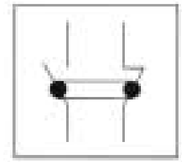
POSITIVE GUIDED *TYPE SH RELAYS* & *TYPE LS CONTACTORS* FOR *SAFETY CIRCUITS*

Certified as Positive Guided AEG Relays and Contactors
1. Independent Test Lab Certified Per IEC 947-5-1
2. 100% Quality Tested Per IEC 947-5-1



Positive Guided for Safety

Purpose - Critical Circuits

IEC Standard 947-5-1 was developed to provide industrials much greater reliance of positive accurate relay signals. While relays and contactors that meet this standard can be used universally, the main applications are *safety circuits* and important *automation machinery* sequencing circuits.

Description

Positive-guided control relays and contactors

The control structure of a safety control system employs control relays and/or contactors to establish the intended functions of the machine. They must function in such a way, that the safety requirements can be met. To achieve this, contacts in these devices control each other mutually. This is only possible, if the position relations of the contacts always remain the same. The most important relation is between the NO and NC contacts. **They must never be closed simultaneously, even if the NO contacts should be welded closed.**

This feature is not normally available in standard relays. The positive-guided relays and contactors should be designed with a one-piece movable contact carrier, thus guaranteeing the same relative position for all the conatacts. In the new state, contacts of the opposite function have at least a contact distance of 0.5mm between the opening of a NO contact and the closing of a NC contact (or vice versa). During the mechanical/ electrical life, this distance increases slightly, thus maintaining the safety characteristic.

This character of the positive-guided relay per IEC947-5 Standard for Control Relays is a special requirement for this type of device.

Safety and Reliability in Auxiliary Interlocks

Auxiliary interlocks signal action taken or required in machinery. If these signals are not constantly reliable, serious problems can result to man and machinery. Major manufacturers, then, demand the most reliable designs available in the industry.

Fulfilling safety requirements does not come free. One important means for achieving the necessary safety level is by using redundant devices. This use of additional equipment, increases not only the cost of the device, but also reduces the reliability of the control system. It is therefore essential to use very reliable devices in order to insure a reliable operation of the machinery. Otherwise one trades safety for poor performance.

POSITIVE GUIDANCE

With a one piece contact carrier, both auxiliary and main poles are assured to operate as a unit. This assures guaranteed positive guidance operation and true feed-back signals to processors.

One piece construction applies to all type SH relays (SH4, 8, 10) and Type LS contactors. (LS4, 7, 17, 27, 37, to 25HP)

AUXILIARY CONTACTS RELIABLE OPERATION

Each pole has 2 movable contacts

The design of each pole in the auxiliary contact system has both parallel movable contacts and 300 micron radius serrated stationary contacts, further assuring contact reliability even with 24 volt DC low power circuits.

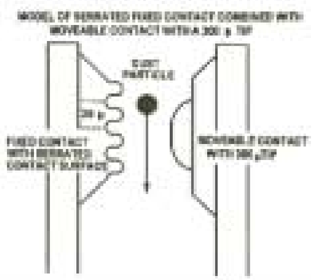
Contact Continuity

CE

The most important issue for reliability of control relays is the contact continuity, which is particularly important for low, increasingly common, control voltages (e.g., 24V DC). Environmental conditions influence the reliability of contacts These influences are dirt, dust, corrosion and aging. Of these, the most important influence is dust. Dust particles up to 20 microns can stick to a vertical plane. Larger grains fall through a vertically mounted contact.

Auxiliary Contact and Relay Contact Design

Design of auxiliary contact accounts for high reliability. The first method to improve the low voltage performance of auxiliary contacts is the use of small tips of about 300 micron radios size on the contact surface. This functions by crushing some of the smaller particles sticking to the contact surface. The next possibility is the use of contact bridges having the form of a (capitol) H. This works by doubling the number of contacts bridges and by connecting both bridges in the middle. This design requires, however, some flexibilty in the contact's bridge which in turn calls for a very thin contact bridge. Thus the smaller cross section allows only small currents. This then is a special purpose contact. Practical application however calls for high performance at low <u>and</u> high level currents. Thus the double bridge was developed having the best overall performance.

