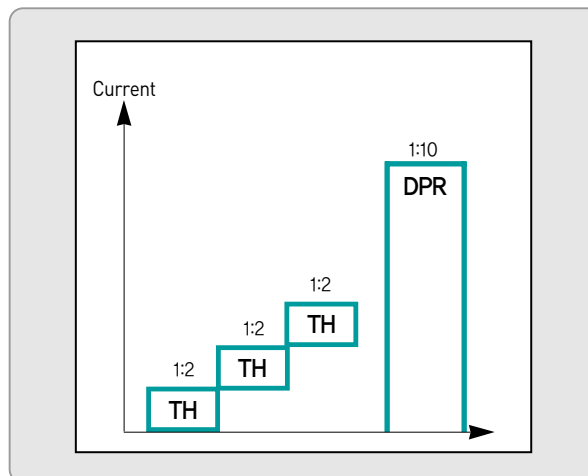
Phase Loss protection

According to the types of DPR, ① Operates after the O-TIME set by the user ② Operates within 4 sec.



※ Under the Phase Loss, the current that flows on the normal coil of motor increases for 150% or more. This current increase raises the temperature of the coil and destroys the insulation of the coil, so that it causes burnout of motor. DPR operates after the O-TIME set by the user or within 4 sec. and protects the burnout of motor(load) by the types of DPR.

Wide Setting Range



※ The Min : Max Current Setting Ratio is more than 1:10, so the protecting range by one type is wide and it offers strong protection function along with easy inventory. One model consisting of 2 types or 3 types can protect the load from 0.1 to 600A.

※ Above information is the comparison of the characteristics between normal Thermal Relay and DPR and do not compare with a specified manufacturer's product.

Ratings

Subject	Type	DPR SP	DPR EP	DPR ES	DPR ES2	DPR SS/SS3
Rated Current Setting Range	01	—	0.1~1.4A	0.1~1.4A	—	—
	06	—	0.5~6.5A	0.5~6.5A	0.5~6.5A	0.5~6.5A
	10	0.5~10A	—	—	—	—
	30	3~30A	3~30A	3~30A	3~30A	3~30A
	50	—	5~50A	5~50A	—	—
	60	—	—	—	5~60A	5~60A
	120	—	—	—	10~120A	10~120A
Aux. Contact	Type	1-SPDT				
	R	Normally Closed				
	N	Normally Open				
Operating Voltage	Capacity	5A/250VAC Resistive Load				
	24V	24VDC/AC (Option)				
	48V	48VDC/AC (Option)				
	220V	90~260VAC (N: 180~260VAC)				
Reset	440V	380/440VAC (N: 360~460VAC)				
		Manual(Instantaneous)/Electrical(Remote)				
Magnetic Contactor		MC 9~22	MC 9~48	MC 9~48	MC 9~85	MC 9~85
Magnetic Switch		Standard (Analogue DPR)				
		MS 9~22	MS 9~48	MS 9~48	MS 9~85	MS 9~85

Technical Information

Type Selection of DPR

Full Load Current of Motor (Ref.)				DPR		
3P 440V		3P 220V				
P(kW)	In(A)	P(kW)	In(A)			
0.1	0.36	-	-	DP/ES-01	SP-10	SP/EP/ES/ ES2/SS/SS3-30
0.2	0.7	0.1	0.71			
-	-	0.2	1.4			
0.75	1.8	-	-			
-	-	0.4	2.3			
1.5	3.3	-	-			
-	-	0.75	3.6			
2.2	4.6	-	-			
3.7	7.5	1.5	6.5			
5.5	11	2.2	9.2			
7.5	15	3.7	15	EP 50 ES2/SS/SS3-06	ES2/SS/SS3-120	ES/ES2/SS/SS3-30
11	21	5.5	22			
15	28	7.5	29			
18.5	34	-	-			
22	39	11	42			
30	54	15	55			
37	66	18.5	67			
45	80	22	78			
55~	99~	30~	107~			

Terminology

D-TIME : Delay time

When a motor starts up, starting current about 5 to 8 time of the rated operating current flows and starting time defers from load (motor) to load. D-TIME is the time during which starting current is not recognized as over current and activation of the DPR is suppressed. It is set by the D-TIME knob and only operates when a motor starts. The Relay which does not have the D-TIME knob and have a O-TIME knob only is set considering D-TIME and O-TIME.

