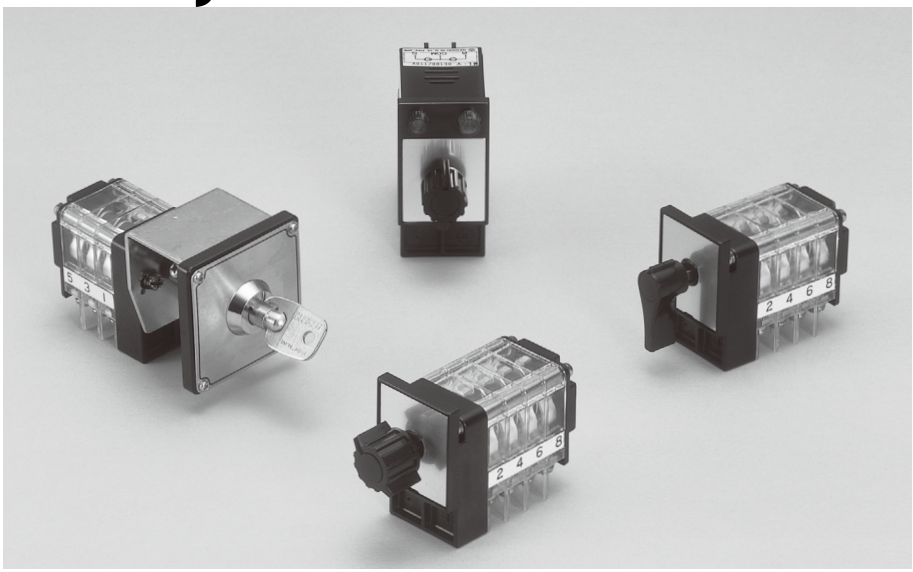
DRUM SWITCH

M, ML TYPE



FEATURES

This micro drum switch is small and highly functional with high reliability. The control switch has critical roles among the control devices that constitute the core of the neural system of a plant. The micro drum switch ensures stable reliability in emergency as well as in normal use. In addition, it effectively utilizes the panel surface as the interface for the control devices, and plays great roles for improving the panel design.

■Sliding contact method

The sliding contact method has been adopted to ensure high contact reliability. In this method, the contacting surfaces of the contactors rub each other so that dust and other foreign matter can be cleaned completely.

■High mounting density

LED indicators are mounted in the nameplate part. This design further improves the mounting density on the panel (ML type).

■Compatibility with various power sources

The power source for indicators is selectable from 110 and 220V AC, 24, 48, 110, and 125V DC. This variety of options allows for complying with different needs.

SPECIFICATIONS (RATINGS, PERFORMANCE)

Specification \ Type	M · MLTYPE
Rated insulation voltage (Ui)	250V AC / DC
Rated current-carring capacity (Ith)	8A
Max. wire size	5.5mm^2
Screw size	M4×8
Withstand voltage	2,500V AC / 1 min.
Rated impulse withstand voltage	±7,000V (1.2 / 50 μs)
Contact resistance	50mΩ max.
Mechanical life	50,000 operations or more, Class 5
Electrical life	10,000 operations or more, Class 5
Shock resistance	294 m/S^2 or more
Vibration resistance	Acceleration: 50 Hz, 20 m/s^2, Time: 2 hours (3 directions)
Operating temperature	–20 to 50°C
Storing temperature	–40 to 70°C
Altitude	2,000m max.

■Breaking performance [electrical life of 10,000 operations (class 5)]

AC			DC				
Rated voltage (V)	Rated current (resistance load) (A)	Rated current (inductive load) (A)	Rated voltage (V)	Rated current (resistance load) (A)	Rated current (inductive load) (A)	2 contacts used in series Rated current (resistance load) (A)	2 contacts used in series Rated current (inductive load) (A)
110	8	8	——	——	——	——	——
220	5	4	48	8	8	8	8
——	——	——	110	3	2	3	3
——	——	——	220	1	0.7	1	1

∗ Inductive load: For AC: Power factor 0.6 to 0.7 (Class: AC11)
For DC: Time constant 40±6 ms (Class: DC12)

PRODUCT CODING

Circuit No. (arrangement) See P. 275 and subsequent pages for standard arrangement diagram.

When indicators are provided: LED display circuit type

ML-H4-2B2A-SD-B1151 (F)

Notch | No. of units | No. of contacts | Contact | Handle

If terminals with a Faston tub are required for the switch unit, specify (F) at the end of the model name.

