

# Great satisfaction is condensed in a small body.

Mitsubishi's Contactors and Motor Starters has been further developed.



# MS-T Series

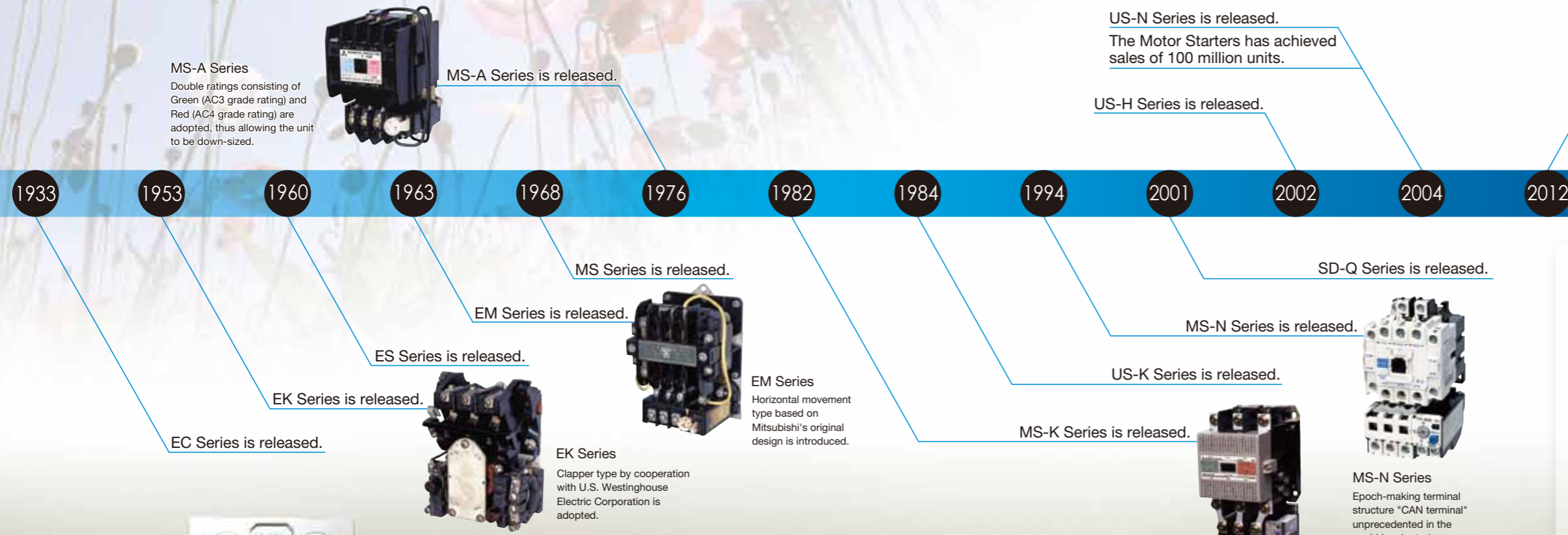
Mitsubishi Contactors and Motor Starters

# Mitsubishi's Contactors and Motor starters continue to be further developed.

Mitsubishi's Contactors and Motor Starters started with EC series in 1933.  
 Since then, products of various series have been highly evaluated by our customers.  
 We will continue to develop ourselves along with our customers.



**MS-T Series is released.**



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Desire to down-size the switchboard



Desire to reduce the types and stock of switchboard parts



Desire to prevent accidents such as electric shock



Aren't there such worries in your current work?

Our new S-T Series will solve customers' problems.



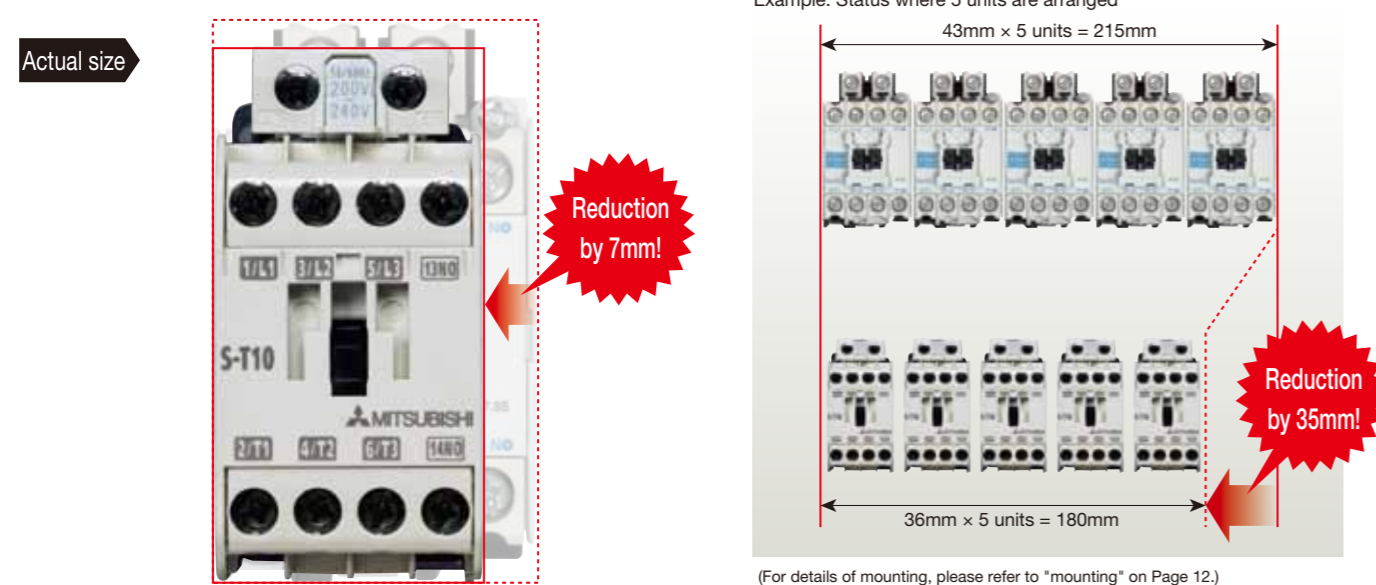
- Down-sizing
- Small
- Standardization
- Standardization
- Safety & Quality
- Safety & Quality
- Smart wiring
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# Down-sizing Small

## 10A frame model has achieved a horizontal width dimension of 36mm!!

The industry-leading smallest dimension\* is achieved in a general purpose Magnetic Contactor. Needless to say, down-sizing of other rated products will be realized to contribute to customers' needs for down-sizing boards.

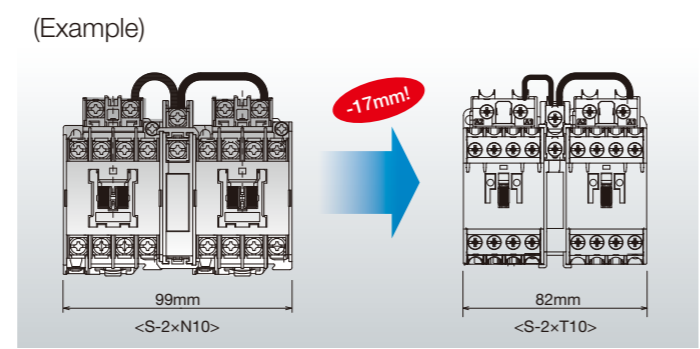
\* In general Magnetic Contactors of 10A frame class (According to our survey conducted in September, 2012)



Frame size		11A	13A		20A	25A
N Series	Front view					
		S-N10	S-N11 (Auxiliary 1-pole)	S-N12 (Auxiliary 2-pole)	S-N20	S-N25
New T Series	Front view					
		S-T10	S-T12 (Auxiliary 2-pole)	S-T20	S-T25	

## Reversing type is also down-sized.

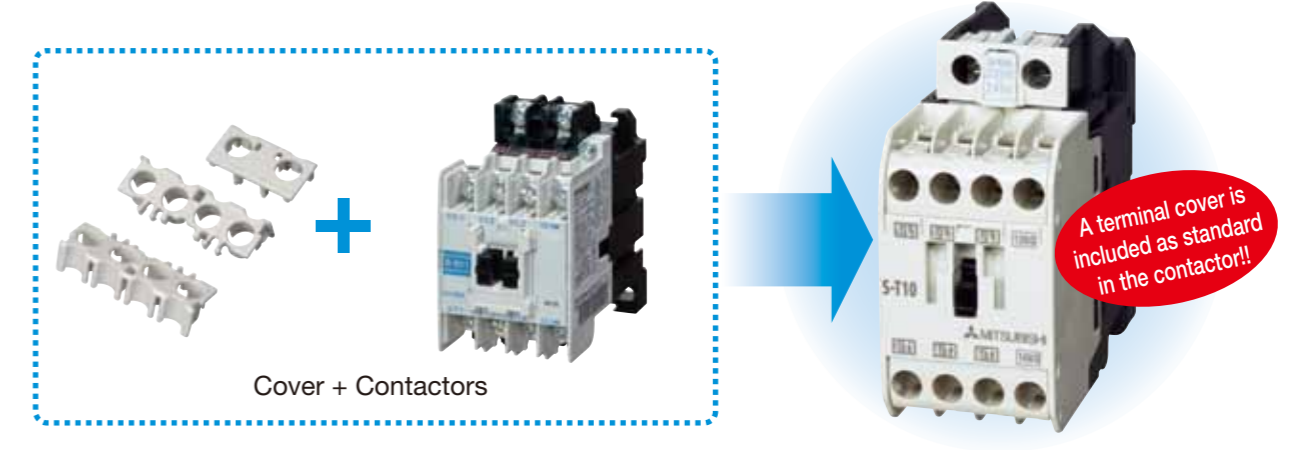
In addition to down-sizing of the Magnetic Contactor, mechanical interlock required for a Reversing Magnetic Contactor is also down-sized. This also contributes to the down-sizing of the switchboard.



# Standardization Standardization

## Terminal cover is included as standard.

Inclusion of a terminal cover as standard can improve the safety within the board and reduce the burdens of designating other types and arranging optional products. Auxiliary contact unit covers are also included as standard. This will reduce storage and cover cost.



## Expansion of standard range for operation coil rating

14 types of operation coil ratings in old series are reduced to 7 types. Applicable voltage range is expanded. Consolidating the number of the produced coils type allows not just the reduction of customer storage, but also shortening of delivery time.

Coil designation	Rated voltage [V]		Coil designation	Rated voltage [V]
	50Hz	60Hz		50Hz/60Hz
AC12V	12	12	AC24V	24
AC24V	24	24	AC48V	48—50
AC48V	48—50	48—50	AC100V	100—127
AC100V	100	100—110	AC200V	200—240
AC120V	110—120	115—120	AC300V	260—300
AC127V	125—127	127	AC400V	380—440
AC200V	200	200—220	AC500V	460—550
AC220V	208—220	220		
AC230V	220—240	230—240		
AC260V	240—260	260—280		
AC380V	346—380	380		
AC400V	380—415	400—440		
AC440V	415—440	460—480		
AC500V	500	500—550		

\* 12VAC type is an order-made product.

## Tropicalization treatment, anticorrosion treatment, and low-temperature-response products are also standardized.

Tropicalization treatment, anticorrosion treatment, and low temperature-response products, which were of special specification, are also standardized in S-T type Magnetic Contactors. This eliminates the necessity of customer's type designation and reduces troublesome task. (excluding MSO-T and TH-T type)

MS-T Series Introduction  
Selection and Application  
Application to Thermal Overload Relay  
Product Introduction  
Overseas Standard  
Type Codes  
Order Procedure  
Outline Drawing  
Warranty and Safety

## Safety & Quality Safety & Quality

### Terminal cover with finger protection

Not only in Magnetic Contactors, a terminal cover is also included as standard even in Thermal Overload Relays, Contactor Relays, and auxiliary contact units, so that DIN and VDE standards-compliant finger protection functions can prevent electric shock and improve safety in the maintenance and periodical check.

[About finger protection]

According to the rules about worker safety and accident prevention against low-voltage electric facilities and devices by DIN EN 50274/VDE 0660 Teil 514, the range over which to protect the contact with the live part is classified into "Finger safe (prevention of finger contact)" and "Back of hand safe (prevention of contact with the back of the hand)" to set the standard.

A terminal cover for MS-T Series meets the requirement of this rule.



### Correspond to subtle load

Responding to a subtle load of 20V3mA under rated current and voltage at an auxiliary contact allows application of the unit to a low-voltage small current circuit of PLC, etc.



## Smart wiring Smart Wiring

### Use of terminal cover and wiring streamlining terminal further improves wiring efficiency.

Inclusion of a terminal cover as standard allows the cover to be used as a guide to improve wiring efficiency. And, wiring streamlining terminals (Type name: S-T□BC) are optionally available. Improvement of wiring efficiency will contribute to customers' workability and productivity.

Easy wiring!



① Screw holder lifts up the screw.

② Insert a round solderless terminal

③ Tighten the screw

## Global Standard Global Standard

### Certification to various major international standards

Not only major international standards such as IEC, JIS, UL, CE, and CCC but also ship standards and other country standards are planned to be certified.

This will help our customers expand their business in foreign countries.

Standards	Applicable standard				Safety certification standard
	International	Japan	European countries	China	U.S. & Canada
			EN EC directive	Certification body	GB
IEC*	JIS	CE	 Planned to be certified in the future.	 Planned to be certified in the future.	 Planned to be certified in the future.

\* This is compliant with Mirror contact specified in the IEC standard.