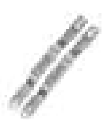


Another design concern comes from investigating the dust particle sizes and behavior. The stationary contact is serrated to form small grooves with 20 micron distance. Dust particles sticking to these grooves do not obstruct the continuity when combined with a 300 micron contact tip as shown above. Tests performed with these contact systems have shown the systems with double bridges and the serrated contacts provide the needed reliable performance.

Magnet Design

Anti-stick magnet design cut out in magnet face in the center of the E magnet provides permanent air gap, assisting clean drop-out over long mechanical life. "E" Type magnet design using evolutionary computer technique.

Each double bridge pole has parallel movable contacts



Coils/Magnet Design

Type LS Coil voltage span is 40% wider than the NEMA standard requirement of +10% and -15%. **This assures cooler operation and longer life.**

+10% | +10%

-15% NEMA Voltage Span | -25% AEG Type LS

<u>Name Plate A.C., Voltage</u>
NEMA 25% total span
AEG "LS" 35% total span
10/25 or 40% wider voltage span

Example: 120V 60HZ Coil
NEMA Span 102V to 132V or 30 Volts
AEG 90V to 132V or 42 Volts 12/30 = 40%

Further insurance against brown outs/burn outs.

Arc Chute Design

U shaped arc runner magnetically starts arc toward contact tips. Iron ridge in center of main stationary contacts draw arc to ridge and off contacts saving silver. Iron tip at end of movable contact attracts arc to tip of contact saving silver.

Extra large contact air gap is designed with contacts in open position.

- **<u>Overloads</u>** with precision trip and differential single-phasing protection. All OL's are ambient temperature compensated.

CE IEC BS NEMA

Additional Performance Insurance, for Safe Operation

For years and years, AEG has been considered a technical leader in electrical design. The above design features have been standard on AEG Type LS Contactors and SH Relays for many years and result in proven performance products. Each of the companies noted below has a major installation using AEG controls/switchgear.

SELECTED KEY INTERNATIONAL USERS OF AEG CONTROLS

SHELL R&D	**PHILLIPS PETROLEUM**	**FORD PLANTS**	**UNION CARBIDE**	**EXXON REFINERIES**
SHELL OFFICE	**SHELL REFINERIES**	**GM OPEL PLANTS**	**LINDE PLANTS**	**EXXON CHEMICAL PLANTS**
AIR PRODUCTS	**TEXACO**	**PORTLAND CEMENT**	**MARATHON**	**GENERAL FOODS**
AMOCO CHEMICALS	**EXXON R&D**	**VOLKSWAGEN**	**MOBIL OIL REFINERIES**	**GULF REFINERY**
BP REFINERIES	**UNIROYAL**	**GOODYEAR**	**PROCTOR & GAMBLE**	**NESTLE**
MONSATO	**UNILEVER**	**KAISER ALUMINUM**	**DUPONT**	**IBM**

E C CONTROLS

POSITIVE GUIDED CONTACTORS

AEG

DESCRIPTION

Positive-guided contactors and motor starters feature N.O. and N.C. contacts which operate interdependently. For such power switching contactors and starters, the N.O. and N.C. contacts can never be closed simultaneously. In the event one of the N.O. contacts welds closed, no N.C. contacts can close. For exmaple, should one or more of the N.O. contacts weld/stick shut when closed, the N.C. contact(s) will remain open with a minimum gap of 0.5mm. This applies to both main contacts as well as auxiliary contacts.

