

2. MOTOR PROTECTION RELAYS

2.1 Thermal Overload Relays

TH-N Series Thermal Overload Relays Will Make a Convenience and Safer Systems.



TH-N12



TH-N20



TH-N12CX

A Selection of Relays for Optimum Motor Protection Characteristics

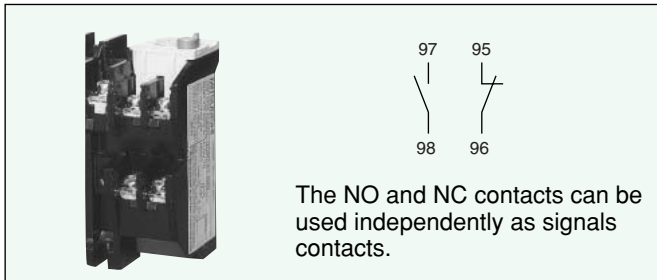
The thermal relay line-up includes two-element units as well as the phase failure protection type models (three-element relays), all with the same external dimensions.

This array of protection characteristics allows you to choose the units best suited to your motor protection needs.

Maintenance and Inspection Are Easy

An operation indicator makes maintenance and inspection easy. Checks can be performed using manual operations.

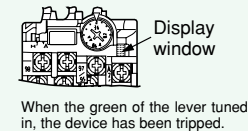
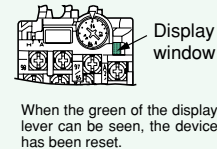
1NO + 1NC Contacts



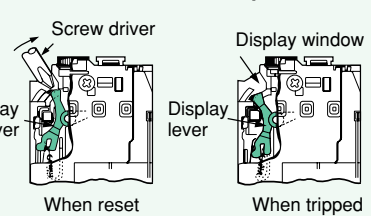
• Display and External Trip Mechanism

TH-N12(KP)/TH-N18(KP)

Display

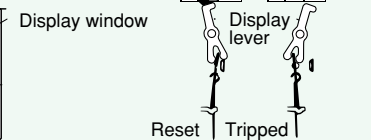
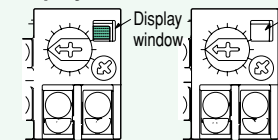


External Trip

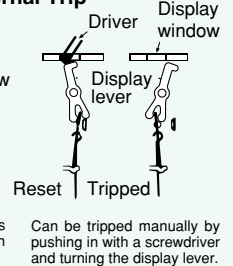


TH-N20(KP)~N600(KP)

Display

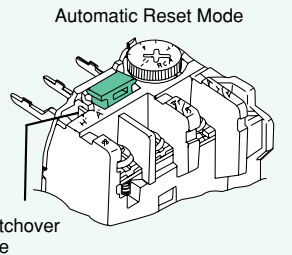
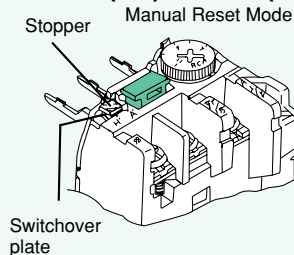


External Trip



• Switching Between Automatic and Manual Reset

TH-N12(KP)/TH-N18(KP)



TH-N20(KP)~N600(KP)



Switching from manual to automatic : Flip the stopper on the end of the reset bar down and then, after pushing it all the way in, rotate it counterclockwise 90° (to position "A").
Switching from automatic to manual : Rotate the reset bar 90° clockwise (to position "H") and the reset bar will pop out.

Rated Current Can Be Set Easily

The value of the rated current is displayed on a dial. Simply adjust the dial to the full-load current of the motor and motor protection is assured.

Finger Protectors

Models with finger protectors that conform to DIN VDE 0106 Part 100 (TH-N□CX) are also available.

Various Accessories

- Independent mount adaptor for TH-N12(CX). : UN-HZ12(CX)
- Reset release : UN-RR□□□
- Trip indicating LED : UN-TL□□

Trip-Free Reset Bar

Choose between automatic and manual reset. Also features tripfree reset bar mechanism.

Table 2.1.1

2.1.1 Selection Guide of Thermal Overload Relays

Max. Fuse Rating (660Vac) IEC 269-1 (A)			Overload Relay			Motor Capacity [kW, (hp)] (Three phase 50/60Hz, based on four poles)			
			Heater design- nation	Setting range (A)	Model (TH-)				
aM	gG	gM				AC220-240V	AC380V	AC400-440V	AC500V
0.5	0.5	—	0.12A	0.1-0.16	N12	—	—	—	—
0.5	1	—	0.17A	0.14-0.22		—	—	—	—
1	2	—	0.24A	0.2-0.32		0.03(1/24)	0.06(1/12)	0.06(1/12)	0.09(1/8)
1	2	—	0.35A	0.28-0.42		0.05(1/16)	0.09(1/8)	0.09(1/8)	0.12(1/6)
1	2	—	0.5A	0.4-0.6		0.06(1/12)	0.12(1.6)	0.12(1.6)	0.18(1/4)
2	4	—	0.7A	0.55-0.85		0.09(1/8)	0.18(1/4)	0.18(1/4)	0.25(1/3)
2	4	—	0.9A	0.7-1.1		0.12(1/6)	0.25(1/3)	0.25(1/3)	0.37(1/2)
2	4	—	1.3A	1.0-1.6		0.18(1/4)	0.37(1/2)	0.37(1/2) 0.55(3/4)	0.55(3/4)
4	6	—	1.7A	1.4-2.0		0.25(1/3)	0.55(3/4)	0.75(1)	0.75(1)
4	6	—	2.1A	1.7-2.5		0.37(1/2)	0.75(1)	—	1.1(1-1/2)
6	10	—	2.5A	2.0-3.0		0.55(3/4)	1.1(1-1/2)	1.1(1-1/2)	1.5(2)
6	10	—	3.6A	2.8-4.4		0.75(1)	1.5(2)	1.5(2)	2.2(3)
8	16	—	5A	4.0-6.0	N18	1.1(1-1/2)	2.2(3)	2.2(3)	3(4)
12	20	—	6.6A	5.2-8.0		1.5(2)	3(4)	3.3,7(4.5)	3.7(5)
12	20	—	9A	7.0-11		2.2(3)	3.7(5) 4(5-1/2)	3(4) 3.7(5)	5.5(7-1/2)
16	25	32M35	11A	9.0-13		3(4)	5.5(7-1/2)	5.5(7-1/2)	7.5(10)
20	32	32M50	15A	12-18		3.7(5)	7.5(10)	7.5(10) 9(12.5)	9(12/5)
25	40	32M63	19A ¹	16-22		5.5(7-1/2)	11(15)	11(15)	11(15)
40	63	32M63	22A	18-26		5.5(7-1/2)	11(15)	11(15)	15(20)
50	80	63M80	29A	24-34		7.5(10)	15(20)	15(20)	18.5(25)
63	80	63M80	35A ²	30-40		9(12.5)	18.5(25)	18.5(25)	22(30)
63	100	100M100	42A	34-50		11(15)	22(30)	22(30)	30(40)
80	125	100M125	54A	43-65		15(20)	30(40)	30(40)	37(50)
100	160	100M160	67A	54-80		18.5(25)	37(50)	37(50)	45(60)
125	200	100M200	82A	65-100	N220□□	22(30)	45(50)	45(60)	55(75)
—	200	100M200	95A ³	85-105		30(40)	55(75)	55(75)	—
—	250	200M250	105A	85-125		30(40)	55(75)	55(75)	75(100)
—	250	200M250	125A	100-150		37(50)	75(100)	75(100)	90(125)
—	315	200M315	150A	120-180		45(60)	90(125)	90(125)	110(150)
—	400	—	180A	140-220		55(75)	110(150)	110(150)	132(175)
—	500	—	210A ⁴	170-250		75(100)	132(180)	132(180)	—
—	630	—	250A	200-300		75(100)	132(180) 160(220)	132(180) 160(220)	160(220)
—	630	—	330A	260-400		90(125) 110(150)	200(270)	200(270)	220(300) 250(340)
—	800	—	500A	400-600		132(180) 160(220)	220(300) 250(340) 300(400)	220(300) 250(340) 300(400)	400(530)
—	1000	—	660A	520-800		200(270) 220(300)	400(530)	400(530)	500(670)

2.1.2 Selection Guide of the Current Transformers for TH-N600KP

Table 2.1.2

Current Transformer for TH-N600KP	Heater Designation(A)		250	330	500	660
	Setting Range(A)		200~300	260~400	400~600	520~800
	Current Transformer Ratio		400/5A	500/5A	750/5A	1,000/5A
	Current Transformer Capacity		At least 15VA			
	Recommended MITSUBISHI Current Transformer Model Number	Cable wiring	CW-15L 400/5A 15VA	CW-15L 500/5A 15VA	CW-15L 750/5A 15VA	—
		Bus bar wiring	CW-15LM 400/5A 15VA	CW-15LM 500/5A 15VA	CW-15LM 750/5A 15VA	CW-40LM 1000/5A 40VA

* Current transformer to be supplied by customer.

2.1.3 Technical Data

Table 2.1.3

Three heater type Two heater type	TH- TH-	N12(CX)KP N12(CX)	N18(CX)KP N18(CX)	N20(CX)KP N20(CX)	N20TA(CX)KP N20TA(CX)	N60(CX)KP N60(CX)	N60TAKP N60TA	N120KP N120	N120TAKP N120TA	N220RHKP N220RH	N400RHKP N400RH	N600KP N600
Max. setting current	A	13	18	22	40	65	105	100	150	220	400	800
Range of setting current	A	0.1-13	2.8-18	0.2-22	18-44	12-65	54-105	34-100	85-150	65-250	85-400	200-800
Rated insulation voltage	V	690	690	690	690	690	690	690	690	1000	1000	690
Permissible ambient temperature	°C	-25 to +55										
Single phase protection	Types TH-N□□□KP provide the protection.											
Bimetal heating	Direct									Via CTs		Via CTs ¹
Max. heater dissipation per current path												
Min. setting	W	0.8	0.9	0.8	1.4	1.7	2.4	2.5	3.2	2.5	2.5	2.5
Max. setting	W	1.8	2.2	2.2	3.5	4.9	5.2	7.1	8.6	6.0	6.0	6.0
Auxiliary contact	1NO + 1NC											
Rated operating current of aux. contacts												
Category	NO	120V	A	2	2							
AC-15	contact	240V	A	1	1							
		500V	A	0.5	0.5							
		NC	120V	A	2	3						
	contact	240V	A	1	2							
		500V	A	0.5	1							
		Category	48V	A	0.4	0.5						
DC-13	110V	A	0.2	0.2								
	220V	A	0.1	0.1								
Main terminal screw size												
Line side	mm	—		M4	M4	M6	M6	M8	M8	—	—	M4
Load side	mm	M3.5	M4	M4	M5	M6	M6	M8	M8	M10	M12	M4
Standard wire sizes recommended		0.24A-2 11A-2	3.6A-2 11A-2 15A-3.5	0.24A-2 11A-2 15A-3.5 19A-3.5	22A-5.5 29/35A-8	15A-3.5 22A-5.5 29/35A-8 42A-14 54A-22	67A-22 82/95A-38	42A-14 54/67A-22 82A-38	105A-60 125A-60	— —	— —	— —
Heater designation-wire size	(mm ²)											
Max. conductor size												
Main												
Line side	mm ²	(2.5) ²	—	6	—	25	—	38	60	—	—	6
Load side	mm ²	2.5	6	6	16	25	38	38	60	150	240	6
Busbar width												
Line side	mm	—		—	—	15	—	20	20	—	—	—
Load side	mm	—		—	—	15	20	20	20	25	30	—
Aux. contacts	mm ²	2.5		4	4	4	4	4	4	4	4	4

Notes: 1. Used with current transformer (to be supplied by the customer). See Table 2.1.2.

2. When used with UN-HZ 12(CX) adaptor.

2.1.4 Selection Guide of Quick Trip Thermal Overload Relay

Table 2.1.4

Applicable contactor	S-N10 S-N11 S-N12	S-N20 S-N21 S-N25 S-N35	S-N25 S-N35	S-N50 S-N65 S-N80 S-N95	S-N80 S-N95
Three heater type with phase failure protection	TH-N12KF	TH-N20KF	TH-N20TAKF	TH-N60KF	TH-N60TAKF
Two heater type	—	TH-N20FS	TH-N20TAFS	TH-N60FS	TH-N60TAFS
Heater setting range (Ordering designation)	1.7~2.5(2.1A) 2.8~4.4(3.6A) 4~6(5A) 5.2~8(6.6A) 7~11(9A) 9~13(11A)	1.7~2.5 (2.1A) 2.8~4.4 (3.6A) 4~6 (5A) 5.2~8 (6.6A) 7~11 (9A) 9~13 (11A) 12~18 (15A)	18~26 (22A) 24~34 (29A) 30~40 (35A) ¹	34~50 (42A) 43~65 (54A)	54~80 (67A) 65~93 (82A) ²

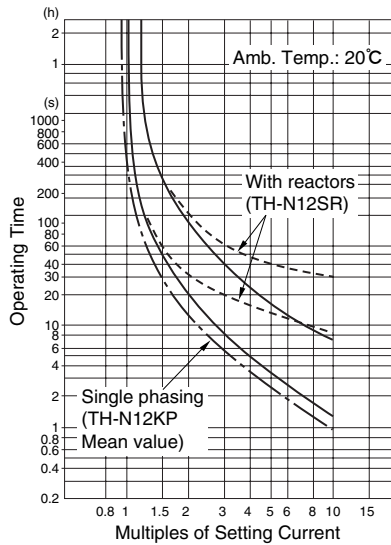
Notes: *1. Only for S-N35.

*2. Only for S-N95.

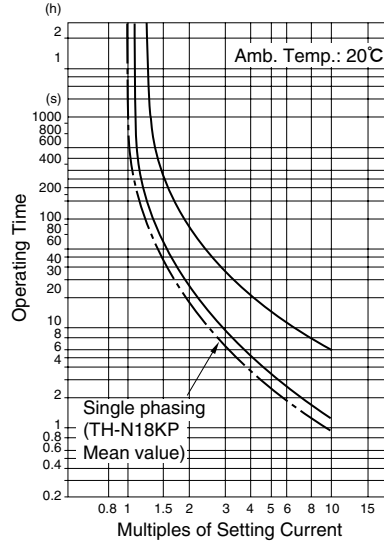
2.1.5 Operating Characteristics of Thermal Overload Relays

(Connecting wire size: Refer to “standard wire size” of Table 2.1.3)

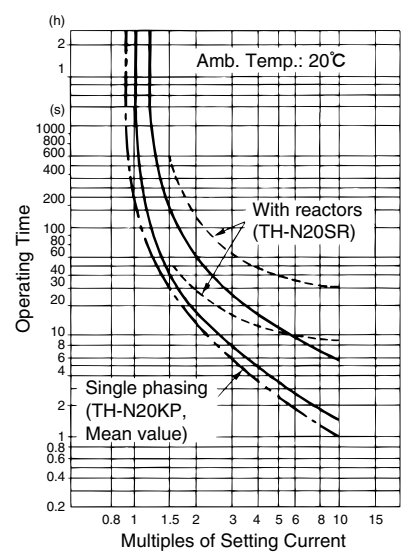
TH-N12
TH-N12KP·TH-N12SR



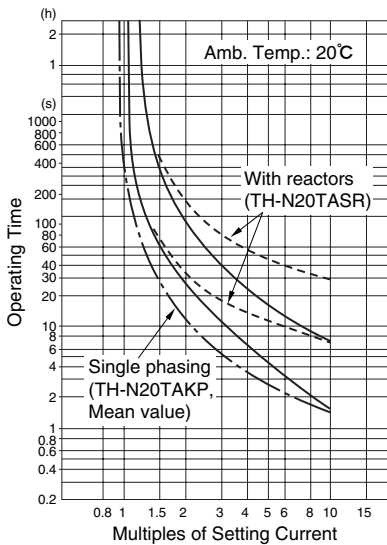
TH-N18
TH-N18KP



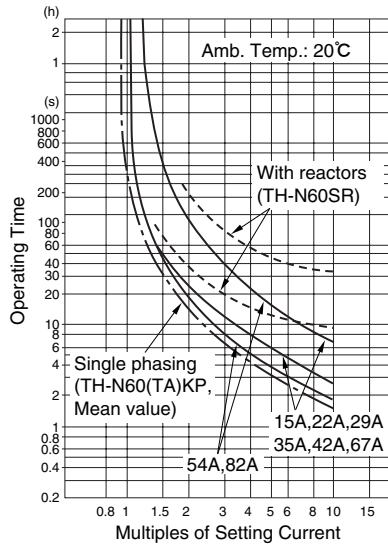
TH-N20·TH-N20KP
TH-N20SR·TH-N20KPSR



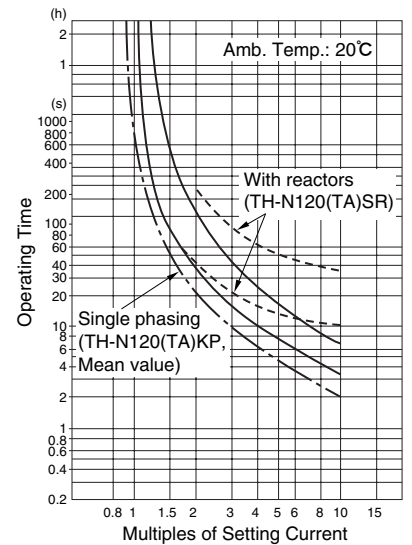
TH-N20TA·TH-N20TAKP
TH-N20TASR·TH-N20TAKPSR



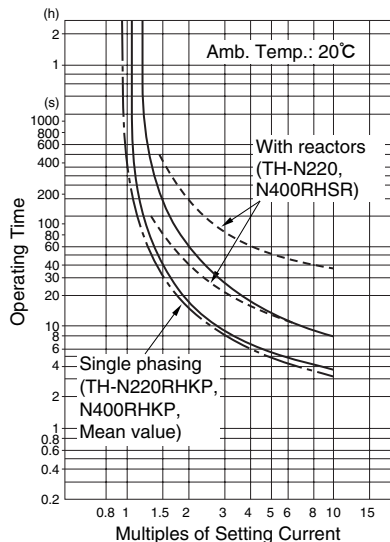
TH-N60·TH-N60TA
TH-N60KP·TH-N60TAKP
TH-N60SR·TH-N60TASR
TH-N60KPSR·TH-N60TAKPSR



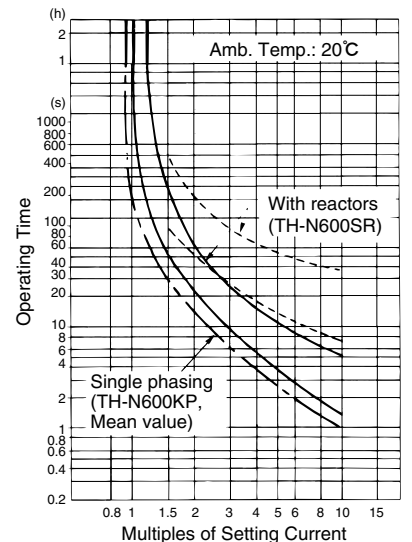
TH-N120·TH-N120KP
TH-N120SR·TH-N120KPSR
TH-N120TA·TH-N120TAKP
TH-N120TASR·TH-N120TAKPSR



TH-N220RH
TH-N220RHKP
TH-N220RHRSR
TH-N220RHKPSR
TH-N400RH
TH-N400RHKP
TH-N400RHRSR
TH-N400RHKPSR



TH-N600
TH-N600KP
TH-N600SR
TH-N600KPSR



2.1.6 Optional Parts and Accessories

Saturable Reactors for Slow Tripping

Ordering designation

THR - G22	PT
↓	↓
Part number	3 heater 2 heater
see table 2.1.6(1)	PT PD

Table 2.1.6 (1)