Munsell color code		
Code	Handle	Flange
B	N1.5	N1.5
BG	7.5BG3/3.5	7.5BG4/1.5

Circuit

Code	Switch
M	M type switch (basic type)
ML	M type switch with indicator
M-KH	M type switch with padlock mechanism
ML-KH	M type switch with indicator and with padlock mechanism
M-KMC	M type switch (key-operated)

Circuit

1	H (for 2 indicators)	For DC
2	Y (for 2 indicators)	For DC
3	H.Y (for 2 indicators)	For AC
4	S (for 1 indicators)	For AC / DC
5	T.C (for 3 indicators)	For AC / DC
6	Y (P-common for 2 indicators)	For DC
9	Special	

Voltage

1	24V DC
2	48V DC
3	100 / 110V DC
4	100 / 110V AC
5	200 / 220V AC
6	125V DC
9	Special

Frame color

1	4 / 1.5
2	B
9	Special

Display color

1	Ⓦ (White)
2	Ⓡ (Red)
3	Ⓖ (Green)
4	Ⓞ (Amber)
5	ⒼⓇ
6	ⒼⓌⓇ
7	ⒼⓄⓇ
9	Special

For special specifications, contact us.

■Notch

Code	H	T	F	S	SB
Notch configuration					
Operation	(90°–2) 2 notches	(45°–3) 3 notches	(45°–4) 4 notches	(45°–3) 3 notches	Automatic rotating return
	Manual return			Automatic return	Automatic axial return

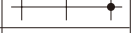
(Note) In the above table, the ● mark indicates the ordinary stop position of the switch and the →mark shows that the switch moves in this direction and then automatically stops in the arrowhead position

●CONTROL SWITCH

DRUM SWITCH

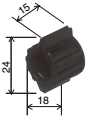
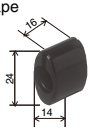
M, ML TYPE

■Contact

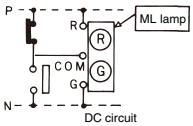
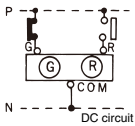
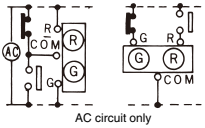
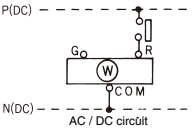
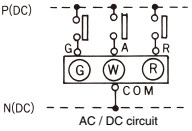
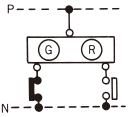
Code	Symbol	Type	Description
B		Normal contact	Making at the B position < 45°>
A			Making at the A position < 45°>
T		Normal contact	Making at the T position < 45°>
F			Making at the F position < 45°>

Code	Symbol	Type	Description
(B) L		Overlapping contact	Stands for a overlap contact. To be added to the standard contact symbol (B to F).
M		Continuous contact	Contact breaks only at the right.
N			Contact breaks only at the left.

■Handle

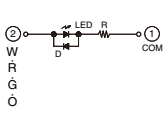
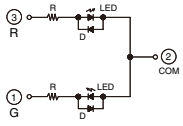
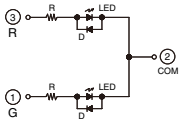
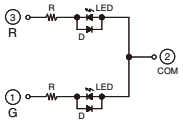
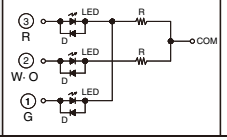
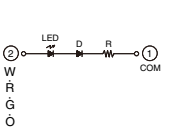
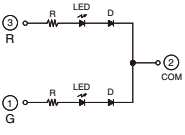
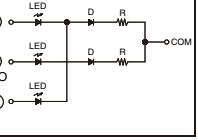
Code	SP	SD	SF
Shape	Pistol shape 	Rose shape 	Octagonal shape 

■LED display circuit type

Code	1	2	3
	H circuit (for DC circuit)	Y circuit (for DC circuit)	H.Y circuit (AC circuit only)
Circuit diagram			
Code	4	5	6
	S circuit (for AC / DC circuit)	T.C circuit (for AC / DC circuit)	Y circuit (for DC circuit, P common)
Circuit diagram			

■ML type lamp circuit

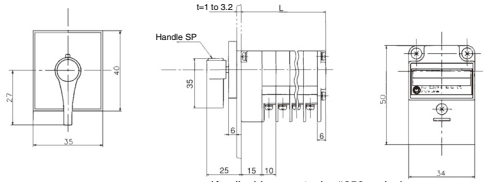
R: Limit resistor D: Rectifying diode LED: LED device

	1 lamp	2 lamps	2 lamps	2 lamps, P common
	S circuit (DC circuit)	H circuit (DC circuit)	Y circuit (DC circuit)	Y circuit (DC circuit)
Lamp circuit diagram				
	3 lamps	1 lamp	2 lamps	3 lamps
	T.C circuit (DC circuit)	S circuit (AC circuit)	H.Y circuit (AC circuit)	T.C circuit (AC circuit)
Lamp circuit diagram				

OUTER DIMENSIONS M TYPE

Automatic or manual return type

M-S,H,T,F

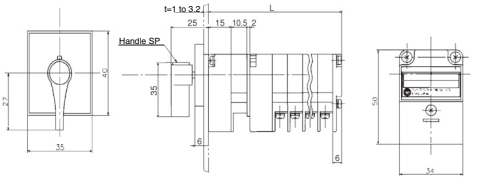


(Applicable receptacle: #250 series)

