

OPTION UNITS WHICH INCREASE THE FUNCTIONS OF MAGNETIC SWITCHES AND APPLICATION TYPE

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1. FOREWORD

Magnetic switches are used as the final output stage of the electric control system in the control of various load machinery. In recent years, application of magnetic switches combined with electronic control devices has become noticeably popular, centered about the control field, and functions which can exchange signals directly with electronic devices is demanded. Because of the demand for labor saving and improvement of safety in the manufacture and maintenance of distribution panels, smart panel devices are demanded. Diverse responses to the needs of general industry, including FA, is demanded and magnetic switches are shifting from the conventional single function product to multifunction products.

The new SC series magnetic switches meet these needs. Their multifunctionalization by renovation of the construction and performance and various options make a wider range of applications possible. These various options and the functions and applications of the applicable types are introduced here.

2. OPTION UNITS CONFIGURATION

The new SC series magnetic switches embody various functions as option units and are aimed at a configuration which can respond instantly to various needs. That is, functions are upgraded according to the application by installing option units to the new SC series magnetic switch. The abundant option units are applicable to all models, and are constructed so that they can be freely mounted and dismounted by the user.

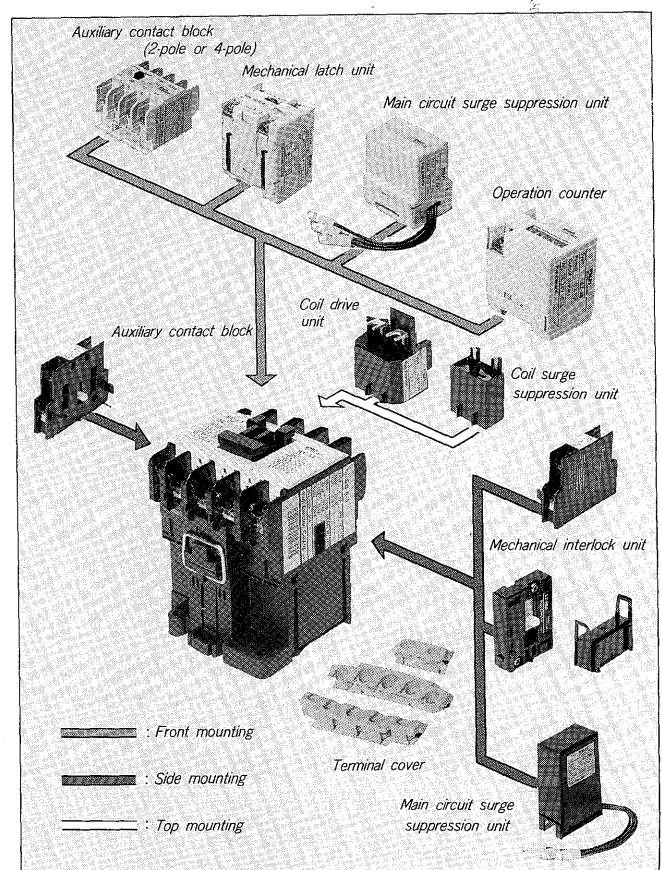
The option units group is shown in *Fig. 1*. The option units of the new SC series are defined by mounting position as (1) front mounting, (2) side mounting, and (3) top mounting.

2.1 Contactor and auxiliary relay option

2.1.1 Auxiliary contact block

Two-pole and 4-pole auxiliary contact block common to all models are available. These blocks can be easily

Fig. 1 Option unit group



mounted and dismounted to and from contactors and auxiliary relays even in the field.

The front mounting type designed to save mounting space is available in 4-pole (4N0, 3N0 1NC, 2N0 2NC) and 2-pole (2N0, 1N0 1NC, 2NC) versions. The side mounting type used when the depth dimension is restricted and when used with other front mounting units is two poles (1N0 1NC). It can be mounted at both the left and right sides (2N0 2NC) in total. The front mounting type is also equipped with 4-pole (2N0 2NC) and 2-pole (1N0 1NC) overlapping contact. The auxiliary contact block can only be mounted at the front or side because of magnet attraction force restrictions.