O-TIME : Over current operating delay time

If over current exceeding the present value flows continuously during operation, the time between the first detection of the over current and the activation of the DPR is adjusted by use of the O-TIME knob. Upon detection of over current, the definite time type activates the DPR after the time set by the O-TIME knob has elapsed. While, the inverse time type activates the DPR according to the current-time characteristic curve selected by the O-TIME knob.

RESET

This is the function to restore the state of the DPR back to the condition it was activated.

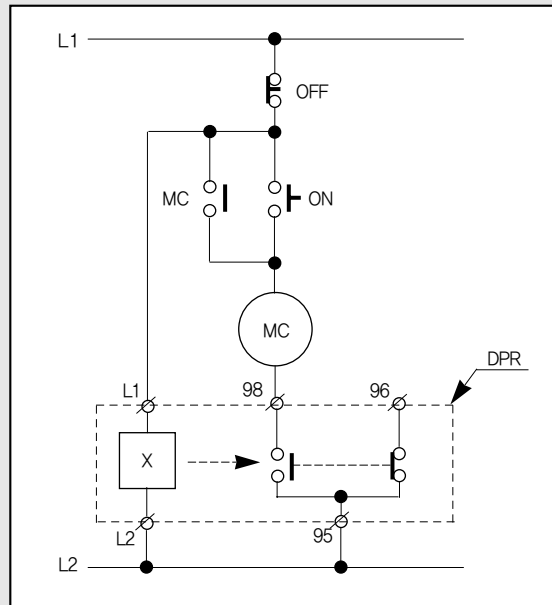
- **Manual Reset** : Pushing the reset button on the front face of the DPR, it is initialized immediately.
- **Electrical Reset** : This method initializes the DPR by cutting off the power source of the control voltage supplied to the DPR. It is initialized by means of a remotely installed "off" button or reset switch.
- **Auto Reset** : This is the automatically initialized function after set time. One is the model that the auto reset time can be set by the user selecting the R-TIME knob or Mode S/W to auto and another is the model that the auto reset time is set when it is dispatched by order.

TEST

It is installed on the front face of the DPR for periodic check and test. While control voltage is normal, continuously pushing the TEST button trips the internal relay after D-TIME + O-TIME has elapsed. You can close the test session by pushing the reset button.

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

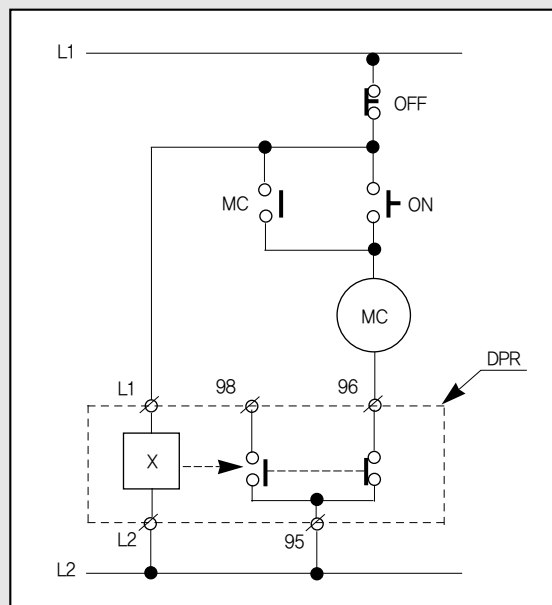
This is the fail-safe mode such that, upon application of the control power to L1 and L2 terminals, the internal circuit of the DPR powers on normally and the internal relay is magnetized consisting the sequence normally, but upon the activation of the DPR by over current, the internal relay gets demagnetized. Also called NVR (no voltage release) function, this is the standard mode for the DPR recommended for perfect protection. The mode can be selected by order or the embedded DIP Switch(NVR) according to models.



Note
This is for users to find the systematic problem in the early stage by disabling the starting of motor in case control voltage is not applied to the DPR or there is an internal defect or its life span has expired.

R Type(Non-Fail-Safe Mode)

This is the non-fail-safe mode such that the internal relay initially remains demagnetized and so it is possible to drive the load regardless of the conditions of the power to L1 and L2 terminals or the operation of the DPR, while the internal relay gets magnetized upon activation of the DPR by over current. The mode can be selected by order or the embedded DIP Switch(NVR) according to models.