A simple illustration of the interdependent function of positive-guided (or forced-guided) contacts is shown in the chart. This important feature is desired in **machine safety circuits** where "fail-to-safe" and/or "single component failure control reliability" is desired. The positive relationship (interdependent operation) between N.O. and N.C. contacts permit self-checking/safety monitoring of the performance of these devices. Such contactors, regardless of whether a contact fails "open" or "closed", provide a higher level of safety system integrity and reliability. This is critical for feedback safety circuits.

SAFETY SYSTEM - CE - CERTIFICATION

POSITIVE GUIDED RELAYS & CONTACTORS

Per IEC 947-5 **3rd Party Test Laboratory Certified**

For safety product testing, only a select number of Independent Test Laboratories are listed and approved to certify safety compliance.

PURPOSE - CRITICAL CIRCUITS

IEC STANDARD 947-5-1 was developed to provide industrials much greater relianceon positive accurate relay signals. While relays and contactors that meet this standard can be used universally, the main application is SAFETY CIRCUITS and important circuits in automation machinery.

Each of the noted AEG Type LS contactors, and AEG Type SH Relays have a 3rd Party Test Laboratory certification as Positive Guided (mechanically linked) contact elements. Each contactor and relay is 100% tested to verify that the required **international standard** is satisfied.

POSITIVE GUIDED CONTACTORS

Catalog Number	Auxiliary Contacts		Current Rating (UL/CSA)		MAX HP
	NO	NC	Inductive	Resistive	@ 480V
LS07.01-◈	-	1	10 AMP	16 AMP	3HP
LS4.01-◈	-	1	16 AMP	20 AMP	7.5HP
LS4.22-◈	2	2	16 AMP	20 AMP	7.5HP
LS7.01-◈	-	1	20 AMP	25 AMP	10HP
LS7.22-◈	2	2	20 AMP	25 AMP	10HP
LS17.01-◈	-	1	27 AMP	30 AMP	10HP
LS17.22-◈	2	2	27 AMP	30 AMP	10HP
LS27.22-◈	2	2	40 AMP	50 AMP	15HP
LS37.22-◈	2	2	55 AMP	62 AMP	25HP
LS47.22-◈	2	2	90 AMP	110 AMP	40HP

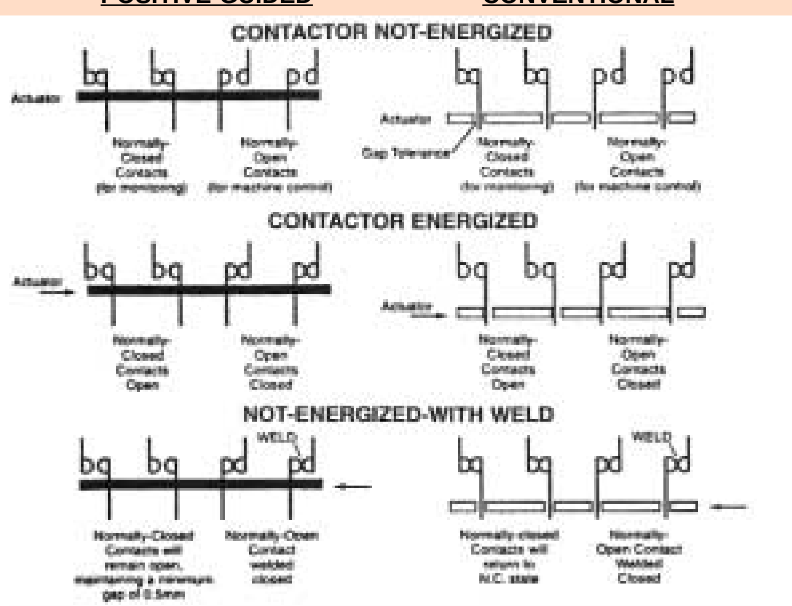
◈Designate coil voltage suffix letter. See pages AEG 22 and AEG 36 (Catalog IC-8), for pricing.

Positive Guided Starters
If full magnetic starter is required, add overload Type B27T from this catalog IC-8, pages 10-37.