Fig. 2 Auxiliary contact block (front mounting)

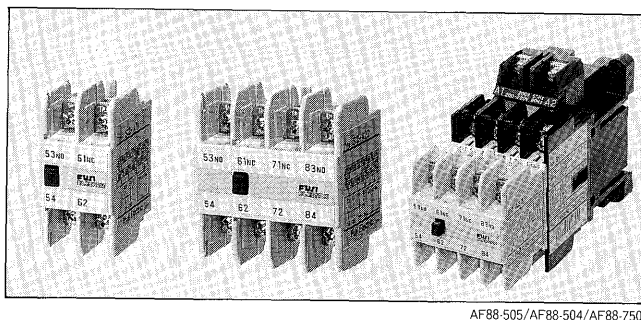
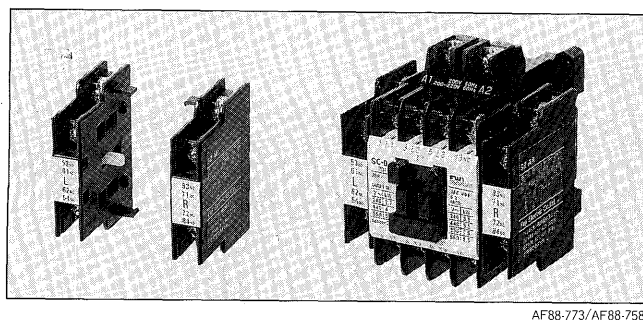


Fig. 3 Auxiliary contact block (side mounting)



Exterior view of the front mounting type auxiliary contact block are shown in Fig. 2. Exterior views of the side mounting type auxiliary contact block are shown in Fig. 3.

The contact reliability of the auxiliary contact block in low voltage and low current circuits has been improved noticeably by using bifurcated contacts, the same as contactor auxiliary contacts and auxiliary relays contacts. (For details, see "High Reliability, Advanced Functions New Type Industrial Relay SH series" in this issue.

2.1.2 Operation counter

For system in which stopping of facilities, plant, etc. introduces a large loss, maintenance of the equipment, including electric machinery, is extremely important. However, the performance and operating conditions of each machine are diverse, and maintenance and inspection are not uniform. Therefore, simplification of maintenance and inspection based on the operating data, etc. of each machine is desirable.

The operation counter counts and displays the number of operations of the contactor, and assists preventive maintenance as a maintenance and inspection period and life criteria. This unit is constructed to mount to the front of the contactor and to mechanically count the operation of the contact carrier.

Two types of operation counters are available: one with counting and display functions but no output contacts (type SZ-J) and one with output contacts which output a signal when a fixed number of operations is reached (type SZ-J with built-in lead switch).

Their exterior views are shown in Fig. 4. Counting system examples are shown in Fig. 5. Operation counter ratings and performance are shown in Table 1.