Note
It takes periodic check since the DPR may fail to protect the load if control voltage is supplied abnormally to the DPR or there is an internal defect or its life span has expired.

Technical Information

Cautions (Common)

- Control Power should be connected and supplied exactly to the control power terminal. If the connection to the output terminal is wrong, it may cause the burnout of DPR and short circuit of system. Wiring work after knowing the wiring diagram on the instruction or catalog thoroughly is highly recommended.
- When wiring, followings should be complied.
 - You should do the wiring exactly referring to the 3-line wiring diagram and connect the terminal and wire to keep enough contacts between them.
 - When tightening bolts, you should use a electric screw driver which can keep the rated torque. When working manually, you should not wear down screws by giving force too much at the last stage of tightening and should use a tool matched well with bolts.
- The CT attached in DPR is for the use of current detection to operate DPR, so it should not be used for other purpose. Also, you should not damage on the CT by giving force too much on the wires to penetrate them.
- An operator should check if the DPR is working properly as an protection relay by pushing Test button regularly in the field, so that the DPR is protecting motor soundly.
- When you carry or install DPRs, they should not be impacted severely and fallen. If this case happens, please check the function by Test button or contact our A/S Center.
- In the power systems with the frequency change equipment such as inverter, DPR may be affected by the harmonics generated from this equipment and various noises. In this kind of system, you should supply the control power through tow winding transformer as shown on the example wiring diagram.
- Please refer to the instruction for the A/S about the effective life of DPR.
- You need to choose and use DPRs according to the applied equipment's characteristics by differentiating N-&R-types for the analogue circuit products.
- Environment and Cautions are as follows;
 - Temperature: Storage (-30~80° C), Operation (-20~60° C). Do not use beyond these ranges.
 - Humidity: 30~85% RH without due condensation. Do not use beyond this range.
 - In the place with much dust, the internal circuit may be weakened by that, so we recommend you to install and operate DPRs preventing dust from incoming and do the cleaning regularly.

Inverse Curve vs. Definite Curve

Definition

- Inverse Curve DPR: If the current flows with more than the setting value(appropriate current), the Trip Time of DPR differs by the over current value
- Definite Curve DPR : If the current flows with more than the setting value(appropriate current), DPR operates and trips the circuit after certain period of time (setting time) regardless of the over current value.

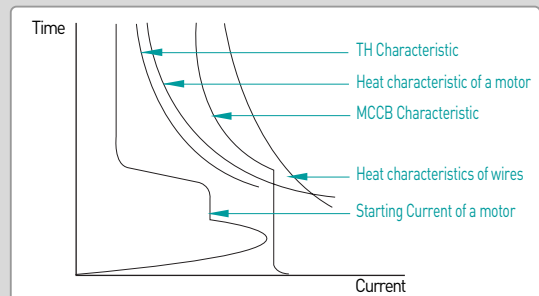
Considerations for the selection of appropriate DPR for the load protection

DPR is mainly used for the protection of motors in the industrial field. The thing which may be overlooked in selecting DPRs is how similar the types of heat characteristics curve of motor and DPR are.

The heat characteristics curve of motor is based on the curves for coils used for rotor and stator, so it shows similar curve to those for coils. Also, the heat characteristics curves of various wires used in the industrial fields like various distribution panels including MCC are usually showing similar curves to that of motor along with the wire connected to motor. Therefore, the relays having similar operation characteristics to this feature should be used in the sequence using motors for the protection of wires and motors.

The characteristics curves of MCCB usually used in distribution panels are also showing the similar curves to those for motors, so, in terms of the protection assistance among the protection equipments, DPRs having the characteristics need to be used.

The Definite Curve DPRs are mostly used for motor protection because the time and current settings are easy to control and the operation can be checked easily, but the Inverse Curve DPRs are most suited for more secured motor protection or the protection for high quality motors because their curves are very similar to the heat characteristics curves of motors.



Type	Trip time in Over Current	Operation Characteristic Curve	Trip in short circuit during motor operation	Appropriate Load
Definite Curve	Constant (fixed time)	Straight Line(parallel to current)	Normal overload trip	Fixed load such as Heater, Electronic Circuit, Lighting, etc.
Inverse Curve	Differential trip according to the over current value	Similar to the heat characteristics curve of motors	Shortest time trip	Motor

Classification of Definite & Inverse Curve DPR by application

- Definite Curve DPR : Loads almost having no change in the starting and operating currents
- Inverse Curve DPR : Loads showing inverse curves in the heat characteristics curves
- Heater, General Lighting product, Electronic Circuit, etc.
- Motor, etc.