No. of units	1	2	3	4	5	6	7	8
L (mm)	31	41	51	61	71	81	91	101

Automatic return type by pulling

M-SB



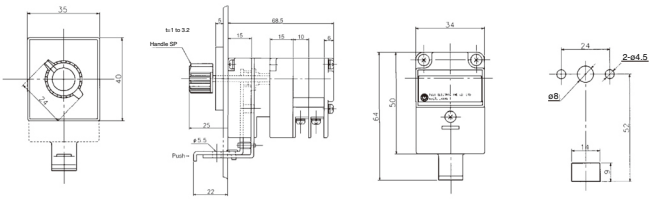
No. of units	1	2	3	4	5	6	7	8
L (mm)	58.5	68.5	78.5	88.5	98.5	108.5	118.5	128.5

Automatic or manual return type with padlock mechanism

M-KH-S,H,T,F

Key off position

Key off C	Key off BA	Key off BAT	Key off BATF
S	H	T	F



○Remove the padlock and push the lock release lever. This allows you to operate the switch. After finishing the operation, release your finger. The switch will be locked automatically.
∗ Use a padlock of 5 mm in diameter.

No. of units	1	2	3	4	5	6	7	8
L (mm)	58.5	68.5	78.5	88.5	98.5	108.5	118.5	128.5

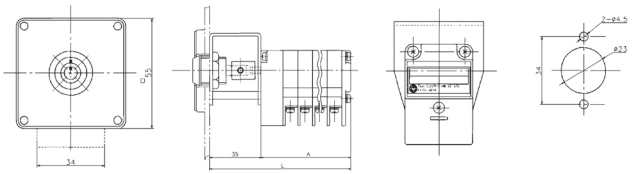
Key-operated type: automatic or manual return type

M-KMC-S,H,T,F

Key off position

Key off C	Key off B	Key off B	Key off A
S	H	HA	HB

Key off A	Key off T / Key off A
T	F



The figure shows the switch with the C-88MS type cylinder lock. There are no more than 10 kinds of keys available and no master key is supplied. If there are more than 10 kinds of keys available and the master key comes with the switch, the L dimension of the switch becomes longer by 5 mm and the key type C110. See the key system on P. 220 and specify the key No.

No. of units	1	2	3	4	5	6	7	8
A (mm)	31	41	51	61	71	81	91	101
L (mm)	66	76	86	96	106	116	126	136

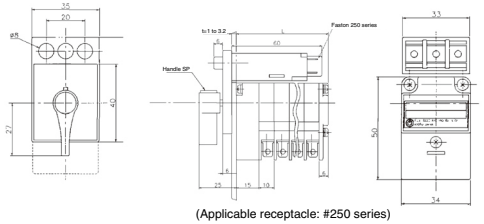
DRUM SWITCH

M, ML TYPE

OUTER DIMENSIONS ML TYPE

Automatic or manual return type with indicators

ML-S,H,T,F

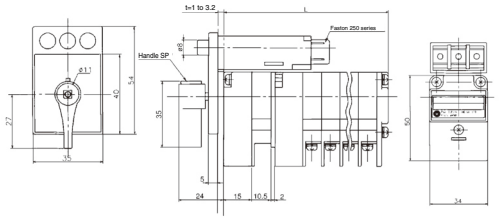


(Applicable receptacle: #250 series)

No. of units	1	2	3	4	5	6	7	8
L (mm)	31	41	51	61	71	81	91	101

Automatic return type by pulling with indicators

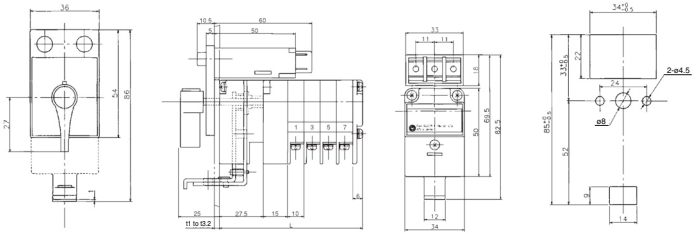
ML-SB



No. of units	1	2	3	4	5	6	7	8
L (mm)	58.5	68.5	78.5	88.5	98.5	108.5	118.5	128.5

Automatic or manual return type with padlock mechanism with indicators

ML-KH-S,H,T,F



Key off position

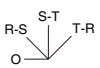
∗ Same as that of the M-KH type.
(P.266)

No. of units	1	2	3	4	5	6	7	8
L (mm)	58.5	68.5	78.5	88.5	98.5	108.5	118.5	128.5

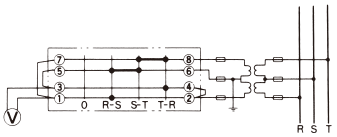
STANDARD ARRANGEMENT DIAGRAM

a) For voltmeter (standard handle: SD)