Fig. 4 Operation counter

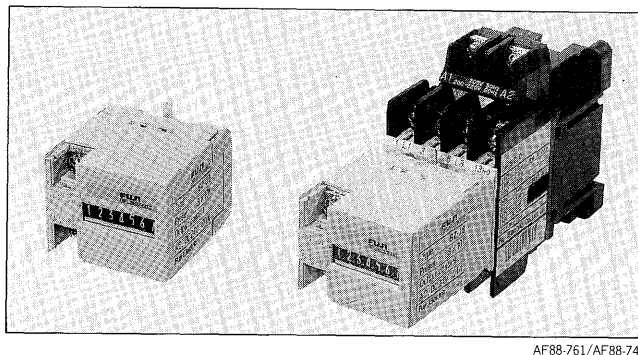


Fig. 5 Counter count display and output display example

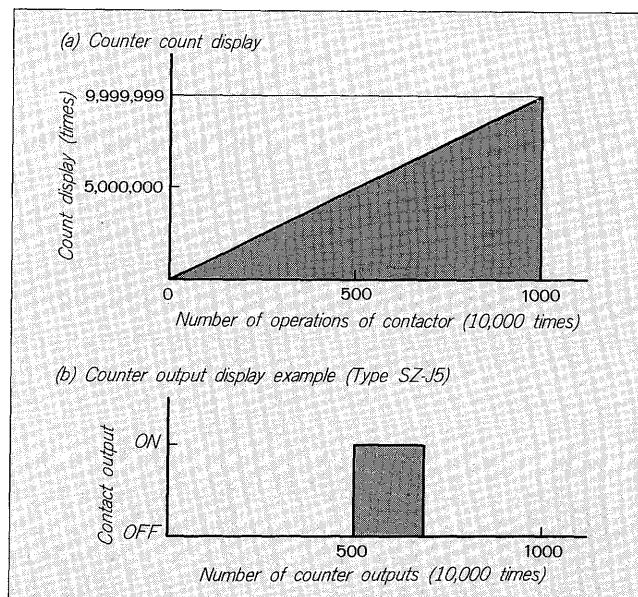


Table 1 Operation counter ratings and performance

Type	SZ-J□		SZ-J
	With alarm output contact		Without output contact
Operating system	Mechanical, total counter		
Number of digits	7		
Counting system	1 count at 1 contactor switching operation		
Maximum counting speed	10cps		
Reset (zero return)	No reset		
Output contacts	Contact arrangement	1a	
	Switching capacity	AC, DC24V, 100mA	
	Max. making current	0.4A	
Performance	Mechanical life expectancy	9,999,999 (number of counts)	

The life of contactor differs with the usage conditions. For instance, when voltage fluctuations are large, when inching is included, and so forth. The counter count display is reference data as life criteria. Regarding actual use,

life forecast and maintenance and inspection interval must be decided after considering the usage conditions.

2.1.3 Main circuit surge suppression unit

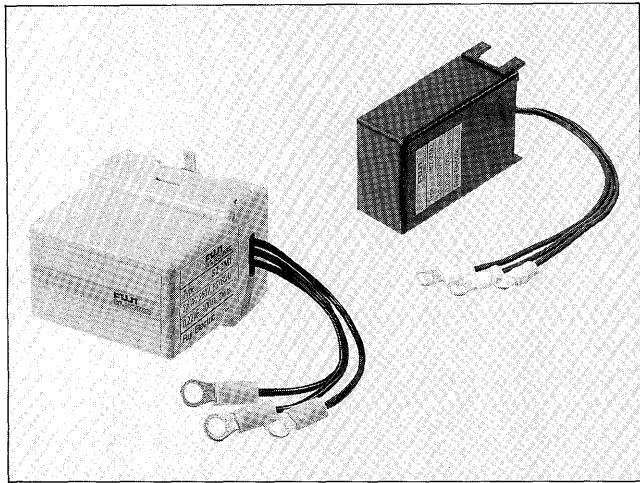
The main circuit surge suppression unit suppresses the affects of surrounding electronic equipment erroneous operation, circuit breakdown, and other surge voltages by absorbing the surge voltage generated when a 3-phase motor load was turned on and off by a contactor.

Delta wired CR elements are built into this unit. The unit mounts to the front or side of the contactor with one touch and is configured so that when matched to the panel space and there is a margin in the depth direction, it is mounted at the front (front mounting type: SZ-ZM1) and when there is surplus floor space, it is mounted to the side (side mounting type: SZ-ZM2).

Exterior views are shown in Fig. 6. A connection diagram example is shown in Fig. 7. The surge voltage suppression effect is shown in Fig. 8.

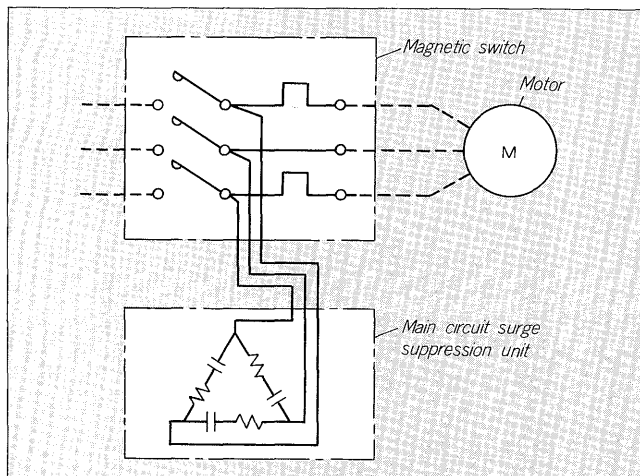
Since the main circuit surge suppression unit cannot suppress surges and noise generated from an inverter, etc., it must be used with another reactor and noise cut transformer (our TRAFY).

