

HIGH RELIABILITY, ADVANCED FUNCTIONS NEW TYPE INDUSTRIAL RELAY SH SERIES

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1. FOREWORD

Contactor type auxiliary relays have been widely used as control relays for some time, but they are now being replaced by the programmable controller (PC) for sequence control, which is becoming increasingly complex. However, because of its comparatively small size, multiple contacts and various contact configurations, use in circuits of up to 660V, ability to be handled without the need for advanced technology, and other features, there is still a strong demand for the auxiliary relay in applications in which control by a small number of auxiliary relays is possible.

The noticeable electronification of the control field in recent has been accompanied by a demand for auxiliary relays with high contact reliability in low voltage and low current circuits which can be combined with these electronic control devices.

The demand for multifunctionalization which allows the addition of various functions to cope with more complex and advanced systems and improvement of installation and wiring and maintenance and inspection ease is also strong.

The industrial relay SH series developed by pursuing high reliability, advanced functions, and easier use to meet the demands of the market is outlined here. Its exterior view is shown in *Fig. 1*.

2. FEATURES AND CONSTRUCTION

2.1 Features

2.1.1 Improvement of contact reliability

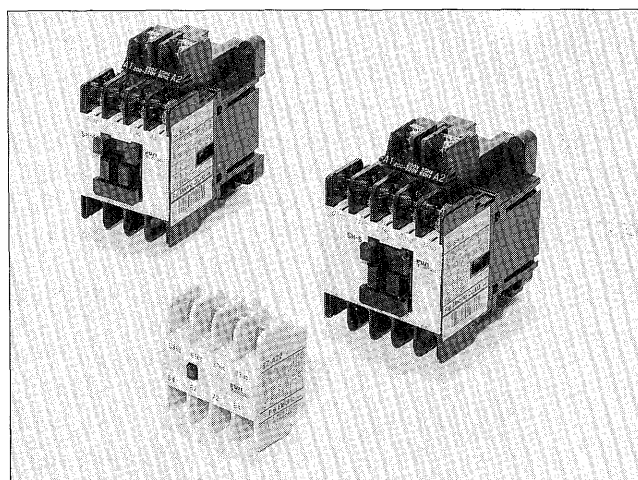
The contact reliability of the SH series standard models has been improved by using bifurcated contacts, optimizing the contact pressure, and using a dust-tight construction. This has made it possible to use them at a minimum working voltage and current of DC5V and 3mA.

The bifurcated contacts are shown in *Fig. 2*.

2.1.2 Multifunctionalization

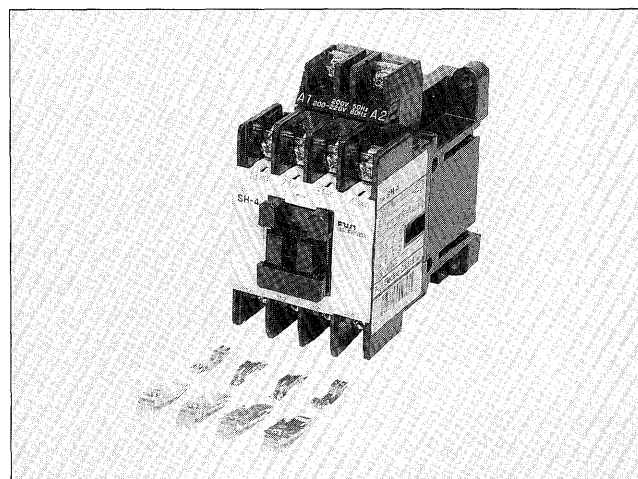
An auxiliary contact block, coil surge suppression unit, coil drive unit, and many other optional units are available with the SH series, and coping with multifunc-

Fig. 1 New type industrial relay SH series



AF88-567

Fig. 2 Exterior view of bifurcated contacts



AF88-982

tionalization is much easier.

2.1.3 Improvement of ease of use

The new SH series can be mounted to a panel by both screw mounting and tracking mounting.