Characteristics Curves

The Characteristic Curve of the Inverse Curve DPR is classified into the Cold Curve and Hot Curve.

- **Cold Curve** : The curve applied when a motor initially starts. The curve is 6 to 8 times of normal operating current (For motors, the starting current is 600 to 800% of normal current).
- **Hot Curve** : The curve applied during a motor operates. It is similar to the heat characteristic curve of a common motor, so it is more efficient in protecting a motor by choosing the close point to the motor's critical temperature as a protection point.
- For DPR, the characteristic curve shows the Cold Curve when the motor is initially starting and Hot Curve after the setting time.
Ex) When starting, if the operating time is set at 10 sec, it shows Cold Curve. After the setting time, it shows Hot Curve. During the operation, it trips though 600% of rated current flows for only 1.3 sec. according to the Hot Curve characteristic.

Caution

Inverse Curve DPR may trip in case motor is restarted several times in serial, so please restart it with minimum 3 sec. interval. The motor with frequent direct-reverse operation should be used extending the setting time a little. However, please consult with us for the application of crane and hoist.



Appendix

Charts for the Selection of Magnetic Switches and MCCBs

Direct Start of Squirrel cage induction motor

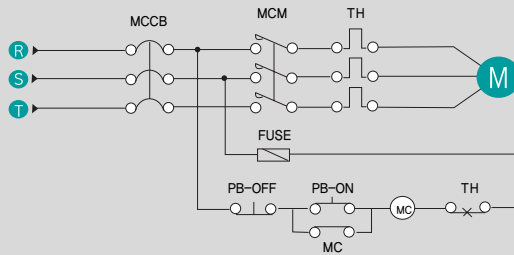
Motor Output	kW	0.12	0.18	0.25	0.37	0.55	0.75	1.1	1.5	2.2	3	3.7	4	5.5	7.5	11	
	HP	1/6	1/4	1/3	1/2	3/4	1	1.5	2	3	4	5	5.5	7.5	10	15	
200V~240V 3 Phase 60Hz	Motor Full Load Current A	1.0	1.5	1.9	2.9	3.3	4.8	6.8	8	11.1	14.7	17.4	18.8	26	34	48	
	Magnetic Switch	MS 9	MS 9	MS 9	MS 9	MS 9	MS 9	MS 9	MS 9	MS 9	MS 18	MS 18	MS 22	MS 32	MS 40	MS 50	
	Rated Operating Current A	11	11	11	11	11	11	11	11	11	18	18	20	26	35	50	
	Overload Relay	TH 22	TH 22	TH 22	TH 22	TH 22	TH 22	TH 22	TH 22	TH 22	TH 22	TH 22	TH 22	TH 22	TH 40	TH 40	TH 85
	TOR Setting Range A	0.63-1.0	1-1.6	1.6-2.5	2.5-4	2.5-4	4-6	5-8	6-9	9-13	12-18	12-18	16-22	18-26	24-36	34-50	
	MCCB	DBS33F	DBS33F	DBS33F	DBS33F	DBS33F	DBS33F	DBS33F	DBS33F	DBS33F	DBS33F	DBS53F	DBS53F	DBS63F	DBS103F	DBS103F	DBS203F
	Rated Current A	5	5	5	10	10	10	15	20	30	40	50	60	75	100	125	
	Sectional area of wire mm ²	2	2	2	2	2	2	2	2	2	2	5.5	5.5	14	14	22	
	380V~440V 3 Phase 60Hz	Motor Full Load Current A	0.5	0.7	0.9	1.4	1.6	2.4	3.4	4.0	5.5	7.3	8.7	9.4	13	17	24
Magnetic Switch		MS 9	MS 9	MS 9	MS 9	MS 9	MS 9	MS 9	MS 9	MS 9	MS 12	MS 12	MS 12	MS 18	MS 22	MS 32	
Rated Operating Current A		7	7	7	7	7	7	7	7	7	9	9	9	13	20	25	
Overload Relay		TH 22	TH 22	TH 22	TH 22	TH 22	TH 22	TH 22	TH 22	TH 22	TH 22	TH 22	TH 22	TH 22	TH 22	TH 40	
TOR Setting Range A		0.4-0.63	0.63-1	0.63-1	1-1.6	1-1.6	1.6-2.5	2.5-4	2.5-4	4-6	5-8	6-9	7-10	12-18	12-18	18-26	
MCCB		DBS33F	DBS33F	DBS33F	DBS33F	DBS33F	DBS33F	DBS33F	DBS33F	DBS33F	DBS33F	DBS33F	DBS33F	DBS33F	DBS33F	DBS53F	DBS63F
Rated Current A		3	3	5	5	5	5	10	10	15	15	20	20	30	40	60	
Sectional area of wire mm ²		2	2	2	2	2	2	2	2	2	2	2	2	5.5	5.5	14	
500V~550V 3 Phase 60Hz		Motor Full Load Current A	0.4	0.56	0.72	1.1	1.3	1.9	2.7	3.2	4.4	5.8	7	7.5	10	13.6	19.2
	Magnetic Switch	MS 9	MS 9	MS 9	MS 9	MS 9	MS 9	MS 9	MS 9	MS 9	MS 12	MS 12	MS 12	MS 18	MS 22	MS 32	
	Rated Operating Current A	6	6	6	6	6	6	6	6	6	9	9	9	13	17	20	
	Overload Relay	TH 22	TH 22	TH 22	TH 22	TH 22	TH 22	TH 22	TH 22	TH 22	TH 22	TH 22	TH 22	TH 22	TH 22	TH 40	
	TOR Setting Range A	0.25-0.4	0.4-0.63	0.63-1	1-1.6	1-1.6	1.6-2.5	2.5-4	2.5-4	4-6	5-8	6-9	6-9	7-10	12-18	16-22	
	MCCB	DBS33F	DBS33F	DBS33F	DBS33F	DBS33F	DBS33F	DBS33F	DBS33F	DBS33F	DBS33F	DBS33F	DBS33F	DBS33F	DBS33F	DBS53F	DBS53F
	Rated Current A	3	3	3	5	5	5	10	10	10	15	15	15	20	40	50	
	Sectional area of wire mm ²	2	2	2	2	2	2	2	2	2	2	2	2	2	5.5	5.5	