Fig. 6 Main circuit surge suppression unit



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Fig. 7 Main circuit surge suppression unit connection diagram



2.1.4 Coil surge suppression unit

The coil surge suppression unit suppresses the affect of surrounding electronic equipment erroneous operation, circuit breakdown, and other surge voltages by absorbing the surge voltage generated when the coil of a contactor and auxiliary relay is turned off.

A type with built-in varistor for preventing electronic equipment voltage breakdown (types SZ-Z1~Z3) and a type with a built-in CR for preventing erroneous operation of electronic equipment by the noise which accompanies the sudden rise of a surge (types SZ-Z4~Z5) are available. Types (SZ-Z6~Z9) with a trip indicator lamp which lights when a voltage is impressed onto the coil are available with the built-in varistor and built-in CR types.

Mounting is performed easily by only tightening the coil surge suppression unit connection terminals with the coil terminals. Since it is accommodated at the dead space at the bottom of the coil terminals, it is a work- and space-saving type which does not take up any mounting area.

Exterior views are shown in Fig. 9. Surge voltage sup-

Fig. 8 Main circuit surge suppression unit effect (AC220V, 2.2kW 3-phase motor)

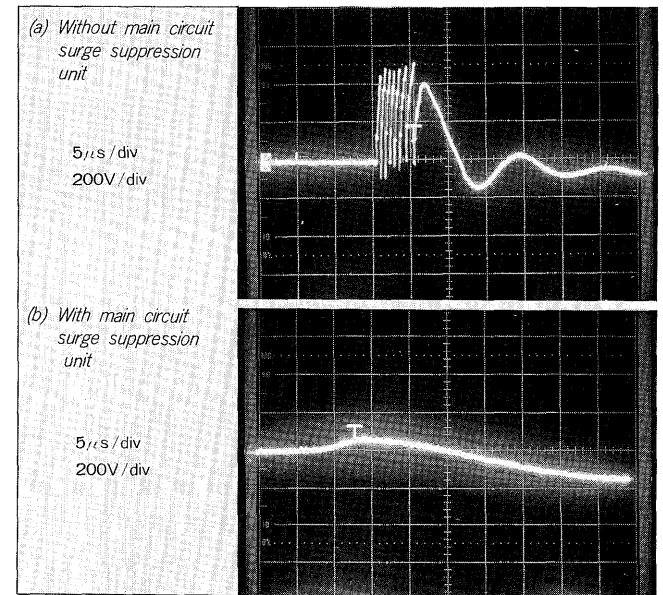
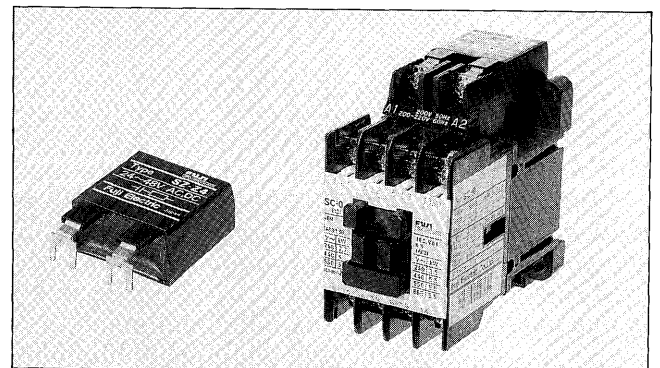


Fig. 9 Coil surge suppression unit



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Fig. 10 Coil surge suppression unit effect (AC200V coil)