Heater Designation	Part number						
	TH-N12 ¹	TH-N20(KP)	TH-N20TA(KP)	TH-N60(KP) TH-N60TA(KP)	TH-N120(KP) TH-N120TA(KP)	TH-N220□□(KP) TH-N400□□(KP)	TH-N600(KP)
0.24A	TSR-A0Y	TSR-C0Y	—	—	—	—	—
0.35A	TSR-A0Y	TSR-C0Y	—	—	—	—	—
0.5A	TSR-A01	TSR-C0Y	—	—	—	—	—
0.7A	TSR-A03	TSR-C03	—	—	—	—	—
0.9A	TSR-A05	TSR-C03	—	—	—	—	—
1.3A	TSR-A09	TSR-C07	—	—	—	—	—
1.7A	TSR-A11	TSR-C09	—	—	—	—	—
2.1A	TSR-A12	TSR-C10	—	—	—	—	—
2.5A	TSR-A13	TSR-C12	—	—	—	—	—
3.6A	TSR-A15	TSR-C15	—	—	—	—	—
5A	TSR-A18	TSR-C17	—	—	—	—	—
6.6A	TSR-A21	TSR-C20	—	—	—	—	—
9A	TSR-A23	TSR-C23	—	—	—	—	—
11A	TSR-A25	TSR-C25	—	—	—	—	—
15A	—	TSR-C26	—	THR-G22	—	—	—
19A	—	TSR-C29	—	—	—	—	—
22A	—	—	TSR-D28	THR-G24	—	—	—
29A	—	—	TSR-D29	THR-G26	—	—	—
35A	—	—	TSR-D28	THR-G27	—	—	—
41A	—	—	—	THR-G27	THR-H41	—	—
54A	—	—	—	THR-G29	THR-H42	—	—
67A	—	—	—	THR-G29	THR-H43	—	—
82A	—	—	—	THR-G30	THR-H43	THR-F10	—
95A	—	—	—	THR-G30	—	—	—
105A	—	—	—	—	THR-H44	THR-F13	—
125A	—	—	—	—	THR-H45	THR-F13	—
150A	—	—	—	—	—	THR-F15	—
180A	—	—	—	—	—	THR-F16	—
210A	—	—	—	—	—	THR-F17	—
250A	—	—	—	—	—	THR-F18	THR-E13
330A	—	—	—	—	—	THR-F19	THR-E13
500A	—	—	—	—	—	—	THR-E13
660A	—	—	—	—	—	—	THR-E13

Note: 1. Saturable reactors can be adopted only for the two heater type TH-N12

Table 2.1.6 (2)

Trip indicator	Thermal overload relay	Voltage(50/60Hz)	Part number
	TH-N12(CX)(KP) TH-N18(CX)(KP)	AC 24/DC24V AC 100-127V AC 200-240V	UN-TL15DC24V UN-TL15AC100V UN-TL15AC200V
Reset release	TH-N20,N20TA(CX)(KP) TH-N60(CX)(KP)~N600(KP)	AC 24/DC24V AC 100-127V AC 200-240V	UN-TL20DC24V UN-TL20AC100V UN-TL20AC200V
	Thermal overload relay	Part number	Length (mm)
Separate mounting adaptor	TH-N12(CX)(KP) TH-N18(CX)(KP)	UN-RR205 UN-RR405 UN-RR555 UN-RR705	200 400 550 700
	TH-N20,N20TA(CX)(KP) TH-N60(KP)~N600(KP) ¹	UN-RR200 UN-RR400 UN-RR550 UN-RR700	200 400 550 700
Separate mounting adaptor	Thermal overload relay	Part number	
	TH-N12(TP/KP) TH-N12CX(TP/KP)	UN-HZ12 UN-HZ12CX	

Note: 1. Except for type TH-N60CX and TH-N60CXKP.

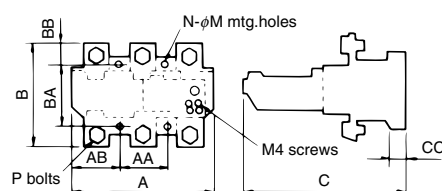
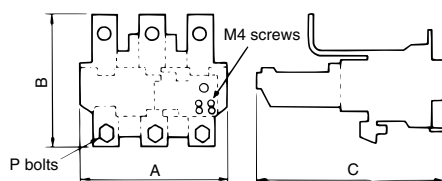
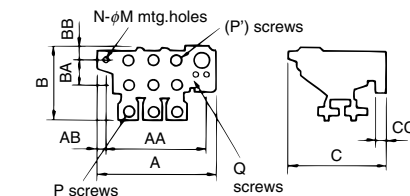
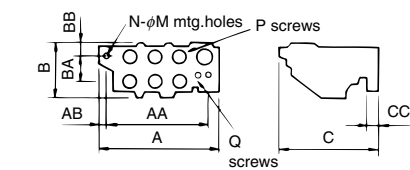
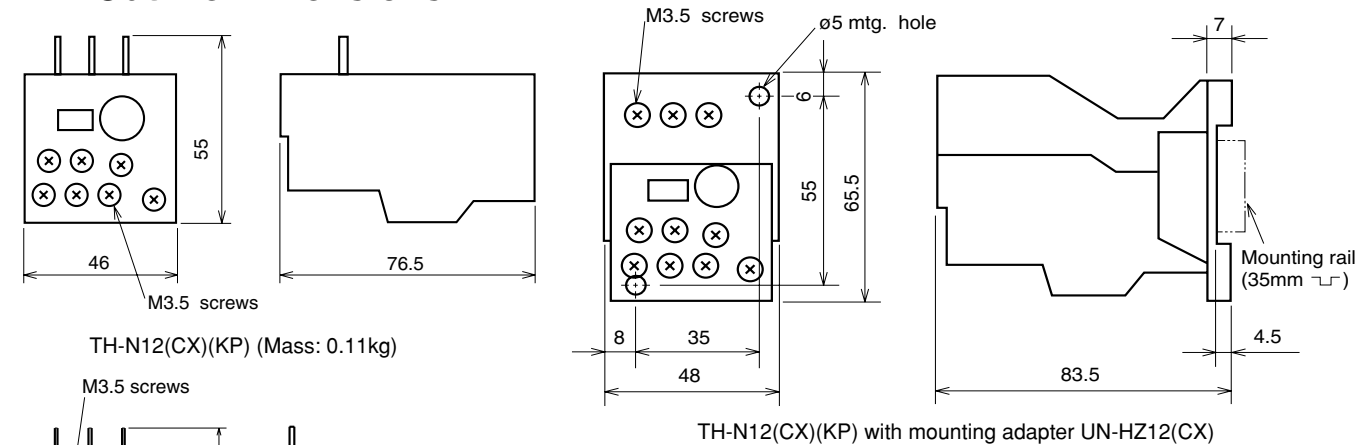
• Connecting Parts for Contactors to Thermal Overload Relays

Table 2.1.6 (3)

	For connection between contactor (non-reversing type) and thermal overload relay	Overload relay	Contactor	Part number	Mass(kg)
		TH-N20(CX)(KP)	S-N20(CX), S(D)-N21(CX)	UN-TH21(CX)	0.02
		TH-N20(CX)(KP), -N20TA(CX)(KP)	S-N25(CX), S(D)-N35(CX)	UN-TH25(CX)	0.02
		TH-N60(CX)(KP)	S-N50(CX), -N65(CX) SD-N50, -N65	BH559N350	0.02
		TH-N60(KP), -N60TA(KP)	S-N80, -N95 SD-N80, -N95	BH569N350 BH569N352	0.04 0.04
		TH-N120(KP), N120TA(KP)	S(D)-N125 S(D)-N150	BH579N355 BH589N355	0.36 0.36

** Connecting bars and mounting plate are included in the OLR of TH-N220RH(KP) and TH-N400RH(KP) for S-N180, -N220, -N300, -N400.*

2.1.7 Outline Dimensions



Type	A	B	C	AA	AB	BA	BB	CC	N	M	P	Q	Mass (kg)
TH-N20(CX)(KP)	63	51	79	19	15	33	8.5	7	2	4.5	M4	M3.5	0.14
TH-N60(KP)	91.5	57	87	70	12	45	6	9	2	4.5	M6	M4	0.28
TH-N60CX(KP)	91.5	57	87	70	12	45	6	9	2	4.5	M6	M4	0.28
TH-N120(KP)	103	67	105	75	14	50	6	10	2	6	M8	M4	0.48
TH-N600(KP)	63	42	83.5	19	14	33	2	7	2	4.5	M4	M4	0.14

Type	A	B	C	AA	AB	BA	BB	CC	N	M	P(P')	Q	Mass (kg)
TH-N20TA(CX)(KP)	74	72	83.5	—	—	—	—	—	—	—	M5 (M4)	M3.5	0.2
TH-N60TA(KP)	89	73.5	83.5	—	—	—	—	—	—	—	M6 (M6)	M4	0.32
TH-N120TA(KP)	112	87	105	—	—	—	—	—	—	—	M8 (M8)	M4	0.75
TH-N120TAHZ(KP)	112	103	105	75	25	50	25	10	2	6	M8 (M8)	M4	1.0

Type	A	B	C	AA	AB	BA	BB	CC	N	M	P	Mass (kg)
TH-N220RH(KP)	144	114	179.5	—	—	—	—	—	—	—	M10	2.5
TH-N400RH(KP)	144	160	193.5	—	—	—	—	—	—	—	M12	2.7

Type	A	B	C	AA	AB	BA	BB	CC	N	M	P	Mass (kg)
TH-N220HZ(KP)	144	104	166.5	47	48.5	62	21	18	4	6	M10	2.5
TH-N400HZ(KP)	144	173	166.5	47	48.5	62	55.5	18	4	6	M12	2.7

Note: Suffix "HZ" denotes separate mounting type.

2.2 Electronic Motor Protection Relays

Series ET-N



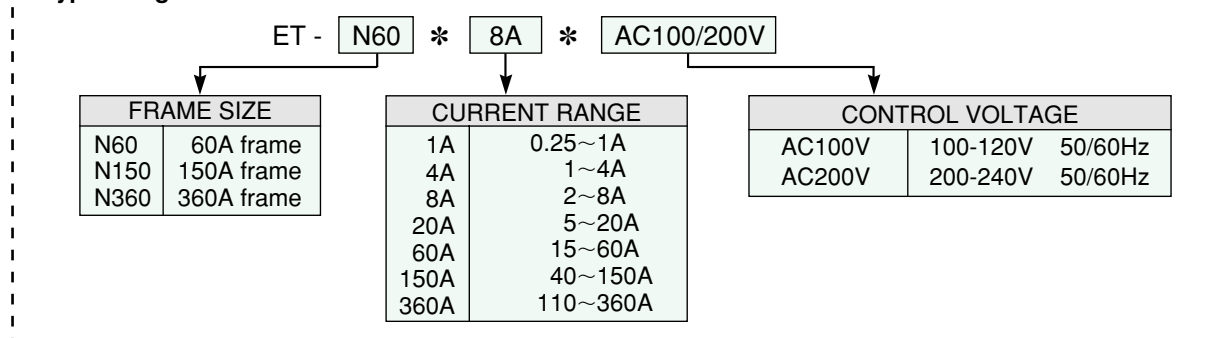
ET-N60 60A

The MITSUBISHI series ET-N relay is an excellent relay that can protect motors electrically. Those series ET-N relays have the following excellent features.

■ Features

- Selectable Protection Mode
 - Overload (including locked rotor condition)
 - Phase failure (including current unbalance)
 - Incorrect phase sequence
- Excellent Wide Current Range
- Easy Wiring
- Easy Setting and Maintainance
- Selectable Tripping Time at 600% of setting.
 - Standard trip (7s.)
 - Quick trip (3s.)
 - Fast trip (5s.)
 - Medium trip (15s.)
 - Slow trip (30s.)
- Withstands High Overcurrent
- Fine Indication of Trip Mode
- Conformity to International Standards
- Can be mounted on 35mm rail (ET-N60)

-Type Designation -



■ Specifications

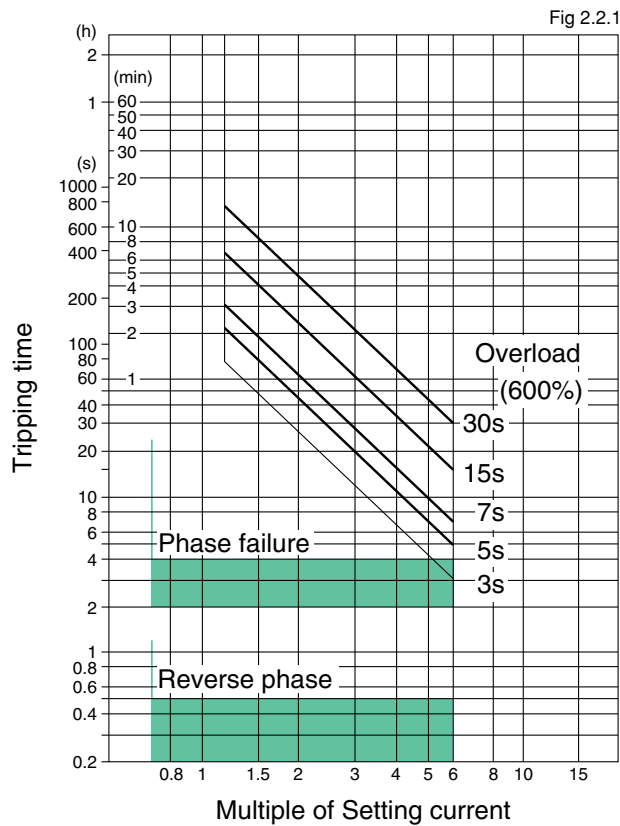
• Ratings and characteristics

Table 2.2.1

Frame size [Current range]			N60[1A]	N60[4A]	N60[8A]	N60[20A]	N60[60A]	N150[150A]	N360[360A]
Rated insulation voltage			VAC	690					
Adjustable setting range			A	0.25-1	1-4	2-8	5-20	15-60	40-150
Applicable motor capacity 3-ph	200-240VAC	kW	0.03-0.2	0.2-0.75	0.4-1.5	1.5-4	3.7-11	11-37	30-90
	380-440VAC	kW	0.05-0.4	0.4-1.5	0.75-2.2	2.2-7.5	7.5-22	22-75	55-150
	200-240VAC	HP	1/16-1/4	1/4-1	1/2-2	2-5	5-15	15-50	40-125
	380-440VAC	HP	1/8-1/2	1/2-2	1-3	3-10	10-30	30-100	75-200
Rated operating current of aux. contacts	Category AC-15	120VAC	A	2					
		240VAC	A	1					
	Category DC-13	24VDC	A	1					
		110VDC	A	0.2					
Permissible ambient temperature/humidity			°C/%RH	-10 to +55/45 to 85					
Control circuit consumption			VA	7.5 (AC100V)/15 (AC200V)					
Control voltage tolerance			times	0.85 to 1.1 (rated control voltage)					
Tripping time				See Fig. 2.2.1					
Tripping condition	Overload	%		[minimum tripping current] 110 to 120 (at setting current)					
	Phase failure	%		more than 70 (at setting current) [Tripping time : 2-4 sec.]					
	Reversal phase	%		more than 70 (at setting current) [Tripping time : less than 0.5 sec.]					
Withstand voltage			VAC	2500 [1 minute]					
Shock resistance	Vibration 10-55Hz	m/s ²		19.6					
	Sine wave pulse	m/s ²		49					
Conductor size	Main terminals	mm ²		2-14			3.5-22	5.5-60	14-200
	Control terminals	mm ²		1.25-2					

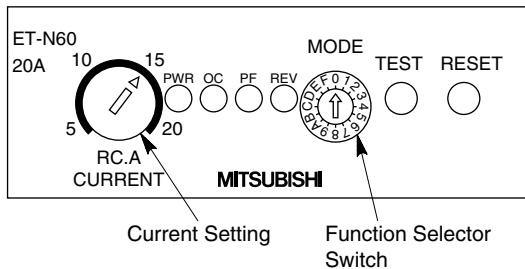
Note: ET-N relay cannot be used on DC circuit

• Characteristic Curves



• Selection of Protection Mode & Tripping Time

Table 2.2.2



The selector switch is set at position "7" (overload and phase failure protection mode; standard trip type) when shipping.

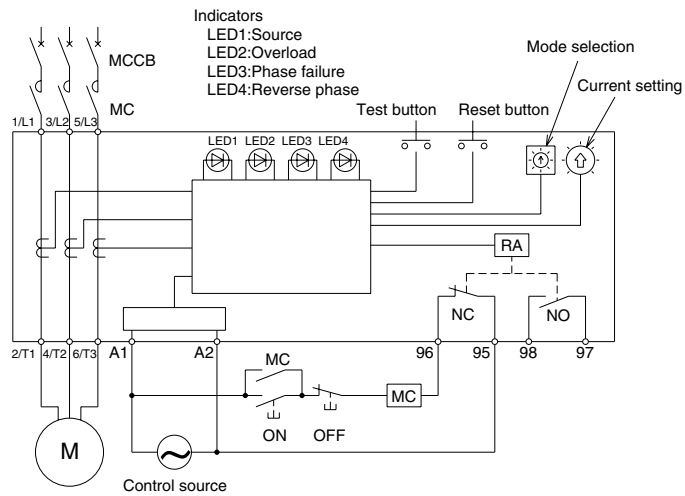
So please reset the position of the changeover switch according to Table 2.2.2 before installation.

Protection mode	Overload tripping time at 600% of setting(s)	Symbol on changeover switch
Overload, phase failure and reversal phase [3E]	3	0
	5	1
	7	2
	15	3
	30	4
Overload and phase failure [2E]	3	5
	5	6
	7	7
	15	8
Overload only [1E]	30	9
	3	A
	5	B
	7	C
	15	D
	30	E

• Application to High Voltage or Big Motor Circuit

The high voltage current transformer (secondary current: smaller than 5A: capacity: more than 5VA) should be connected to ET-N60*8A in the star connection, when the load is high voltage or big AC motor.

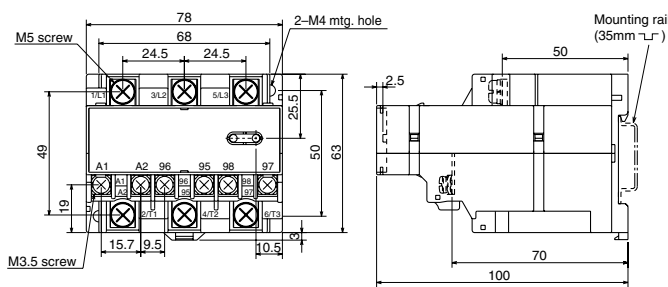
■ Wiring Precautions



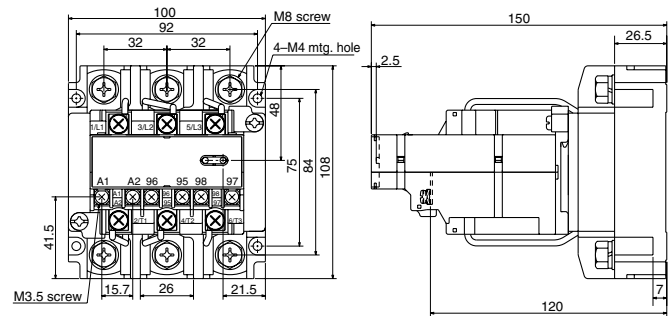
- The control source should be wired in the same phases as the contactor control source.
- When the load is a single phase motor, use 1/ L1-2/T1 and 5/L3-6/T3 phases.
And re-set the position of changeover switch to "A" to "E".

- If capacitors are used to correct the power factor, connect the capacitor in the power source side of the ET-N relay.