## List of Produced Models

### Motor Starters/Magnetic Contactors (NonReversing)

Frame		New release																											
Category AC-3		T10	T12	T20	T21	T25	T32	N10	N11	N12	N18	N20	N21	N25	N35	N50	N65	N80	N95	N125	N150	N180	N220	N300	N400	N600	N800		
Rated capacity [kW]		220V	2.5	3.5	4.5	5.5	7.5	7.5	2.5	3.5	3.5	4.5	5.5	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	125	190	220	
Auxiliary contact		440V	4	5.5	7.5	11	15	15	4	5.5	5.5	7.5	11	11	15	18.5	22	30	45	55	60	75	90	132	160	220	330	440	
Model Name		(Note 5)	1a	1a1b	1a1b	2a2b	2a2b	-	1a	1a	1a1b	-	1a1b	-	2a2b	-	-	-	-	-	-	-	-	-	-	-	-	-	
Motor Starters	Enclosed	Standard specification MS-□	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	
		With press button MS-□PM	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	
		3-element thermal MS-□KP	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	
	Open type	Standard specification MSO-□	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇
			DC operated type MSOD-□	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇
			With saturable reactor MSO-□SR	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇
			2-element quick trip type thermal overload relays MSO-□FS	-	-	◇	◇	◇	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			3-element thermal overload relays MSO-□KP	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇
			3-element thermal overload relays with saturable reactor MSO-□KPSR	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇
			3-element quick trip type thermal overload relays MSO-□KF	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇
			Mechanically latched type MSOL-□	-	-	-	◇	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			Delay open type MSO-□DL	-	-	-	◇	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			With a terminal cover MSO-□CX (Note 4)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Wiring streamlining terminal MSO-□BC	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	
	Magnetic Contactors	Open type	Standard specification S-□	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇
			DC operated type SD-□	-	◇	◇	◇	-	◇	-	◇	-	◇	-	◇	-	◇	-	◇	-	◇	-	◇	-	◇	-	◇	-	◇
			Mechanically latched type SL-□	-	-	-	◇	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			Surge absorber-built-in type S-□SA (Note 3)	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇
			Surge absorber-built-in type SD-□SA	-	◇	◇	◇	-	◇	-	◇	-	◇	-	◇	-	◇	-	◇	-	◇	-	◇	-	◇	-	◇	-	◇
		With a terminal cover S-□CX (Note 4)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		Wiring streamlining terminal S-□BC	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	
		Delay open type S-□DL	-	◇	-	◇	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Note 1: The ◇ a current product, ◇ mark a product to be sequentially released, and the - mark an out of production target.  
 Note 2: The values noted in ( ) of AC-3 grade rated capacity are applied for a boxed Motor Starters.  
 Note 3: S-□SA type is a surge absorber-installed type. Alternate current operation coils of N50 to N800 types with surge absorption function contained do not generate coil open/close surge, so that a surge absorption unit for coil is not required.  
 Note 4: Magnetic Contactors and Thermal Overload Relays in MSO/S-N50CX and N65CX are provided with a terminal cover.  
 Note 5: The auxiliary contact arrangements for mechanical latch type and delay release type are different. For details, please refer to the Catalog for MS-N.

### Thermal Overload Relays

Frame		New release													
Heater designation		T18	T25	N12	N18	N20	N20TA	N60	N60TA	N120	N120TA	N220	N400	N600	
		0.12 to 15	0.24 to 22	0.12 to 11	1.3 to 15	0.24 to 15	22 to 29	15 to 54	67 to 82	42 to 82	105 to 125	82 to 180	105 to 330	250 to 660	
Thermal	Standard specification TH-□	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	
	2-element thermal overload relays with saturable reactor TH-□SR	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	
	2-element quick trip type thermal overload relays TH-□FS	-	◇	-	-	◇	◇	◇	◇	◇	◇	◇	◇	◇	
	3-element thermal overload relays TH-□KP	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	
	3-element thermal overload relays with saturable reactor TH-□KPSR	-	◇	-	-	◇	◇	◇	◇	◇	◇	◇	◇	◇	
	3-element quick trip type thermal overload relays TH-□KF	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	
	With a terminal cover TH-□CX	-	-	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	
	Wiring streamlining terminal TH-□BC	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇

Note 1: The ◇ a current product, ◇ mark a product to be sequentially released, and the - mark an out of production target.

### Motor Starters/Magnetic Contactors (Reversing)

Frame		New release																												
Category AC-3		2x T10	2x T12	2x T20	2x T21	2x T25	2x T32	2x N10	2x N11	2x N18	2x N20	2x N21	2x N25	2x N35	2x N50	2x N65	2x N80	2x N95	2x N125	2x N150	2x N180	2x N220	2x N300	2x N400	2x N600	2x N800				
Rated capacity [kW]		220V	2.5	3.5	4.5	5.5	7.5	7.5	2.5	3.5	4.5	5.5	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	125	190	220			
Auxiliary contact		440V	4	5.5	7.5	11	15	15	4	5.5	5.5	7.5	11	11	15	18.5	22	30	45	55	60	75	90	132	160	220	330	440		
Model Name		(Notes 5 to 7)	(1a2)+2b	(1a1b×2)+2b	2a2b×2	2a2b×2	(1a2)+2b	(1a2)+2b	2a2b	1a1b	2a2b×2	2a2b×2	3a3b×2	4a4b×2																
Motor Starters	Boxed	Standard specification MS-□	-	-	◇	◇	◇	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		2E (2-element) Thermal MS-□KP	-	-	◇	◇	◇	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	Open type	Standard specification MSO-□	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇		
			DC operated type MSOD-□	-	◇	-	◇	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
			With saturable reactor MSO-□SR	◇	◇	◇	◇	◇	-	◇	◇	-	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	
			3-element quick trip type thermal overload relays MSO-□KF	◇	◇	◇	◇	◇	-	◇	◇	-	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	
			3-element thermal overload relays MSO-□KP	◇	◇	◇	◇	◇	-	◇	◇	-	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	
			With a terminal cover MSO-□CX (Note 4)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
			Wiring streamlining terminal MSO-□BC	◇	◇	◇	◇	◇	-	◇	◇	-	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	
		Magnetic Contactors	Open type	Standard specification S-□	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇
				DC operated type SD-□	-	◇	◇	◇	-	◇	-	◇	-	◇	-	◇	-	◇	-	◇	-	◇	-	◇	-	◇	-	◇	-	◇
				Mechanically latched type SL-□	-	-	-	◇	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Surge absorber-built-in type S-□SA (Note 3)	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇
				Surge absorber-built-in type SD-□SA	-	◇	◇	◇	-	◇	-	◇	-	◇	-	◇	-	◇	-	◇	-	◇	-	◇	-	◇	-	◇	-	◇
			With a terminal cover S-□CX (Note 4)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Wiring streamlining terminal S-□BC		◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇		

Note 1: The ◇ a current product, ◇ mark a product to be sequentially released, and the - mark an out of production target.  
 Note 2: The values noted in ( ) of AC-3 grade rated capacity are applied for a boxed Motor Starters.  
 Note 3: S-□SA type is a surge absorber-installed type. Alternate current operation coils of N50 to N800 types with surge absorption function contained do not generate coil open/close surge, so that a surge absorption unit for coil is not required.  
 Note 4: Magnetic Contactors and Thermal Overload Relays in MSO/S-N50CX and N65CX are provided with a terminal cover.  
 Note 5: +2b of T10 and T12 auxiliary contact arrangements in Reversing type represents b contact built in the UT-ML11 interlock unit.  
 Note 6: For auxiliary contact arrangement in Reversing type, X2 is displayed as combined auxiliary contact arrangement of two Magnetic Contactors. Please specify the contact arrangement for which two main units are combined must be designated. <Designation example> In case of 1b x 2 + 2b: 2B  
 Note 7: The auxiliary contact arrangement for mechanical latch type is different. For details, please refer to the Catalog for MS-N.

### Contactors Relays

Frame		New release				
Number of contacts		T5	T9	N4	N5	N8
Contact arrangement		5a	9a	4a	5a	8a
		4a1b	7a2b	3a1b	4a1b	7a1b
		3a2b	5a4b	2a2b	3a3b	6a2b
					2a3b	5a3b
					4a4b	
Standard type	SR-□	◇	◇	◇	◇	◇
DC operated type	SRD-□	◇	◇	◇	◇	◇
With large capacity contact	SR-□JH	◇	◇	◇	◇	◇
	SRD-□JH	◇	◇	◇	◇	◇
With a terminal cover	SR-□CX	-	-	◇	◇	◇
	SRD-□CX	-	-	◇	◇	◇
Wiring streamlining terminal	SR-□BC	◇	◇	-	-	-
Surge absorber (varistor)-built-in type	SR-□SA	◇	◇	◇	◇	◇
	SRD-□SA	◇	◇	◇	◇	◇

Note 1: The ◇ a current product, ◇ mark a product to be sequentially released, and the - mark an out of production target.  
 Note 2: SR-T□SA type is a surge absorber-installed type.

About Handling

Note

Precautions for Use

- ▲ Be sure to periodically check the Motor Starters and apply danger prevention measures on the sequence of important circuits. (The Motor Starters contacts may suffer from defective continuity, welding, and burning.)
- ▲ When performing installation, wiring, and maintenance & inspection, be sure to disconnect the Motor Starters from the power supply. It may cause electric shock. In addition, the malfunction attributable to vibration, impact, and false wiring may exert serious results (machine malfunction, short-circuiting of power supply, etc.) on the Magnetic Contactors.

Performance

The performance described in this catalog is based on the result of a test conducted under the conditions specified in the Standard (IEC60947-4-1 "Low-voltage switchgear and controller" etc.). If actual use condition is different from this test condition, the user must evaluate the condition (by using an actual device).

Use condition

Although the device can operate without any problem when under the conditions described in this chapter, be careful about the following matters.

- Ambient temperature**  
Even when the device is used in accordance with normal usage, deterioration of the insulation will progress. In particular, as the ambient temperature increases, the insulation life is shortened. In general, it is said that every time the ambient temperature increases by 6 to 10°C, the insulation life decreases by half (Arrhenius law). In a case where the ambient temperature is high and voltage exceeding the rated voltage is continuously applied to coil, the coil temperature increases and life may be shortened dramatically.
- Vibration/Impact**  
Although vibration of 19.6m/s<sup>2</sup> and impact of 49m/s<sup>2</sup> do not cause contact malfunction, even when the vibration and impact are below these values but are applied continuously, fatigue failure may cause some trouble. In particular, please note that the resonance of an installed board may exert a large vibration on the product.

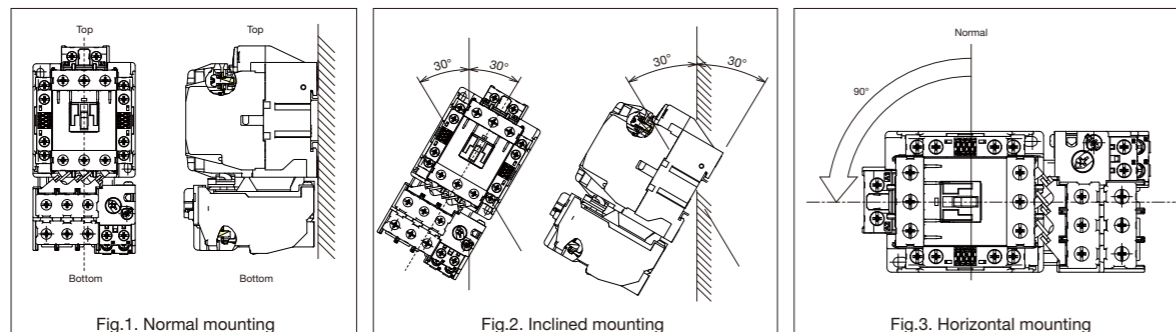
Usage environment

- Ambient temperature** : -10°C to 40°C  
(Applied to the outside of the control board) Average daily atmospheric temperature: 35°C (Max.), Average yearly atmospheric temperature: 25°C (Max.)
- Maximum temperature of the** : 55°C However, the ambient temperature of boxed MS type is 40°C (Average yearly temperature of the inside of the control board is 40°C or less.)  
inside of the control board Please note that the operating characteristics of the Magnetic Contactors and Thermal Overload Relays may vary with the ambient temperature.
- Ambient temperature** : 45% to 85% RH However, dew condensation and freezing should be avoided.
- Height above sea level** : 2000 m or less
- Vibration** : 10 to 55 Hz, 19.6 m/s<sup>2</sup> or less
- Impact** : 49 m/s<sup>2</sup> or less
- Atmosphere** : Inclusion of dust, smoke, corrosive gas, moisture, salt content and the like in the atmosphere should be avoided as much as possible.  
Please note that continuing to use the device in a closed condition for a long period may cause contact failure. Never use the device under an atmosphere that contains flammable gas.
- Storage temperature/Relative humidity** : -30°C to 65°C 45% to 85% RH However, dew condensation and freezing should be avoided.  
The storage temperature is ambient temperature during transportation or storage and should be within the usage temperature when starting to use the device.

Mounting

Direct mounting

- The device should be mounted in a dry location low in dust and vibration.
- The normal mounting direction is the direction shown in Fig. 1 on a vertical surface, but mounting the device at an inclination angle of up to 30 degrees in either direction is allowed. (Fig. 2)
- Mounting the device on a floor or ceiling is not allowed. (Mounting the device on a floor or ceiling may affect the continuity performance, operation performance, and durability of the contact.)
- If mounting the device in a horizontal orientation cannot be avoided, be sure to rotate the device by 90 degrees in a counterclockwise direction from the normal mounting direction as shown in figure 3 when mounting it. If the device is mounted in a horizontal orientation, its characteristic is nearly unchanged but mechanical durability may be deteriorated. Horizontal mounting of reversing type is not allowed.



Tightening torque of mounting screw

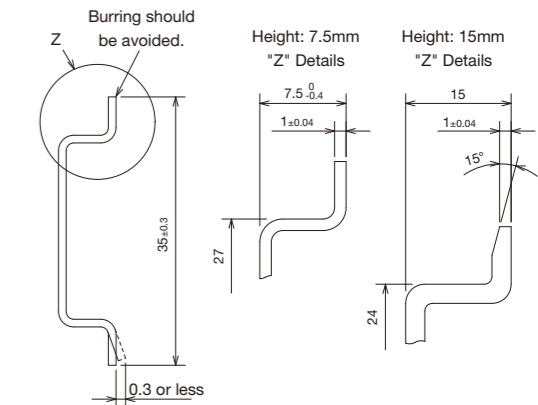
The device should be mounted by force of tightening torques shown in the right table.

Screw size	Tightening torque of mounting screw N·m
M4	1.2 to 1.9

Mounting of IEC 35mm wide rail

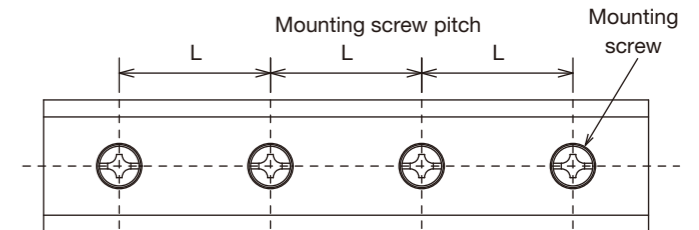
- T10 to T32 types and SR-T type are standard devices allowed to be mounted on an IEC 35mm wide rail.
- DIN, EN, IEC, and JIS C2812 standards-compliant 35mm wide rails come in two types: 7.5mm and 15mm in rail height. Their shapes and dimensions are as shown in the figure below.