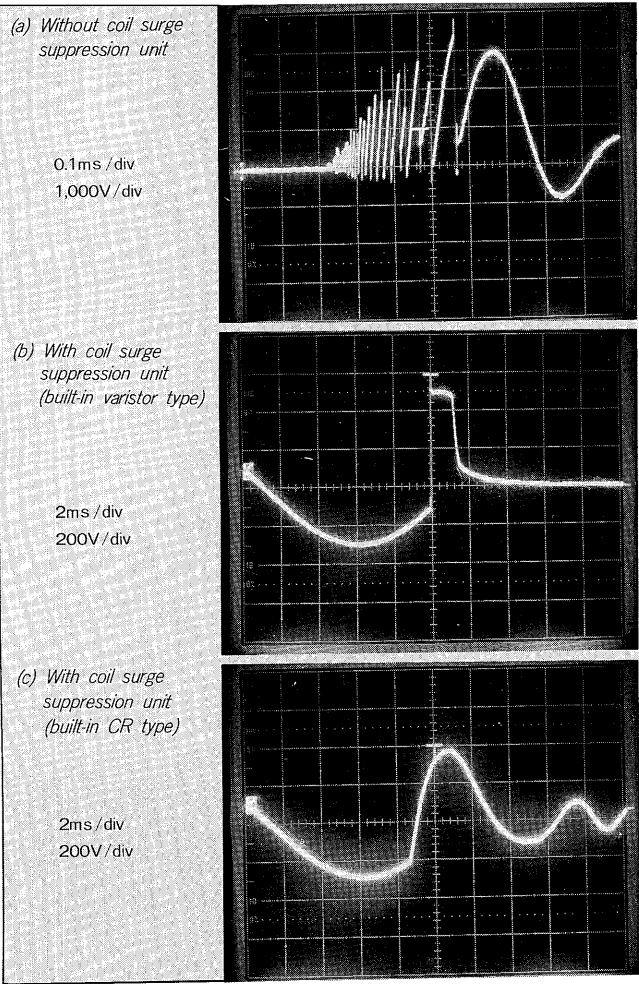
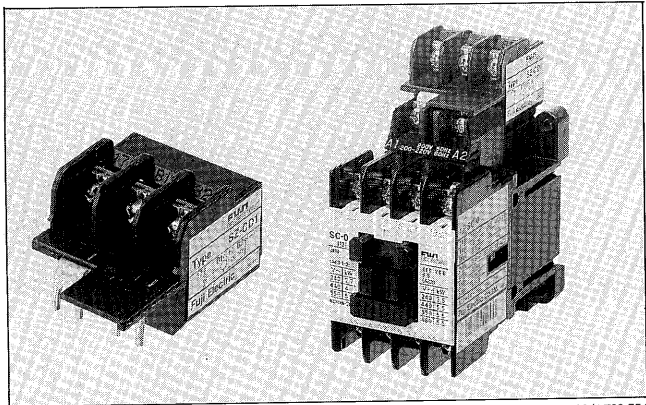


Fig. 11 Coil drive unit



pression effect examples are shown in Fig. 10.

2.1.5 Coil drive unit

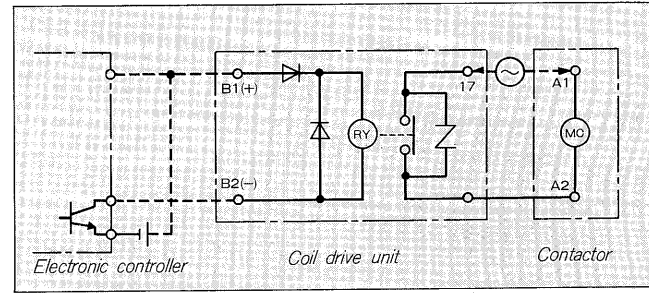
The coil drive unit for IC output is an interface unit which can directly drive the operating coil of a contactor or auxiliary relay even with the low level current of the transistor output (DC24V, 10mA) of a programmable controller (PC) and other electronic control circuit.

It is mounted easily by only tightening the connection

Table 2 Coil drive unit specifications

Operating section	Rated voltage	DC24V
	Operating voltage	70% or less of the rated voltage (at 20°C)
	Reset voltage	10% or less of the rated voltage (at 20°C)
	Max. allowable voltage	130% or less of the rated voltage (at 20°C)
	Rated power consumption (operating current)	0.2W (8.3mA)
Contact section	Max. switching current	AC220V, DC110V
	Rated current	3A
	Max. making current	10A
	Max. switching capacity	DC24~48V 20W(L/R = 7ms) AC1000~220V 200VA (cosφ = 0.4)

Fig. 12 Coil drive unit connection diagram



terminals of the coil drive unit together with the coil terminals with a screw. Since the conventional interface relay can be omitted, wiring man-hours and mounting space can be saved.

Exterior views are shown in Fig. 11. The specifications are shown in Table 2. A connection circuit example is shown in Fig. 12.