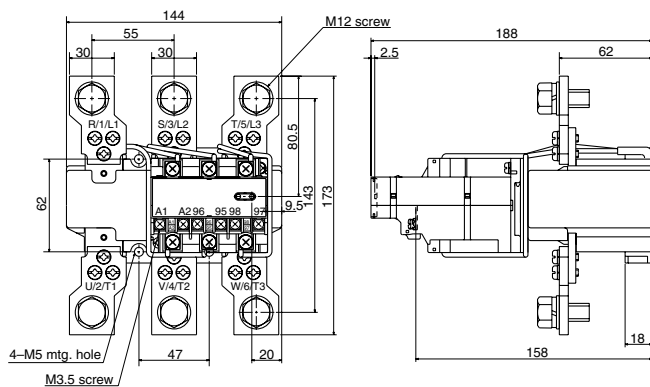
■ Outline Dimensions



ET-N60(1-60A) (Mass: 0.3kg)



ET-N150 (Mass: 1.6kg)



ET-N360 (Mass: 2.5kg)

3. DEFINITE PURPOSE CONTACTORS & STARTERS

3.1 DC Contactors

Series DU



DU-A60

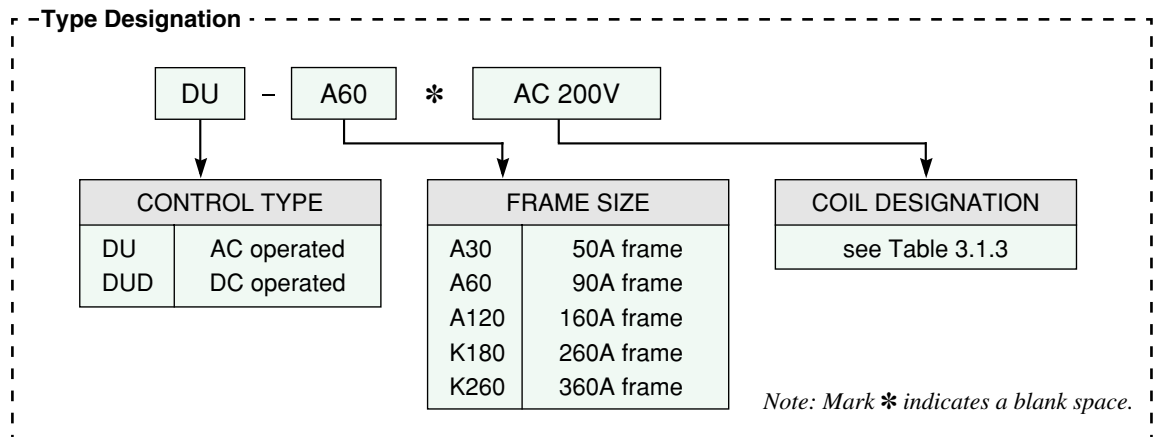


DU-K180

The MITSUBISHI series DU contactors are designed for DC circuits, that is the variable-speed drive-control circuits (SCR switching circuit) and DC motor control circuits.

Features

- Compact design
- High break capacity
- CSA certified models are also available on AC operated type, add suffix "UR" immediately after the Frame size.
- Double break contacts
- UL recognized component (If  marking is required add suffix "UR" immediately after the Frame size).
- Long Life



Specifications

- Number of main contacts type DU : 2NO1NC, type DUD : 2NO
Number of auxiliary contacts type DU & DUD : 2NO2NC

Ratings

Table 3.1.1

Frame size				A30	A60	A120	K180	K260
Conventional free air thermal current			A	50	90	160	260	360
Rated operating current for SCR switching circuit*		110VDC	A	40	80	160	260	360
		240VDC	A	40	80	160	260	360
		440VDC	A	15	30	60	90	130
		500VDC	A	15	30	60	90	130
		500VDC	A	15	30	60	90	130
1-pole 		110VDC	A	120	240	480	720	1.040
		240VDC	A	120	240	480	720	1.040
		440VDC	A	120	240	480	720	1.040
		500VDC	A	120	240	480	720	1.040
		500VDC	A	120	240	480	720	1.040
Rated operating current for SCR switching circuit		110VDC	A	50	90	160	260	360
		240VDC	A	50	90	160	260	360
		440VDC	A	40	80	160	260	360
		500VDC	A	40	80	160	260	360
		500VDC	A	40	80	160	260	360
Rated operating current category DC 2 & 4		110VDC	A	30	60	120	180	260
		240VDC	A	20	40	80	120	175
		440VDC	A	7.5	15	30	—	—
		110VDC	A	20	40	80	100	150
		240VDC	A	15	30	60	75	100
Rated operating current category DC2 & 4		110VDC	A	40	80	160	240	350
		240VDC	A	30	60	120	180	260
		440VDC	A	20	40	80	120	175
		110VDC	A	20	40	80	100	150
		240VDC	A	15	30	60	75	100
Rated operating current of aux. contacts	Category AC-15	110VAC	A	6				
		240VAC	A	5				
	Category DC-13	110VDC	A	0.6				
		240VDC	A	0.2				

Note: For SCR switching, making current of NO contacts is 2 times the rated operating current and making current of NC contact is 1 times, the rated operating current which means the peak value at making. In this application NO and NC contacts do not break any current.

• Characteristics

Table 3.1.2

Frame size				A30	A60	A120	K180	K260
Mechanical life			operations	2.5 million				
Electrical life			operations	0.5 million				
Permissible ambient temperature			°C	−10 to 55				
Coil voltage tolerance			times	0.85 to 1.1 (rated coil voltage)				
Coil consumption		Inrush Sealed Watts	VA VA W	240 28 7 (26)	520 47 13 (35)	1260 100 25 (50)	480 44 5(41)	480 54 7.3(55)
Operating time	Make	NO contacts ON NC contact OFF	msec msec	15 (60) 12	20 (100) 13	20 (140) 13	30(150) 26	40(180) 37
	Break	NO contacts OFF NC contact ON	msec msec	6(18) 12	11 (27) 18	11 (37) 18	110(25) 112	125(30) 135
Make and break capacity Category DC2 & DC4		Make Break	tmes times	4 (at the rated operating current) 4 (at the rated operating current)				
Permissible switching frequency			operations/hour	1,200				
Vibration resistance		10-55Hz	m/s²	19.6				
Shock resistance		10 msec half sine wave	m/s²	49				
Conductor size	Main terminals		mm²	2-25	2-35	6-70	10-150	16-185
	Control terminals		mm²	1-4			1-2.5	

Note: Parenthesized data is for type DUD, DC operated contactors.

• Coil designation

Table 3.1.3

Coils for type DU-A			Coils for type DU-K		Coils for type DUD	
Coil designation	Applicable voltage		Coil designation	Applicable voltage	Coil designation	Applicable voltage
	50Hz	60Hz				
AC100V	100VAC	100-110VAC	AC100V	100-127VAC 50/60Hz	DC24V	24VDC
AC120V	110-120VAC	115-120VAC	AC200V	200-240VAC 50/60Hz	DC48V	48VDC
AC200V	200VAC	200-220VAC			DC100V	100VDC
AC230V	220-240VAC	230-240VAC			DC110V	110VDC
AC400V	380-415VAC	400-440VAC	AC300V	260-350VAC 50/60Hz	DC120V¹	120VDC
AC440V	415-440VAC	460-480VAC	AC400V	380-440VAC 50/60Hz	DC125V	120-125VDC ²
AC500V	500VAC	500-550VAC	AC500V	460-550VAC 50/60Hz	DC200V	200VDC
					DC220V	220VDC

Notes: 1. Only for type DUD-A60

2. 125V DC for type DUD-A60

■ Spare parts

Table 3.1.4

Spare parts	Ordering designation
Main contact kits for DU-□ ¹	MAIN KIT DU-□
Main contact kits for DUD-□ ²	MAIN KIT DUD-□
Auxiliary contact kits for DU(D)-A□ ³	Z926783G30
Auxiliary contact Units for DU(D)-K□ ⁴	UN-AX150
Coils for DU-□ ⁵	DU-□-COIL AC-V
Coils for DUD-□ ⁶	DUD-□-COIL DC-V

Notes: 1. Contact kit of type DU consists of three moving contacts and six stationary contacts.

2. Contact kit of type DUD consists of two moving contacts and four stationary contacts.

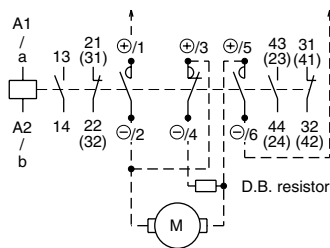
3. Aux. contact kits of type DU(D)-A□ are all the same.

4. Aux. contact units of type DU(D)-K□, UN-AX 150 are the same as those of the standard series S-N contactors.

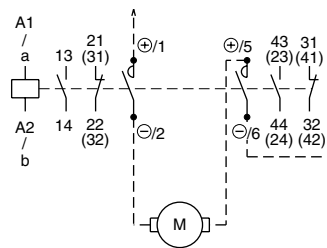
5. Coils for DU-K 180/K 260 are the same as S-N220/N300 each.

6. Coil for DUD-A30 includes only one coil. Other DC operated coils of type DUD include two coils.

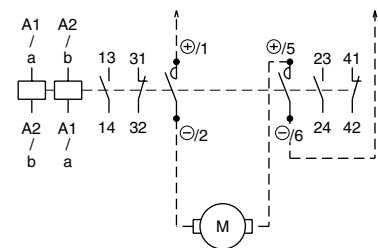
■ Contact Arrangements



DU-A30, DU-A60, DU-A120
DU-K180, DU-K260



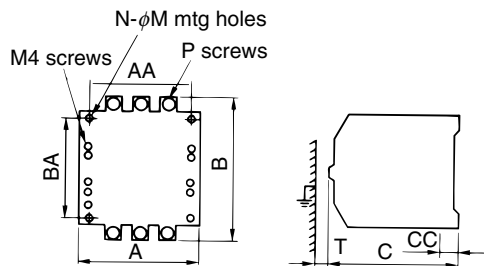
DUD-A30, DUD-A60
DUD-K180, DUD-K260



DUD-A120

Note: Values in parenthesis are shown on auxiliary terminals of DU-A  or DUD-A .

■ Outline Dimensions



Type	A	AA	B	BA	C	CC	N	M	P	Mass(kg)	T
DU-A30	100	86	118	90	105.5	12.5	3	5	6	1.2	10
DU-A60	120	100	144	100	128.5	16	3	5	6	2.0	10
DU-A120	162	130	160	140	162	2.3	4	6	10	4.1	10
DU-K180	138	120	204	190	174	1.6	4	6	10	5.5	30
DU-K260	163	145	243	225	195	2.3	4	8	12	10	50
DUD-A30	101	86	108	90	135.5	3.2	3	5	6	2.1	10
DUD-A60	120	100	144	100	161.5	2	3	5	6	3.5	10
DUD-A120	162	130	160	140	187	2.3	4	6	10	7.1	10
DUD-K180	138	120	204	190	200	1.6	4	6	10	7.5	30
DUD-K260	163	145	243	225	220	2.3	4	8	12	13.5	50

3.2 Medium Voltage Vacuum Contactors

Series SH-V



SH-V160

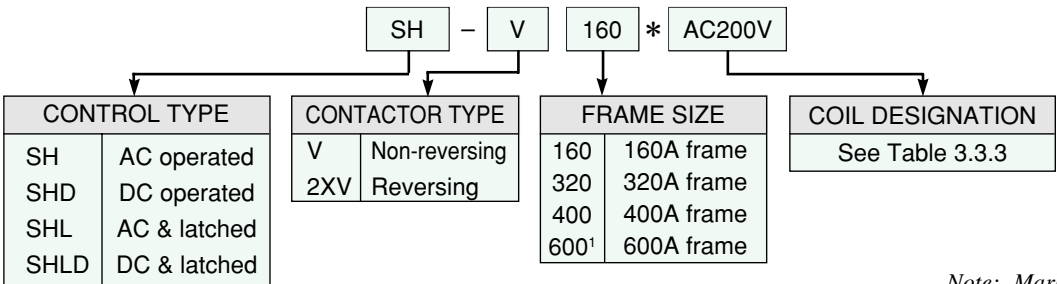
The MITSUBISHI series SH-V contactors are specially designed for the areas of mining, pumping, sawing and other applications where voltage above 1500VAC are frequently used.

■ Features

- Compact design
- Lightweight
- Long service life
- Easy inspection & maintenance
- Applications over a wide range of voltage
- High insulation strength



Type Designation



Note: Mark * indicates a blank space.

Note: 1. Only AC operated non-reversing type is available for Frame size 600.
SH-V600 is not presently certified by CSA.

■ Specifications

• Ratings

Table 3.2.1

Frame size			V160	V320	V400	V600
Rated insulation voltage		V	1,500	1,500	1,500	1,500
Rated operating capacity	Three phase motor category AC3	240V	55(180)	90(320)	115(400)	160(630)
		440V	110(180)	200(320)	250(400)	300(630)
		660V	160(180)	315(320)	400(400)	600(600)
	Three phase capacitor	1,000V	225(160)	450(320)	550(400)	750(600)
		1,500V	315(160)	700(320)	800(400)	1,000(600)
		240V	50(150)	75(250)	100(300)	200(580)
Resistance load rating category AC-1	Conventional free air thermal current	440V	100(150)	150(250)	200(300)	400(580)
		1,000V	250(150)	300(200)	300(200)	—
	Short circuit interrupting current	1,500V	350(150)	500(200)	500(200)	—
Resistance load rating category AC-1		A	200	350	450	750
Conventional free air thermal current		lth	200	350	450	750
Short circuit interrupting current		A	4,000			5,040
Withstand current for short time	for 2 seconds	kA	4			6
	for 10 milliseconds	kA	33			
Rated operating current of aux. contacts	Category AC-15	240VAC	A	5		
		480VAC		3		
	Category DC-13	660VAC		3		
		110VAC		1.2		
		220VAC	A	0.2		

Note: A surge absorber is required for motors less than 5.5kW only.

● Characteristics

Table 3.2.2

Frame size			V160	V320	V400	V600
Mechanical life ^{1,2}		operations	2.5 million			
Electrical life ^{3,4} .(category AC3)		operations	0.5 million			
Permissible ambient temperature		°C	-10 to +55			
Coil voltage tolerance		times	0.85 to 1.1(rated coil voltage)			
Coil consumption	AC operated Inrush	VA	550			1150
	Sealed	VA	45			55
	Watts	W	5.2			7.3
	DC operated Inrush	VA	500			—
	Sealed	VA	40			—
	Mechanically latched Inrush	VA	550			—
Operating time(approx.)	Make	msec	40			65
	Break	msec	130			80
Make and break current capacity	Make	times	10(at AC3 rated operating current)			
	Break	times	8(at AC3 rated operating current)			
Permissible switching frequency		operations/hour	1,200			
Vibration resistance	10-55Hz	m/s ²	19.6			
Shock resistance	Sine wave pulse	m/s ²	49			
Conductor size	Main terminals	mm ²	5.5-100	14-200		70-325
	Control terminals	mm ²	1-2.5			

Notes: 1. Mechanical life of the latched type is 0.25 million operations.

2. Mechanical life of vacuum tube is 1 million.

3. When the load is three phase capacitors, electrical life is 0.1 million operations.

4. Electrical life of the latched type is 0.25 million operations.

● Coil Designation

Table 3.2.3

Coil designation	Rated voltage
AC100V	100~127V 50/60Hz
AC200V	200~240V 50/60Hz
AC300V	260~350V 50/60Hz
AC400V	380~440V 50/60Hz
AC500V	460~550V 50/60Hz
DC100V	100-110 VDC
DC200V	200-220 VDC

Note: When ordering the latched type contactor, specify the coil designation of the closing coil and the tripping coil.
Place "MC" before the closing coil designation and place "MT" before the tripping coil designation.

■ Spare Parts & Accessories

Table 3.2.4

Contactor Catalog Number	Coil Part Number ¹	Main Contact Part Number	Auxiliary Contacts Number		Vacuum Tube Gauge Part Number
			Replacement(1NO 1NC)	Add-on(2NO 2NC)	
SH-V160	SH-V160COIL AC V	SH-V160TUBES ²	UA-AXVV1	UA-AXVV2 ³	SH-V160 GAUGE
SH-V320		SH-V320TUBES ²			
SH-V400		SH-V400TUBES ²			
SH-V600	SH-V600COIL AC V	SH-V600TUBES ²		UA-AXVV4	SH-V600 GAUGE

Notes: 1. See Table 3.3.3 for Coil Designation.

2. Set of three vacuum bottles supplied.

3. Consists of two UA-AXVV1 contact blocks on the mounting plate. Mounts on left side of contactor.

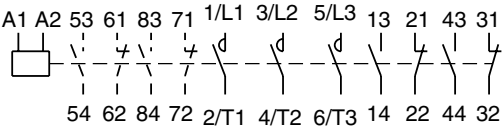
● Surge absorber

As the vacuum tubes of SH-V use a special contact material, the surge voltage by current chopping is very small. Surge absorbers are required only for motors smaller than 5.5kW.

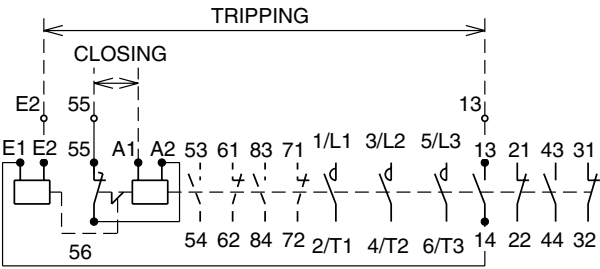
Table 3.2.5

Applicable voltage	Ordering designation
up to 440VAC	UA-SU4
up to 550VAC	UA-SU5
up to 660VAC	UA-SU6
up to 1,000VAC	UA-SU10
up to 1,500VAC	UA-SU15

Contact Arrangement

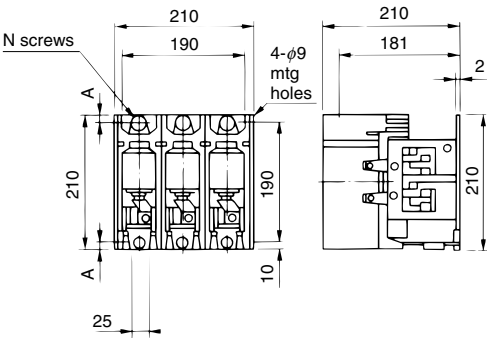


SH-V□



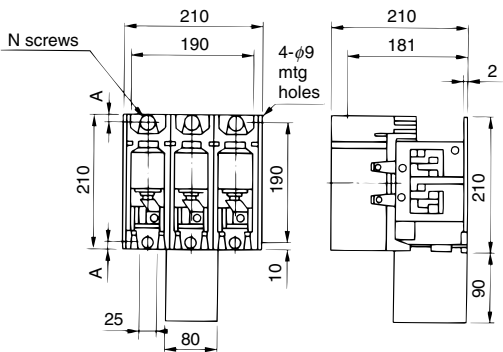
SHL-V□
SHLD-V□

Outline Dimensions

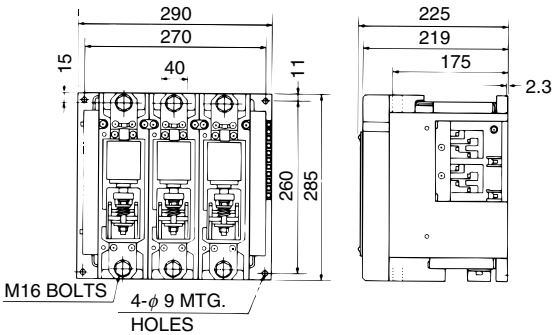


SH-V160, V320, V400 (Mass:12.5kg)

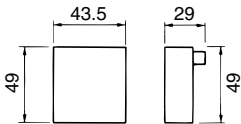
KEYS	N	A
SH-V160	M8	10
SH-V320	M10	12.5
SH-V400	M10	12.5
SHL(D)-V160	M8	10
SHL(D)-V320	M10	12.5
SHL(D)-V400	M10	12.5



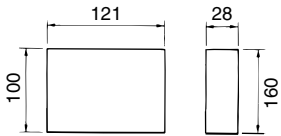
SHL-V160, V320, V400 (Mass:14kg)
SHLD-V160, V320, V400



SH-V600(Mass:22kg)



UA-AXVV1(Mass:0.2kg)



UA-AXVV2 (Mass:0.5kg)

3.3 Compact 3-Pole Contactors

Series S-N $\square$ 8

The MITSUBISHI series S-N $\square$ 8 compact 3-pole contactors are designed for limited panel space applications such as machine control panels.