Rail	Rail specifications
1	TH35-7.5 Rail width: 35mm, Rail height: 7.5mm
2	TH35-15 Rail width: 35mm, Rail height: 15mm



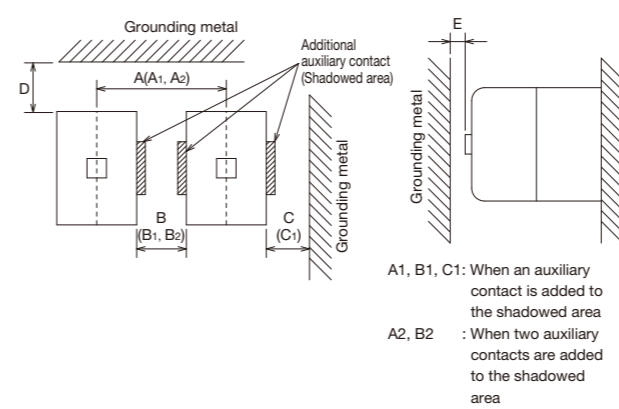
- Maximum pitch of rail mounting screw L(mm)**  
When mounting a rail on a surface of the board, be sure to keep the rail mounting screw pitch below the dimension shown in the following table in order to secure sufficient mechanical strength.

Rail	Frame		SR-T5/T9
	T10 T12 T20 T21	T25 T32	
TH35-7.5			250
TH35-15			500



Mounting space and arc space

When mounting the Magnetic Contactors side by side, be sure to keep the devices isolated by a distance longer than the dimension shown in the following table. Also, the Magnetic Contactors and adjacent grounding metal should be isolated by a distance longer than the dimension shown in the following table. The content described in ( ) is applied when additionally mounting auxiliary contacts. Although an arc space is not required in a position above the Magnetic Contactors, it is recommended to provide a space longer than the E dimension shown in the following table in consideration of the product movement caused by variation in depth dimension of Magnetic Contactors and the vibration produced when turning on or releasing the contactor.



Mounting space and arc space

Frame	Minimum mounting space				Arc Space (Note 1)	Upper mounting space E
	A(A <sub>1</sub> , A <sub>2</sub> ) dimension [mm]	B(B <sub>1</sub> , B <sub>2</sub> ) dimension [mm]	C(C <sub>1</sub> ) dimension [mm]	D dimension [mm]		
T10	41 (A <sub>1</sub> = 53, A <sub>2</sub> = 65)	5 (Note 2) (B <sub>1</sub> = 17, B <sub>2</sub> = 29)	10 (C <sub>1</sub> = 22)	15	0	5 (Note 3)
T12	48					
T20	48 (A <sub>1</sub> = 60, A <sub>2</sub> = 72)					
T21	68 (A <sub>1</sub> = 80, A <sub>2</sub> = 92)					
T25	48 (A <sub>1</sub> = 60, A <sub>2</sub> = 72)					
T32	48 (A <sub>1</sub> = 60, A <sub>2</sub> = 72)					
SR-T5	48					
SR-T9	48	5 (Note 2)	10			3

Note 1. The value of this arc space is a value of IEC and JIS Standards-based closed circuit shut-off capacity test.  
Note 2. Although the B dimension of T10 to T32 allows closely-attached mounting, when continuing to apply current to the device or when mounting a product high in open/close frequency and high utilization on the same rail, the device life may be shortened in terms of temperature increase and impact, so please keep the space between the devices over the minimum value shown in the above table as much as possible when mounting them.  
Note 3. E dimension is 3mm when mounting UT-AX2 or UT-AX4 with contactors.

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About Handling **Note**

Connection

● Applicable electric wire size and tightening torque and terminal dimension of terminal screw

⚠ This may cause overheating or fire. Be sure to properly keep the tightening torque and periodically re-tighten the screw. However, please note that tightening the screw under the status where oil is adhered to the terminal portion may damage the terminal screw even within the existing tightening torque. Electric wires should be properly connected according to the electric wiring diagram. Tightening the terminal screw should be properly conducted within the tightening torque shown in the right table. Insufficient tightening of the terminal screw may cause overheating or cause the electric wire to drop off. Excessive tightening torque may damage the tightening screw. Adhesion of rock paint, thermo label, etc. to electric wire connection or contact may cause heat generation due to defective continuity, so this is very dangerous.

The main circuit terminals of T10 to T32 and TH-T18/T25 types are allowed to be connected via any of single wire, stranded wire, and solderless terminal. The main circuit terminals and operating circuit terminals of T10 to T32 and TH-T18/T25 types are self-up terminals, which facilitate wiring.

Model	Terminal dimension and size/type of screw				Applicable electric wire size [φ mm, mm <sup>2</sup> ]		Connection conductor thickness (D)	Applicable solderless terminal size (JST Cat No.)		Tightening torque of terminal screw N·m		
	Main circuit			Operating circuit	Main circuit	Operating circuit		Main circuit (Note 1)	Main circuit	Operating circuit	Main circuit	Operating circuit
	Dimension of terminal portion A x B x C [mm] (Note 1)	Screw size	Screw type									
SR-T5, T9	-	-	-	M3.5x7	-	-	-	-	-	-	-	
S-T10, T12, T20	7.5x3.7x4.5	M3.5x7	cross slot screw with pressure plate	M3.5x7	φ 1.6 0.75 to 2.5	φ 1.6 0.75 to 2.5	1.6	1.25-3.5 to 2-3.5 5.5-S3	1.25-3.5 to 2-3.5	0.9 to 1.5	0.9 to 1.5	
S-T21, T25, T32	10.5x5.2x5.5	M4x10.5	cross slot screw with pressure plate	M3.5x7	φ 1.6 - 2.6 1.25 to 6	-	3	1.25-4 to 5.5-4	-	1.2 to 1.9	-	
TH-T18 (Load side)	7.5x4x4	M3.5x7	cross slot screw with pressure plate	M3.5x7	φ 1.6 0.75 to 2.5	φ 1.6	2	1.25-3.5 to 2-3.5 5.5-S3	1.25-3.5 to 2-3.5	0.9 to 1.5	0.9 to 1.5	
TH-T25 (Power side / Load side)	10.2x6.8x5/ 10.2x5.7x5	M4x10.5/ M4x10.5	cross slot screw with pressure plate	M3.5x7	φ 1.6 - 2.6 1.25 to 6	0.75 to 2.5	2.5	1.25-4 to 5.5-4	-	1.2 to 1.9	-	

Note 1: The dimension of the main circuit terminal is a dimension for board conductor wiring. (See the right diagram) The board conductor thickness (D dimension) must be below the allowable connection conductor thickness stated above because of the length of the terminal screw. In case of wiring with two boards used, the total value of two boards must be below the value (D dimension) shown in the table.

Note 2: In each terminal, two wires or two solderless terminals are allowed to be connected.

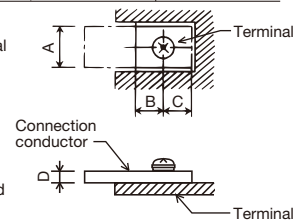
Note 3: The cross slot screw with pressure plate of T Series and N Series are same in size but different in pressure plate dimension, so please avoid the mixed use of such screws. This may break the insulation barrier or make the wire likely to fall out.

Note 4: When using IEC60529-based finger safe specification, be sure to use an insulation tube-attached solderless terminal.

Note 5: Tightening the 3 terminal screw excessively without wiring may break the screw and consequently disable the tightening, so please avoid such excessive tightening.

Note 6: Operational circuits are coil terminals of magnetic contactors and control circuit terminals of Thermal Overload Relays.

Note 7: Please use swaging tool which is recommended by JST.

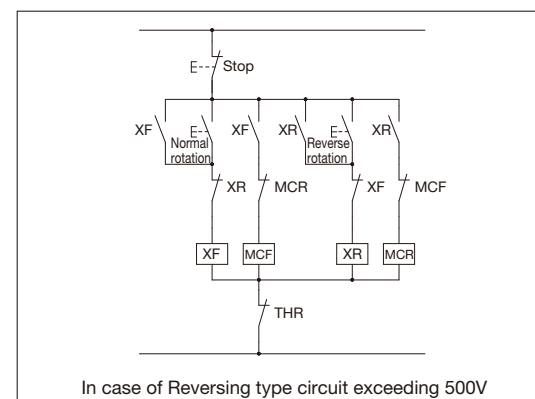


● Application to a circuit exceeding 380V

- When applying MSO, S-T10, T12, T20, SR-T5, T9, and TH-T18 types to a circuit exceeding 380V to set a solderless terminal wiring, please use an insulating tube-attached solderless terminal.
- When applying such parts to a Reversing type circuit exceeding 500V, please use an SR-T type Contactor Relays (XF, XR) as shown in the right figure to set the switching time allowance.

● Wiring direction

Although the upper terminal side is usually set to the power supply side when wiring, the lower terminal side may be set to the power supply side when it is unavoidable due to some reason of the board wiring. However, the mounting direction must be in accordance with the description on Page 12.



Operating circuit

- ⚠ Applying a low voltage that does not operate the Magnetic Contactors to the operating circuit may cause overcurrent to the coil, which may cause the coil to be burned in a short time.
- ⚠ If the operating circuit wiring is too long, when the coil's instantaneous current flows, the wiring impedance may cause a reduction in the coil voltage, so that the operating circuit may fail to be activated. And, the stray capacitance of the wired line may cause the coil's excitation not to be released even when releasing the excitation.

● Power supply voltage variation range and voltage drop of the operating circuit

- Operating voltage  
When the rated voltage and frequency are applied to the coil at an ambient temperature of 40°C (Inside temperature of the board: 55°C), the device operates without any problem at 85 to 110% of the rated voltage of the coil after the temperature increases and becomes saturated.
- Voltage drop  
Even when the coil is excited at the rated voltage and the voltage drops to 65% of the rated voltage (first 1 to 2 cycles; however in case of 0.1 second or more, 70%) when the main contact is contacted, contact welding does not occur at a current ten times the rated operational current, allowing the device to operate without any problem.
- Voltage/Frequency and coil rating of operating circuit  
The voltage/frequency of the operating circuit and the same of the operation coil must be matched. Applying a voltage exceeding 100% of the rated voltage to the operating circuit when using the coil may acceleratedly deteriorate the coil insulation and consequently reduce mechanical durability, so set the coil's average voltage to 95 to 100% of the rated voltage when using the coil.

Application to special environment

⚠ Please note that the operating characteristics of the electromagnetic contactor and thermal relay may vary with the ambient temperature.

● High temperature

When using Motor Starters or Magnetic Contactors at high ambient temperature, the temperature may mainly affect the insulation life (continuous electric conduction life) of the operation coil and the aging variation of the molding component. MSO and S-T type without a box are standard products available even at the inside temperature of 55°C.

● Low temperature

Although the Magnetic Contactors may be transported to a cold region or used in such a cold region or under cold conditions such as those found in a refrigerator with the contactor incorporated in a switchboard, the S-T type Magnetic Contactors is applicable as a standard product. Also, MSO-T type Motor Starters and TH-T type Thermal Overload Relays of low temperature specification are not manufactured. Applicable temperature range of low-temperature-based products: -50 to 55°C (Operating temperature) -60 to 65°C (Storage temperature)

● Corrosive gas

S-T type Magnetic Contactors is of corrosion resistance-increased specification as a standard product. Corrosive gases that exist in an environment with an Motor Starters or Magnetic Contactors used are gases such as sulfuric acid (SO<sub>2</sub>), hydrogen sulfide (H<sub>2</sub>S), chlorine (Cl<sub>2</sub>), and ammonia (NH<sub>3</sub>), and conductive portions can be protected by plating a metal resistant to such gases on the portion. However, because there is no adequate corrosion prevention method for the contact, such gases may increase the contact resistance, resulted in increased temperature. Additionally, if the environment contains some corrosive gas but is under dry condition, this may delay the progression of corrosion, so using the switchboard with the inside kept as dry as possible is also one of the corrosion prevention methods. In the Motor Starters and Thermal Overload Relays, corrosion-prevented products (MSO-T□YS, TH-T□YS) of the specification with increased corrosion resistance to such corrosive gases are also manufactured.

● Dust

Motor Starters and Magnetic Contactors used in an iron foundry, construction site, or powder conveying machine tend to be subject to a relatively large amount of dust. When using the control board in such locations, the board must be dust-prevention-structured. Also, using the board under hermetically-sealed condition for a long period may cause contact failure.

● Export of the products to tropical regions

The environment of exported products which pass through tropical regions tends to be of high temperature and high humidity, and humidity is the environmental factor that affects the Motor Starters and Magnetic Contactors most severely. Humidity is the biggest rust-generating factor and the exported products must be in a structure resistant to humidity. Therefore, it is recommended to put a moisture absorbent (Silica gel) in an amount of 3kg or more per m<sup>3</sup>; so as to lower the humidity.

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## Specification List Table

### Motor Starters/Magnetic Contactors

Frame		T10	T12	T20	T21	T25	T32		
Applicable standard		IEC60947-4-1, EN60947-4-1, JIS C8201-4-1							
Model name	Magnetic Contactors (Without Thermal Overload Relays, Open type)	Non-Reversing	S-T10	S-T12	S-T20	S-T21	S-T25	S-T32	
		Reversing	S-2xT10	S-2xT12	S-2xT20	S-2xT21	S-2xT25	S-2xT32	
	Motor Starters (With standard 2-element, With Thermal Overload Relays)	Open type	Non-Reversing	MSO-T10	MSO-T12	MSO-T20	MSO-T21	MSO-T25	-
		Reversing	MSO-2xT10	MSO-2xT12	MSO-2xT20	MSO-2xT21	MSO-2xT25	-	
Main contact rating	Rated insulation voltage [V]	690							
	Rated impulse withstand voltage [kV]	6							
	Rated frequency [Hz]	50/60							
	Pollution degree	3							
Main contact rating	Category AC-3 (Three-phase squirrel-cage motor load standard responsibility) (Note 1) [kW/A]	220 to 240VAC	2.5/11	3.5/13	4.5/18	5.5/22	7.5/30(7.5/26)	7.5/32	
		380 to 440VAC	4/9	5.5/12	7.5/18	11/22	15/30(15/26)	15/32	
		500VAC	4/7	5.5/9	7.5/17	11/17	15/24	15/24	
		690VAC	4/5	5.5/7	7.5/9	7.5/9	11/12	11/12	
	Category AC-4 (Three-phase squirrel-cage motor load inching responsibility) [kW/A]	220 to 240VAC	1.5/8	2.2/11	3.7/18	3.7/18	4.5/20	5.5/26	
		380 to 440VAC	2.2/6	4/9	5.5/13	5.5/13	7.5/17	11/24	
		500VAC	2.7/6	5.5/9	5.5/10	5.5/10	7.5/12	7.5/13	
	Category AC-1 (Resistance, heater load)	100 to 240VAC	20	20	20	32	32	32	
		380 to 440VAC	11	13	13	32	32	32	
	Conventional free air thermal current Ith [A]		20	20	20	32	32	32	
Auxiliary contact rating	Contact arrangement	Non-Reversing	1a	1a1b	2a2b		-		
		Non-Reversing	1b	2a/2b	-		-		
		Reversing (Note 3, Note 5)	1a x 2 + 2b	1a1b x 2 + 2b	2a2b x 2		-		
		Reversing (Note 3, Note 5)	1b x 2 + 2b	2a x 2 + 2b / 2b x 2 + 2b	-		-		
	Additional options maximum number of units. (Note 4)	Non-Reversing	*1	*1	*1	*1	*1	*1	
		Reversing (Note 3, Note 5)	*2	*2	*2	*2	*2	*2	
Rated operational current	120VAC	6							
(Category AC-15 : Alternating current coil load)	240VAC	3							
rated working current	24VDC	3							
(Category DC-13 : Direct current coil load)	110VDC	0.6							
Conventional free air thermal current Ith [A]		10							
Performance	Mechanical durability [ten thousand times]	1000							
	Electrical durability [ten thousand times]	Category AC-3	Please refer to the Electrical durability curve on Page 17						
		Category AC-4	Please refer to the Electrical durability curve on Page 17						
		Category AC-1	50						
Switching frequency [time/hour]	Category AC-3	1800							
	Category AC-4	300							
	Category AC-1	1200							
Characteristic	Coil consumption	Inrush [VA]	47		75		55		
		Sealed [VA]	7		6		4.5		
		Watts [W]	2.2	2.2	2.2	2.4	2.4	1.8	
Outside dimensions	Magnetic Contactors (without Thermal Overload Relays) (Width x Height x Depth) [mm]	Non-Reversing	36x75x78	43x75x78	43x75x78	63x81x81	63x81x81	43x81x81	
		Reversing	82x85x78	97x85x78	97x85x78	136x81x81	136x81x81	96x81x111	
	Open type Motor Starters (Width x Height x Depth) [mm]	Non-Reversing	45x115x79	45x115x79	45x115x79	63x128x82	63x128x82	-	
		Reversing	90x125x79	97x125x79	97x125x79	136x128x82	136x128x82	-	
IEC 35mm rail mounting		Possible	Possible	Possible	Possible	Possible	Possible		
Models of mountable options	Auxiliary contact-added unit	(Contact arrangement 1a1b)	UT-AX2/AX11					* Scheduled to be released in fiscal 2013	
		(Contact arrangement 2a2b)	UT-AX4						
	Surge absorbers for coil	(Varistor) (Note 2)	UT-SA21						
		(Varistor + Indicating LED)	UT-SA22						
		(CR)	UT-SA23						
		(Varistor + CR)	UT-SA25						
Mechanical interlocks	UT-ML11			UN-ML21					