Type V4M

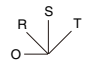


Nameplate No.
MA-453

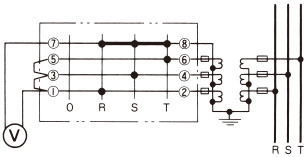


3-phase, 3-wire, 2-PT

Type NV4M



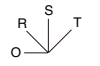
Nameplate No.
MA-452



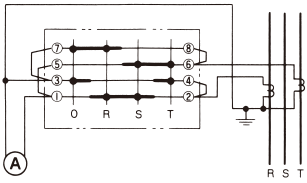
3-phase, 3-wire, 3-PT

b) For ammeter (standard handle: SD)

Type A4M

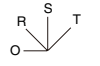


Nameplate No.
MA-455

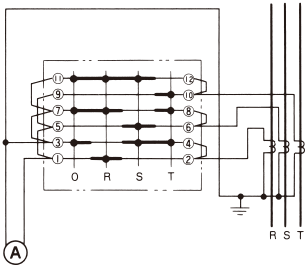


3-phase, 3-wire, 2-CT

Type A6M

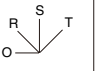


Nameplate No.
MA-455

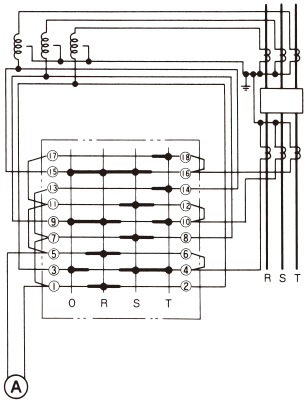


3-phase, 3-wire, 3-CT

Type A9M



Nameplate No.
MA-455



3-phase, 3-wire, 3-CT

* For nameplates, see page 274.

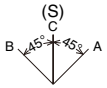
●CONTROL SWITCH

DRUM SWITCH

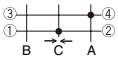
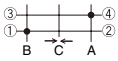
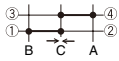
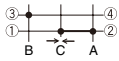
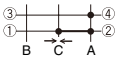
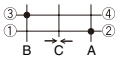
M, ML TYPE

STANDARD ARRANGEMENT DIAGRAM

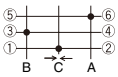
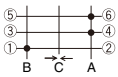
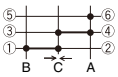
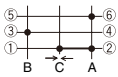
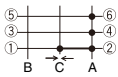
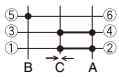
■Automatic return and pulling type (S, SB)



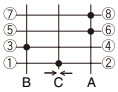
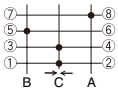
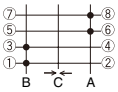
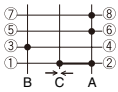
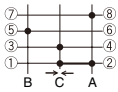
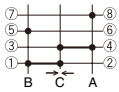
●2 contacts (2 units)

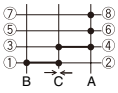
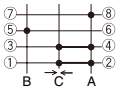
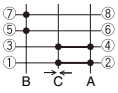
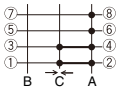
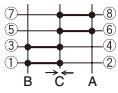
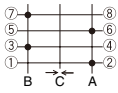
Type (automatic return)	S2001M	S2002M	S2003M	S2004M	S2005M	S2101M
Detail	S2-1C1A	S2-1B1A	S2-1M1N	S2-1N1B	S2-1N1A	S2-1A1B
Contact arrangement						
Type (pulling)	SB2001M	SB2002M	SB2003M	SB2004M	SB2005M	SB2101M

●3 contacts (3 units)

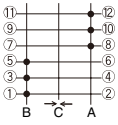
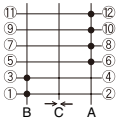
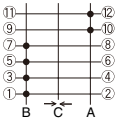
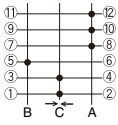
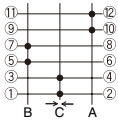
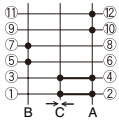
Type (automatic return)	S3001M	S3002M	S3003M	S3004M	S3005M	S3006M
Detail	S3-1C1B1A	S3-1B2A	S3-1M1N1A	S3-1N1B1A	S3-1N2A	S3-2N1B
Contact arrangement						
Type (pulling)	SB3001M	SB3002M	SB3003M	SB3004M	SB3005M	SB3006M

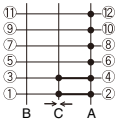
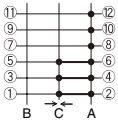
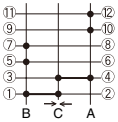
●4 contacts (4 units)

Type (automatic return)	S4001M	S4002M	S4003M	S4004M	S4005M	S4006M
Detail	S4-1C1B2A	S4-2C1B1A	S4-2B2A	S4-1N1B2A	S4-1N1C1B1A	S4-1M1N1B1A
Contact arrangement						
Type (pulling)	SB4001M	SB4002M	SB4003M	SB4004M	SB4005M	SB4006M