S-N48

Features

- Compact design—Very limited required mounting space.
- Front clip-on type auxiliary contact block can be added.
- Coil surge absorbers are available.
- Can be mounted on 35mm rail.

Type Designation

S -	2X	N38	CX	*	AC 200V
REVERSING OR NON-REVERSING		FRAME SIZE	FINGER PROTECTION		COIL DESIGNATION
None 2X	Non-reversing Reversing	See table 3.3.1	None CX	Not provided Provided	See Table 1.5.1 on page12

Note: Mark* indicates a blank space

Specifications

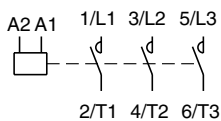
Rating and characteristics

Table 3.3.1

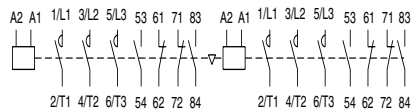
Type			S-N18 (CX)	S-N28 (CX)	S-N38 (CX)	S-N48 (CX)
Rated insulation voltage		V	AC690			
Rated operational current	220-240V	A(kW)	18(4.5)	26(7.5)	39(11)	50(15)
	380-440V	A(kW)	16(7.5)	17(7.5)	32(15)	40(18.5)
3-ph, category AC-3	500V	A(kW)	13(7.5)	13(7.5)	24(15)	32(18.5)
	690V	A(kW)	9(7.5)	9(7.5)	12(11)	17(15)
Conventional free air thermal current		A	25	30	60	80
Electrical life		operations (million)	1			
Mechanical life			10	5		
Rated making current for 100,000 cycle operations Peak let through time 0.5ms		A	200	300	500	670
Switching frequency(AC3)		operations/hour	1800	1800	1800	1200
Coil consumption (at rated coil voltage)	Inrush	VA	60		110	
	Sealed	VA	10		13	
	Watts	W	3		4 · 5	
Terminal screw size	Main terminal		M4	M4	M5	M5
	Control terminal		M3.5	M3.5	M3.5	M3.5
Conductor size (Compression terminal size)	Main terminal		1~6		2~16	
	Control terminal		1~2.5		1~2.5	
Additional auxiliary contact block			UN-AX2 or UN-AX4			

Note: 1. For finger protection type, order model name followed by suffix "CX".

Contact Arrangement

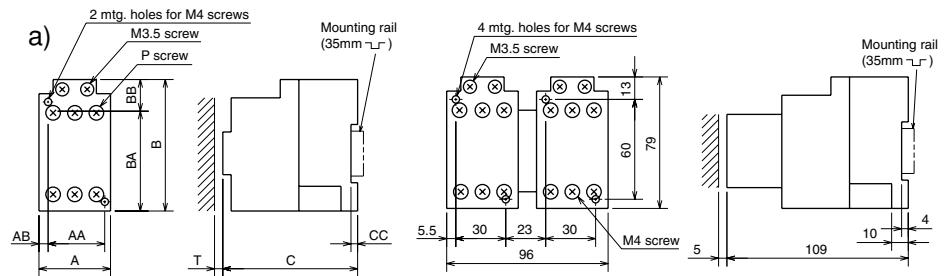


S-N $\square$ 8 (CX)

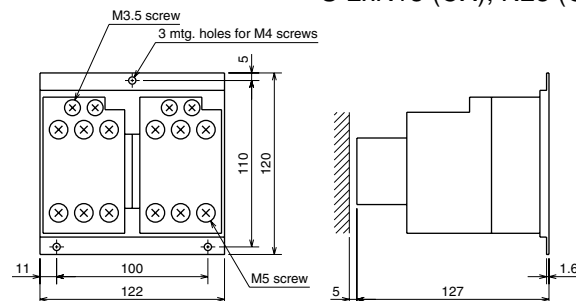


S-2xN $\square$ 8 (CX)

Outline Dimensions



S-2xN18 (CX), N28 (CX)



S-2xN38 (CX), N48 (CX)

	Fig.	A	B	C	AA	AB	BB	BA	CC	CA	D	P	Q	Mass(kg)	T
S-N18 (CX), N28 (CX)	a	43	79	81	30	7	60	6	10	109	4	M4	M3.5	0.33	5
S-N38 (CX), N48 (CX)	a	54	90	93	40	7	80	6	7	121	4	M5	M3.5	0.4	5

3.4 NC Main Contact Contactors



B-N20



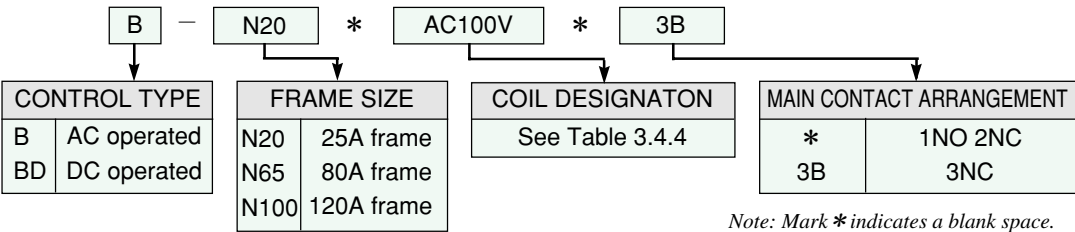
B-N65

The MITSUBISHI series B-N contactors are specially designed for the dynamic braking circuit of motors, switching motor-starting resistors and switching of emergency lighting.

Features

- 2 or 3 NC main contacts.
- Suitable for a variety of loads.
- Compact design
- Both AC operated models & DC operated models

Type Designation



Note: Mark * indicates a blank space.

Specifications

- Number of main contacts: Special arrangement 3 NC can be supplied only with type B-N20/N65.

Ratings

Table 3.4.1

FRAME SIZE				N20	N65	N100	
Conventional free air thermal current		Ith	A	25	80	120	
DC Rated operating current category DC-2 & DC-4	2NC ¹	110VDC	A	8	20	30	
		220VDC	A	1	3	3	
	3NC ²	110VDC	A	15	50	—	
		220VDC	A	5	20	—	
Electrical life		Operations	0.5 million				
DC Rated operating current category DC-1	2NC ¹	110VDC	A	15	30	40	
		220VDC	A	5	10	20	
	3NC ²	110VDC	A	20	65	—	
		220VDC	A	10	30	—	
Electrical life		Operations	0.5 million				
AC 3-ph Rated operating current	1NC	200-220VAC	A	18	50	80	
		380-440VAC	A	13	35	55	
	Electrical life (Making/Breaking)		Operations	0.5 million (6 (rated operating current)/no breaking)			
	AC 1-ph Rated operating current	2NC ¹	200-220VAC	A	18	50	80
Electrical life (Making/Breaking)			Operations	0.5 million (6 (rated operating current)/rated operating current)			

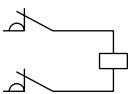
Notes: 1. At 2NC series connection
2. At 3NC series connection

Rated operating current of aux. contacts.

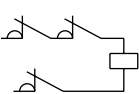
Table 3.4.2

Category	Rated voltage	A
AC-15	120VAC	6
	240VAC	5
	440VAC	3
	500VAC	3
DC-13	48VDC	3
	110VDC	0.6
	220VDC	0.2

Notes: 1. At 2NC series connection



2. At 3NC series connection



Characteristics

Table 3.4.3

FRAME SIZE				N20	N65	N100
Mechanical life			Operations	5 million		
Coil consumption	Inrush	VA		90 (—)	210 (—)	270 (—)
	Sealed	VA		15 (—)	23 (—)	24 (—)
	Watts	W		4 (9)	2.8 (24)	2.9 (24)
	Coil voltage tolerance	times		0.85 to 1.1 (at rated coil voltage)		
Operating time	Coil off → NC on	msec		19 (16)	75 (21)	120 (50)
	Coil on → NC off	msec		11 (35)	20 (80)	22 (130)
Make and break current capacity			DC-2 & DC-4	4 (rated operating current L/R ≤ 15 msec)		
Conductor size	Main terminals	mm ²		1-6	2-25	(6-70) ²
	Control terminals	mm ²		1-2.5		

Notes: 1. Parenthesized data if for type BD-□ DC operated contactors.
2. Conductor size in parentheses indicate compression terminal style not for bare clamping.

Coil Designation

Table 3.4.4

Type	Coil designation	Applicable voltage
B-N20	AC100V	100V/50Hz, 100-110V/60Hz
	AC200V	200V/50Hz, 200-220V/60Hz
	AC400V	380-415V/50Hz, 400-440V/60Hz
B-N65 B-N100	AC100V	100-127V/50Hz, 100-127V/60Hz
	AC200V	200-240V/50Hz, 200-240V/60Hz
	AC400V	380-440V/50Hz, 380-440V/60Hz
BD-N20 BD-N65 BD-N100	DC100V	DC100V
	DC110V	DC110V
	DC200V	DC200V
	DC220V	DC220V

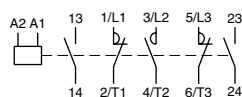
Spare Parts

Table 3.4.5

Spare parts	Ordering designation
Main contact kits for B(D)-N20 1NO2NC for B-N20 3NC for B(D)-N65 1NO2NC for B-N65 3NC for B(D)-N100 Auxiliary contact kits for B(D)-N20 for B(D)-N65 for B(D)-N100 Coils for B-N □ AC operation for BD-N □ DC operation	PARTS MAIN KIT B(D)-N20 1A2B BH739N304 B-N20 3B BH739N302 B(D)-N65 1A2B BH769N305 B-N65 3B BH769N306 B(D)-N100 BH779N303 PARTS AUX KIT B(D)-N20 BH739N312 B(D)-N65 BH539N315 B(D)-N100 BH579N312 B-N □-COIL AC....V BD-N □-COIL DC....V

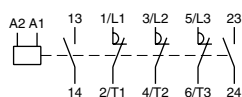
Contact Arrangements

main contacts: 1NO2NC
aux. contacts: 2NO



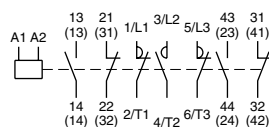
B-N20, BD-N20

main contacts: 3NC
aux. contacts: 2NO



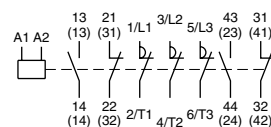
B-N20

main contacts: 1NO2NC
aux. contacts: 2NO2NC



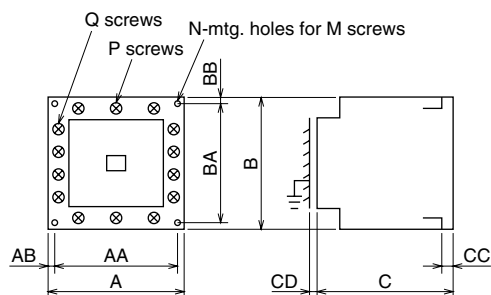
B-N65, B-N100
BD-N65, BD-N100

main contacts: 3NC
aux. contacts: 2NO2NC



B-N65

Outline Dimensions



Type	A	B	C	AA	AB	BA	BB	CC	CD	N	M	P	Q	Mass(kg)
B-N20	63	81	81	54	4.5	60	14	6.5	5	2	M4	M4	M3.5	0.4
B-N65	100	124	127	80	10	110	7	12	10	2	M5	M6	M4	1.7
B-N100	100	150	137	90	5	125	12.5	2	10	4	M4	M8	M4	2.7
BD-N20	63	81	113	54	4.5	60	14	6.5	5	2	M4	M4	M3.5	0.7
BD-N65	100	134	158	80	10	110	17	12	10	2	M5	M6	M4	3.0
BD-N100	102	150	162	90	6	125	12.5	1.6	10	4	M4	M8	M4	4.3

3.5 Delay Open Type Magnetic Starters & Contactors

Series S/MSO-N□DL



MSO-N□DL

The MITSUBISHI series MSO-N□DL starters and S-N□DL contactors are specially designed to prevent instantaneous “drop-out” when connected to motors, resulting from momentary voltage drop or power interruption caused by lightening or similar.
A capacitor connected in parallel with the operating coil of the contactor discharges so that the starter or contactor will remain closed for 1 to 4 seconds.

Type Designation

MSO – N21 DL * 7.5kW * 380V * AC200V

TYPE

MSO Starter
S Contactor

FRAME SIZE

See Table 3.5.1

MOTOR LOAD CAPACITY

7.5kW

MAIN CIRCUIT VOLTAGE

380V

CONTROL CIRCUIT VOLTAGE

AC100V
AC200V

100-110V 50/60Hz
200-220V 50/60Hz

Note: Mark * indicates a blank space.

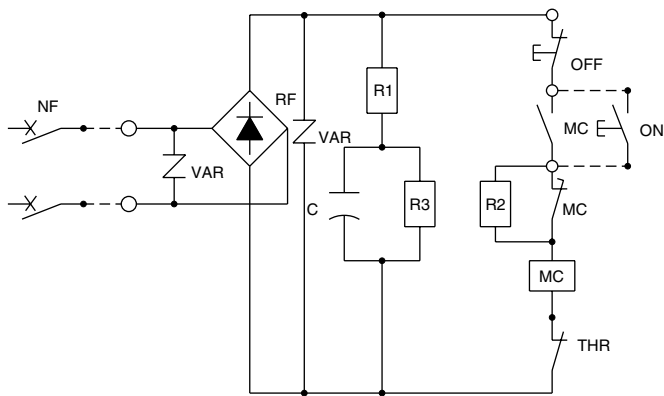
Specifications

Ratings and Characteristics

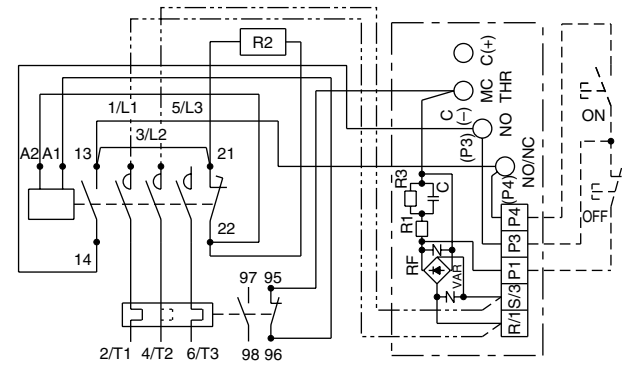
Table 3.5.1

Frame size				N12	N21	N35	N50	N65	N80	N95	N150	N220	N300	N400
Three phase motor	220-240VAC	kW	3.5	5.5	11	15	18.5	22	30	45	75	90	125	
	380-440VAC	kW	5.5	11	18.5	22	30	45	55	75	132	160	220	
	500-550VAC	kW	5.5	11	18.5	22	30	45	55	90	132	160	225	
Category AC-3	220-240VAC	A	13	22	40	55	65	85	105	150	250	300	400	
	380-440VAC	A	12	22	40	50	65	85	105	150	250	300	400	
	500-550VAC	A	9	17	32	38	60	75	85	140	200	250	350	
Conventional free air thermal current		I _{th}	A	20	32	60	80	100	135	150	200	260	350	450
Available aux. contacts				1NO1NC										
Holding time			sec.	2 ⁺² ₋₁										
Control circuit power consumption	Inrush	VA	21	40	44	55	55	66	66	76	100	140	140	
	Sealed	VA	13	18	19	26	26	27	27	55	66	85	85	

Diagrams Circuit



Typical Wiring Diagram

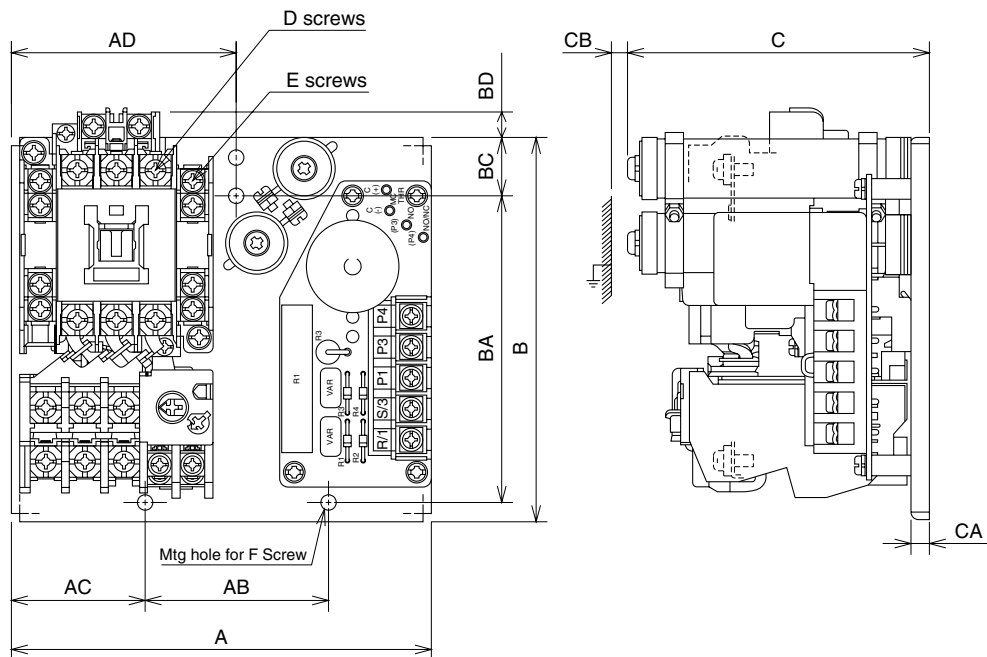


Note: R/1-R/1 & S/3-S/3 (---) wiring is omitted if the control circuit voltage is 100VAC or the main circuit voltage differs from the control circuit voltage.

● Caution

- When the circuit breaker (NF) is made (ON) and disconnected (OFF) repeatedly within a short time interval [eg: when the instantaneous power failure occurs within a short time interval], electrical parts might be damaged or specified holding time might not be assured.
Causes; 1) Overload occurs by frequent inrush current to RF and R1.
2) Enough electricity is not charged into the capacitor (C).
- Even after the power is turned off (after the NF is disconnected), current might remain in the capacitor (C). So please take care to avoid the electrical shock, when you check or repair the system.

■ Outline Dimensions



■ Dimensions

Table 3.5.2

Dimension Model	A	AB	AC	AD	B	BA	BC	BD	C	CA	CB	D	E	F
MSO-N12DL	132	40	49	69	110	100	5	12.5	98	6	5	M3.5	M3.5	3-M4
MSO-N21DL	137	60	43	73	125	100	19	11	98	6	5	M4	M3.5	3-M4
MSO-N35DL	134	50	42	67	162	150	6	23	114	8	5	M5	M3.5	3-M4
MSO-N50/65DL	150	50	56	81	168	150	9	26.5	141	8	10	M6	M4	3-M5
MSO-N80/95DL	170	100	35	85	220	200	10	39.5	165	8	10	M6	M4	3-M6
MSO-N150DL	210	140	26	105	270	250	10	33	177.5	8	30	M8	M4	3-M8
MSO-N220DL	230	140	20	90	290	250	12	21	208.5	8	30	M10	M4	3-M8
MSO-N300/400DL	300	200	10	—	361.5	200	25	30	229	8	50	M12	M4	4-M8

Notes: 1. Dimensions CB is the arc clearance.

2. Outline dimensions of S-N□DL are the same as those of MSO-N□DL, except for S-N300/N400DL. Dimension B of S-N300/N400DL is 250mm.

3.6 DC Interface Contactors

Series **SD-Q**



SD-Q11

MSOD-Q11

SD-Q DC interface contactors designed to be directly driven by the transistor output DC24V are DC operated contactors of compact size and high ability.

- By combining the efficient electromagnet with permanent magnet, SD-Q contactors are able to be directly driven by the transistor output DC24V 0.1A of a programmable logic controller, etc. SD-Q series is lineup contained reversing contactors applied to motors of 3 ϕ 440V5.5kW starters with the thermal overload relay, and additional auxiliary contact block, etc.