Note 1: The content within ( ) of rated capacity and rated operational current is applied to the Motor Starter.  
 Note 2: Coil surge absorber-mounted type (□-□ SA type) is also manufactured. UT-SA21 type is mounted.  
 Note 3: +2b of T10 and T12 auxiliary contact arrangements in Reversing type represents b contact built in the UT-ML11 interlock unit.  
 Note 4: The maximum number of additional options is equal to the number of auxiliary contact units UT-AX4 mounted on the main unit.  
 Note 5: For auxiliary contact arrangement in Reversing type, X2 is displayed as combined auxiliary contact arrangement of two Magnetic Contactors. Please specify the contact arrangement for which two main units are combined must be designated. <Designation example> In case of 1b x 2 + 2b: 2B  
 Note 6: Operational coil input and coil consumption are average values in case of applying 220V60Hz to AC200V coil.

### Closed circuit current capacity & Breaking current capacity

Frame	T10	T12	T20	T21	T25	T32	
Closed circuit current capacity	220 to 240VAC	110	130	180	250	300	320
Category AC-3 [A]	380 to 440VAC	90	120	180	230	300	320
	500VAC	70	90	170	170	240	240
Breaking current capacity Category AC-4 [A]	220 to 240VAC	88	104	144	200	240	256
	380 to 440VAC	72	96	144	184	240	256
	500VAC	56	72	136	136	192	192

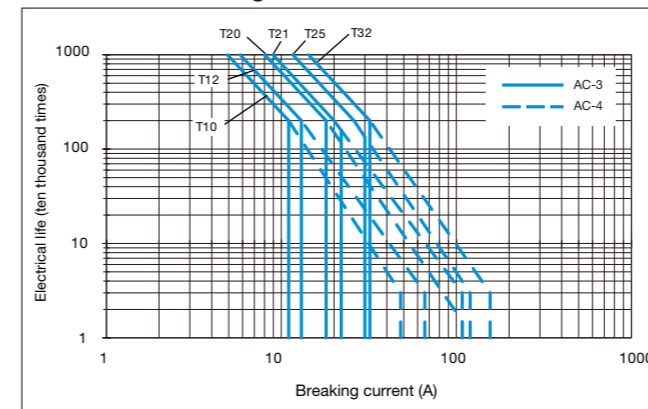
Note 1: Open/close frequency of closed circuit current capacity and breaking current capacity is 50 respectively (IEC60947-4-1).

### Short-circuit Protection Coordination

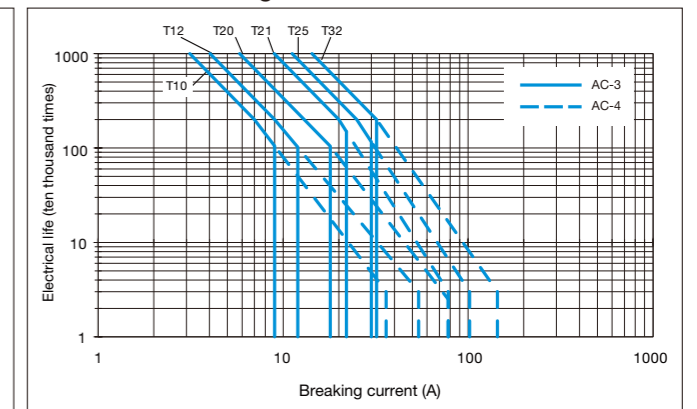
Magnetic Contactors model		S-T10	S-T12	S-T20	S-T21	S-T25	S-T32	SR-T5/T9
Type 1	Short-circuit protection device rating	40A			80A			-
	* Fuse gG (IEC60269-1/2)	16A			-			16A
	Main circuit	40A			80A			-
	Auxiliary circuit	16A			-			16A

### Electric Durability Curve

● Main circuit voltage 220 to 240VAC



● Main circuit voltage 380 to 440VAC



### Coil ratings

#### Coil types and ratings (Alternating current operation type)

● For S-T10 to T32 types  
 For SR-T5 and T9 types

Coil designation	Rated voltage [V]		Coil display
	50Hz	60Hz	
AC24V	24	24	Rated voltage and frequency
AC48V	48-50	48-50	
AC100V	100-127	100-127	
AC200V	200-240	200-240	
AC300V	260-300	260-300	
AC400V	380-440	380-440	
AC500V	460-550	460-550	

Note: Even when the single rating (example: 200V60Hz) is specified for an order, the above rating voltage is indicated on the product.

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- For S-T10SA to T32SA types  
For SR-T5SA and T9SA types

Coil designation	Rated voltage [V]		Coil indication	Varistor voltage [V]
	50Hz	60Hz		
AC24V	24	24	Rated voltage and frequency	120
AC48V	48-50	48-50		120
AC100V	100-127	100-127		470
AC200V	200-240	200-240		470
AC300V	260-300	260-300		910
AC400V	380-440	380-440		910

Note 1: Add "SA" to the end of the type name to order the operation coil surge absorber mounting type (varistor).  
Example: S-T10SA AC100V

Note 2: Even when the single rating (example: 200V60Hz) is specified for an order, the above rating voltage is indicated on the product.

## Contact Reliability

### Contact reliability of main and auxiliary contacts

The minimum working voltage and current of the main and auxiliary contacts of the S-T type Magnetic contactors and the contact of the SR-T type Contactor Relays vary depending on the allowable failure rate. Apply the following diagrams.

- The contact reliability reduces when a contact is connected in series or when the current is applied and broken at the time of opening and closing the contact.

Prescribe remedies such as connecting the contact in parallel (providing redundancy).

- The contact must be connected in parallel (providing redundancy) if reliability greater than the contact reliability shown the diagrams 1 to 3 is required.

#### Magnetic contactors

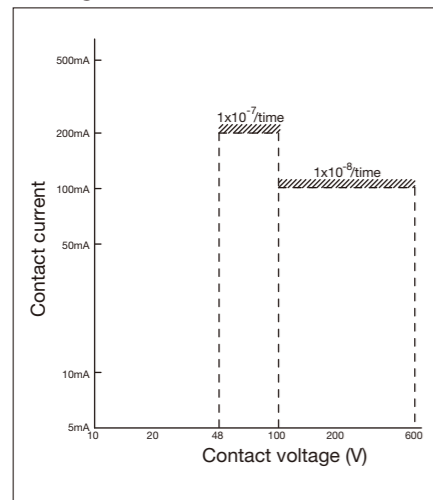


Diagram 1. S-T main contact

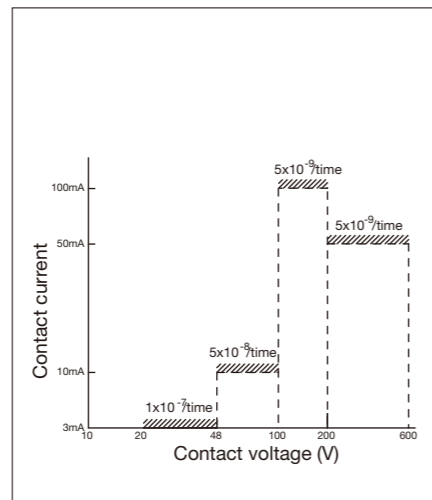


Diagram 2. S-T auxiliary contact

#### Contactor Relays

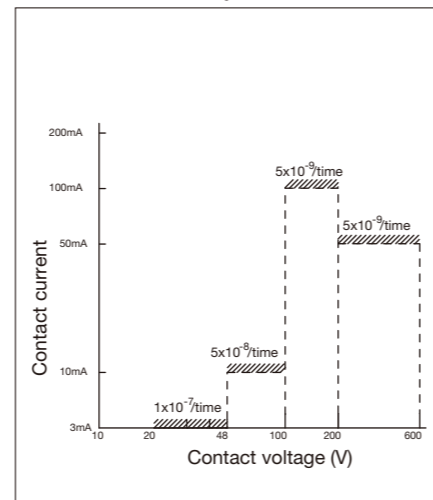


Diagram 3. SR-T5, T9

Note 1: The contact reliability indicates the failure rate  $\lambda$  60 (the number of failures/the number of opening and closing operations, per contact) at 60% reliability standard. This reliability is applied when the product is in use under a clean atmosphere in the standard specification environment (Refer to page 12).

Note 2: The contact resistance of the contacts may change due to economical corrosion and that may affect the contacts in the case of a light load.

It is recommended that regular inspections to be conducted, with load opening and closing performed several times in the inspection, and that consideration be provided on the system side.

## Specification List

### Thermal Overload Relays

#### Model list

Frame		T18	T25
Appearance			
Model name	with 2-elements	For Motor Starters For independent mounting	TH-T18 -
	with 3-elements	For Motor Starters For independent mounting	TH-T18KP TH-T25KP
	Outside dimensions (mm)	For Motor Starters	45×55×76.5
	W×H×D	For independent mounting	-
Product weight [kg]	For Motor Starters	0.11	0.16
	For independent mounting	-	-
Applicable standard		IEC, EN, JIS	
Use condition	Ambient temperature [°C]	-10 to +40 (Standard: 20°C; maximum temperature on the board: 55°C)	
	Frequency [Hz]	0(DC) to 400	
Rated insulation voltage [V]		690	
Rated impulse withstand voltage [kV]		6	
Pollution degree		3	
Main circuit specifications	Heater designation (adjustable range of stabilized current) [A] (Rated operational voltage : 550V maximum)	0.12 (0.1 to 0.16)	0.24 (0.2 to 0.32)
		0.17 (0.14 to 0.22)	0.35 (0.28 to 0.42)
		0.24 (0.2 to 0.32)	0.5 (0.4 to 0.6)
		0.35 (0.28 to 0.42)	0.7 (0.55 to 0.85)
		0.5 (0.4 to 0.6)	0.9 (0.7 to 1.1)
		0.7 (0.55 to 0.85)	1.3 (1 to 1.6)
		0.9 (0.7 to 1.1)	1.7 (1.4 to 2)
		1.3 (1 to 1.6)	2.1 (1.7 to 2.5)
		1.7 (1.4 to 2)	2.5 (2 to 3)
		2.1 (1.7 to 2.5)	3.6 (2.8 to 4.4)
		2.5 (2 to 3)	5 (4 to 6)
		3.6 (2.8 to 4.4)	6.6 (5.2 to 8)
		5 (4 to 6)	9 (7 to 11)
		6.6 (5.2 to 8)	11 (9 to 13)
		9 (7 to 11)	15 (12 to 18)
11 (9 to 13)	22 (18 to 26)		
Power consumption [VA/element] at minimum/maximum stabilization		0.8 / 1.8	1.0 / 2.1
Terminal screw size		M3.5	M4
Compatible with terminal	Electric cable size [mm <sup>2</sup> ]	φ 1.6, 0.75 to 2.5	φ 1.6 to 2.6, 1.25 to 6
	Solderless terminal size	1.25-3.5 to 2-3.5, 5.5-S3	1.25-4 to 5.5-4
Contact arrangement		1a1b	1a1b
Conventional free air thermal current Ith [A]		2	5
Rating Operational Current [A]	Category AC-15 (AC operated Magnetic contactors Coil opening and closing/ a contact/b contact)	AC24V	2 / 2
		AC120V	2 / 2
	Category DC-13 (DC operated Magnetic contactors Coil opening and closing)	AC240V	1 / 1
		AC550V	0.5 / 0.5
Minimum applicable load level	DC24V	0.5	1
	DC110V	0.2	0.2
	DC220V	0.1	0.1
Terminal screw size		M3.5	M3.5
Compatible with terminal	Electric cable size [mm <sup>2</sup> ]	φ 1.6, 0.75 to 2.5	φ 1.6, 0.75 to 2.5
	Solderless terminal size	1.25-3.5 to 2-3.5	1.25-3.5 to 2-3.5
Trip class		10A	
Operating characteristic curve description page		Page 21	
Vibration resistance (vibration resistance malfunction performance)		10 to 55 Hz, 19.6 m/s <sup>2</sup>	
Trip-free		○	○
Reset method		Manual/Automatic switchable	Manual/Automatic switchable
Operation indication (lever indication)		○	○
Manual trip check		○	○

Note 1: The ambient temperature compensator is mounted on all types.  
Note 2: ○ indicates standard equipment.