NEMA RATING. Above contactors LS4, 7, 27, 47 fully meet NEMA Ratings and can be supplied NEMA labeled at NEMA Horse Power Ratings. (UL Listed/CSA).
See this Catalog IC-8, pages AEG 22, 23.

POSITIVE GUIDED vs. CONVENTIONAL CONTACTS

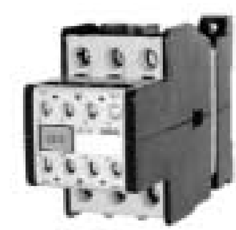
POSITIVE-GUIDED | CONVENTIONAL



MAGNETIC STARTER

XLS47
(40 HP)

LS27▲
(15 HP)



LS37▲
(25 HP)

▲ CONTACTORS ARE DESIGNED WITH INTERGRAL AUXILIARY CONTACTS

◈ COIL VOLTAGE SUFFIX		
AC◈		
60HZ	**50HZ**	
-A	120V	110V
-C	208V/230V	220V
-E	480V	440V
-F	600V	550V
-D		380V
-G	24V	22V
-H	280V/277V	240V
DC◈ •		
-MTW	12VDC	• Price Addition for DC Coil.
-NTW	24VDC	
-OTW	48VDC	
-PTW	120VDC	
-RTW	220VDC	

Standard AC coil design tolerance is +10%, -25% coil nameplate voltage.

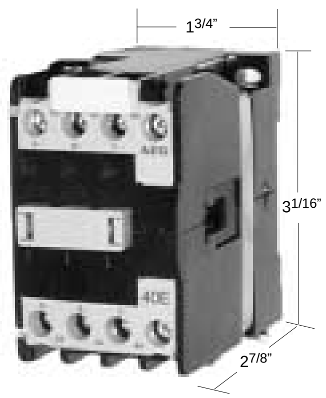
POSITIVE GUIDED
Type SH4 / SH8 / SH10 RELAY

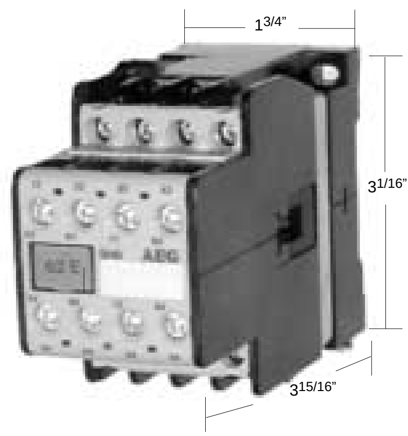
AEG

20 Amp AC & DC Positive Guided Relays and Contactors

CE

Space Saving Dimensions





Positive Guided Relays

Type SH04, SH4, 8, 10

For critical safety circuits, self checking duplicate circuits can be required. The following type SH multipole relays have positive action of the contacts. This positive guided design assures that no normally open contact can close before any normally closed contact can open. The normally open contact will have a 0.5mm contact gap.*

If a N.O. contact welds closed, no N.C. contact can close.

"Positive Guided" contacts are not positive break or positive opening contacts.

*Per the IEC safety standards (IEC 947-5-1)

USER BENEFITS

Full Approvals

World Wide Acceptance

CE D N SP IEC UTE S S UL BS NEMA

Available Worldwide

Recognized as one of the leading heavy duty industrial product lines, Type XLS starters, contactors and Type SH relays are available in over 100 countries including every industrial nation in the free world.

Industry Accepted & Preferred

RELIABILITY DEMANDING industries including steel, oil, cement, chemical, automotive, widely use and demand type SH controls in their systems.