Features

- Special design to be directly driven by the transistor output DC24V
 - By combining an electromagnet with permanent magnet, coil operating current is reduced to DC24V55mA(1.3W) for SD-Q11 and DC24V75mA(1.8W) for SD-Q19
 - Compliance with many international standards
Applicable standards: IEC, DIN, VDE, BS, JIS, JEM
Approved standards: UL, CSA, TÜV
 - Built-in surge absorber
 - Provision of terminal covers
 - Mountable on a IEC 35mm width rail
 - Compact size and high performance
- SD-Q11, SD-Q12 : 3 ϕ 240V3kW SD-Q19 : 3 ϕ 240V4.5kW
3 ϕ 440V4kW 3 ϕ 440V5.5kW
- Mirror contact: Normally closed auxiliary contact cannot be closed when power contact is welded. The function conform to requirements of IEC60947-4-1.
 - Variable combination: Auxiliary contact block (UQ-AX2(KR)) can be added onto a contactor (SD-Q11 (SD-QR11))

Type Designation

• Magnetic motor starter

MSOD - Q11 CX KP * 9A * 200V * DC24V * 1B

BASIC TYPE	
MSOD	DC operation type

THERMAL OVERLOAD RELAY WITH CAN TERMINAL	
No symbol	Standard
CX	With CAN terminal

FRAME SIZE	
Non-reversing	Q11
	Q12
	Q19
Reversing	QR11
	QR12
	QR19

THERMAL OVERLOAD RELAY COMBINATIONS	
No symbol	Overload protection type with two heater elements
KP	Overload and phase failure protection type with three heater elements

HEATER DESIGNATION OF OVERLOAD RELAY	
Q11	0.12 (0.1 to 0.16), 0.17 (0.14 to 0.22)
Q12	0.24 (0.2 to 0.32), 0.35 (0.28 to 0.42)
QR11	0.9 (0.7 to 1.1), 1.3 (1 to 1.6), 1.7 (1.4 to 2)
QR12	2.1 (1.7 to 2.5), 2.5 (2 to 3), 3.6 (2.8 to 4.4)
	5 (4 to 6), 6.6 (5.2 to 8), 9 (7 to 11), 11 (9 to 13)
	1.3 (1 to 1.6), 1.7 (1.4 to 2), 2.1 (1.7 to 2.5)
Q19	2.5 (2 to 3), 3.6 (2.8 to 4.4), 5 (4 to 6)
QR19	6.6 (5.2 to 8), 9 (7 to 11)
	11 (9 to 13), 15 (12 to 18)

Note: The thermal overload relay for each type is as follows.
Q11, Q12, QR11, QR12 : TH-N12 (CX)(KP)
Q19, QR19 : TH-N18 (CX)DM(KP)

AUXILIARY CONTACT ARRANGEMENT※
Please designate when the contact arrangement is special.
The standard contact arrangement will be used if there is no designation.

COIL DESIGNATION
DC24V

MAIN CIRCUIT VOLTAGE
Do not add AC onto the main circuit voltage.

• Magnetic contactor

SD - Q12 * DC24V * 2A

BASIC TYPE	
SD	DC operation type

COIL DESIGNATION	
DC24V	

FRAME SIZE	
Non-reversing	Q11, Q12, Q19
Reversing	QR11, QR12, QR19

AUXILIARY CONTACT ARRANGEMENT ※
Please designate when the contact arrangement is special.
The standard contact arrangement will be used if there is no designation.

※Code of arrangement for special Auxiliary contact

ARRANGEMENT	CODE
1NC	1B
2NO	2A

A: Normally open
B: Normally closed

Note: Mark * indicates a blank space.

Specifications

• Ratings & characteristics

Table 3.6.1

Type			Non-reversing	SD-Q11 SD-Q12	SD-Q19
			Reversing	SD-QR11 SD-QR12	SD-QR19
Rated insulation voltage			V	690	
Conventional free air thermal current			A	20	30
Rated operational current	Category AC-3	220 to 240V AC	A	12	18
		380 to 440V AC	A	9	13
		500V AC	A	7	13
		690V AC	A	5	7
	Category AC-1	220 to 240V AC	A	*1) 10 (15)	30
		380 to 440V AC	A	10	20
Rated 3ph motor capacity	Category (IEC) AC-3	220 to 240V AC	kW	3	4.5
		380 to 440V AC	kW	4	5.5
		500V AC	kW	4	7.5
		690V AC	kW	4	5.5
Pick-up voltage(to rated coil voltage)			%	85	85
Coil consumption(at rated coil voltage)(at 20℃)			W	1.3	1.8
Coil current(at 20℃)			mA	55	75
Operating times (at rated coil voltage)		Closing	mS	<50	<60
		Opening	mS	<20	<35
Mechanical endurance			operations	10 million	10 million
Electrical endurance		category AC-3	operations	1 million	2 million
		category AC-1	operations	0.5 million	0.5 million
Permissible ambient temperature			℃	-10 to 55	-10 to 55
Switching frequency			operations/hour	1800	1800
Conductor size			mm ²	1 to 2.5	main; 1 to 6 control; 1 to 2.5
Terminal screw tightening torque range (standard value)			N·m	0.94 to 1.17 (1.0)	main; 1.18 to 1.86 (1.47) control; 0.94 to 1.51 (1.17)

Note:*1. The electrical endurance at the rating given in parentheses is 0.25 million.

• Ratings of auxiliary contacts

Table 3.6.2

Rated insulation voltage			V	690
Conventional free air thermal current			A	10
Rated operational current	Category AC-15	240V AC	A	3
		440V AC	A	1
	Category DC-12	24V DC	A	10
Mechanical endurance			operations	10 million
Electrical endurance			operations	*2) 0.5million

Note:*2. The electrical endurance for the UQ-AX2 (KR) type auxiliary contact block is 0.25 million.

• Auxiliary contact block

Table 3.6.4

Use	For non-reversing type and for reversing type left side	For reversing type right side
Model name	UQ-AX2	UQ-AX2KR
Applicable contactor /starter	SD-Q11.SD-QR11 MSOD-Q11 MSOD-QR11	SD-QR11 MSOD-QR11

• Coil rating and Ordering designation

Table 3.6.3

Rated voltage (V DC)	Ordering designation
24VDC	24VDC

Note: The operation coil terminal has a polarity. A1(+), A2(-)

Contact Arrangement & Wiring Diagram

Table 3.6.5

Non-reversing	
Type	
Standard	SD-Q11 Aux. 1 NO
	SD-Q12.Q19 Aux. 1 NO 1 NC
Special	Aux. 1 NC
	Aux. 2 NO

Reversing			
Type	SD-QR11	SD-QR12	SD-QR19
Standard			

Outline Dimensions

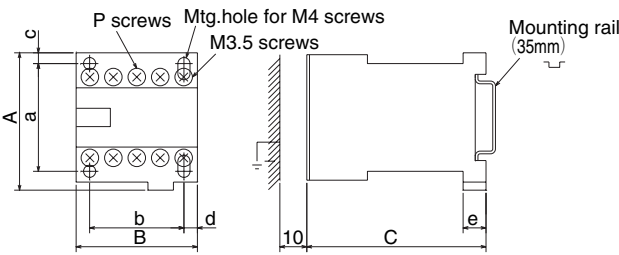


Fig.1 SD-Q type

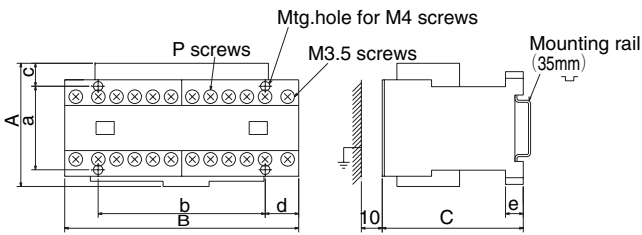


Fig.2 SD-QR type

• Magnetic contactors and magnetic motor starters (mm)

Type		Dimensions									Mass [kg]	Reference drawing
		A	B	C	a	b	c	d	e	P		
Non-reversing	SD-Q11	51	45	66.5	40	35	4	5	8.5	M3.5	0.19	Fig.1
	SD-Q12	52	56	67.5	40	35	5	5	8.5	M3.5	0.21	Fig.1
	SD-Q19	58	66	78	50	55	4	5.5	9	M4	0.34	Fig.1
Reversing	SD-QR11	59	90	66.5	40	80	11	5	8.5	M3.5	0.42	Fig.2
	SD-QR12	59	112	67.5	40	80	11	16	8.5	M3.5	0.46	Fig.2
	SD-QR19	79.5	133	77.5	50	110	22	11.5	9	M4	0.72	Fig.2

3.7 DC Interface Modules

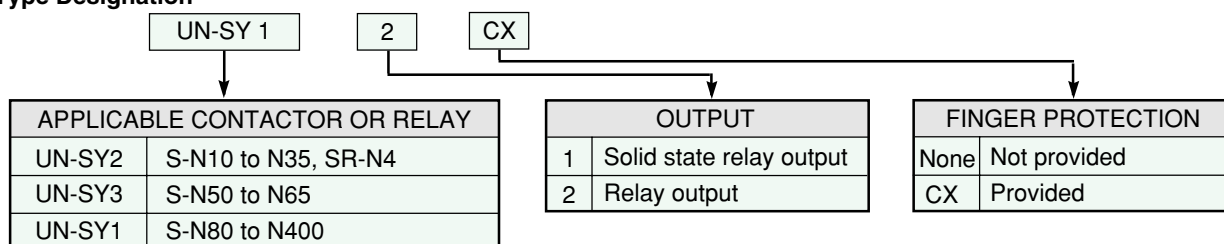


The MITSUBISHI type UN-SY interface module is an optional unit for S-N series contactors or SR-N series relays, controlled by the transistor output of a programmable controller.

■ Features

- Easy mounting on the Type S-N10 to S-N65 contactors and SR-N series relays.
- Separate mounting type for the Type S-N80 to S-N400 contactors.
- Relay or solid state output versions are available.

Type Designation



Note: Suffix "CX" is available only for UN-SY21 or SY22.

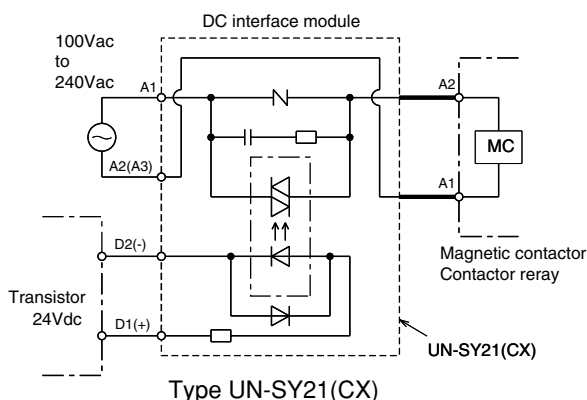
■ Specifications

Table 3.7.1

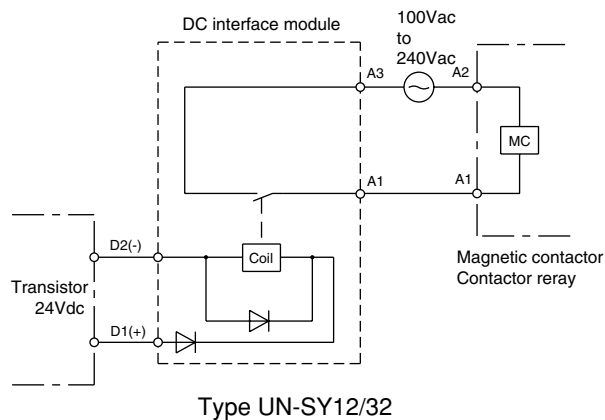
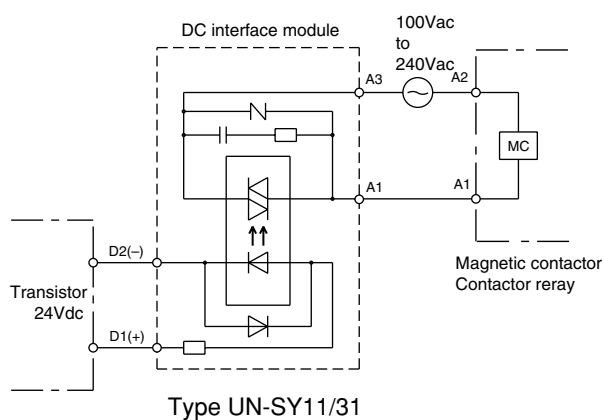
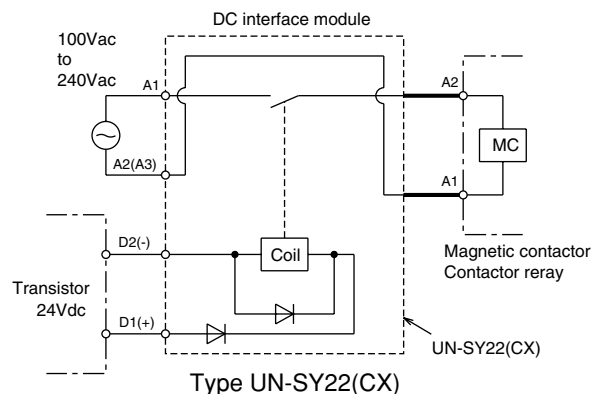
Type		UN-SY21(CX)	UN-SY31	UN-SY11	UN-SY22(CX)	UN-SY32	UN-SY12	
Output		Solid state relay			Relay			
Applicable Type of contactor or relay		Direct mounting to contactor or relay	S-N10 to N35 S-N18, N28, N38, N48	S-N50, N65	—	S-N10 to N35 S-N18, N28, N38, N48	S-N50, N65	—
		Separate mounting	—	—	S-N80 to N400	—	—	S-N80 to N400
Input	Rated control voltage		24Vdc			24Vdc		
	Permissible voltage tolerance		80% to 110% of rated control voltage					
	Min. working voltage		18Vdc			18Vdc		
	Max. breaking voltage		4Vdc			1Vdc		
	Power consumption		0.4W			0.24W		
Output	Rated voltage		100Vac to 240Vac 50/60Hz					
	Rated operating current		0.5A (category AC11)					
	Responce time		11ms or less			10ms or less		
	OFF-state leakage current		3mA/240Vac			—		
	Mechanical life		—			5 million operations		
	Electrical life		—			1 million operations		
Ambient temperature		−10 to 55°C						

Connection

(1) Solid State Output



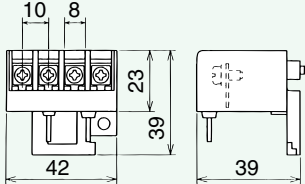
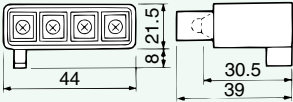
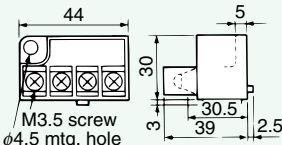
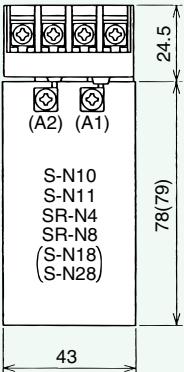
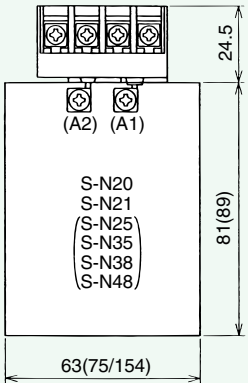
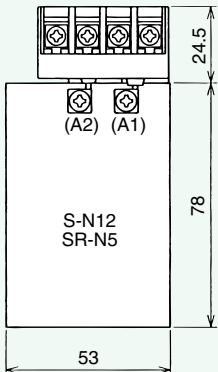
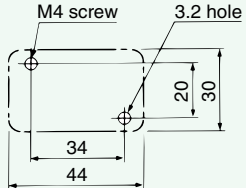
(2) Relay Output



Mounting

- Direct mounting – Type S-N10 to S-N65 and SR-N4
Remove the coil terminal screw from the contactor or relay, then slide the tab on the interface module to the groove on the contactor or relay. Fasten the connecting conductor with the coil terminal screw.
- Separate mounting – Type S-N80 to S-N400
Mount the interface module (UN-SY11/12) with screw on a panel as follows.

Outline Dimensions

Type Number	UN-SY21/22(CX)		UN-SY-31/32	UN-SY11/12
Module Outline dimensions				
Overall Mounting dimensions	Coupling outline			Mtg. hole layout for separate mounting
				

4. RELAYS

Series **SR-N**

4.1 Contactor Relays



SR-N4

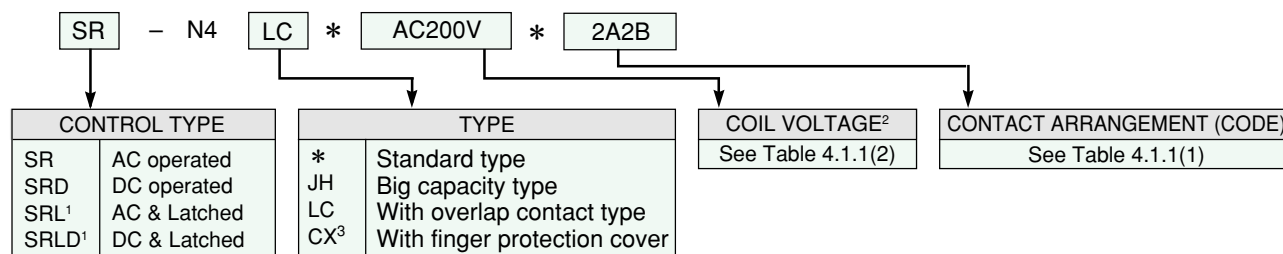
The MITSUBISHI series SR-N contactor relays are specially designed for use in low voltage control circuit applications. Series SR-N have many superior features.

■ Features

- High reliability: By adopting bifurcated moving contacts and by improving the shape of the contacts, contact performance has been made more reliable than ever.
- Long life
- Can be mounted on 35mm rail
- Dust-proof construction
- Easily visible coil ratings
- Easy wiring (self-rising terminal screws)
- Various accessories common with the series S-N contactors
(Head-and side clip-on type additional aux. contact blocks, surge absorbers, safety covers)
- Finger protected types are available (DIN 57106/VDE 0106 Part 100)

---Type Designation---

● Standard types



Notes: 1. For latched type relays, JH and LC types cannot be available.

2. When ordering the latched type relays, please specify the closing coil and tripping coil voltage.

ex: SRL-N4 *MC-AC200V *MT-AC100V *4A
 closing coil tripping coil

3. Only suffix "CX" is admitted to make any combination with other tabulated suffixes.

Note: Mark * indicates a blank space.

4.1.1 Specifications

Rating and characteristics

Table 4.1.1 (1)

Type	SR-SRD-	N4 (CX)	N4JH (CX)	N4LC (CX)
Available contact arrangements (code)		4NO (4A) 3NO+1NC (3A1B) 2NO+2NC (2A2B)	4NO (4A) 2NO+2NC (2A2B)	4NO (4A) 2NO+2NC (2A2B)
Rated insulation voltage	V	660		
Conventional free air thermal current	lth A	16	20	16
Rated operating current	110VAC	A	6	6 (3) ²
	230VAC	A	5	5 (3) ²
	440VAC	A	3	3 (3) ²
	550VAC	A	3	3 (3) ²
	110VAC	A	16	16
	230VAC	A	12	12
	440VAC	A	5	5
	550VAC	A	5	5
	24VDC	A	5	3
	48VDC	A	3	2
	110VDC	A	0.8(2) ¹	0.5
	220VDC	A	0.2(0.8) ¹	0.1
Category DC-13 (large coil load)	24VDC	A	8	5
	48VDC	A	3	2
	110VDC	A	2(4) ¹	1
	220VDC	A	0.4(1) ¹	0.2
Category DC-14	24VDC	A	10	8
	48VDC	A	8	5
	110VDC	A	5(8) ¹	3
	220VDC	A	1(3) ¹	0.5
Mechanical life	Operations	10 million (latched type 1 million)		
Electrical life	Operations	0.5 million		
Permissible ambient temperature/humidity	°C/%RH	-25 to +55/45 to 85		
Coil consumption	Inrush	VA	60	
	Ac-operated	VA	10	
	Sealed	W	3	
	Watts	W	7	
Coil voltage tolerance	DC-operated	W	0.85 to 1.1 (rated coil voltage)	
	Watts	W		
Operating time (average)	Make	ms	15 (AC)	50 (DC)
	Break	ms	10 (operated)	10 (operated)
Switching frequency		operations /hour	1,800	
Vibration resistance	10-55Hz	m/s ²	19.6	
Shock resistance	10 msec. half sine wave	m/s ²	49	
Conductor size		mm ²	1.0 to 2.5	

Notes: 1. Parenthesized rated operating current is for switching the load in 2-pole series connection.