MS-T Series Introduction Selection and Application Application to Thermal Overload Relays Product Introduction Overseas Standard Type Codes Order Procedure Outline Drawing Warranty and Safety

## Selection Table

### Thermal Overload Relays

#### Application to standard three-phase motor of Thermal Overload Relays

Thermal Overload Relays			Standard three-phase motor capacity [kw]		Magnetic contactors that can be combined			
Heater designation (A)	Setting range (A)	Short-circuit protector rating (A) * Fuse gS (IEC60282-1/2)	Frame	200-220V	380-440V	TH-T18		TH-T25
0.12	0.1-0.16	2	TH-T18			S-T10	S-T12	S-T20
0.17	0.14-0.22	2						
0.24	0.2-0.32	2		0.03	0.05			
0.35	0.28-0.42	2		0.05	0.1			
0.5	0.4-0.6	2		0.07				
0.7	0.55-0.85	4		0.1	0.18			
0.9	0.7-1.1	4		0.25				
1.3	1.0-1.6	4		0.2	0.37, 0.55			
1.7	1.4-2.0	6		0.75				
2.1	1.7-2.5	6		1	1.1			
2.5	2.0-3.0	10		1.5	3, 3.7			
3.6	2.8-4.4	10		2.2	3, 3.7			
5	4.0-6.0	16		5.5				
6.6	5.2-8.0	20		3.7	7.5, 9			
9	7.0-11	20		11				
11	9.0-13	25						
15	12-18	32						
22	18-26	50						

## Precautions for Use

### Thermal Overload Relays

#### Disassembly

The Thermal Overload Relays are adjusted at the time of assembly. Do not disassemble it.

#### Ambient temperature correction

The TH-T type Thermal Overload Relays are adjusted with the Motor Starters in the standard box (the MS type) relative to the ambient temperature of 20°C (The temperature on the control board of the MSO type Motor Starters is 35°C). The ambient temperature compensator is mounted on the TH-T type Thermal Overload Relays. Therefore, the ambient temperature less affects the operational characteristic change. The minimum operating current change according to the ambient temperature change relative to the ambient temperature of 20°C (the temperature on the control board of 35°C) generally depends on the characteristics in the diagrams 1 and 2.

The Thermal Overload Relays have a characteristic that the operating current becomes high when the ambient temperature is low and becomes low when the ambient temperature is high. If the ambient temperature of the installation site is significantly different from 20°C (the temperature on the control board of 35°C), the setting current of the Thermal Overload Relays needs to be corrected as shown in diagrams 1 and 2. In addition, note that the correction factor has a characteristic to be the minimum scale>middle scale>maximum scale at the adjustment knob location. (Note that the Thermal Overload Relays may operate at a current of less than 100% stabilized current if in use at temperatures exceeding the allowable working temperature of 40°C (55°C).)

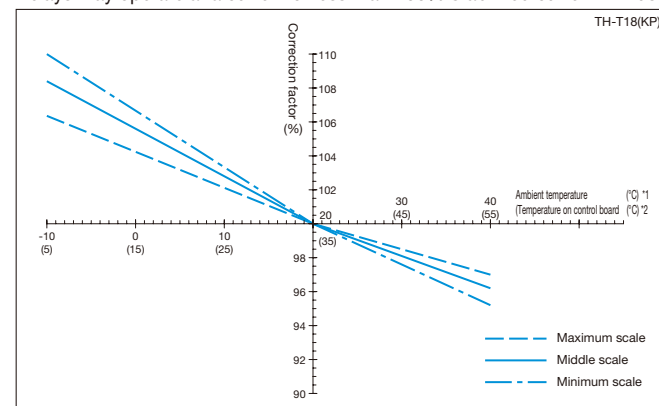


Diagram 1. Ambient temperature correction curve (T18 frame)

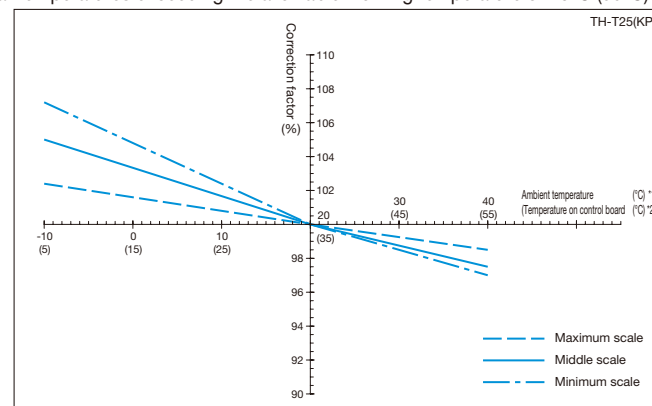


Diagram 2. Ambient temperature correction curve (T25 frame)

Correction factor: Percentage of the minimum operating current at the ambient temperature of 20°C (the temperature on the control board of 35°C)

<Correction procedure of setting current>  
Determine the correction factor of the working ambient temperature according to the curves in diagrams 1 and 2 and use the value of all load currents of the motor divided by the determined correction factor as the stabilization value.  
Example: The ambient temperature correction factor for TH-T25 at the ambient temperature of 40°C (the temperature on the control board of 55°C) is 97% at the minimum scale according to diagram 2. If the motor rated current is 15A, the stabilization value is 15.5A (=15/0.97).

Note 1: [\*1] The ambient temperature applied to the MS type indicates the outside temperature of the box. To be released in the future  
[\*2] The temperature including temperature increase on the control board applied to the MSO type is indicated.

#### Connecting electric cable size and operating current

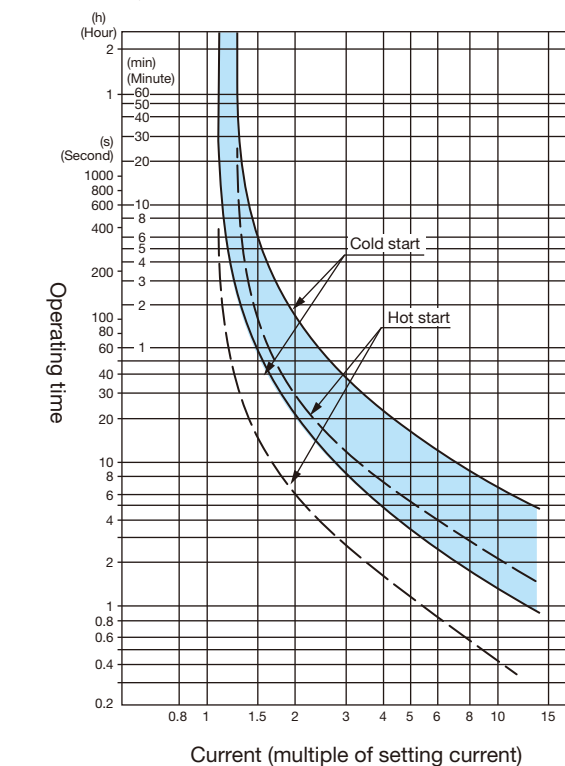
The TH-T type adjusts the minimum operating current with the standard electric cable size shown in the following table. If the electric cable is thicker or thinner than this standard electric cable size, the operating current becomes high or low, respectively. Therefore, correct the stabilized current (divide it by the change rate of the minimum operating current) to use a size different from the standard connecting electric cable size.

Model name	Heater designation [A]	Standard electric cable size [mm <sup>2</sup> ]	Connecting electric cable size [mm <sup>2</sup> ]	Change rate of minimum operating current [%]
TH-T18(KP)	0.12 to 15	2	1.25	98
TH-T25(KP)	0.24 to 11		2.5	103
TH-T25(KP)	15, 22	3.5	2	97
			6	104

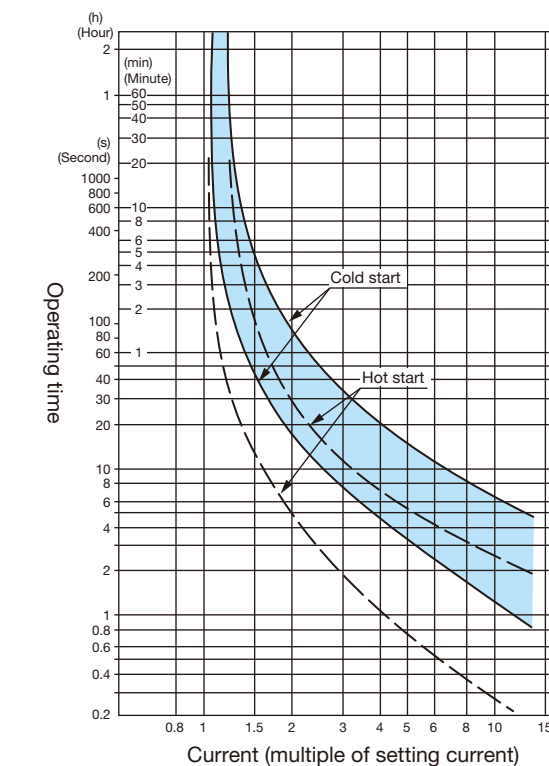
#### Operating Characteristic of Thermal Overload Relays (Ambient Temperature of 20°C) Thermal Overload Relays

For the information on the connecting electric cable size, refer to page 14.

#### ● TH-T18, T18KP

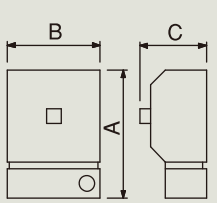


#### ● TH-T25, T25KP



## Motor Starters

- MSO-T series (non-Reversing)
- MSO-2xT series (Reversing)

Model name	Non-Reversing	MSO-T10				MSO-T12				MSO-T20				MSO-T21				MSO-T25			
	Reversing	MSO-2xT10				MSO-2xT12				MSO-2xT20				MSO-2xT21				MSO-2xT25			
Rated capacity (kW) Category AC-3	220 to 240VAC	2.5				3.5				4.5				5.5				7.5			
	380 to 440VAC	4				5.5				7.5				11				15			
	500VAC	4				5.5				7.5				11				15			
Heater rating (designation) of standard Thermal Overload Relays (A)	0.12	0.17	0.24	0.35	0.12	0.17	0.24	0.35	0.12	0.17	0.24	0.35	0.24	0.35	0.5	0.7	0.24	0.35	0.5	0.7	
	0.5	0.7	0.9	1.3	0.5	0.7	0.9	1.3	0.5	0.7	0.9	1.3	0.9	1.3	1.7	2.1	0.9	1.3	1.7	2.1	
	1.7	2.1	2.5	3.6	1.7	2.1	2.5	3.6	1.7	2.1	2.5	3.6	2.5	3.6	5	6.6	2.5	3.6	5	6.6	
Operation coil rating		Refer to pages 17 and 18																			
Auxiliary contact arrangement	Non-Reversing	1a	1a1b				1a1b				2a2b				2a2b						
		1b	2a/2b				2a/2b				—				—						
	Reversing	1ax2+2b	1a1bx2+2b				1a1bx2+2b				2a2bx2				2a2bx2						
	Non-Reversing	A	115				115				128				128						
		B	45				45				63				63						
		C	79				79				82				82						
Option	Reversing	A	125				125				128				128						
		B	90				97				136				136						
		C	79				79				82				82						
IEC 35mm rail mounting type		←—————→																			
Option	Front clip-on auxiliary contact block mounting type	←—————→																			
	Side clip-on auxiliary contact block mounting type	←—————→																			
	Surge absorber mounting type	←—————→																			
	Reversing mechanical interlock mounting type	←—————→																			

### Thermal Overload Relays that can be combined with Magnetic Contactors

Thermal Overload Relays type names and heater types that can be combined with Magnetic Contactors

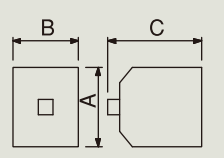
Magnetic Contactors frame	Thermal Overload Relays type name that can be combined	Heater designation (adjustable range of stabilized current) (A)
T10, T12, T20	TH-T18	0.12(0.1 to 0.16) 0.17(0.14 to 0.22) 0.24 (0.2 to 0.32) 0.35(0.28 to 0.42) 0.5(0.4 to 0.6) 0.7(0.55 to 0.85) 0.9(0.7 to 1.1) 1.3(1 to 1.6) 1.7(1.4 to 2) 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)* 15(12 to 18)*
T21, T25	TH-T25	0.24(0.2 to 0.32) 0.35(0.28 to 0.42) 0.5(0.4 to 0.6) 0.7(0.55 to 0.85) 0.9(0.7 to 1.1) 1.3(1 to 1.6) 1.7(1.4 to 2) 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) 15(12 to 18) 22(18 to 26)

Note 1: Select the value closer to the heater designation if the stabilized current has two values.

Note 2: Heater designation marked with \* has Motor Starters frames that cannot be applied. For information on the applicable Motor Starters frames, refer to the "Heater rating (designation) of standard Thermal Overload Relays" field in the above table.

## Magnetic contactors

- S-T series (non-Reversing)
- S-2xT series (Reversing)

Model name	Non-Reversing	S-T10	S-T12	S-T20	S-T21	S-T25	S-T32	
	Reversing	S-2xT10	S-2xT12	S-2xT20	S-2xT21	S-2xT25	S-2xT32	
Rated operational current (A) Category AC-3	220 to 240VAC	11	13	18	22	30	32	
	380 to 440VAC	9	12	18	22	30	32	
	500 VAC	7	9	17	17	24	24	
Conventional free air thermal current Ith (A)		20	20	20	32	32	32	
Operation coil rating		Refer to pages 17 and 18						
Auxiliary contact arrangement	Non-Reversing	1a	1a1b	1a1b	2a2b	2a2b	—	
		1b	2a/2b	2a/2b	—	—	—	
	Reversing	1ax2+2b	1a1bx2+2b	1a1bx2+2b	2a2bx2	2a2bx2	—	
	Non-Reversing	A	75	75	75	81	81	81
		B	36	43	43	63	63	43
		C	78	78	78	81	81	81
Option	Reversing	A	85	85	85	81	81	81
		B	82	97	97	136	136	96
		C	78	78	78	81	81	111
IEC 35mm rail mounting type		←—————→						
Option	Front clip-on auxiliary contact block mounting type	←—————→						
	Side clip-on auxiliary contact block mounting type	←—————→						
	Surge absorber mounting type	←—————→						
	Reversing mechanical interlock mounting type	←—————→						

## Thermal Overload Relays

### TH-T series

Model name	TH-T18	TH-T25
Application	MSO-T10 -T12 -T20	MSO-T21 -T25
Standard heater rating (designation) (A)	0.12, 0.17, 0.24, 0.35, 0.5, 0.7, 0.9, 1.3, 1.7, 2.1, 2.5, 3.6, 5, 6.6, 9, 11, 15	0.24, 0.35, 0.5, 0.7, 0.9, 1.3, 1.7, 2.1, 2.5, 3.6, 5, 6.6, 9, 11, 15, 22
Contact arrangement	1a1b	1a1b
	A	55
	B	45
	C	76.5
		51
		63
		79

### Heater types

Heater types of TH type Thermal Overload Relays

For Motor Starters		For single mounting		Heater designation (adjustable range of stabilized current) (A)
2-element	3-element	2-element	3-element	
T18	T18KP	— Note 1	— Note 1	0.12(0.1 to 0.16) 0.17(0.14 to 0.22) 0.24 (0.2 to 0.32) 0.35(0.28 to 0.42) 0.5(0.4 to 0.6) 0.7(0.55 to 0.85) 0.9(0.7 to 1.1) 1.3 (1 to 1.6) 1.7(1.4 to 2) 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) 15(12 to 18)
T25	T25KP	T25 Note 1	T25KP Note 1	0.24(0.2 to 0.32) 0.35(0.28 to 0.42) 0.5(0.4 to 0.6) 0.7(0.55 to 0.85) 0.9(0.7 to 1.1) 1.3(1 to 1.6) 1.7(1.4 to 2) 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) 15(12 to 18) 22(18 to 26)

Note 1: Combining UT-HZ18 **To be released in the future** allows the T18 frame to be used singly (screw mounting or IEC 35 mm rail mounting).  
Combining UN-RM20 allows the T25 frame for single mounting to have the IEC 35mm rail mounted.