2.1.6 Terminal cover

(1) Live parts exposure restriction

Ample consideration has always been given to isolation of the terminal section. Recently, however, the restrictions on protection any electric shock have been strengthened, especially in Europe, and limiting of the exposure of live parts has become general.

VBG4 (West Germany accident prevention standard "Electric Facilities and Handling Method") is the policy related to live parts exposure prevention. This standard describes the approach to protection for use of electric facilities to prevent electric shock accidents. DIN57106 Teil100 and VDE0106 Teil100 were revised and the following were specified based on the VBG4 approach:

(a) Finger protection

This is related to electric shock accident prevention nearest the operating section. The test finger (12mm diameter) must not touch the live part from the perpendicular direction relative to the machine. [Fig. 13(a)].

(b) Back-of-the-hand protection

This is related to the prevention of exposure of

Fig. 13 Live parts exposure restrictions according to DIN

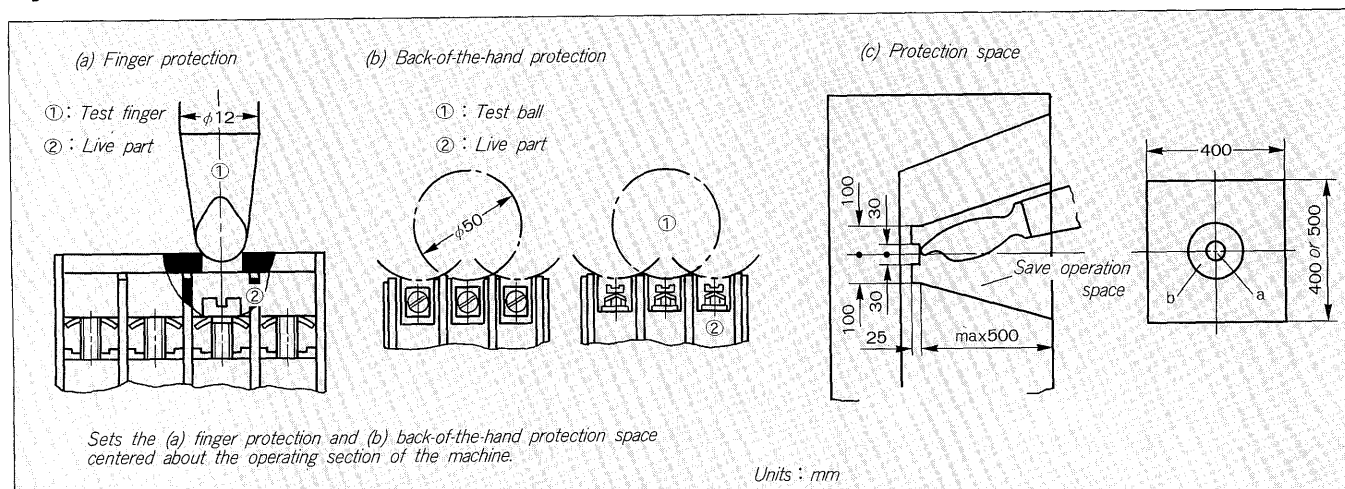
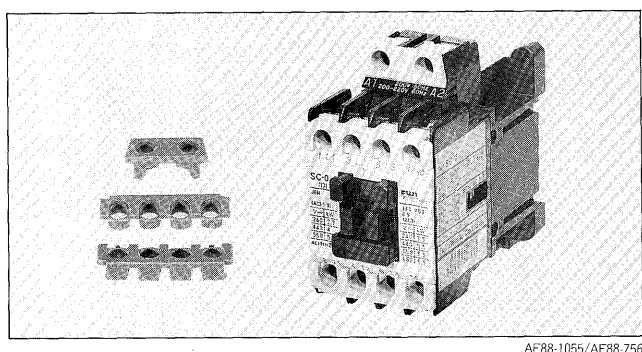


Fig. 14 Terminal cover and contact mounting state



live parts near the operating parts inside the panel. A 50mm diameter ball must not touch the live parts. [Fig. 13(b)].

(c) Protective space

The range over which there is a danger of the machine being touched by hand, centered about the operating parts, is estimated and made the live parts exposure prevention space. [Fig. 13(c)]

(2) Terminal cover

The new SC series magnetic switch was provided with a terminal cover which takes these standards into account as an option. Since crimp terminals are generally used for wiring end processing in Japan, the construction is such that the terminal cover can be mounted and dismounted after wiring. This takes into account workability at maintenance and inspection.