2. Parenthesized rated operating current is for switching of NC contact.

Coil voltage

Table 4.1.1 (2)

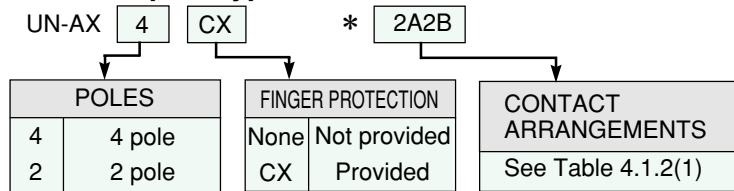
Coil designation	Rated voltage (AC)		Coil designation	Rated voltage (AC)		Coil designation	Rated voltage (DC)
	50Hz	60Hz		50Hz	60Hz		
AC12V	12V	12V	AC220V	208-220V	220V	DC24V	24VDC
AC24V	24V	24V	AC230V	220-240V	230-240V	DC48V	48VDC
AC48V	48-50V	48-50V	AC260V	240-260V	260-280V	DC100V	100VDC
AC100V	100V	100-110V	AC380V	346-380V	380V	DC110V	110VDC
AC120V	110-120V	115-120V	AC400V	380-415V	400-440V	DC125V	120-125VDC
AC127V	125-127V	127V	AC440V	415-440V	460-480V	DC200V	200VDC
AC200V	200V	200-220V	AC500V	500V	500-550V	DC220V	220VDC

Note: AC operated coils are the same as those of S-N10 etc., and DC operated coils are the same as those of SD-N11 etc.

4.1.2 Auxiliary Contact Blocks

Type Designation

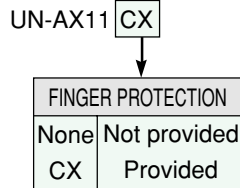
● Front clip-on types



[FOR LOW SIGNAL LEVEL] UN-LL22 CX

FINGER PROTECTION	
None	Not provided
CX	Provided

● Side clip-on types



Note: Mark * indicates a blank space.

Ratings and characteristics

Table 4.1.2 (1)

Type			UN-	AX2 (CX)	AX4 (CX)	AX11(CX)	LL22 (CX)		
Applicable contact arrangements				2NO 1NO+1NC 2NC	4NO 3NO+1NC 2NO+2NC	1NO+1NC	1NO+1NC [Standard]	1NO+1NC ¹ [Low level]	
Rated insulation voltage			V	690				250	
Conventional free air thermal current			lth	A	16				1
Rated operating current	Category AC-15 (coil load)	110VAC	A	6				240VAC 20mA (COS ϕ ≥0.95) 48VDC 100mA (L/R≤1msec) Minimum operating current 5VDC 5mA	
		220VAC	A	5					
		440VAC	A	3					
	Category DC-13 (large coil load)	48VDC	A	3					
		110VDC	A	0.8					
		220VDC	A	0.2					
Mechanical life		operations	10 million				2.5 million		
Electrical life		operations	0.5 million				0.5 million		
Permissible ambient temperature/humidity			°C/%RH	-25 to +55/45 to 85					
Switching frequency			operations /hour	1,800					
Conductor size			mm²	1.0 to 2.5					

Note: 1. Contact reliability may be decreased if it is operated more than 1 million operations

Selection guide & contact arrangements

Table 4.1.2 (2)

Front clip-on types	UN-AX2 2A 2NO	UN-AX2 1A1B 1NO+1NC	UN-AX2 2B 2NC	UN-LL22 standard 1NO+1NC low level 1NO+1NC
	UN-AX4 4A 4NO	UN-AX4 3A1B 3NO+1NC	UN-AX4 2A2B 2NO+2NC	
Side clip-on types	UN-AX11			
	 1NO+1NC When mount on left side		 When mount on right side	

Note: Front clip-on types and side clip-on contact block should not be mounted both.

4.1.3 Contact Arrangements of Contactor Relay

Table 4.1.3

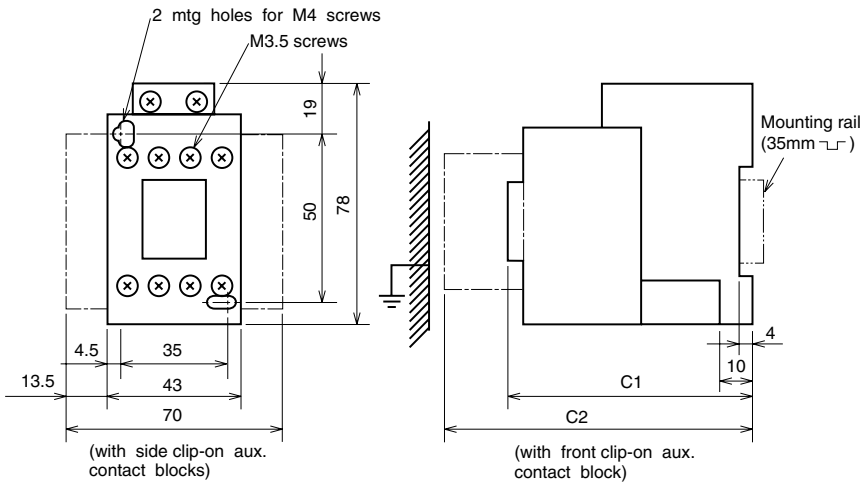
With standard contacts		
4NO SR-N4(CX)AC.....V 4A SRD-N4(CX)DC.....V 4A	3NO + 1NC SR-N4(CX)AC.....V 3A1B SRD-N4(CX)DC.....V 3A1B	2NO + 2NC SR-N4(CX)AC.....V 2A2B SRD-N4(CX)DC.....V 2A2B
With big capacity contacts		
4NO SR-N4JH(CX)AC.....V 4A SRD-N4JH(CX)DC.....V 4A		
	2NO + 2NC SR-N4JH(CX)AC.....V 2A2B SRD-N4JH(CX)DC.....V 2A2B	
With late break contacts		
	3NO + 1NC (late break) SR-N4LC(CX)AC.....V 3A1B SRD-N4LC(CX)DC.....V 3A1B	2NO + 2NC (late break) SR-N4LC(CX)AC.....V 2A2B SRD-N4LC(CX)DC.....V 2A2B
With mechanical latching		
4NO SRL-N4 AC.....V 4A SRLD-N4 DC.....V 4A	3NO + 1NC SRL-N4 AC.....V 3A1B SRLD-N4 DC.....V 3A1B	2NO + 2NC SRL-N4 AC.....V 2A2B SRLD-N4 DC.....V 2A2B

4.1.4 Spare Coils & Accessories

Spare coils and accessories are common with the series S-N contactors.

- Spare coils See Table 1.8.1(except for Type SRL(D)latched relays)
- Surge absorbers(suppressors) See Table 1.8.6

4.1.5 Outline Dimensions



• Key to Dimensions

Model	C1	C2	Mass (kg)
SR-N4(CX)	78	106	0.3
SRD-N4(CX)	110	138	0.62
SRL-N4(CX) SRLD-N4(CX)	134	—	0.45

Note: Front clip-on and side clip-on contact block should not be mounted both.

4.2 Voltage Detection Relays

Series **SRE**



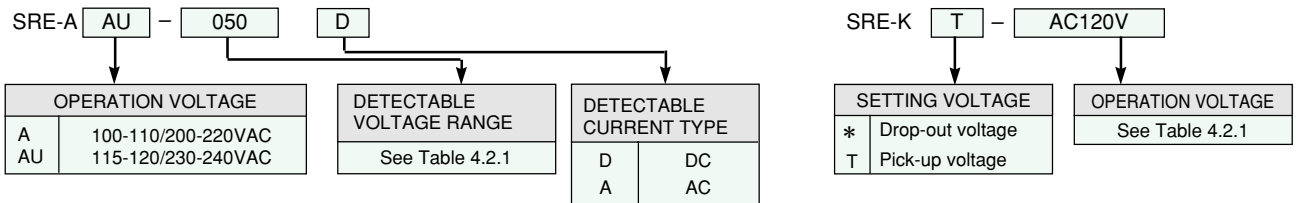
SRE-AA

The MITSUBISHI series SRE relays are specially designed for voltage sensing. The type SRE-A is specially designed for the detection of undervoltage or overvoltage conditions. The type SRE-K is particularly useful for the switching of automatic transfer panels. The type SRE-K can detect undervoltage by simply connecting to the power-source terminals.

■ Features

- High sensibility
- High reliability
- Easy wiring
- High surge tolerance
- Wide detective voltage range

Type Designation



■ Specifications

• Selection table

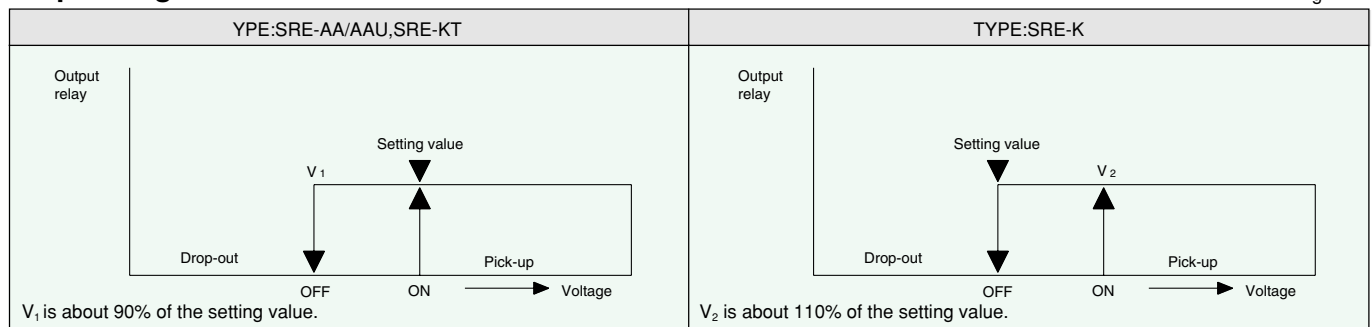
Table 4.2.1

Type	Detectable voltage range	Permissible input voltage (continuous)	Input impedance	Operation voltage
SRE-AA SRE-AAU	0P5D	0.1-0.5VDC	± 100VDC	20KΩ
	1P5D	0.3-1.5VDC	± 100VDC	50KΩ
	005D	1- 5VDC	± 150VDC	100KΩ
	015D	3-15VDC	± 150VDC	100KΩ
	050D	10-50VDC	± 200VDC	500KΩ
	150D	30-150VDC	± 300VDC	800KΩ
	250D	50-250VDC	± 300VDC	800KΩ
	015A	3-15VAC	150VAC	100KΩ
	050A	10-50VAC	200VAC	500KΩ
	150A	30-150VAC	300VAC	800KΩ
SRE-K	AC100V	75-105VAC	120VAC	100-110V, 50/60Hz
	AC120V	90-125VAC	132VAC	115-120V, 50/60Hz
	AC200V	150-210VAC	240VAC	200-220V, 50/60Hz
	AC240V	180-250VAC	264VAC	230-240V, 50/60Hz
	DC 12V	9-12.5VDC	14VDC	12VDC
	DC 24V	18-25VDC	28VDC	24VDC
	DC100V	75-105VDC	120VDC	100VDC
SRE-KT	AC100V	80-115VAC	120VAC	100-110V, 50/60Hz
	AC120V	95-130VAC	132VAC	115-120V, 50/60Hz
	AC200V	160-230VAC	240VAC	200-220V, 50/60Hz
	AC240V	190-260VAC	264VAC	230-240V, 50/60Hz
	DC 12V	10-14VDC	14VDC	12VDC
	DC 24V	20-28VDC	28VDC	24VDC
	DC100V	80-115VDC	120VDC	100VDC

Note: The type SRE-A □ D, for DC detection can be used for full-wave rectification voltage.

• Operating Condition

Fig 4.2.1



● Ratings and characteristics

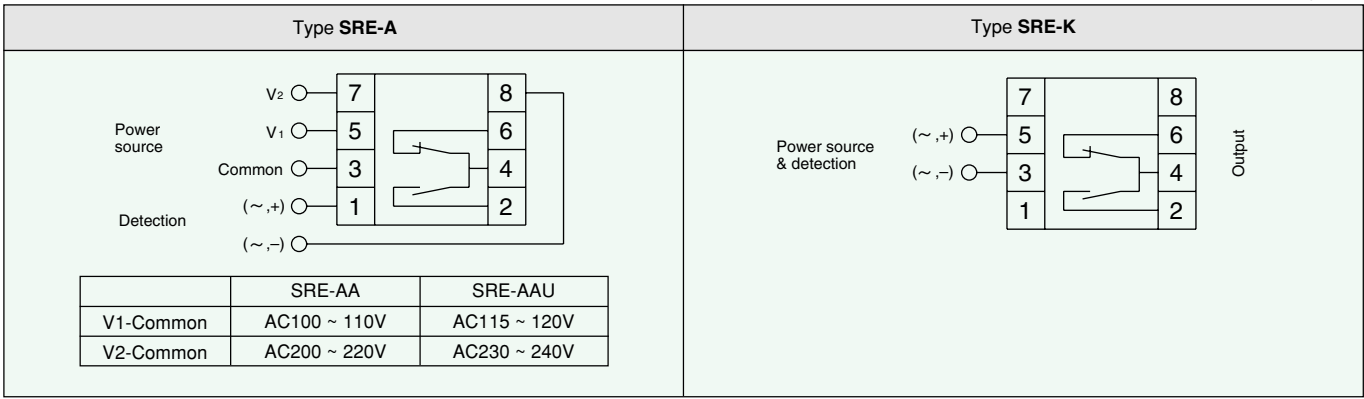
Table 4.2.2

Type				SRE-A		SRE-K	
Output contact arrangement				1 changeover			
Conventional free air thermal current			lth	A	3		
Rated operating current of output contact	Category AC-15	110VAC		A	1.5		
		220VAC		A	1.0		
	Category DC-13	24VDC		A	1.0		
		110VDC		A	0.2		
Accuracy	Repetitive operation ¹			%	±1		
	Control voltage fluctuation			%	±1.5	—	
	Ambient temperature change			%	±2.5		
Response time(at 150% of the rated voltage)				msec	100 to 200		
Mechanical life				operations	10 million		
Electrical life				operations	0.25 million		
Permissible ambient temperature/humidity				°C/ %RH	−10 to +55/max. 85		
Power consumption				VA	2		
Operation voltage tolerance (ambient temperature 40°C)				%	85 to 110	—	
Withstand voltage				VAC	1500 [1 minute]		
Insulation resistance (500VDC insulation tester)				MΩ	min. 100		
Vibration resistance		10 to 55Hz		m/s ²	19.6		
Shock resistance		10msec half sine wave		m/s ²	98		

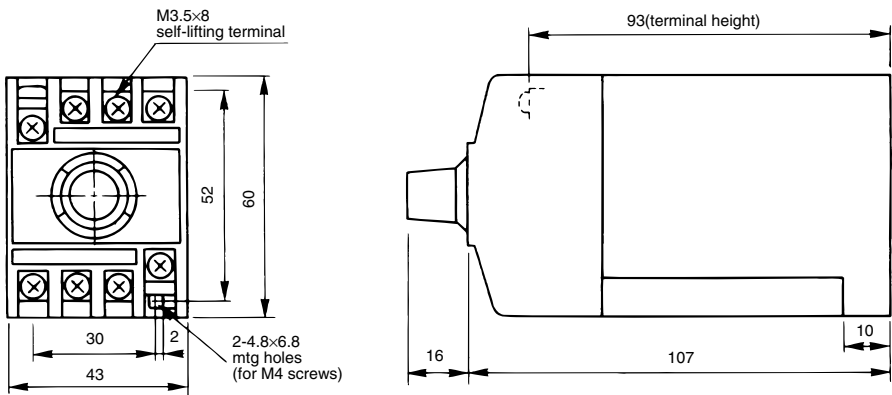
Note: 1. Repetitive operation accuracy (%) = $\pm \frac{1}{2} \times \frac{\text{max. measurement} - \text{min. measurement}}{\text{max. scale value}} \times 100$.

■ Wiring precautions

Fig 4.2.2



■ Outline dimensions



4.3 Re-Starting Relay



UA-DL2 with PF-08RM

The MITSUBISHI series UA-DL re-starting relays are specially designed for automatic re-starting. When the power recovers from an instantaneous power failure or voltage drop the UA-DL re-starts the stopped equipment or machines.

■ Features

- Easy installation and easy wiring
- Compact design
- Versatility of the control voltage (100VAC & 200VAC)
- Indicator lamp is provided.
- Selectable permissible max. power failure time (1sec. & 2sec.).

Type Designation

UA-DL2 * AC100/200V

SOCKETS type: PF-08RM/08TM

See page 66

CONTROL VOLTAGE	
Ordering designation	Rated control voltage (50/60Hz)
AC100/200V	100-110/200-220VAC
AC120V	100-110/110-120VAC
AC240V	200-220/220-240VAC

Notes: 1. DC control voltage type is not available.
2. Mark * indicates a blank space.

■ Specifications

● Ratings & characteristics

Table 4.3.1

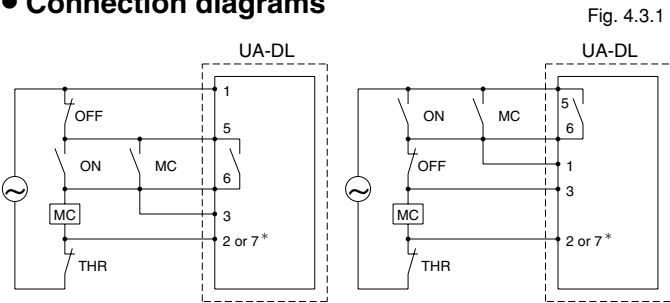
Output contact arrangement				1 NO
Rated operating current of output contact	Category	110VAC	A	1.5
	AC-15	220VAC	A	1.0
Selection of permissible max. power failure time			sec.	1 and 2
Accuracy	Set permissible power failure time		%	−20 to +50 (when 100VAC/200VAC is applied)
	Control voltage fluctuation		%	±35
	Ambient temperature change		%	±25
Minimum energizing time			sec.	5
Electrical life			operations	0.5 million
Permissible ambient temperature/humidity			°C/ %RH	−10 to +55/max. 85
Control voltage tolerance			%	85 to 110 (rated control voltage)
Power consumption			VA	3
Vibration resistance		10 to 55Hz	m/s ²	19.6
Shock resistance		10 msec. half sine wave	m/s ²	98
Withstand voltage			VAC	2000 (50/60Hz 1min.)
Insulation resistance			MΩ	min. 100

Note: 1. When shipping, permissible power failure is set to 2 secs.

When the required re-setting time is 1 sec., please turn the time setting dial to left until it stops.

When you want the permissible power failure time longer than 2 sec., please consult with MITSUBISHI.

● Connection diagrams



Connection of control switch differs in the above 2 connection diagrams.