## Contactors Relays

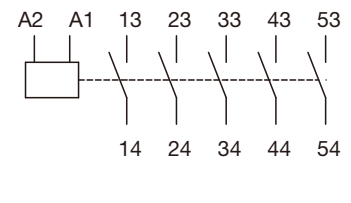
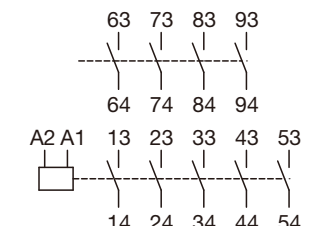
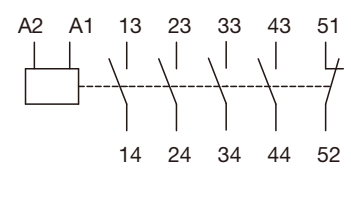
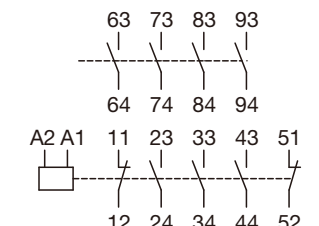
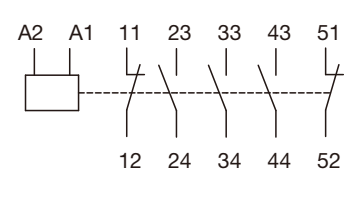
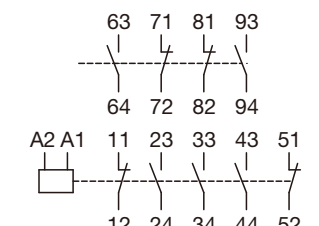
### Specification List

Model name		SR-T5	SR-T9	
Number of contacts		5	9	
Contact arrangement		5a 4a1b 3a2b	9a 7a2b 5a4b	
Rated insulation voltage [V]		690		
Rated impulse withstand voltage [kV]		6		
Rated frequency [Hz]		50/60		
Pollution degree		3		
Contact rating (Note 1)	AC rated operational current [A]	Category AC-15 (Coil load)	120VAC 240VAC 440VAC 550VAC	6 3 1.5 1.2
		Category AC-12 (resistive load)	120VAC 240VAC 440VAC 550VAC	10 8 5 5
			Category DC-13 (large coil load)	24VDC 48VDC 110VDC 220VDC
	Category DC-12 (resistive loads)	24VDC 48VDC 110VDC 220VDC		10 8 5(8) 1(3)
		Conventional free air thermal current Ith [A]		10
	Performance	Mechanical durability [ten thousand times]		1,000
Electrical durability [ten thousand times]		50		
Switching frequency [time/hour]		1,800		
Characteristic	Coil consumption	Inrush [VA]	47	
		Sealed [VA]	7	
		watts [W]	2.2	
Optional unit (Note 2)	Surge absorber		○	○
	Additional auxiliary contact		○	×
IEC 35mm rail mounting		○	○	

Note 1: The value in brackets indicates the current when switching the load with 2 poles in series.  
Note 2: In the optional unit field, ○ and X indicate mountable and non-mountable, respectively.  
Note 3: Coil consumption are average values in case of applying 220V60Hz to AC200V coil.

## Contact Relays

### Contact arrangement/Contact placement

Model name	SR-T5	SR-T9
Contact arrangement	5a	9a
	4a1b	7a2b
	3a2b	5a4b
Contact placement	 <p>5a</p>	 <p>9a</p>
	 <p>4a1b</p>	 <p>7a2b</p>
	 <p>3a2b</p>	 <p>5a4b</p>


### Combination with additional auxiliary contact block

The SR-T series contactor type Contactor Relay is usable in combination with the following additional auxiliary contact blocks.

Contactor Relay	Auxiliary contact blocks	Front clip-on						Side clip-on	
		UT-AX4			UT-AX2*			UT-AX11*	UT-AX11*
Model name	Contact arrangement	4a	3a1b	2a2b	2a	1a1b	2b	1a1b+1a1b	1a1b
SR-T5	5a	9a	8a1b	7a2b	7a	6a1b	5a2b	7a2b	6a1b
	4a1b	8a1b	7a2b	6a3b	6a1b	5a2b	4a3b	6a3b	5a2b
	3a2b	7a2b	6a3b	5a4b	5a2b	4a3b	3a4b	5a4b	4a3b

Note 1: The auxiliary contact blocks cannot be mounted on SR-T9.



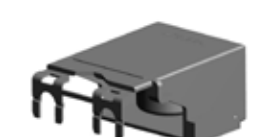

Note 2: The Contactor Relay is not usable with front clip-on and side clip-on blocks mounted at the same time.

Note 3: The contact arrangements in  are standard combinations.

\* Scheduled to be released in fiscal 2013

## Optional unit

### Model list (for MS-T series)

Model name	Auxiliary contact blocks			Operation coil surge absorber unit				Mechanical interlocks
	UT-AX4	UT-AX2 *	UT-AX11 *	UT-SA23	UT-SA21	UT-SA22	UT-SA25	UT-ML11
Type	Front clip-on			Mounting on top				Side clip-on
Mounting	Front clip-on			Mounting on top				Side clip-on
Specification/ Function	Twin contact built-in 4-pole auxiliary contact (4a, 2a2b, 3a1b)	Twin contact built-in 2-pole auxiliary contact (2a, 1a1b, 2b)	Twin contact built-in 2-pole auxiliary contact (1a1b)	Operation coil surge absorber				Combining it with two single Magnetic contactors configures the reversing type. ML11 is the electrical interlock 2b contact built-in type.
				With CR	With varistor	With varistor + indicating lamp	With varistor + CR	
Appearance (Typical example)								
Applied model	Motor Starters			T10-T32				T10-T20
	Magnetic contactors			T10-T32				T10-T20
	Contactor Relays			SR-T5				-
Others	Combination with UT-AX11 is not available.			Combination with UT-AX2/4 is not available.				-

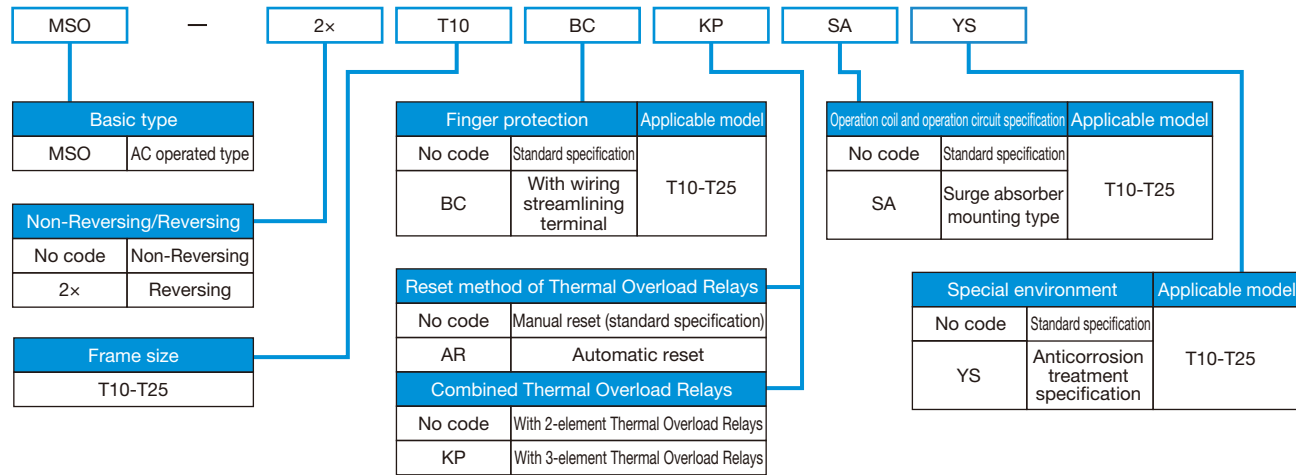
\* Scheduled to be released in fiscal 2013



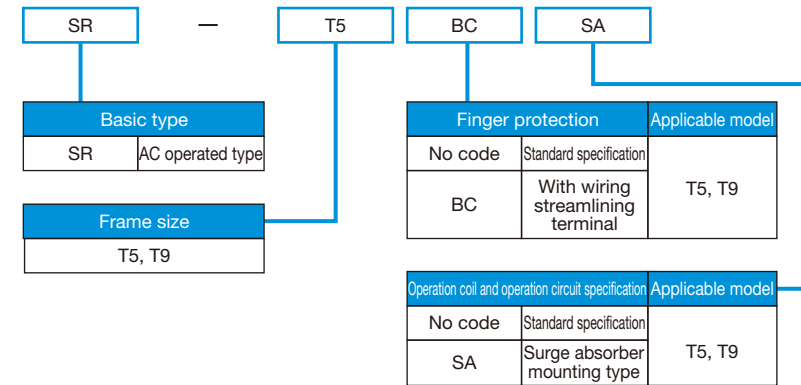
## Type Codes

\* For the information on type codes for orders, check the note in Order Procedure.

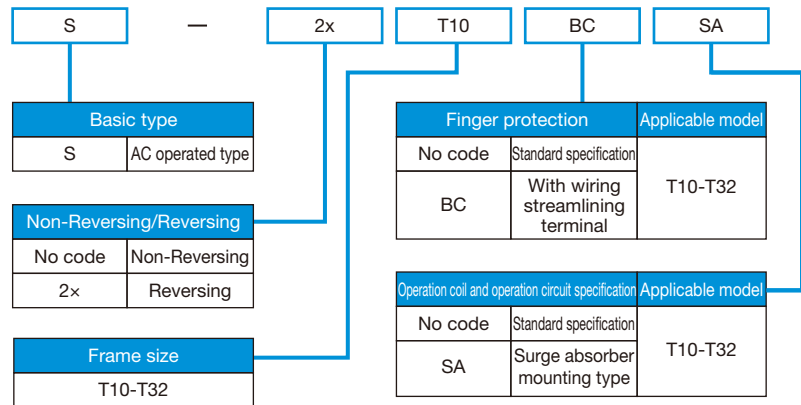
### Motor Starters



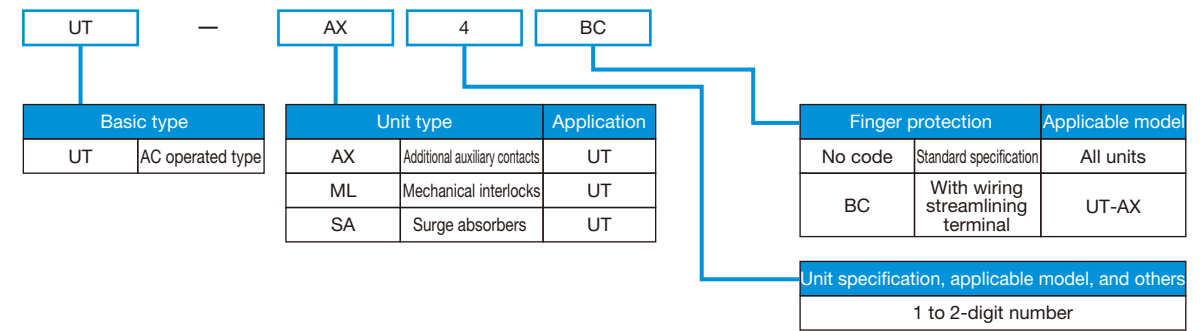
### Contactor Relays



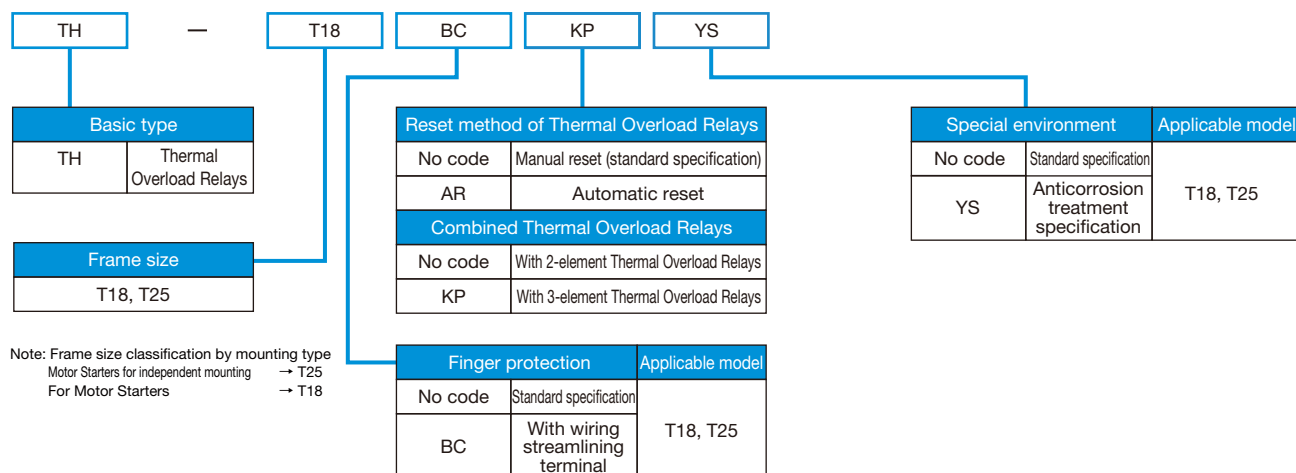
### Magnetic contactors



### Optional units



### Thermal Overload Relays



Note: Frame size classification by mounting type  
 Motor Starters for independent mounting → T25  
 For Motor Starters → T18