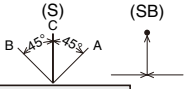
Type (automatic return)	S4007M	S4008M	S4009M	S4010M	S4011M	S4101M
Detail	S4-1M1N2A	S4-2N1B1A	S4-2N2B	S4-2N2A	S4-2M2N	S4-2(1A1B)
Contact arrangement						
Type (pulling)	SB4007M	SB4008M	SB4009M	SB4010M	SB4011M	SB4101M

●6 contacts (6 units)

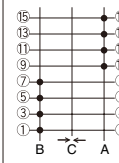
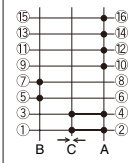
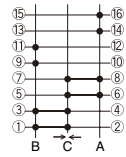
Type (automatic return)	S6001M	S6002M	S6003M	S6004M	S6005M	S6006M
Detail	S6-3B3A	S6-2B4A	S6-4B2A	S6-2C1B3A	S6-2C2B2A	S6-2N2B2A
Contact arrangement						
Type (pulling)	SB6001M	SB6002M	SB6003M	SB6004M	SB6005M	SB6006M

Type (automatic return)	S6007M	S6008M	S6009M
Detail	S6-2N4A	S6-3N3A	S6-1M1N2B2A
Contact arrangement			
Type (pulling)	SB6007M	SB6008M	SB6009M

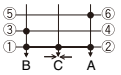
■Automatic return and pulling type (S, SB)



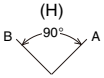
●8 contacts (8 units)

Type (automatic return)	S8001M	S8002M	S8003M
Detail	S8-4B4A	S8-2N2B4A	S8-2M2N2B2A
Contact arrangement			
Type (pulling)	SB8001M	SB8002M	SB8003M

●3 contacts (3 units)

Type (automatic return)	SQ3001M
Detail	SQ3-1U1B1A
Contact arrangement	

■90° 2-position changeover



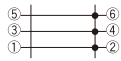
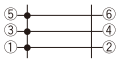
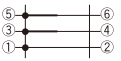
●1 contact (1 unit)

Type	H1001M	H1002M
Detail	H1-1A	H1-1B
Contact arrangement		

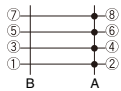
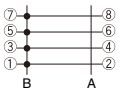
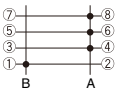
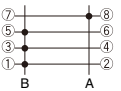
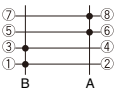
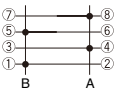
●2 contacts (2 units)

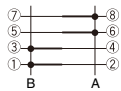
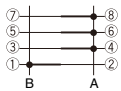
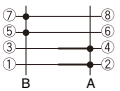
Type	H2001M	H2002M	H2003M	H2004M
Detail	H2-2A	H2-2B	H2-1B1A	H2-1BL1AL
Contact arrangement				

●3 contacts (3 units)

Type	H3001M	H3002M	H3003M	H3004M	H3005M
Detail	H3-3A	H3-3B	H3-1B2A	H3-2B1A	H3-1B2BL
Contact arrangement					

●4 contacts (4 units)

Type	H4001M	H4002M	H4003M	H4004M	H4005M	H4006M
Detail	H4-4A	H4-4B	H4-1B3A	H4-3B1A	H4-2B2A	H4-1B1A1BL1AL
Contact arrangement						

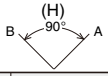
Type	H4007M	H4008M	H4102M
Detail	H4-2BL2AL	H4-1BL3AL	H4-2AL2B
Contact arrangement			

DRUM SWITCH

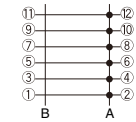
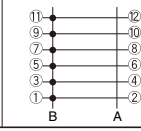
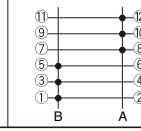
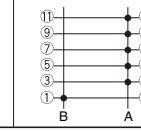
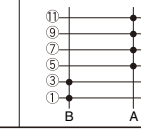
M, ML TYPE

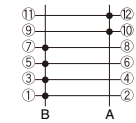
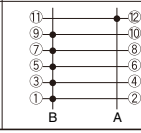
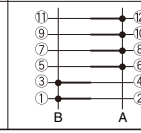
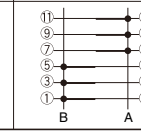
STANDARD DEVELOPMENT DIAGRAM

■90° 2-position changeover (H)

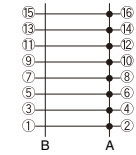
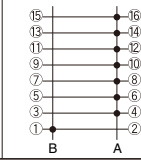
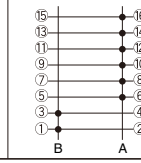
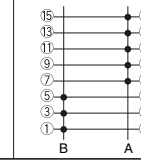
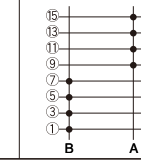