* Selection table of terminals

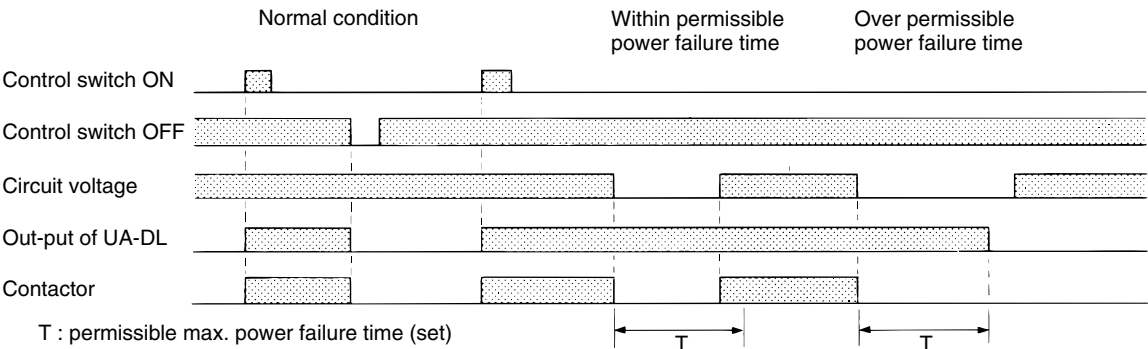
Table 4.3.2

Control voltage	AC100/200V	AC120V	AC240V
Terminal No.			
2	100-110VAC	100-110VAC	200-220VAC
7	200-220VAC	110-120VAC	220-240VAC

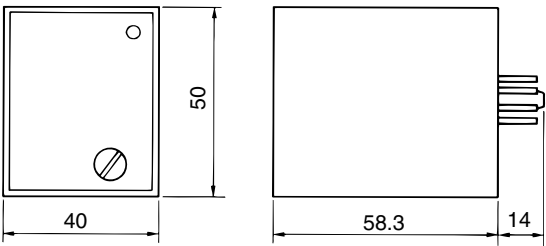
1. The terminal (2) and (7) connections differ according to the control circuit voltage. Connect according to the circuit voltage. (Refer to connfarm, above Table 4.3.2)
2. The external switch (OFF push-button switch in connection diagram) which issues the OFF command requires an OFF time of 50ms or more.
3. When using a relay contact instead of the push-button switch (OFF), use a contact that does not open when the power fails. If the push-button switch (OFF) section opens, UA-DL2 will turn OFF, and the magnetic contactor will not restart.
4. An electrolytic capacitor is used, so periodically check the operation time.

● Operation characteristics

Fig. 4.3.2

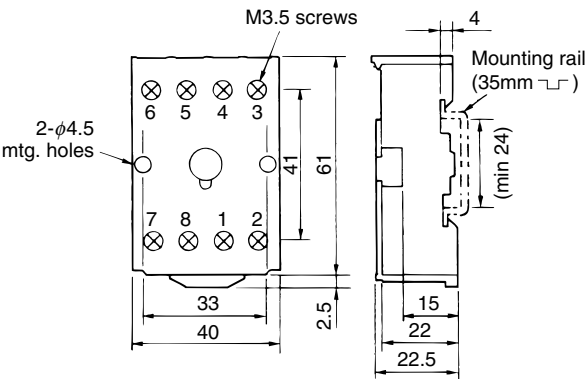


■ Outline Dimensions

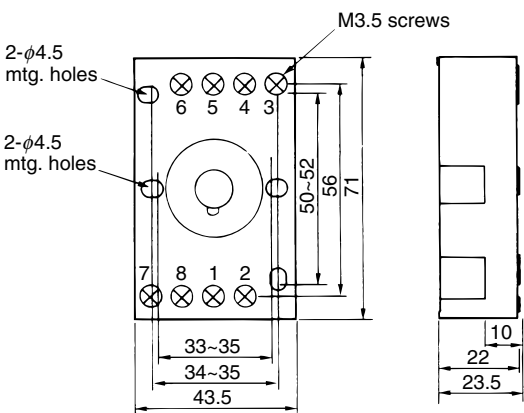


UA-DL2 (Mass: 0.1kg)

Note: 2 pcs of locking springs are enclosed in the each package of UA-DL.



PF-08RM (Mass: 0.05kg)



PF-08TM (Mass: 0.05kg)

4.4 Solid State Time Delay Relays

Series **SRS-H**



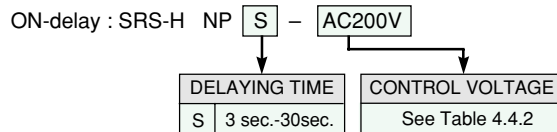
SRS-HNPS

The MITSUBISHI series SRS-H solid state time delay relays are specially designed for high accuracy and easy mounting.

■ Features

- High accuracy
- Compact design
- High reliability
- Easy mounting (for direct panel mounting or mounting on 35mm rail)
- With finger protection (terminal cover) model is available
- 1 delayed & 1 instantaneous changeover contact for ON-delay relay.

Type Designation



■ Specifications

• Time delay selection

Table 4.4.1

Relay type		Adjustable time range	Contacts
ON-delay	SRS-HNPS	3 sec. - 30 sec.	1 delayed and 1 instantaneous changeover

• Control voltages

Table 4.4.2

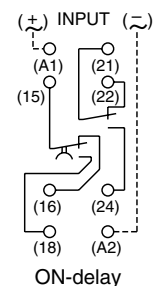
Ordering designation	Rated voltage
AC100V	100-120V 50/60Hz
AC200V	200-240V 50/60Hz
AC400V	380-440V 50/60Hz

• Rating & characteristics

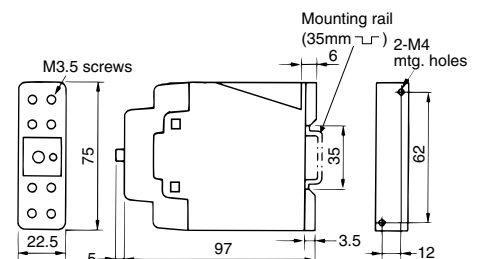
Table 4.4.3

Type				ON-delay
Conventional free air thermal current		A		2
Rated operating current	Category	120VAC	A	1.5
	AC-15	240VAC	A	1
		440VAC	A	0.3
Accuracy	Repetitive operation	%		±0.5
	Control voltage fluctuation	%		±1
	Ambient temperature change	%		±5
Minimum pause time		msec.		100
Mechanical life		operations		10 million
Electrical life		operations		0.1 million
Permissible ambient temperature		°C		-10 to 55
Permissible ambient relative humidity		%RH		45 to 80
Control voltage tolerance		%		85 to 110 (rated control voltage)
Power consumption	Control voltage	AC	VA	5 (AC100V/AC200V) 10 (AC400V)
Vibration resistance		10-55Hz	m/s ²	19.6
Shock resistance		10msec half sine wave	m/s ²	49
Withstand voltage		[live parts to ground]	VAC	2000 (1 min.)

• Internal wiring



■ Outline Dimensions



SRS-HNPS (Mass: 0.15kg)

4.5 Pneumatic Time Delay Relays

Series SRT-N



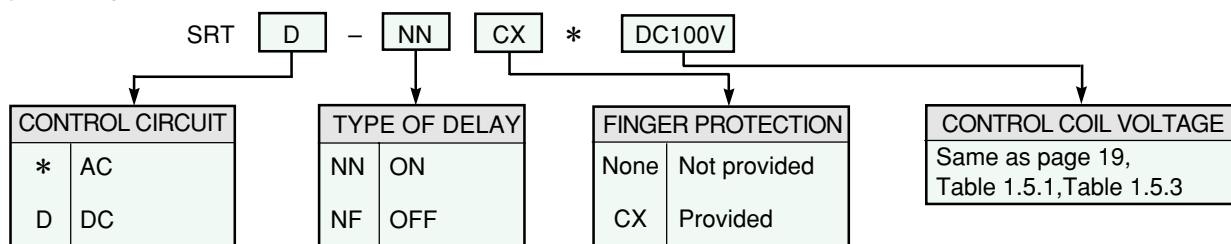
The MITSUBISHI series SRT pneumatic time delay relays are designed for general purpose time delaying, such as star-delta starters and transfer panels.

■ Features

- Easy delaying time adjustment
- Can be mounted on 35mm rail
- High contact reliability: By using bifurcated moving contacts, contact performance has been made more reliable than ever.
- Finger protected types are available
- Manual testing
- 2 delayed contacts (1NO1NC) & 4 instantaneous contacts (2NO2NC)

SRT-NN

Type Designation



Note: Mark * indicates a blank space.

■ Specifications

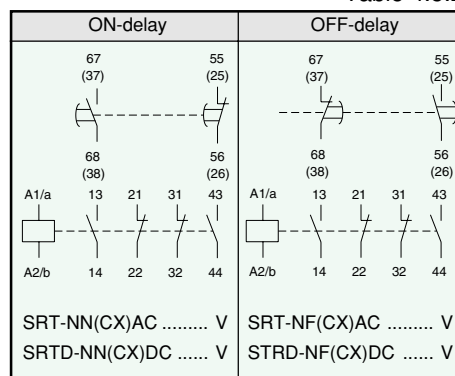
• Ratings & characteristics

Table 4.5.1

Adjustable delay time range			sec.	0.1 to 60	
Type of contacts			—	Delayed	Instantaneous
Conventional free air thermal current I _{th}			A	10	16
Rated operating current	category	110VAC	A	5	6
		220VAC	A	3	5
		440VAC	A	1	3
		550VAC	A	1	3
	category	110VAC	A	6	16
		220VAC	A	4	12
		440VAC	A	1.5	5
		550VAC	A	1.5	5
	category	24VDC	A	1	5
		48VDC	A	0.5	3
		110VDC	A	0.3	0.8
		220VDC	A	0.15	0.2
category	24VDC	A	2	10	
	48VDC	A	1	8	
	110VDC	A	0.6	5	
	220VDC	A	0.3	1	
Rated insulation voltage			VAC	660	
Mechanical life			operations	1 million	
Electrical life			operations	1 million	0.5 million
Repeat accuracy			%	±10	
Min. pause time			msec.	500	
Min. energizing time	AC operated		msec.	15	
	DC operated		msec.	30	
Permissible ambient temperature			°C	−5 to 55	
Control coil voltage tolerance			%	85 to 110	
Make and break capacity (at rated operating current)	AC		times	11	
	DC		times	2	
Average operating times	AC operated	Make	msec.	—	11
		Break	msec.		10
	DC operated	Make	msec.	—	45
		Break	msec.		10
Coil consumption	AC operated	Inrush	VA	50	
		Sealed	VA	10	
	DC operated		W	7	
Switching frequency			operations /hour	1,800	
Vibration resistance 10-55Hz			m/s ²	19.6	
Shock resistance 10msec. half sine wave			m/s ²	49	
Conductor size			mm ²	1.0 to 2.5	

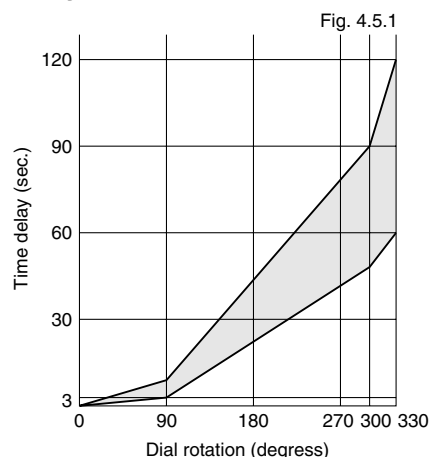
■ Contact arrangement

Table 4.5.2

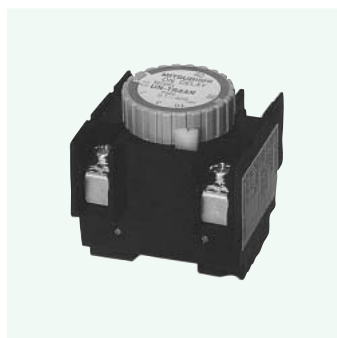


- Notes: 1. 13-14, 43-44 Instantaneous NO contacts
 23-24, 33-34 Instantaneous NC contacts
 55-56, 65-66 Delayed NC contacts
 57-58, 67-68 Delayed NO contacts
 2. Aux. contact block should not be mounted.

• Delay time characteristics



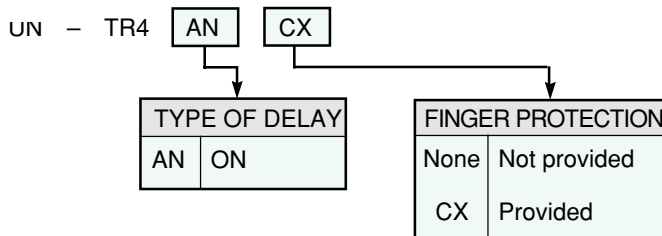
Pneumatic Time Delay Modules



UN-TR4AN

Type UA-TR pneumatic time delay modules are designed for attachment to series S-K contactors and SR-K contactor relays.

Type Designation



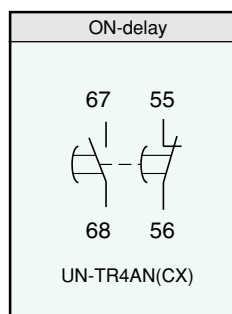
Applicable contactor and relay selection

Table 4.5.3

Type	Type of delay	Applicable contactors and relays	
UN-TR4AN(CX)	ON delay	AC operated	S-N10(CX), N11(CX), N18(CX) SR-N4(□□)(CX)
		DC operated	SD-N11(CX) SRD-N4(□□)(CX)

Note: When this module is mounted, aux. contact block should not be mounted.

Contact arrangement



Note: 55-56 Delayed NC contacts
67-68 Delayed NO contacts

Ratings & characteristics

..... See delayed contacts of Table 4.5.1

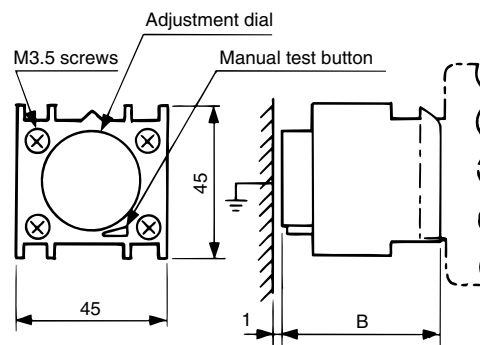
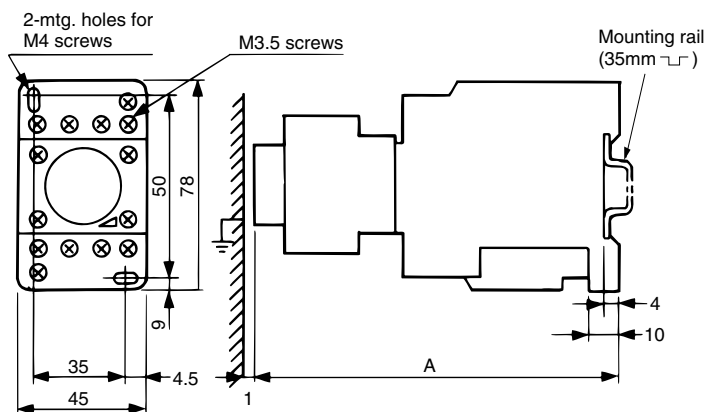
Delay time characteristics

..... See Fig.4.5.1

Key to Dimensions

Type	A	B	Mass(kg)
SRT-NN(CX), -NF(CX)	121.5	—	0.36
SRTD-NN(CX), -NF(CX)	153.5	—	0.68
UN-TR4AN(CX)	—	48.5	0.06

Outline Dimensions



5.2 Specifications

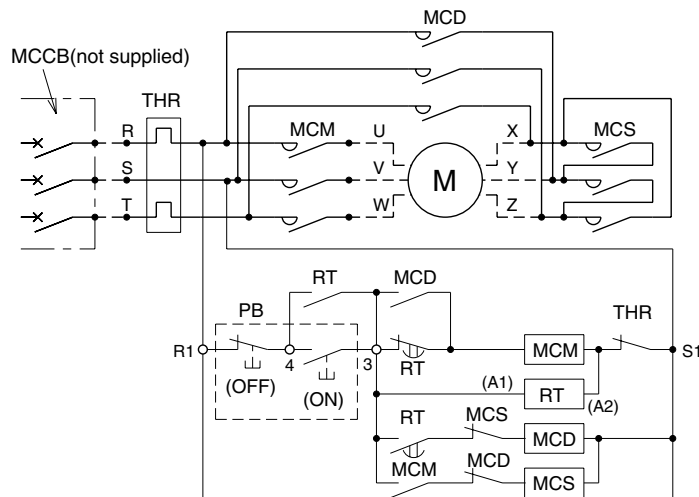
• Characteristics

Table 5.2.1

Item	Frame size	N20	N35	N50	N65	N80	N95	N125	N150	N220	N300
Mechanical life	operations	1 million									
Electrical life	operations	0.25 million									
Permissible and temp.	°C	-25 to 55									
Coil consumption											
At star connection	VA	35(40)	33(38)	40(45)	38(43)	41(46)	49(54)	65(70)	79(84)		
At delta connection	VA	35(40)	31(36)	45(50)	45(50)	51(56)	53(57)	85(90)	105(110)		
Coil voltage tolerance	%	85 to 110(rated coil voltage)									
Couductor size											
Line side	mm ²	4-16	4-25	6-35	10-50	10-70	16-95	16-120	16-150	16-210	70-300
Motor side	mm ²	2.5-6	2.5-10	4-25	4-25	6-35	6-35	10-70	16-95	16-150	35-200
Control terminal	mm ²	1-2.5	1-2.5	1-2.5	1-2.5	1-2.5	1-2.5	1-2.5	1-2.5	1-2.5	1-2.5

Notes: 1. The value in the bracket “()” indicates the coil consumption for control voltage “380~440V”.