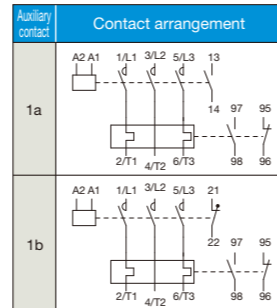
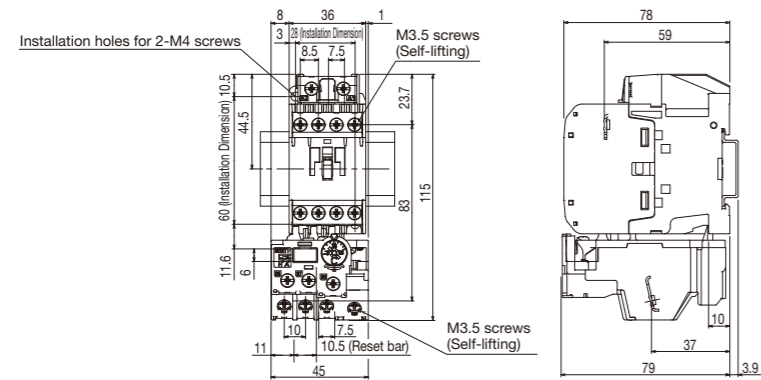




# Outline drawing, Contact arrangement

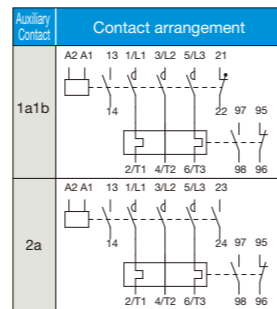
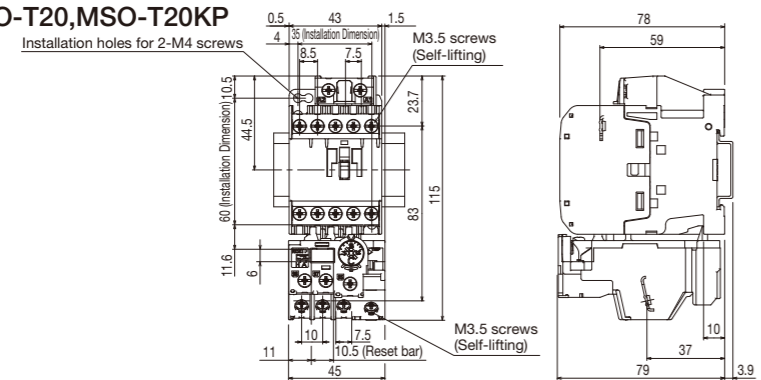
## Motor Starters

### MSO-T10,MSO-T10KP



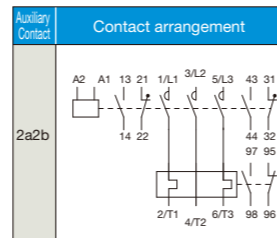
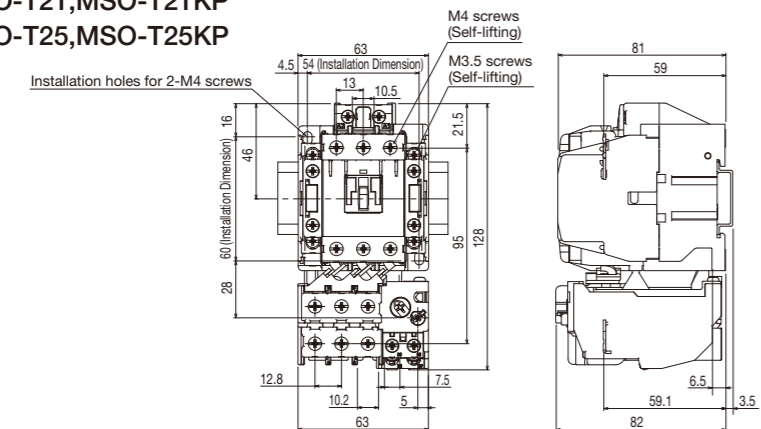
### MSO-T12,MSO-T12KP

### MSO-T20,MSO-T20KP



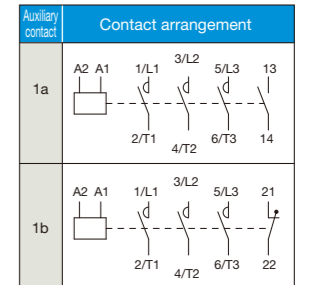
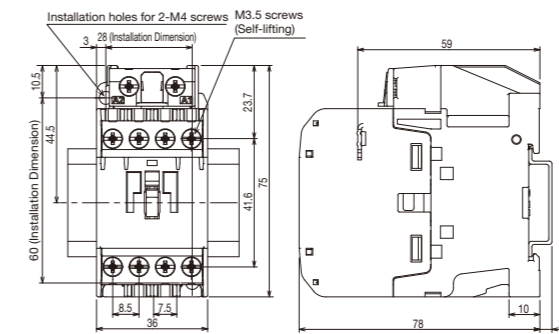
### MSO-T21,MSO-T21KP

### MSO-T25,MSO-T25KP



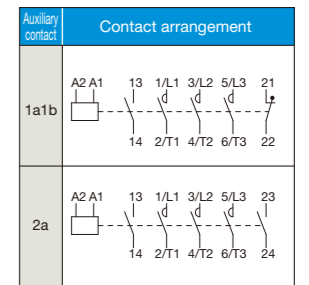
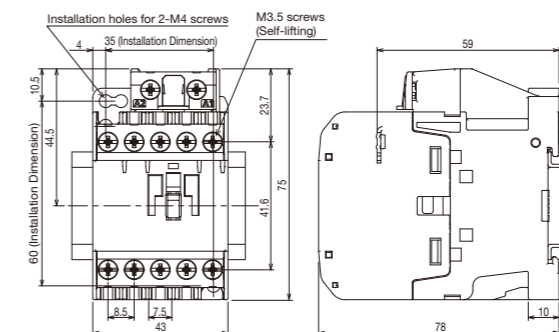
## Magnetic contactors

### S-T10



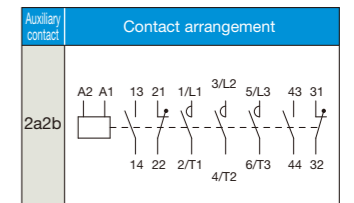
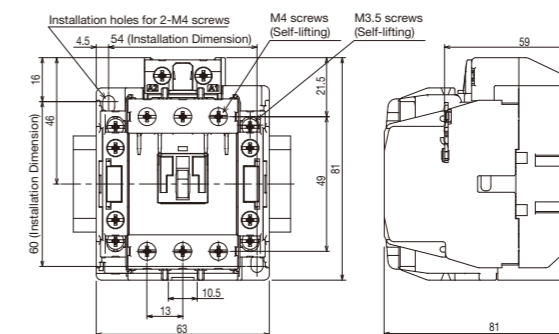
### S-T12

### S-T20

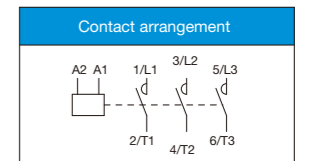
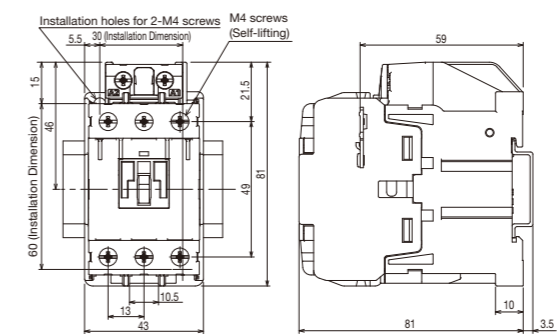


### S-T21

### S-T25

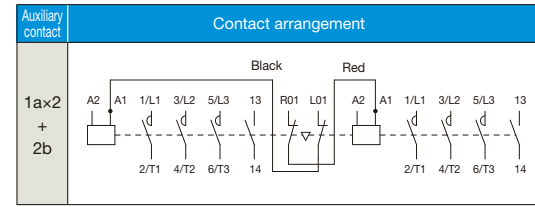
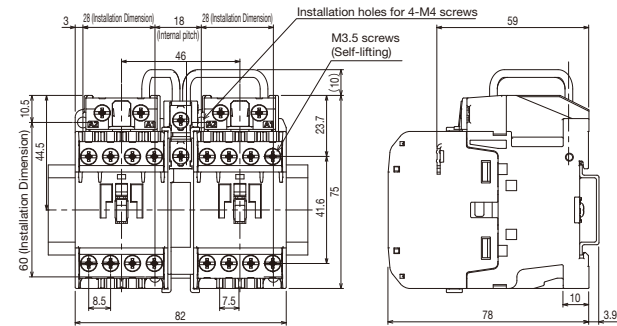


### S-T32



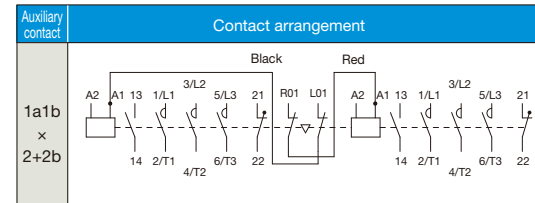
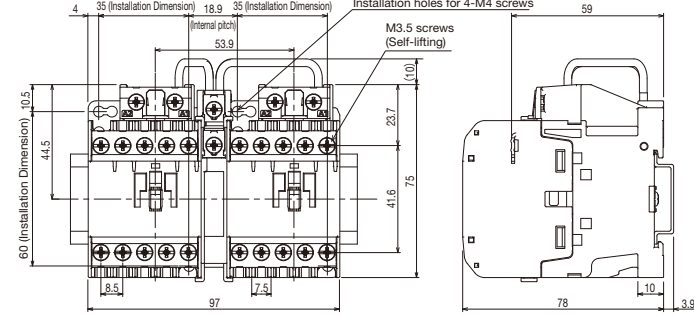
# Outline drawing, Contact arrangement

## S-2xT10



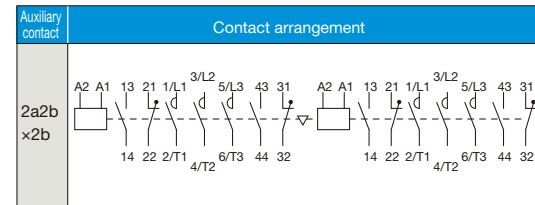
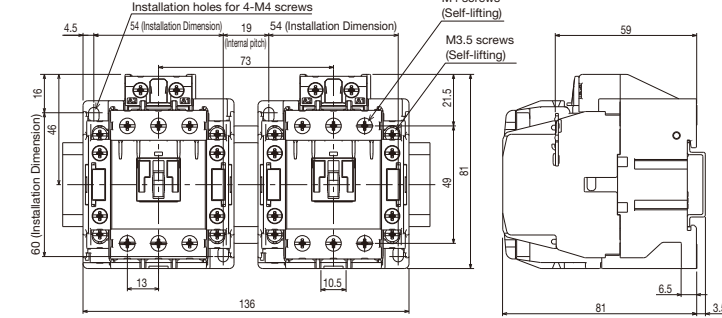
## S-2xT12

## S-2xT20

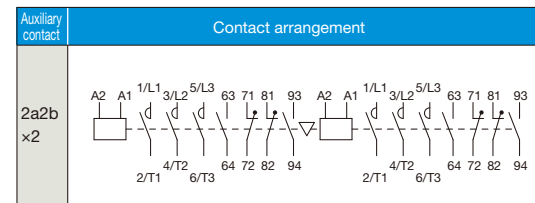
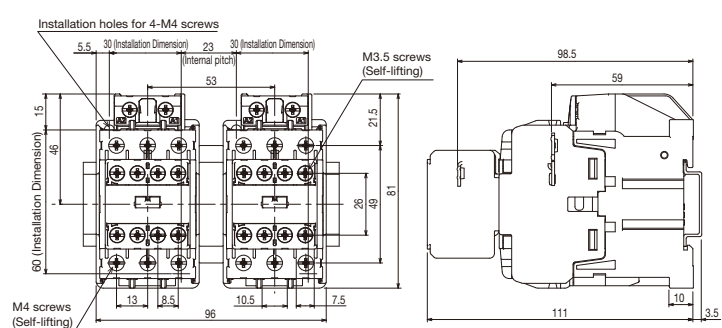


## S-2xT21

## S-2xT25

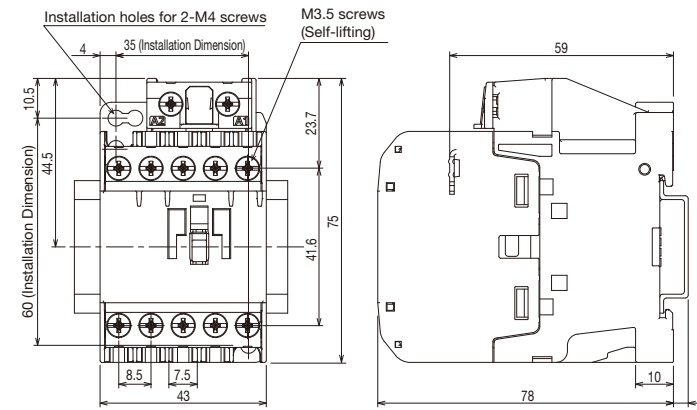


## S-2xT32



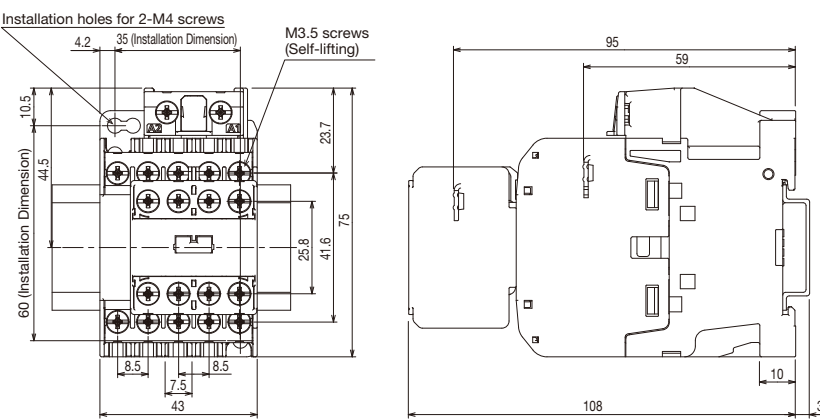
## Contactor Relays

### SR-T5



For contact arrangement and contact allocation, see Page 26.

### SR-T9



For contact arrangement and contact allocation, see Page 26.



## [Notes for adopting the product]

Before purchasing and using our products, please confirm the following product warranty.



### Period and scope of warranty

#### ●Warranty period

- (1) The warranty period for our products shall be one year after purchase or delivery to the designated location. However the maximum warranty period shall be 18 months after production, in consideration that the maximum length of distribution period is to be 6 months after shipping.
- (2) This warranty period may not apply in the case where the use environment, use conditions, or the number of open/close operation times specifically impact the lives of products.