Part # with AC Coil *⟐Add coil suffix*	POLES NO	POLES NC	AC Coil Operation	DC Coil Operation
Basic 4 pole			**List**	**List**
SH4-40-⟐	4	0	$62	$90
SH4-31-⟐	3	1	$62	$90
SH4-22-⟐	2	2	$62	$90
Adder poles to above relays...Add up to 3 poles max.				
HS17.10 10 Amp NO Pole			$13	$13
HS17.01 10 Amp NC Pole			$13	$13
Basic 8 pole 30,000,000 Operations				
SH8-80-⟐	8	0	$104	$132
SH8-62-⟐	6	2	$104	$132
SH8-44-⟐	4	4	$104	$132
Basic 10 pole Type				
SH10-55-⟐	5	5	$120	$148
SH10-73-⟐	7	3	$120	$148
SH10-10-⟐	10	0	$120	$148

AC Contact Rating Per Pole
SH4, SH8, SH10 RELAYS

Max. Voltage	Amperes Make	Amperes Break	Contiuous Carrying Current Only (Amperes)
120	60	6.00	20
240	30	3.00	20
480	15	1.50	20
600	12	1.20	20
Maximum DC Contact Rating Per Pole			
125	5.0	1.1	20
250	5.0	0.55	20

COIL BURDEN

	SH04 AC (VA)	SH04 DC (Watts)	SH4,8 AC (VA)	SH4,8 DC (Watts)
Inrush	16	2.4*	55	6.5
Holding	4.9	2.4	10	6.5

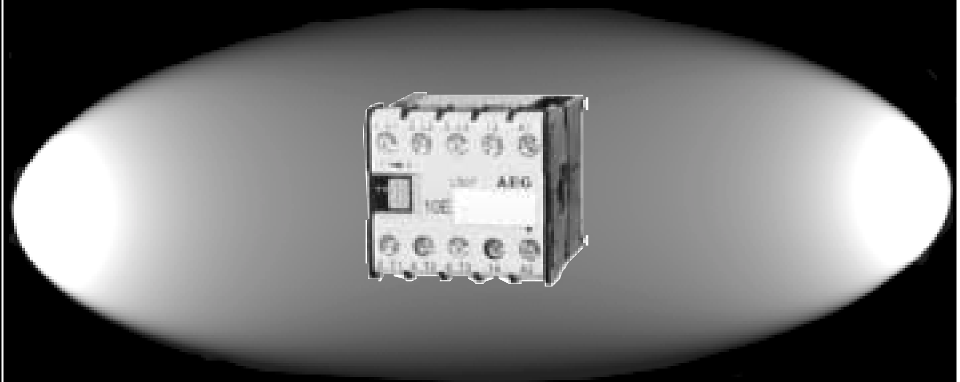
⟐COIL VOLTAGE SUFFIX

AC⟐	60HZ	50HZ	DC⟐•	
-A	120V	110V	-MSW	12VDC
-C	208/230V	220V	-NSW	24VDC
-D		380V	-OSW	48VDC
-E	480V	440V	-PSW	110VDC
-F	600V	550V	-RSW	220VDC
-G	24V	22V		

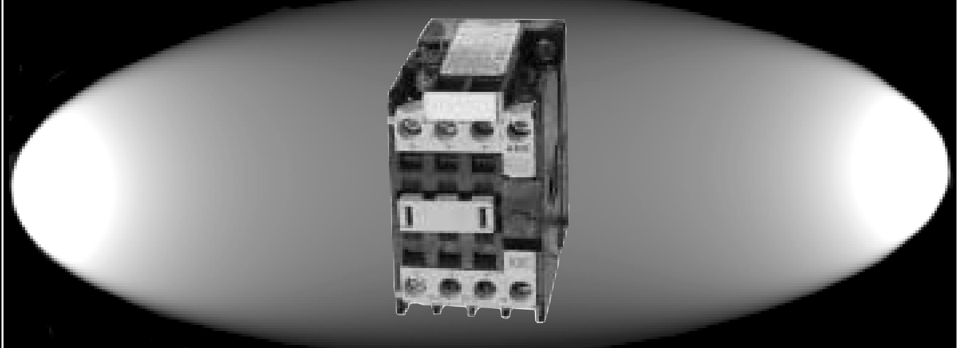
• SW Single Winding DC Power Plant

BULLETIN C-1

POWER SWITCHING CONTACTORS



LS07



LS7

LS107

Electrical & Electronic Controls
7 West Cross Street, Hawthorne, N.Y. 10532
(914) 769-5000   FAX (914) 769-3641

More sizes to choose from means cost savings.