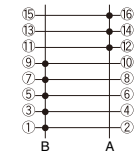
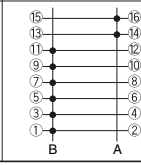
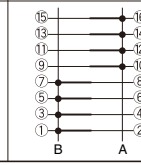
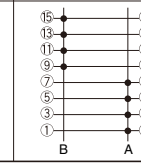
●6 contacts (6 units)

Type	H6001M	H6002M	H6003M	H6004M	H6005M
Detail	H6-6A	H6-6B	H6-3B3A	H6-1B5A	H6-2B4A
Contact arrangement					

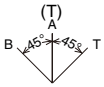
Type	H6006M	H6007M	H6008M	H6009M
Detail	H6-4B2A	H6-5B1A	H6-2BL4AL	H6-3BL3AL
Contact arrangement				

●8 contacts (8 units)

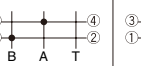
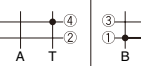
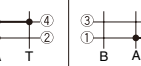
Type	H8001M	H8002M	H8003M	H8004M	H8005M
Detail	H8-8A	H8-1B7A	H8-2B6A	H8-3B5A	H8-4B4A
Contact arrangement					

Type	H8006M	H8007M	H8008M	H8101M
Detail	H8-5B3A	H8-6B2A	H8-4BL4AL	H8-4A4B
Contact arrangement				

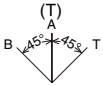
■45° 3-position changeover (T)



●2 contacts (2 units)

Type	T2001M	T2002M	T2003M	T2004M	T2101M
Detail	T2-1A1T	T2-1B1A	T2-1B1T	T2-1BA1AT	T2-1AT1T
Contact arrangement					

■45° 3-position changeover (T)



●3 contacts (3 units)

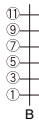
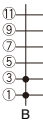
Type	T3001M	T3002M	T3003M	T3004M	T3005M	T3006M
Detail	T3-1A2T	T3-1B1A1T	T3-1BL1AL1TL	T3-1B2A	T3-2B1A	T3-1B1T1AT
Contact arrangement						

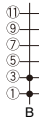
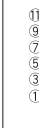
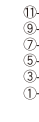
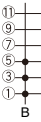
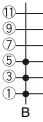
●4 contacts (4 units)

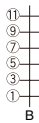
Type	T4001M	T4002M	T4003M	T4004M	T4005M
Detail	T4-2A2T	T4-2B2A	T4-1B1A2T	T4-1B2A1T	T4-2B2T
Contact arrangement					

Type	T4006M	T4007M	T4008M	T4009M	T4010M
Detail	T4-2B1A1T	T4-3B1T	T4-1B1A1T1BA	T4-1A1T2AT	T4-1BL1AL2TL
Contact arrangement					

●6 contacts (6 units)

Type	T6001M	T6002M	T6003M	T6004M	T6005M
Detail	T6-2A4T	T6-1B1A4T	T6-1B3A2T	T6-1B4A1T	T6-2B2A2T
Contact arrangement					

Type	T6006M	T6007M	T6008M	T6009M	T6010M
Detail	T6-2B4T	T6-2B4A	T6-2B1A3T	T6-3B3A	T6-3B3T
Contact arrangement					

Type	T6011M	T6012M
Detail	T6-2A2T2AT	T6-2BL2AL2TL
Contact arrangement		

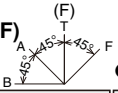
●CONTROL SWITCH

DRUM SWITCH

M, ML TYPE

STANDARD ARRANGEMENT DIAGRAM

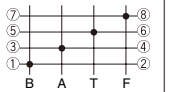
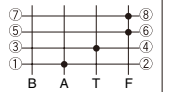
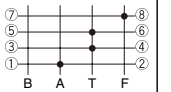
■45° 4-position changeover (F)



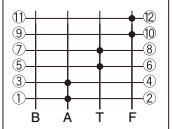
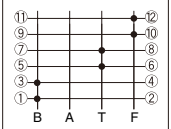
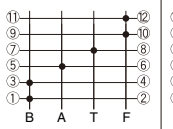
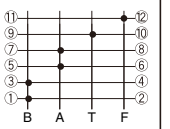
●3 contacts (3 units)

Type	F3001M	F3002M
Detail	F3-1A1T1F	F3-1F1TF1ATF
Contact arrangement		

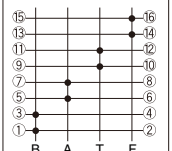
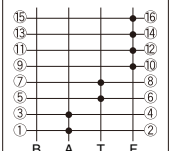
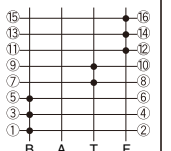
●4 contacts (4 units)

Type	F4001M	F4002M	F4003M
Detail	F4-1B1A1T1F	F4-1A1T2F	F4-1A2T1F
Contact arrangement			

●6 contacts (6 units)