#### ●Scope of warranty

- (1) When any failure occurs during the above warranty period which is clearly our responsibility, we will replace or repair the failed portion of the product free of charge at the location of purchase or delivery.  
Note that the "failure" mentioned here shall not include such items as scratches and discoloration which do not affect performance.
- (2) In the following cases, even during the warranty period, charged repair services shall be applied.
  - ① Failures caused by inappropriate conditions, environment, handling, and uses other than those specified in catalogs, instruction manuals or specifications.
  - ② Failures caused by inappropriate installation.
  - ③ Failures caused by the design of customer's equipment or software.
  - ④ Failures caused by the customer tampering with our products such as reworks without our authorization.
  - ⑤ Failures caused by the customer failing to correctly maintain or replace components such as spare parts, as specified by documents such as instruction manuals.
  - ⑥ Failures caused by uses of the product other than ordinarily intended.
  - ⑦ Failures caused by force majeure such as fire and abnormal voltage accidents, and natural disasters such as earthquake, wind and flood.
  - ⑧ Failures caused by reasons that were unforeseeable by the level of technology at the time of shipment.
- (3) The warranty that is mentioned here shall mean warranty of the unit of delivery, and any losses induced by the failures of delivered products shall be excluded from our warranty.

#### ●Failure diagnosis

In principle, primary failure diagnosis shall be conducted by the customer. However this job, if requested by the customer, can be performed by us or our service company with charge. In this case, a service fee shall be charged to the customer in accordance with our price list.

### Recommendation for renewal due to life

Our Motor Starters and Magnetic Contactors with contacts and mechanical parts have certain wear life in line with the number of switching operations, while our coil wires and electronic parts have aging degradation life influenced by the use environment and use conditions.

Regarding the use of our Motor Starters and contactors, we

recommend customers to renew the products every 10 years as a rule, provided that the products are used in line with the number of open/close operations specified by this catalog or the instruction manual.

We also recommend to renew devices other than the Motor Starters and Magnetic Contactors described in this catalog every 10 years as a rule.

### Exemption from warranty related to opportunity or secondary losses.

Regardless of in or out of warranty period, loss of opportunity and lost earnings at the customer side caused by the failures of our products, any damages caused by special situation regardless of our foreseeability, secondary losses, accident compensation, damages on anything other than our products, compensation to other jobs, and damages caused by any reasons for which we are not held responsible, shall be outside the scope of our compensation.

### Exemption from warranty related to opportunity or secondary losses.

- (1) The contents of products shown in this catalog are for your selection of models. When you actually use the product, read the "Instruction Manual" carefully beforehand and use correctly.  
Please note that the external view or specifications that should not affect the model selection can change without preannouncement.
- (2) When using a product listed in this catalog, you are required to accept that your use should not lead to any serious accident if by any chance the product develops any failures or errors, and, in the event any failure or error occurs, backup or fail-safe functions are in place outside the device by the system.
- (3) The products described in this catalog are designed and manufactured as general products to be used for general industrial fields. For this reason, the products described in this catalog should not be used for the applications requiring special quality assurance systems, such as serious public uses as atomic power plants and other power plants owned by power companies, railway applications and government and public office applications.  
Note, however, that the products shall be applicable to such uses if the use is limited and the customer agrees not to require specially high quality.  
Furthermore, when the customer is investigating application for the uses where serious impact is foreseen to the human body and assets and therefore high reliability for security and control system is required, such as aviation, medical services, railways, combustion and fuel equipment, manned transportation equipment, entertainment facilities and security machines, please contact our representatives and discuss any necessary agreement or specifications.

### Supply period of spare goods after production stop

- (1) For the discontinuation of production, we will announce in such media as "Sales and Service" paper created by us.

## [Notes for security related issues]

- Before performing the installation, wiring works, operation and maintenance/check for the products described in this catalog, make sure to read the "Instruction Manual" or "Notes for Use" attached to the product for correct usage.
- In spite of our continued efforts to enhance the quality and reliability of our product, the product can fail. The products described in this catalog can bring about serious results, such as malfunctions of machinery, short circuit at power supply, and catching fire, by the malfunction caused by vibration, physical shock and improper wiring. Pay special attention to avoid any secondary accidents such as injuries and fire, as the result of failures or malfunctions.
- When you find any questions or you need more details after reading this catalog, please contact your dealer or our company.

[For using the products described in this catalog, please observe the following items. ]



### ⚠ Danger

- Make sure to disconnect the power before you perform installation, removal, wiring works, or maintenance/checking. There is a risk of receiving an electric shock or occurrence of a malfunction.
- When the product is energized, avoid touching or coming near the product, especially the terminals having electricity. There is a risk of receiving an electric shock or burn injury.

### ⚠ Notes

- Use the product in the use environment described in this catalog and Instruction Manual. Do not install the product in any abnormal environment with high temperature, high humidity, dust, corrosive gas or excessive vibration/shock. There is a risk of catching fire, malfunctions, electric shock or failure.
- Avoid applying shocks by dropping or falling the product during transportation and unpacking. This will lead to breakage or failure of products.
- Do not use the product when it has received damage during transportation, installation or wiring. This can cause fire or malfunctions.
- Make sure that only technicians qualified for electric work or wiring should perform installation, wiring works and maintenance/checking of the product.
- Make sure that no foreign objects such as dust, iron powder and wire chips enter the product during installation and wiring works. There is a risk of contact failures and malfunctions leading to damage or fire at the load.
- When you use mounting screws of the wrong size or use a small number of screws than specified, or when the mounting to the rail of IEC 35mm width is defective, there is a risk that the product may fall.
- When you apply wiring works, be sure to use the wire size that suits the applied voltage, flow current and inrush current, and to fasten wires with the correct torque as specified in this catalog or the instruction manual. Defective wiring can cause fires, accidents and failures.
- To terminal screws and mounting screws, apply the torque as we specify for tightening, and regularly apply retorquing. When the tightening torque is too large, the work can damage terminal screws or mounting screws. When the terminal screws or mounting screws slacken or are broken, they can cause overheating or fire, or the body can fall off to create serious accidents.
- Confirm the rated values and specifications, and make sure to use a product that meets the requirements. When you use a product exceeding the rated/specified values, it may cause insulation breakdown leading to earth fault or short circuit accidents, or create the cause of fire by overheating or breakdown due to inability to shutdown.
- When a product described in this catalog is to be used in a facility where a failure can lead to injury to the human body or serious damage to earnings, make sure to install some safety mechanism.
- Apply regular checks to the product and use safety measures on the sequence to the critical circuits. The contacts of Motor Starters can develop defective conduction, welding or burnout.
- Contactors and Motor Starters can create welding of contacts disabling the opening, due to such causes as switching operation for excessive current, abnormal wearing of contacts, chattering at operational instruction contacts, aging degradation and product life. Also the contacts may fail to open due to unexpected mechanical constraints other than contact adhesion. Since the disability of contact to open can cause the machine to go out of control, secure safety by assuming the mechanical constraints or contact welding leading to inability of open/close operations. There remains a risk of fire even when an overload protective device (Thermal Overload Relays) is provided.
- The example connection described in this catalog only shows a typical one to run a system. For the protection of each device and safety measures, the customer is requested to consider the connection for each system.
- Do not apply reworks to the product or disassemble the product. These may cause failures.
- When you dispose of the products, treat them as industrial waste products.

## [Related Products]

## Sequencer

## MELSEC-Q Series Universal Model

High speed, large capacity data processing is now achieved to cope with increasingly complicated production/manufacturing facilities.

- ◎High speed, high accuracy machine control is achieved by multi-CPU configuration using various controllers that support iQ Platform.
- ◎The support for Ethernet with built-in CPU allows easy connection of a programming tool, GOT.
- ◎Lineup of 20 models, ranging from small capacity of 10k steps to large capacity of 1000k steps
- ◎A rich network integrates various FA layers seamlessly.



## Production Specifications

Program capacity	10k steps - 1000k steps
Number of input/output points [X/Y] / number of input output device points[X/Y]	256 points - 4096 points/8192 points
Basic instructions' processing speed (LD instruction)	120ns - 9.5ns
External connection interface	USB (supported by all models), Ethernet, RS-232, memory card
Function unit	I/O, analogue, high-speed counter, positioning, temperature input, temperature adjustment, network unit
Unit expansion mode	Building block type
Network	Ethernet, CC-Link IE controller, CC-Link IE field, CC-Link, CC-Link/LT, MELSECNET/H, SSCNET, AnyWire, RS-232, RS-422

## HMI

## Graphic Operation Terminal GOT1000 Series, Model GT16

All-in-one configuration of full functions desired for a display, enclosed in a full-flat body

- ◎Ethernet, RS-422/485 and RS-232 interfaces are equipped as standard in all models. This feature enables various ways of communication.
- ◎Supports multimedia unit, video/RGB unit (optional) that enable recording and playing of smooth motion video.
- ◎USB device and host are mounted in the front side as standard. The feature allows easy connection with PC and data handling.
- ◎Large memory capacity of 15MB. Enables use of optional functions and real parts without concern about the memory capacity.



## Production Specifications

Screen size	5.7 type, 8.4 type, 10.4 type, 12.1 type, 15 type
Resolution	VGA, SVGA, XGA
Intensity adjustment	4 step, 8 step
Touch panel method	Analogue resistive film method
Built-in interface	RS-232, RS-422/485, Ethernet, USB, CF card
Supported software	GT Works3
Input power voltage	AC100 - 240V (+10%, -15%), DC24V (+25%, -20%)

## Inverter

## FREQROL-A700 Series

High function, high performance inverter

- ◎Allows high precision, quick-response speed control by real sensorless vector control even when you use a general purpose motor without PLG (encoder). (200% torque/0.3Hz (less than 3.7K))
- ◎Combining with a motor with PLG, you can achieve a full-fledged vector control (when using the option).
- ◎Built-in noise filter (EMC filter) enables reduction of noises arising from the inverter.
- ◎Since the product allows operation of an IPM motor, it can run the motor at the optimum motor characteristic by auto-tuning.



## Production Specifications

Inverter capacity	200V class : 0.4kW to 90kW, 400V class : 0.4kW to 500kW
Control method	IPM control, Soft-PWM control, high carrier frequency PWM control (selectable from V/F, advanced flux vector and real sensorless vector), vector control (when using option)
Output frequency range	0.2 - 400Hz (real sensorless vector control, with upper limit frequency at vector control being 120Hz)
PM off-line auto-tuning	Automatic measurement of motor constant when using MM-CF series allows operation at the optimum motor characteristic. (It also enables the use of IPM motors other than MM-CF series, or IPM motors of other brands.)
Starting torque	200% 0.3Hz (less than 3.7K), 150% 0.3Hz (more than 5.5K) (when using real sensorless vector control, or vector control)

## AC Servo

## Mitsubishi General-purpose AC Servo MELSERVO-J4 Series

Industry-leading level of high performance servo

- ◎Industry-leading level of basic performance: Speed frequency response (2.5kHz), 4,000,000 (4,194,304p/rev) encoder
- ◎Advanced one-touch tuning function achieves the one-touch adjustment of advanced vibration suppression control II, etc.
- ◎Equipped with large capacity drive recorder and machine diagnosis function for easy maintenance.
- ◎2-axis and 3-axis servo amplifiers are available for energy-conservative, space-saving, and low-cost machines.



## Product Specifications

Power supply specifications	1-phase/3-phase 200V AC
Command interface	SSCNET III/H, SSCNET III (compatible in J3 compatible mode), pulse train, analog
Control mode	Position/Speed/Torque
Speed frequency response	2.5kHz
Tuning function	Advanced one-touch tuning, advanced vibration suppression control II, robust filter, etc.
Safety function	STO, SS1
Compatible servo motor	SS2, SOS, SLS, SBC, SSM (compatible when combined with motion controller)
Rotary servo motor capacity	Rotary servo motor, linear servo motor, direct drive motor
	0.05 to 7kW

## EDM

## Wire EDM MV1200R

A global standard model pursuing speed and precision

- ◎With the control of instruction unit being 0.1µm and internal interpolation unit being 1nm, high precision and smooth mechanical work have been achieved.
- ◎Operation and display that do not let one feel the layer structure of the screen, as well as easy program control using standard implementation of Ethernet I/F have been realized.
- ◎A compact unit integrating a display and controller being integrated has contributed to miniaturization of the control board.
- ◎A compact unit with integration of the display and controller has contributed to miniaturization of the control board.



## Production Specifications

Maximum number of control axes (NC axis + main axis + PLC axis)	Type A: 11 axes Type B: 9 axes
Maximum number of paths	Type A: 2 paths Type B: 1 path
Minimum instruction unit	0.1µm
Minimum control unit	1nm
Maximum program memory capacity	Type A: Max.2,000KB (5,120m) Type B: 500KB (1,280m)
Maximum PLC program memory capacity	Type A: 32,000 steps Type B: 20,000 steps
Main functions (for machining center)	OMR-DD control (high-speed synchronous tapping function), high-speed high precision control, tool tip control, tilted surface work, etc.
Main functions (for lathe)	Milling interpolation, 2-path simultaneous thread cutting, inter-path control axis synchronization, control axis superposition, mixed control, etc.

## Robot

## Industrial Robot MELFA F Series RV-4F

High-speed, high-precision, high-function 4kg transportable vertical-multijoint robot

- ◎Using the unique driving technology, higher-speed motion has been realized.
- ◎Hand wiring and internal piping have contributed to enhanced tooling performance.
- ◎Expansion of the rotational axis motion range has enabled full utilization of the installation space.
- ◎Adoption of flap-shape arm has realized an operational area suited to a compact area.



## Production Specifications

Degree of freedom of motion	6
Structure	Vertical multijoint type
Installation posture	Floor standing, hanging from the ceiling, hanging on the wall (with some restrictions on the motion range at J1)
Weight capacity	4kg
Maximum reach diameter	515mm
Cycle time (load weight)	0.36 sec. (1kg)
Position repetition accuracy	±0.020mm
Protection Specifications	IP40 (Clean specification: ISO class 3, oil mist specification: IP67)

# Contactors and Motor Starters

 **Safety Warning**

To ensure proper use of the products listed in this catalog, please be sure to read the instruction manual prior to use.

Mitsubishi Electric Corporation Nagoya Works is a factory certified for ISO14001 (standards for environmental management systems) and ISO9001(standards for quality assurance management systems)



Eco Changes is the Mitsubishi Electric Group's environmental statement, and expresses the Group's stance on environmental management. Through a wide range of businesses, we are helping contribute to the realization of a sustainable society.

## MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE: TOKYO BLDG., 2-7-3, MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN  
[www.MitsubishiElectric.co.jp/melfansweb](http://www.MitsubishiElectric.co.jp/melfansweb)