• Connection



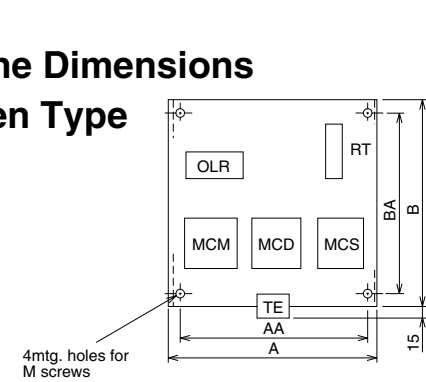
• Control Voltage

Table 5.2.2

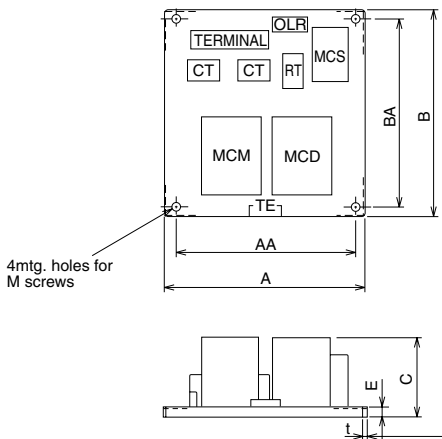
EYD(O)-N20(KP)to N95(KP)			EYD(O)-N125(KP)to N300(KP)	
Control voltage designation	Rated voltage		Control voltage designation	Rated voltage 50Hz/60Hz
	50Hz	60Hz		
AC100V	100V	100-110V	AC100V	100-120V
AC120V	110-120V	115-120V	AC200V	200-240V
AC220V	208-220V	220V	AC400V	380-440V
AC230V	220-240V	230-240V		
AC380V	380V	380V		
AC400V	380-415V	400-440V		
AC415V	380-415V	400-440V		
AC440V	415-440V	460-480V		

5.3 Outline Dimensions

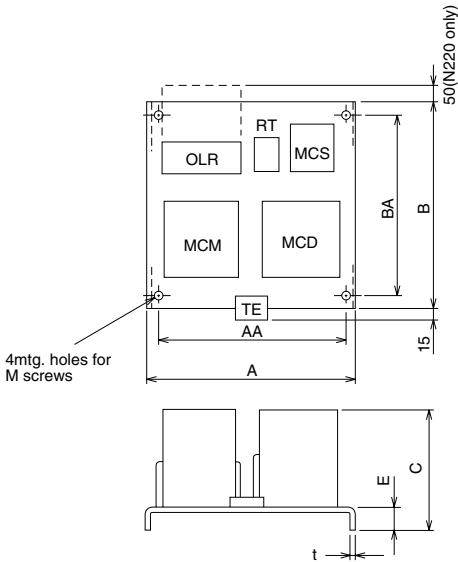
5.3.1 Open Type



Type EYDO-N20, N35



Type EYDO-N300, N400



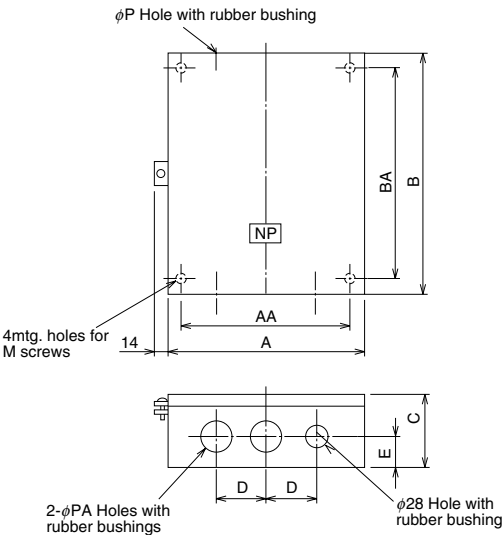
Type EYDO-N50~N220

• Dimensions

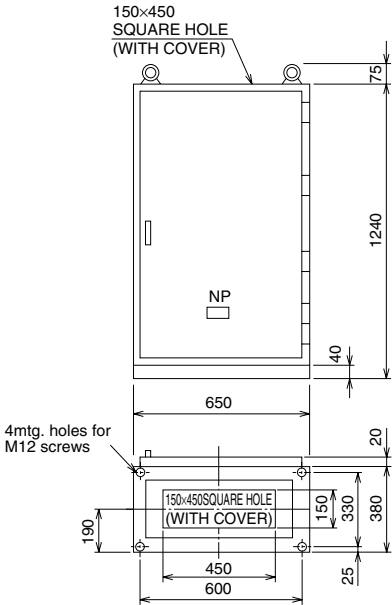
Table 5.3.1

Type	A	B	C	AA	BA	E	M	t	Mass (kg)
EYDO-N20	230	220	114	200	200	12	M6	2.3	4
EYDO-N35	270	270	114	250	250	12	M6	2.3	5
EYDO-N50	270	270	118	250	250	12	M6	2.3	5.5
EYDO-N65	270	270	118	250	250	12	M6	2.3	5.5
EYDO-N80	270	270	140	250	250	12	M6	2.3	7
EYDO-N95	380	430	180	350	400	15	M8	3.2	11
EYDO-N125	380	430	180	350	400	15	M8	3.2	13
EYDO-N150	380	430	189	350	400	15	M8	3.2	14
EYDO-N220	380	430	189	350	400	15	M8	3.2	21
EYDO-N300	600	600	210	550	550	15	M12	3.2	42
EYDO-N400	600	600	210	550	550	15	M12	3.2	42

5.3.2 Enclosed Type



Type EYD-N20~N220



Type EYD-N300, N400 (Mass 120kg)

• Dimensions

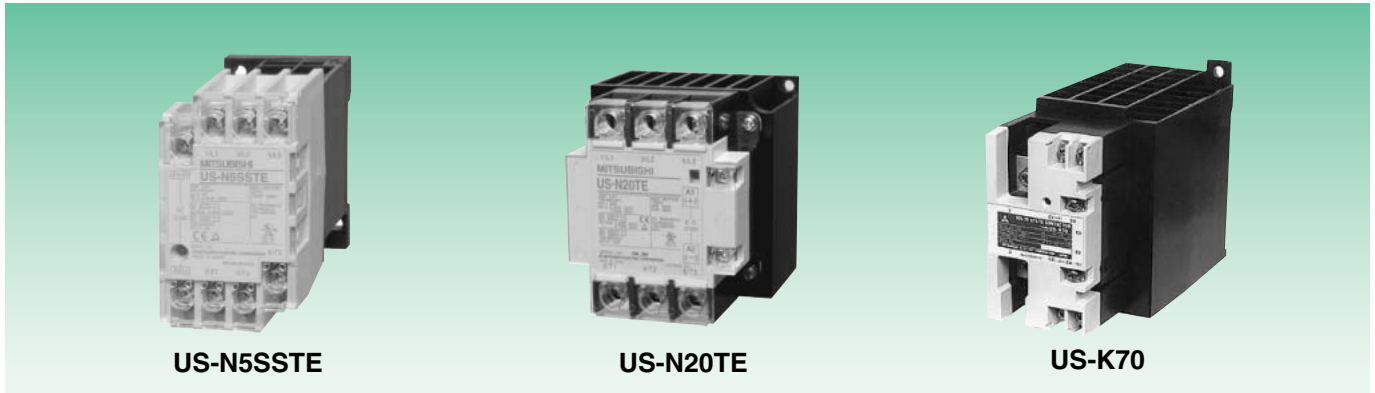
Table 5.3.2

Type	A	B	C	AA	BA	D	E	M	P	PA	Mass (kg)
EYD-N20	260	360	165	200	300	75	60	M6	40	28	7
EYD-N35	310	460	165	250	400	75	60	M8	52	40	9
EYD-N50	310	460	165	250	400	75	60	M8	52	40	10
EYD-N65	310	460	165	250	400	75	60	M8	52	40	10
EYD-N80	310	460	165	250	400	75	60	M8	52	40	12
EYD-N95	460	660	225	400	600	125	80	M12	78	62	24
EYD-N125	460	660	225	400	600	125	80	M12	78	62	26
EYD-N150	460	660	225	400	600	125	80	M12	78	62	28
EYD-N220	460	660	225	400	600	125	80	M12	78	62	34

6. SOLID STATE CONTACTORS

6.1 Features

■ US-N/K Series (for motor/heater load)



High-accuracy opening/closing, maintenance-free

With no electrical or mechanical wear sections, this type is a suitable maintenance-free selection for high-accuracy opening/closing (motor, heater, light, capacitor switching, etc.)

No sound noise, clean operation

The best suitable for applications that reduce to avoid sound noise (Ex.: hotels, hospitals, offices, or clean rooms, etc.).

Applicable to a wide range of main circuit voltage (US-N20(TE) to US-N50(TE))

Can be used with a wide main voltage range from 100 to 480VAC.

Conformity to International Standards (US-N Series)

The standard model complies with or is approved to be compliant with not only domestic standards but also various overseas standards.

Standard installation protection cover for live part location to improved safety (US-N Series)

A live part location protection cover, with finger protection complying with DIN and VDE Standards, is provided as a standard to improve safety.

Various line up and series

<Heater load>

- 2-circuit, 3-circuit integrated type
- Cycle control type power adjuster

<Motor load>

- 2-circuit, 3-circuit integrated type

<Current frame>

- 200VAC 5A to 200A frame
- 400VAC 20A to 200A frame

■ US-H Series (for heater load)



Best suitable for heater loads

Suitable for high-accuracy opening/closing applications such as injection molding machines and semiconductor manufacturing machines, etc.

Applicable to a wide range of main circuit voltage

Can be used with a wide main voltage range from 24 to 480VAC.

Conformity to International Standards

The standard model complies with or is approved to be compliant with not only domestic standards but also various overseas standards.

Live part location protection cover available for improved safety (option)

A live part location protection cover (Type UN-CV501US) can be easily mounted after the control cabinet is mounted to improve safety.

6.2 Product Scope

■ US-N/K • US-H Series Models

Table 1. US-N type, US-K type solid state contactors (standard model)

200VAC class (100 to 240VAC)	AC-1 class rated operating current (A) (Note 5)		5	8	20	30	40	50	70	
	Heater capacity (kW)	1 ϕ 200V (Note 2)	1	1.6	4	6	8	10	14	
		3 ϕ 200V	1.7	2.7	6.9	10.3	13.8	17.3	24.2 (Note 1)	
	Maximum motor capacity (kW)		0.4	0.4	2.2	3.7	5.5	5.5	11 (Note 1)	
	For three-phase load US-N□ US-K□		 US-N5SS US-N5SSTE	 US-N8SS US-N8SSTE	 US-N20 US-N20TE	 US-N30 US-N30TE	 US-N40 US-N40TE	 US-N50 US-N50TE	 US-N70NS US-N70NSTE	
For single-phase load For three-phase load (using two or three) US-K□								 US-K70		
400VAC class (200 to 440VAC)	AC-1 class rated operating current (A) (Note 5)				20	30	40	50	70	
	Heater capacity (kW)	1 ϕ 400V (Note 2)			8	12	16	20	28	
		3 ϕ 400V			13.8	20.7	27.7	34.6	48.5 (Note 1)	
	Maximum motor capacity (kW)				3.7	7.5	7.5	15	22 (Note 1)	
	For three-phase load US-N□ US-NH□ US-KH□				 US-N20 US-N20TE	 US-N30 US-N30TE	 US-N40 US-N40TE	 US-N50 US-N50TE	 US-NH70NS US-NH70NSTE	
For single-phase load For three-phase load (using two or three) US-KH□								 US-KH70		
Mounting on 35mm rail			Possible with standard product		(Note 4)					
Protection cover for live part location			Mounted as a standard part (Not mounted for US-K70 or KH70)							
Driving unit					UA-DR1					
Driving unit with output			UA-SH8 (Note 6)		UA-SH1					
Reversing unit			UA-RE							
Fault detecting unit			UN-FD (for main circuit 200V), UN-FD4 (for main circuit 400V)							
Power control unit			UA-PC							
Options (Note 3)			 UA-SH8  UA-DR1  UA-SH1  UA-RE							

	80	100	120	150	200
	16	20	24	30	40
	27.7	34.6 (Note 1)	41.5	52 (Note 1)	69 (Note 1)
	11	15 (Note 1)	15	18.5 (Note 1)	22 (Note 1)
					
	US-N80NS US-N80NSTE	US-K100TE	US-K120TE	US-K150TE	
					
		US-K100		US-K150	US-K200

	80	100	120	150	200
	32	40	48	60	80
	55.4	69.3 (Note 1)	83	103.9 (Note 1)	138.5 (Note 1)
	22	30 (Note 1)	30	37 (Note 1)	45 (Note 1)
					
	US-NH80NS US-NH80NSTE	US-KH100TE	US-KH120TE	US-KH150TE	
					
		US-KH100		US-KH150	US-KH200

	
UN-FD	UA-PC

Table 2. US-K type solid state contactor (for DC load)

Direct current	DC-1 class rated operating current (A)	8
	Rated voltage	DC24~110V
	For DC load US-KD8	 US-KD8
	Option	Driving unit with output UA-SH8
Mounting on 35mm rail		Possible with standard product

Note 1. For the US-K(H)□ type, the capacity when applied for a three-phase load using two or three US-K(H)□ type units for the single-phase load is shown.

Note 2. This is the capacity per pole.

Note 3. □ in the option unit field indicates the applicable range.

Note 4. Possible with a dedicated part (US-□RM).

Note 5. If ambient temperature is higher than 40°C, the derating factor shown in Fig.1 should be applied to the rated operating current.

Note 6. When installing the output driving unit UA-SH8 type onto the US-N5SS/N8SS (TE) type, remove the US-N□ type unit's cover first.

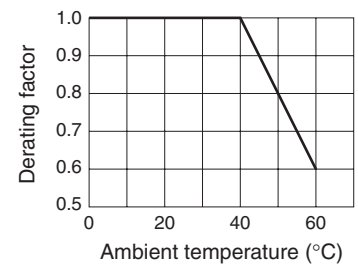


Fig.1

■ US-H Series Models

Solid state contactor for heater loads, suitable for high-frequency heater switching applications such as injection molding machines and semiconductor manufacturing machines.

Table 3. US-H type solid state contactor

Rated operating current (AC-51) (-10 to 40°C) (Note 1)		20A	30A	40A	50A	20A	30A	40A	50A
Heater capacity (-10 to 40°C) (Note 1)	1 ϕ 200V	4kW	6kW	8kW	10kW	4kW	6kW	8kW	10kW
	3 ϕ 400V	6.9kW	10.3kW	13.8kW	17.3kW	—	—	—	—
	3 ϕ 400V	13.8kW	20.7kW	27.7kW	34.6kW	—	—	—	—
Tolerable maximum current (peak) 60Hz 1 cycle		330A	800A	1000A	1300A	330A	800A	1000A	1300A
Rated operating voltage		AC24V~AC480V 50/60Hz							
Operating voltage range		AC20V~AC528V							
Main circuit control method		Batch control				Individual control			
Standard		US-H20	US-H30	US-H40	US-H50	US-H20DD	US-H30DD	US-H40DD	US-H50DD
									
		US-H20	US-H40	US-H20DD	US-H40DD				
Mounting on 35mm rail		US-H20RM	US-H30RM	—	—	US-H20DDRM	US-H30DDRM	—	—
Options	Fault detecting unit	UN-FD (for main circuit 200V) UN-FD4 (for main circuit 400V)							
	Power control unit	UA-PC							
	Protection cover of live part location	UN-CV501US							

Note:1. If ambient temperature is higher than 40°C, the derating factor shown in fig.2 should be applied to the rated operating current.

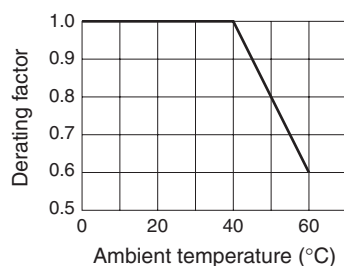


Fig.2

MITSUBISHI ELECTRIC WORLDWIDE SALES NETWORK

Country/Region	Company name and address	Telephone
Australia	Mitsubishi Electric Australia Pty. Ltd., 348 Victoria Road, Rydalmere N.S.W. 2116, Austraria	+61-(0)2-9684-7586
Belgium	Emac S.A., Industrialaan 1, B-1702 Groot-Bijgaarden, Belgium	+32-(0)2-4810211
Chile	Rhona S.A., Varinate Aqua Santa 4211 Vina Del Mar-Chile	+56-32-320652
China	Mitsubishi Electric Automation (Shang Hai) Ltd. 1-3/F., Block 5, 103 Cao Bao Road, Shanghai China	+86-(0)21-6120-0808
Colombia	Inpovarltada Proelectrico, Carrera 43G No.27-12, Medellin, Colombia	+57-1-232-2300
Denmark	Louis Poulsen Co.A/S., Geminivej 32, DK-2670 Greve, Denmark	+45-(0)43-95-95-95
Egypt	Cairo Electrical Group, 9 Rostoum Street, Garden City, Apt.5, P.O.Box : 165-11516 Cairo, Egypt	+20-2-796-1337
Germany	Mitsubishi Electric Europe B.V., German Branch, Gother Strasse 8, 40880 Ratingen, Germany	+49-(0)2102-486-0
Greece	Antonios Drepanias S.A., 52.Arkadias Street GR 12132, Peristeri Athens Greece	+30-(1)57815995781699
Hong Kong	Mitsubishi Electric Automation (Hong Kong) Ltd. 10/F., Manulife Tower, 169 Electric Road, North Point, Hong Kong	+852-2887-8870
Indonesia	P.T.Sahabat Indonesia, Muara Karang Selatan Blok A/Utare No.1, Kav No.11 Kawasan Industri Pergudangan Jakarta Utare 14440	+62-21-661-0651
Ireland	Mitsubishi Electric Europe B.V., Irish Branch, Westgate Business Park, Ballymount, Dublin 24, Ireland	+353-(0)1-450-5007
Italy	Mitsubishi Electric Europe B.V., Italy, C.D. Colleoni-P. Perseolng.2, Via Paracelso 12 1-20041 Agrate Brianza (M1)	+39-(0)396-0531
Korea	Mitsubishi Electric Automation (Korea) Ltd. 2/F., 660-11, Deungchon-Dong, Kangseo-ku, Seoul 157-030, Korea	+822-3660-9607
Kuwait	Salem M. Al-Nisf Electrical Co. W.L.L., P.O.Box 4784 Safat 13048 Safat, Kuwait	+965-481-5282
Lebanon	Comptoir Delectricite Generate-International, Cebaco Center-Block A, Autostrade Dore, P.O.Box 90-953, Beirut-Lebanon	+961-1-240430
Myanmar	Peace Myanmar Electric Co., Ltd., No.137/139, Botataung Pagoda Road, Botataung Town Ship 11161, Yangon, Myanmar	+95-(0)1-202589
Netherlands	Imtech Marine & Industry, Postbox 5054, NI-3008 Ab-Rotterdam, Netherlands	+31-(0)10-487-1911
New Zealand	Melco Sales (N.Z.) Ltd., 1 Parliament Street, Lower Hut1, New Zealand	+644-569-7350
Norway	SCANELECAS, 5074 Godvik-Bergen Leirvikasen 43B, Norway	+47-55-506000
Pakistan	Prince Electric Co., 16 Brandreth Road Lahore 54000, Pakistan	+92-765-4342
Peru	I.T.E., Ingenieros s.a., Paseo de la Republica 3573, Lima 27, Peru	+51-14-41-1825
Philippines	Edison Electric Integrated, Inc., 24TH Floor, Galleria Corporate Center, Edsa cor. Ortigas Ave., Quezon City	+632-634-8691-96
Poland	MPL Technology Sp Zo.o., Ul.Sliczna 36 31-444 Krakow, Poland	+48-(0)12-632-28-85
Saudi Arabia	Center of Electrical Goods, Al-Nabhaniya Street-4th Crossing Al-Hassa Road, P.O. Box 15955, Riyadh 11454, Saudi Arabia	+966-1-477-149
Singapore	Mitsubishi Electric ASIA PTE Ltd. 307 Alexandra Road #05-01/02 Mitsubishi Electric Building Singapore	+65-6473-2308
Slovenia	INEA, Ljubijanska 80, 61230 Domzale, Slovenia	+386-61-718000
South Africa	Circuit Breaker Industries Ltd., Private Bag 2016. Isando 1600, Johannesburg, South Africa	+27-(0)11-928-2000
Spain	Mitsubishi Electric Europe B.V., Spanish Branch, Carretera De Rubi 76-80, 08190-Sant Cugat Del Valles (Barcelona) Spain	+34-(0)93-595-3131
Sweden	Euro Energy Components AB, Energigatan 15 S-43422 Kungsbacka Sweden	+46-(0)300-51800
Switzerland	Trietec A G., Mühlenstrasse 136, 8200 Schaffhausen, Switzerland	+41-52-6258425
Taiwan	Setsuyo Enterprise Co., Ltd., 6th, Fl., Number 105, Wu Kung 3rd Rd, Wu-Ku Hsiang Taipei. Taiwan, ROC	+886-(0)2-2298-8889
Thailand	United Trading & Import Co. Ltd., 77/12 Burmrunmuang Road, Klong Mahanak, Pomprab, Bangkok 10100, Thailand	+66-2-6649647-50
Turkey	HEDEF, Balmumcu-Istanbul Barboros Bulv. Iba Blokleri Gazi Umur P. So Turkey	+90-(0)212-2754876
U.K.	Mitsubishi Electric Europe B.V., UK Branch, Travellers Lane, Hatfield, Herts AL10 8XB, United Kingdom	+44-(0)1707-276100
U.S.A.	Mitsubishi Electric Automation, Inc., 500 Corporation Woods Parkway, Vernon Hills, IC60061, U.S.A.	+1-847-478-2100
Uruguay	Fivia., AV. Uruguay 1274/76 11100 Montevideo Uruguay	+598-2-920808
Venezuela	Adesco S.A., P.O.Box 78034 Caracas 1074A, Venezuela	+58-241-4439
Vietnam	Sa Giang Techno Co., Ltd., 207/4 Nguyen Van Thu St., Dakao Ward, Dist1, Ho Chi Minh City, Vietnam	+84-8-825-6453

Safety tip: Be sure to read the instruction manual thoroughly before using these products.

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