Type	F6001M	F6002M	F6003M	F6004M
Detail	F6-2A2T2F	F6-2B2T2F	F6-2B1A1T2F	F6-2B2A1T1F
Contact arrangement				

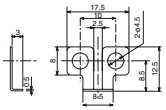
●8 contacts (8 units)

Type	F8001M	F8002M	F8003M
Detail	F8-2B2A2T2F	F8-2A2T4F	F8-3B2T3F
Contact arrangement			

ACCESSORIES

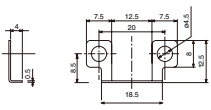
Jumper

●MS bar A



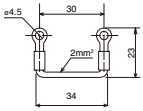
Between adjacent terminals

●MS bar B



For skipping one terminal

●MS bar C



For skipping two terminals

Handle

SP - B

Code	Shape
SP	Pistol shape
SD	Rose shape
SF	Octagonal shape

Code	Color
B	N1.5
BG	7.5BG3/3.5

For dimensions, see page 265 "Handle".

ML LED pack

ML-2352

Circuit	Voltage	Display color	Frame color
1 H (for 2 indicators)	1 24V DC	1 Ⓦ (White)	1 7.5BG4/1.5
2 Y (for 2 indicators)	2 48V DC	2 Ⓡ (Red)	2 N1.5
3 H.Y (for 2 indicators)	3 100 / 110V DC	3 Ⓖ (Green)	
4 S (for 1 indicator)	4 100 / 110V AC	4 Ⓞ (Amber)	
5 T.C (for 3 indicators)	5 200 / 220V AC	5 ⒼⓇ	
6 Y (P-common for 2 indicators)	6 125V DC	6 ⒼⓌⓇ	
		7 ⒼⓄⓇ	
9 Special	9 Special	9 Special	9 Special

∗ **For circuits, see the specification of the LED display part circuit on P. 265.**

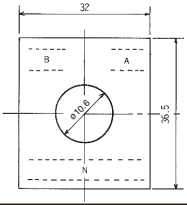
Handle cap remover

●M remover

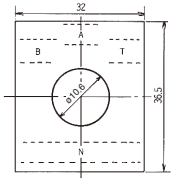
Nameplate

Material.....Aluminum

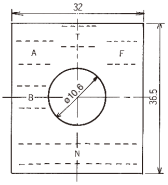
Letter.....Round Gothic



Nameplate No.	B	A	N
MA-000	無	地	
MA-200	切	入	
MA-201	手動	自動	
MA-202	単独	連動	
MA-209	停止	運転	
MA-211	現場	電気室	
MA-212	電気室	中央	
MA-251	切	入	しゃ断器
MA-252	切	入	操作スイッチ
MA-253	手動	自動	切換スイッチ
MA-270	不使用	使用	切換スイッチ
MA-277	閉	開	
MA-278	現場	中央	
MA-279	No.1	No.2	
MA-292	切	入	しゃ断器テスト
MA-293	現場	中操	操作切換器
MA-227E	OPEN	CLOSE	
MA-281E	OFF	ON	CIRCUIT BREAKER
MA-282E	LOCAL	REMOTE	CONTROL
MA-1201E	OFF	ON	AUTO RECLOSING



Nameplate No.	B	A	T	N
MA-290	切	交流しゃ断器	入	
MA-291	切	線路開閉器	入	
MA-292	切	しゃ断機テスト	入	
MA-293	現場	操作切換器	中操	
MA-300	閉	停止	開	
MA-376E	LOCAL	OFF	REMOTE	CONTROL



Nameplate No.	B	A	T	F	N
MA-452	O	R	S	T	電圧計
MA-453	O	R-S	S-T	T-R	電圧計
MA-455	O	R	S	T	電流計
MA-464	O	R-N	N-T	T-R	電圧計
MA-1401(E)	OFF	R	Y	B	AMMETER

DRUM SWITCH

M, ML TYPE

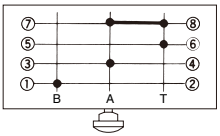
REPRESENTATION OF ARRANGEMENT DIAGRAM

1 Graphic symbol

Action of contact	Symbol
Normal making contact	●
Maintained making contact	◄●
Continuous making contact	●–
Overlap making contact	●–

Operation	Symbol
Manual return (rotating direction)	Not indicated
Manual return (axial direction)	●–
Auto return (to neutral position)	◄–
Auto return (axial direction)	●–

2 Representation method for contact arrangement

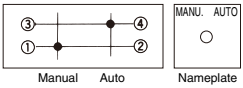


The development is diagrammatically represented as follows. For further details, see "3 Example of diagrammatical representation of development".

1. Denote a terminal with ○ and enter its number in that circle.
2. The extent of the development figure is defined by a solid-line frame.
3. An operation position is shown with a vertical thin line between terminals.
4. An operation position name is shown on the handle in the development figure.
5. The contact symbol in the above 1, which is shown on the thin line showing the operation position, indicates that the mutually opposite terminals in that position are closed.
6. The function symbols showing the operation direction and the return position are written on the handle in the development figure.
7. The handle for the switch is shown in the lower position of the figure.