Motor Output	kW	15	18.5	22	30	37	45	55	75	90	110	132	160	200	250
	HP	20	25	30	40	50	60	75	100	125	150	180	220	270	340
200V~240V 3 Phase 60Hz	Motor Full Load Current A	65	79	93	125	148	180	220	300	360	440	528	640	800	1000
	Magnetic Switch	MS 65	MS 85	MS 100	MS 125	MS 150	MS 180	MS 220	MS 300	MS 400	600AF	600AF	800AF	800AF	
	Rated Operating Current A	65	80	100	125	150	180	220	300	400	600	600	800	800	
	Overload Relay	TH 85	TH 85	TH 100	TH 150	TH 150	TH 220	TH 220	TH 400	TH 400	600AF	600AF	600AF	600AF	
	TOR Setting Range A	54-75	63-85	65-100	100-150	100-150	120-180	160-240	260-400	260-400	400-600	400-600	520-800	520-800	
	MCCB	DBS203F	DBS203F	DBS203F	DBS203F	DBS403F	DBS403F	DBS603F	DBS603F	DBS803F	DBS803F	DBS803F	DBS1003F	DBS1203F	
	Rated Current A	150	175	200	225	300	400	500	600	700	800	1000	1200		
	Sectional area of wire mm ²	38	38	60	60	100	100	150	200	200	250	325	325		
	380V~440V 3 Phase 60Hz	Motor Full Load Current A	32.5	39.5	46.5	63	74	90	110	150	180	200	264	320	400
Magnetic Switch		MS 40	MS 50	MS 50	MS 65	MS 85	MS 100	MS 125	MS 150	MS 180	MS 220	MS 300	MS 400	MS 400	600AF
Rated Operating Current A		32	48	48	65	80	100	120	150	180	200	300	400	400	630
Overload Relay		TH 40	TH 85	TH 85	TH 85	TH 85	TH 100	TH 150	TH 150	TH 220	TH 220	TH 400	TH 400	TH 400	600AF
TOR Setting Range A		24-36	34-50	34-50	54-75	63-85	65-100	85-125	100-150	160-240	160-240	200-300	260-400	260-400	400-600
MCCB		DBS103F	DBS103F	DBS203F	DBS203F	DBS203F	DBS203F	DBS203F	DBS403F	DBS403F	DBS403F	DBS403F	DBS603F	DBS603F	DBS803F
Rated Current A		100	100	125	125	150	200	225	300	350	400	500	600	700	800
Sectional area of wire mm ²		14	22	22	38	38	60	60	100	100	150	200	200	200	325
500V~550V 3 Phase 60Hz		Motor Full Load Current A	26	31.6	37.2	50	59	72	88	120	144	176	211	256	320
	Magnetic Switch	MS 40	MS 50	MS 50	MS 65	MS 75	MS 85	MS 125	MS 150	MS 180	MS 180	MS 300	MS 300	MS 400	600AF
	Rated Operating Current A	26	38	38	60	64	75	90	140	180	180	250	250	350	500
	Overload Relay	TH 40	TH 85	TH 85	TH 85	TH 85	TH 85	TH 100	TH 150	TH 220	TH 220	TH 400	TH 400	TH 400	600AF
	TOR Setting Range A	18-26	24-36	28-40	45-65	45-65	63-85	65-100	100-150	100-150	160-240	200-300	200-300	260-400	260-400
	MCCB	DBS63F	DBS103F	DBS103F	DBS103F	DBS203F	DBS203F	DBS203F	DBS203F	DBS403F	DBS403F	DBS403F	DBS403F	DBS603F	DBS803F
	Rated Current A	60	75	100	100	125	150	175	225	300	350	400	500	600	700
	Sectional area of wire mm ²	14	22	22	38	38	60	60	100	100	150	200	200	200	325