The operating coil is common with the new small contactor SC series. It is an easy to handle cassette coil. Handling ease has been improved by constructing the

Fig. 3 State of parts at coil replacement

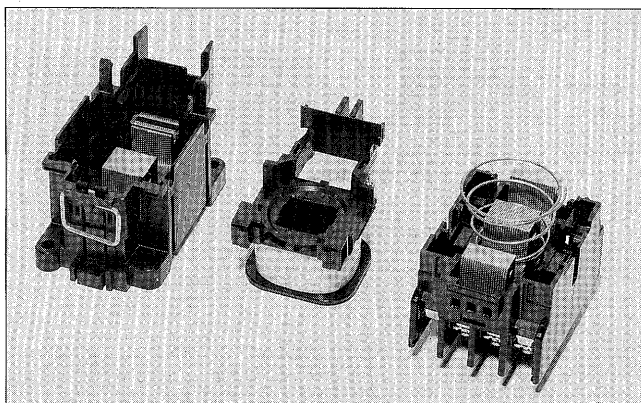
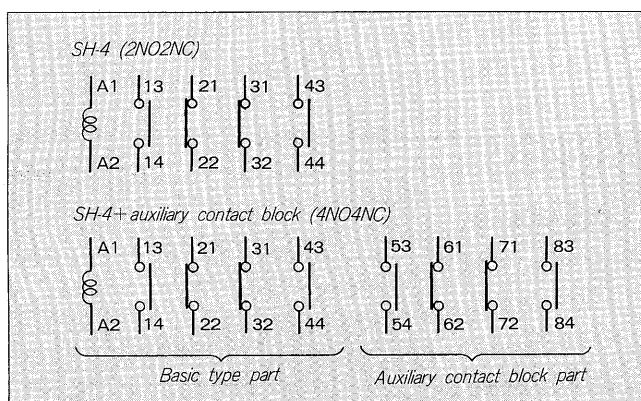


Fig. 4 Examples of auxiliary relay terminal numbers



operating coil so that there are no parts which can drop out and it can be replaced easily.

The state of the parts at coil replacement is shown in Fig. 3.

2.1.4 International product

(1) Meets world standards

The SH Series is constructed to meet IEC, VDE, BS, NEMA, UL, CSA, BV, Lloyd and other major standards of the world, besides, of course, domestic standards.

(2) Terminal numbers

The SH series uses IEC terminal numbers to qualify as an international product. A terminal numbers example is shown in Fig. 4.

IEC standards specify the terminal numbers. The future trend is toward worldwide standardization. IEC standards represent the terminal numbers of auxiliary circuit by a 2-digit number. The units digit is called the function number, and represents NO contacts, NC contacts, etc. The tens digit is called the sequence number, and is numbered consecutively. The contact configuration type and position can be ascertained by reading the terminal number.

(3) Terminal cover

The same terminal cover matched to the finger protection specifications for Europe as the new small contactor SC series is optional with the SH series.

2.2 Construction

For the SH series, the contacts in the new small contactor SC series are also made bifurcated contacts and the features of the SC Series are retained.

(1) Bifurcated contacts

In recent years, electronic control devices, of which the PC is typical, have come into wide use in control systems, and lowering of the signal voltage and current levels has advanced. Recently, a need has arisen to make it possible to use the auxiliary relays, which transmit these signals, with loads from the 24V, 10mA of the past to several volts and several milliamperes. Examples of the input level of Fuji Electric PC are given in Table 1.

The causes of contact failure are dust which enters from the outside, wear powder produced from the inside, and chemical products of the contact surface. In the past, a system which removes foreign matter from the contact surface, such as the spitz slide mechanism, and the bifurcated contact system which reduces the generation of contact failures, and corrosion-resistant gold contacts, etc. were used against this. However, with the spitz slide mechanism, obtaining reliability at several volts and several milliamperes is difficult. With gold contacts, the affect on cost was a problem.

Table 1 Example of Fuji Electric PC input levels

PC series		Rated input current (mA)*							
		MICREX -F	FUJIOLOG -B	FUJIOLOG-μK		FUJIOLOG-μT		FUJIOLOG-μY	
				μK	mini	mini	micro	mini	micro
Rated input voltage	AC, DC	5V	4						
		12V	3						
		24V	7						
		48V	5						
		100V	5						
	AC	100V	10	10	10				
		200V	10	10	10				
	DC	24V	10	6	10	10	7	10	7
		100V	5						

* When there are several kinds of input cards, modules, etc., shows the minimum rating.