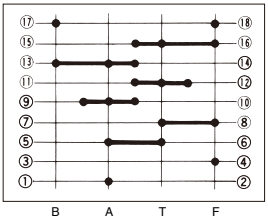
3 Example of diagrammatic representation of development

(1)



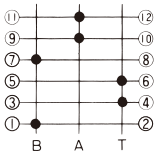
The figure shows the switch that is designed to stop in the switching position. More specifically, when the switch is set to the AUTO position, the circuit between terminals 3 and 4 is closed with that between terminals 1 and 2 opened. When the switch is set to the MANU. position, opening and closing are reversed.

(2)



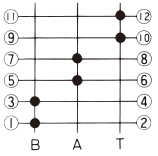
The figure shows the same switching position stop mechanism as in (1) with 4-point switching.
The circuit between terminals 5 and 6 shows that it is continuously closed when the switch becomes positions A and T.
The circuit between terminals 9 and 10 shows that it is closed until the switch goes from position A to the middle between positions A and T, and is opened in position T.
The circuit between terminals 11 and 12 shows that it is closed until the switch goes from position T to the middle between positions T and A, and is opened in position A. Therefore, the circuit between terminals 9 and 10 and that between terminals 11 and 12 are simultaneously closed when the switch goes to the middle between positions A and T.

4 Example of selecting a contact arrangement figure



For example, select the right figure T6005M from the standard development figures (P. 268 through 273) when the switch with the circuit in the left figure is required.
In this case, the terminal numbers should be assigned as in the standard drawing.

T6005M



TECHNICAL DATA

Breaking and making current capacity

Type		AC			DC		
		Test voltage (V)	Test current (A)	Load condition	Test voltage (V)	Test voltage (V)	Load condition
M, ML	Rotating operation type	121	8	Power factor: Pf = 0.6 – 0.7	52.8	11	Time constant: L/R = 40±6ms
		242	4		121	2.2	
		—	—		242	0.77	

Break / make circuit current capacity test
To conduct the break / make circuit current capacity test, connect the air-core reactor, which is connected in series to a resistor, to the switch as illustrated in Fig. 1 or 2. Using the test current specified in Table 1, perform CO 50 times for AC and 20 times for DC at intervals of 10 seconds when the voltage is 1.1 times the rated operating voltage of the switch. At this test, check for:
(1) Short-circuit between poles or earth fault due to generated arc, or broken or burnt switch.
(2) Any other harmful fault in use

Remarks: CO means performing the making action (C) and then the breaking action (O) about 50 ms later. For a switch that has some identical structures used for the same electric potential, select an adjacent contact or a contact that is most likely to lead the arc to the frame and then carry out the test using the circuit shown in Fig. 1. For a switch in which an adjacent contact is used at a different electric potential, perform the test as shown in Fig. 2.

Fig. 1

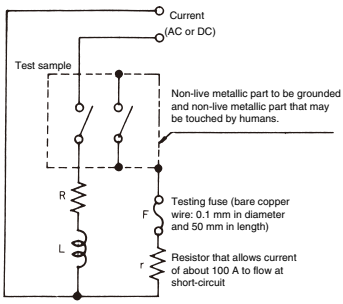
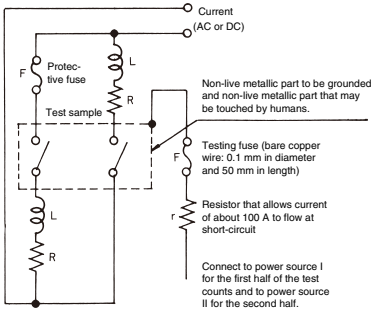


Fig. 2



Remarks: For DC, connect a parallel resistor so that 1% of the test current value flows in parallel with the loads (R·L).

Table 1

AC or DC	Class	Test voltage	Test current		Power factor (AC) or time constant (DC L/R: ms)
			Making	Breaking	
Alternating current (AC)	AC11	1.1*Ue*	11.0 *Ie*	11.0 *Ie*	0.6 to 0.7
	AC12	1.1*Ue*	2.2 *Ie*	2.2 *Ie*	0.6 to 0.7
	AC13	1.1*Ue*	1.1 *Ie*	1.1 *Ie*	0.9 to 1.0
Direct current (DC)	DC11	1.1*Ue*	1.1 *Ie*	1.1 *Ie*	100±15
	DC12	1.1*Ue*	1.1 *Ie*	1.1 *Ie*	40±6
	DC13	1.1*Ue*	1.1 *Ie*	1.1 *Ie*	7±1
	DC14	1.1*Ue*	1.1 *Ie*	1.1 *Ie*	1 max.

Remarks: *Ie* stands for rated operating current and *Ue* rated operating voltage.