Y-△ Start of Squirrel cage induction motor

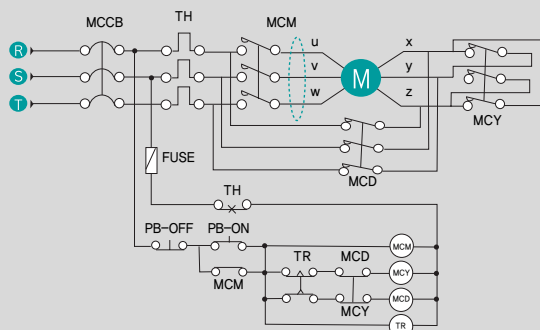
Motor Output		kW	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110	132	160	
			HP	7.5	10	15	20	25	30	40	50	60	75	100	125	150	180	220
200V~240V 3 Phase 60Hz	Motor Full Load Current	A	26	34	48	65	79	93	125	148	180	220	300	360	440	528	640	
	Magnetic Contactor		MC 22	MC 32	MC 40	MC 50	MC 50	MC 65	MC 85	MC 100	MC 125	MC 150	MC 180	MC 220	MC 300	MC 400	MC 400	
	Rated Operating Current	A	20	26	35	50	50	65	80	100	125	150	180	220	300	400	400	
	Overload Relay		TH 40	TH 40	TH 85	TH 85	TH 85	TH 100	TH 150	TH 220	TH 220	TH 220	TH 400	TH 400	600AF	600AF	600AF	
	TOR Setting Range	A	18-26	24-36	34-50	54-75	63-85	85-125	100-150	100-150	160-240	160-240	260-400	260-400	400-600	400-600	520-800	
	Starting Contactor		MC 22	MC 22	MC 32	MC 32	MC 40	MC 40	MC 50	MC 65	MC 65	MC 65	MC 85	MC 100	MC 125	MC 150	MC 220	MC 220
	Operating Contactor		MC 22	MC 32	MC 40	MC 50	MC 50	MC 65	MC 85	MC 100	MC 125	MC 150	MC 180	MC 220	MC 300	MC 400	MC 400	
	MCCB		DBS53F	DBS103F	DBS103F	DBS203F	DBS203F	DBS203F	DBS203F	DBS403F	DBS403F	DBS403F	DBS603F	DBS603F	DBS803F	DBS1003F	DBS1003F	
	Rated Current	A	50	75	100	125	150	175	200	250	300	400	600	700	800	1000	1200	
	Sectional area of wire	mm ²	5.5	14	14	22	22	38	38	60	60	100	150	150	200	325	325	
380V~440V 3 Phase 60Hz	Motor Full Load Current	A	13	17	24	32.5	39.5	46.5	63	74	90	110	150	180	220	264	320	
	Magnetic Contactor		MC 22	MC 22	MC 22	MC 32	MC 40	MC 40	MC 50	MC 65	MC 65	MC 85	100AF	125AF	150AF	180AF	220AF	
	Rated Operating Current	A	20	20	20	25	32	32	48	65	65	80	100	120	150	180	220	
	Overload Relay		TH 22	TH 22	TH 40	TH 40	TH 40	TH 85	TH 85	TH 85	TH 100	TH 100	TH 220	TH 220	TH 220	TH 400	TH 400	
	TOR Setting Range	A	9-13	12-18	18-26	24-36	28-40	34-50	45-65	63-85	65-100	85-125	120-180	160-240	160-240	200-300	260-400	
	Starting Contactor		MC 22	MC 22	MC 22	MC 22	MC 22	MC 32	MC 40	MC 40	MC 40	MC 50	MC 65	MC 85	MC 100	MC 100	MC 125	
	Operating Contactor		MC 22	MC 22	MC 22	MC 32	MC 40	MC 40	MC 50	MC 65	MC 65	MC 85	MC 100	MC 125	MC 150	MC 180	MC 220	
	MCCB		DBS33F	DBS33F	DBS53F	DBS103F	DBS103F	DBS103F	DBS203F	DBS203F	DBS203F	DBS203F	DBS403F	DBS403F	DBS403F	DBS603F	DBS603F	