The terminal cover and a terminal cover mounting state example are shown in Fig. 14.

2.2 Thermal relay options

The thermal relay option group is shown in Fig. 15.

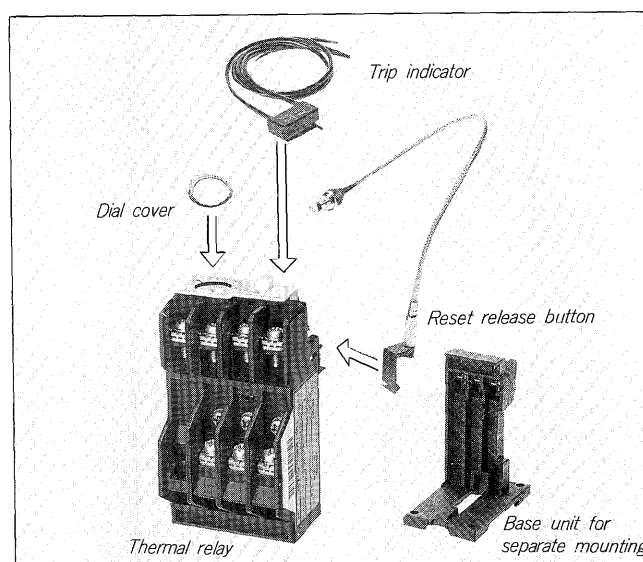
(1) Dial cover

This prevents careless modification of the thermal relay current setting value.

(2) Reset release button

This makes it possible to reset the thermal relay from

Fig. 15 Thermal relay options



the front of the panel and from a remote position. It also improves mountability by one-touch mounting.

(3) Trip indicator

This indicates the trip operation by means of a lamp when the thermal relay trip indication is difficult to see deep inside the panel, etc.

(4) Base unit for separate mounting

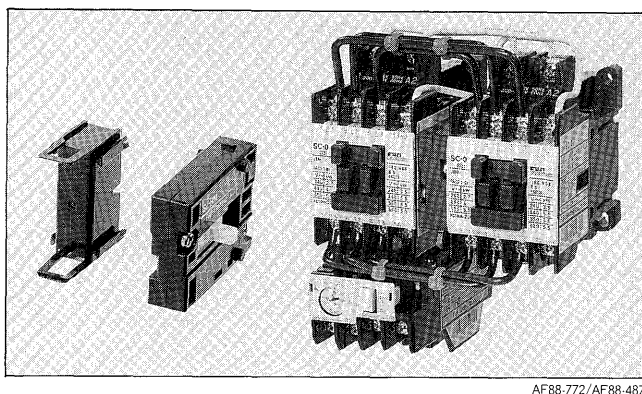
This is a mount which uses the thermal relay as a separate motor protection device. It is a mount unit which allows both screw mounting and track mounting. The thermal relay can be installed to this unit with one touch.

3. APPLICATION MODELS

3.1 Reversing magnetic switch and contactor

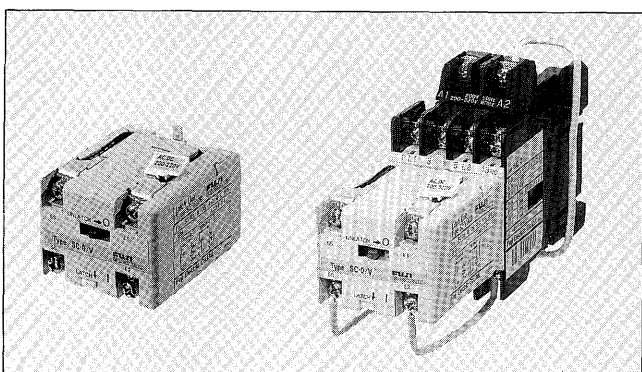
Conventionally, reversing magnetic switches for use in motor forward and reverse operation and plugging operation are assembled at the factory and shipped.