Fig. 5 Contact resistance continuous measurement test result (DC 5V, 3mA)

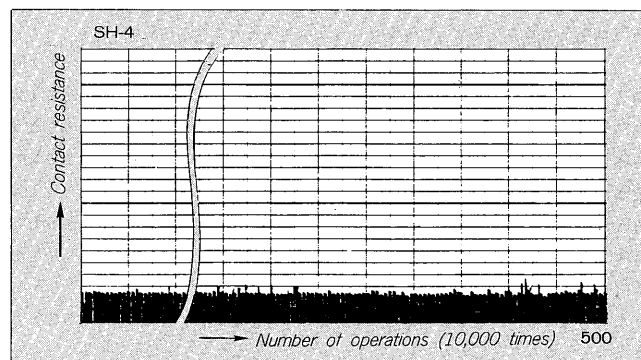


Fig. 6 Contact reliability test results

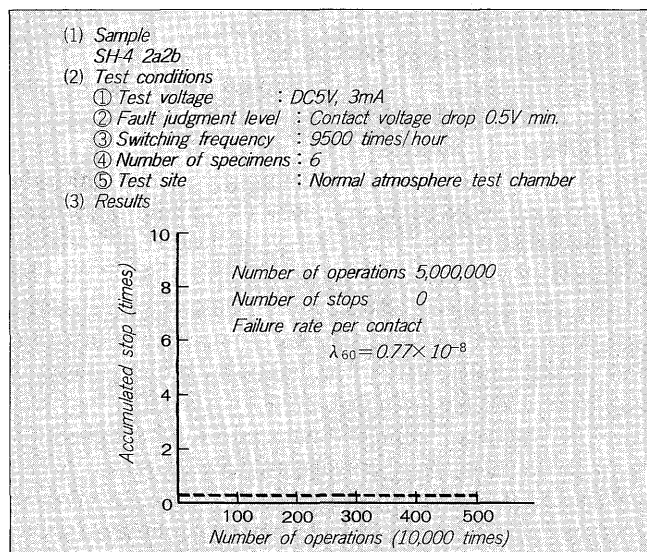


Table 2 SH series types and contact configurations

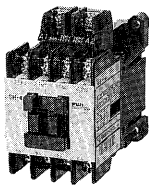
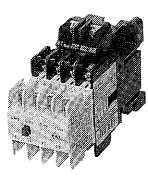
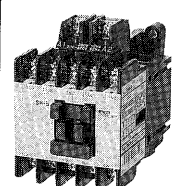
Appearance and type designation			
	SH-4	SH-4 (w/auxiliary contact block)	SH-5
Contact No.	4	8	5
Contact configuration	4NO 3NO1NC 2NO2NC	8NO, 7NO1NC 6NO2NC, 5NO3NC 4NO4NC	5NO, 4NO1NC 3NO2NC, 2NO3NC 1NO4NC, 5NC

Table 3 SH series ratings

Rated thermal current (A)	Making and breaking current (AC) (A)	Rated operational current (A)						Minimum operational voltage & current
		AC			DC			
		Rated operational voltage	AC11 (coil load)	AC13 (resistive load)	Rated operational voltage	DC11 (coil load)	DC14 (resistive load)	
10	66	110V	6	10	24V	3	5	DC5V 3mA
	33	220V	3	8	48V	1.5	3	
	16.5	440V	1.5	5	110V	0.55	2.5	
	13.2	550V	1.2	5	220V	0.27	1	

The contact reliability of the SH series standard types was improved by using bifurcated contacts, optimizing the contact pressure of the contacts, pursuing low-wear moving parts material and construction, and using a dust-tight contact part construction. This has made it possible to use them at a 10^{-7} level failure rate even with a DC5V, 3mA load, besides, of course, a DC24V, 10mA load.

Figure 5 is the data obtained by measuring the number of operations and contact resistance change. It shows that the contact resistance of the bifurcated contacts of the SH series is stable even at the 5V, 3mA level.

The results of a contact reliability test are shown in Fig. 6. The contact reliability test was conducted in a normal atmosphere test chamber. Since the contact reliability drops in bad environments, such as where dust and corrosive gases are present, care must be taken in use.

For the SH series, contact bounce has been minimized by contact part and magnetic part damping construction innovations. However, since contact bounce of several milliseconds is unavoidable, depending on the closing phase, when input directly to a counting circuit, etc., intervention of a delay circuit and other countermeasures are necessary.

(2) Contact configuration

A top mounting contact block (2 contacts and 4

contacts type) or side mounting auxiliary contact block (2 contacts) can be installed to the four contacts SH-4 type and five contacts SH-5 type. Six-contact, 7-contact, 8-contact, and 9-contact auxiliary relays can be built and relays with various contact configurations can be obtained by combining these.

3. SPECIFICATIONS AND RATINGS

The SH series types and contact configurations are shown in Table 2. Their ratings are shown in Table 3.

For the performances and tests, see "Long Life, Advanced Functions New Small Contactor SC Series" in this issue.

4. CONCLUSION

We are confident that the new type industrial relay SH series, together with the new small contactor SC series, are revolutionary products based on many years of accumulated technology and experience. Farther completion is planned based on the comments of users. We request the guidance and cooperation of all those concerned in the future.