	Rated Current	A	30	30	50	75	75	100	125	150	175	200	300	350	400	500	600	
	Sectional area of wire	mm ²	5.5	5.5	5.5	14	14	14	22	38	38	38	60	60	100	150	150	
500V~550V 3 Phase 60Hz	Motor Full Load Current	A	9.8	12.8	18	24.4	29.6	35	47	56	68	83	113	135	165	198	240	
	Magnetic Contactor		MC 12	MC 12	MC 22	MC 22	MC 32	MC 40	MC 50	MC 50	MC 65	MC 85	MC 85	MC 125	MC 150	MC 150	MC 180	
	Rated Operating Current	A	9	9	17	17	20	26	38	60	64	75	75	90	140	140	180	
	Overload Relay		TH 22	TH 22	TH 22	TH 40	TH 40	TH 40	TH 85	TH 85	TH 85	TH 100	TH 100	TH 150	TH 220	TH 220	TH 400	
	TOR Setting Range	A	7-10	9-13	16-22	18-26	24-36	24-36	34-50	45-65	54-75	65-100	85-125	100-150	120-180	160-240	200-300	
	Starting Contactor		MC 9	MC 12	MC 12	MC 18	MC 22	MC 22	MC 22	MC 32	MC 40	MC 50	MC 50	MC 65	MC 85	MC 100	MC 125	
	Operating Contactor		MC 12	MC 12	MC 22	MC 22	MC 32	MC 40	MC 50	MC 50	MC 65	MC 85	MC 85	MC 125	MC 150	MC 150	MC 180	
	MCCB		DBS33F	DBS33F	DBS53F	DBS53F	DBS63F	DBS103F	DBS103F	DBS103F	DBS203F	DBS203F	DBS203F	DBS403F	DBS403F	DBS403F	DBS603F	
	Rated Current	A	20	30	40	50	60	75	100	100	150	175	225	250	300	350	500	
	Sectional area of wire	mm ²	2	2	5.5	5.5	14	14	22	22	38	38	38	60	100	100	100	

Direct Start



- Note 1. Standard 3 phase-4 pole squirrel induction motor is based.
 2. TH setting ranges are based on the motor full load current
 3. Sectional area of wire is the thickness which can be connected to MCM. MCCB ratings are for the "line protection".
 4. Breaking Capacity was not considered.

Y-△ Start



- Note 1. Standard 3 phase-4 pole squirrel induction motor is based.
 2. TH setting ranges are based on the motor full load current
 3. When wiring on the part of the dotted line in the picture, the ratings of TH are applied by multiplying " $1/\sqrt{3}$ " of the setting ranges above.
 4. Sectional area of wire is the thickness which can be connected to MCM. MCCB ratings are for the "line protection".
 5. Breaking Capacity was not considered.
 6. Separate mounting unit for TH is recommended for Y-△ start. (Type combined with MC can be used when wiring on the part of the dotted line in the picture.)