Fig. 16 Interlock unit and reversing motor starter



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Fig. 17 Mechanical latch unit and mechanically held contactor



AF88-762/AF88-550

With the new SC series, mechanically interlocked reversing magnetic switches and contactors are assembled by the user to eliminate adjustment and shorten the delivery period. The mechanical interlock unit (type SZ-RM) consists of an interlock mechanism which mechanically prevents simultaneous closing of contactors and a joint block for direct connection of two contactors. A reversing type can be easily configured at the site by combining this with a reversing wire kit (type SZ-RW□). Of course, conventional assembly at the factory and shipment is also possible.

An example of an interlock unit and mechanically interlocked reversing magnetic switch is shown in Fig. 16.

3.2 Mechanically held contactor

The mechanically held type is used to save load circuit or coil power at which opening of the contactor by a power failure, momentary power failure, voltage drop, etc. is a problem.

With the new SC series, a mechanical hold unit (type SZ-V□) common to all types is available so that a mechanically held contactor can be easily configured.

An example of the mechanical hold unit and mechanically held contactor is shown in Fig. 17. The operating circuit is shown in Fig. 18.

3.3 OFF-delay release contactor

When trouble occurs in an electric power system

Fig. 18 Mechanically held contactor operation circuit

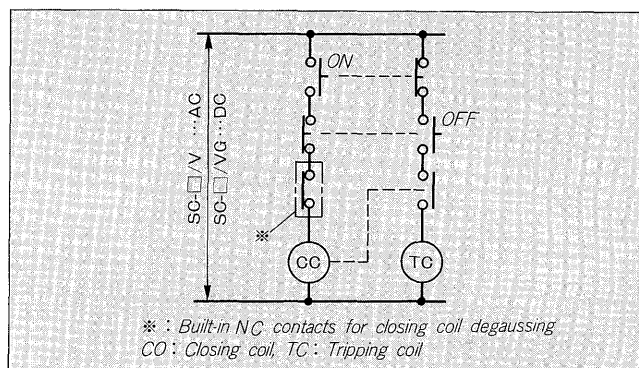
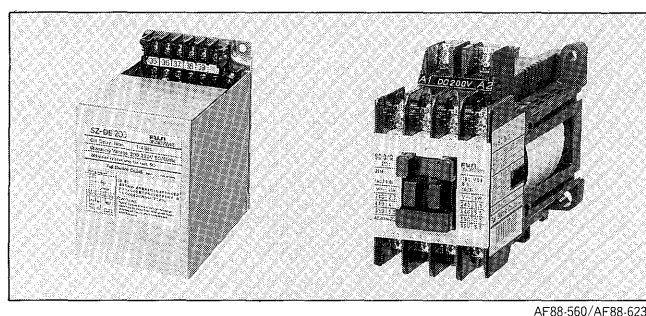


Fig. 19 OFF-delay release unit and DC operating contactor



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due to lightning, etc., a short power failure and voltage drop is generated until the trouble is removed. A momentary power failure and voltage drop of about 0.3 seconds or less cannot be avoided. For safety, up to about 1 second must be considered.

On the other hand, when a voltage drop of 50% or more continues for 0.005 to 0.02 seconds, the magnetic switch is released. To avoid shutdown of the facility at a momentary power failure and voltage drop, an OFF-delay release contactor which delays the release operation about 1 to 5 seconds is used.

With the new SC series, an OFF-delay release contactor can be configured by combining a DC operated contactor and OFF-delay release unit. An example of combination of an OFF-delay release unit and DC operated contactor is shown in Fig. 19.

When the power supply capacity is low, such as the electric power facility for a small factory, farm, and temporary work, the starting current when a motor is started causes a large voltage drop and the contactor may be attracted while bouncing. Since a capacitor is charged and there is no abnormal operation even when used when there is a voltage drop of about 50%, such as this, the OFF-delay release contactor is convenient.

3.4 Motor starter with enclosure

Conventionally the motor starter with cover used in motor start and stop control was mainly an iron box. However, a plastic box is used with the new SC series. This offers such advantages as improvement of isolation,

The image shows a rectangular, white, textured object, possibly a piece of paper or a small box, standing upright. The object has a small, dark, circular mark near the top center. The background is a light, textured surface.

The pushbutton magnetic switch has also been serialized with a plastic box with the new SC series.

The various options and application models functions of the new SC series which meets diverse needs were introduced above. The opinion of users regarding these function of the new SC series will be obtained and the series filled out farther in the future.