HORSEPOWER	TYPE	CE AMPERES
1 HP	LS07	16A
5 HP	LS4	20A
10 HP	LS7	25A
10 HP	LS17	30A
15 HP	LS27	40A
25 HP	LS37	55A
30 HP	LS47	90A
50 HP	LS57	100A
60 HP	LS77	110A
75 HP	LS87	110A
100 HP	LS107	135A
150 HP	LS177	225A
200 HP	LS247	350A
300 HP	LS220K	600A
400 HP	LS280K	700A
500 HP	LS375K	1,000A
900 HP	LS450K	1,250A

4 POLE CONTACTORS

See “K” Contactor Catalog Section from 20 Amp to 1250 Amp

AEG

TYPE LS
AC CONTACTORS

COMPACT NEMA RATED
BLOCK CONTACTORS TYPE LS

Size 00 thru (600 Amp)
Plus “K” Contactors
4 Pole to 1250 Amp

KEY DESIGN BENEFITS

Reliable Operation

- 10,000,000 + Mechanical Life
- 1,000,000 Electrical Life
- 55ºC Allowed Ambient Design
- Stainless Steel Springs
- “E” Magnet with Notched Air Gap
- Anti Rust Protected Magnets
- Higher in rush Current Allowed
- Elaborate Arc Quenching System
- Enclosed - Protected Contacts/Coil System

FOR SAFETY CIRCUITS

- Positive Guided Contactors, Type LS.
- Certified as Positive Guided Per IEC 947-5.

(See page AEG 9)

Load Matching $ Savings

- With more size selections,

Significant Cost Savings result

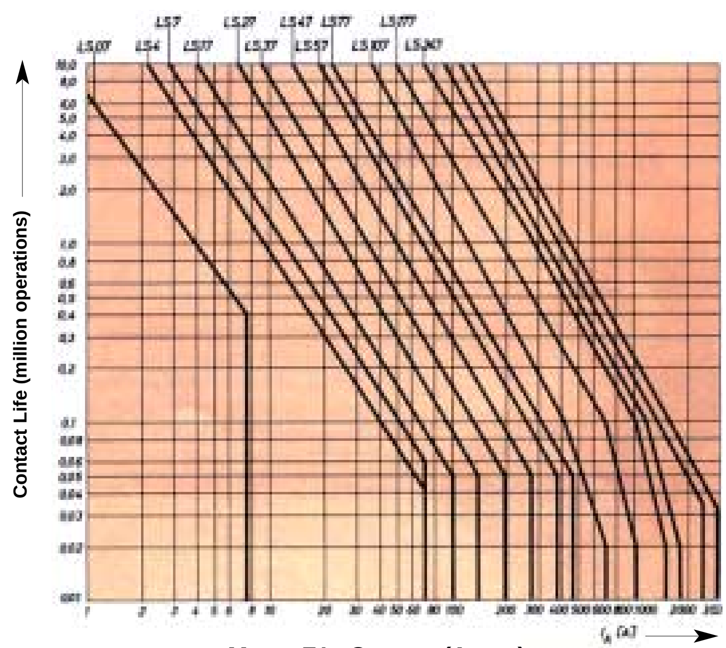
Operational Savings

- Fast Coil Change
- 1,000,000 Electrical Life
- 55ºC Allowed Ambient Design
- Stainless Steel Springs
- “E” Magnet with Notched Air Gap
- Anti Rust Protected Magnets
- Higher in rush Current Allowed
- Elaborate Arc Quenching System
- Enclosed - Protected Contacts/Coil System

FOR SAFETY CIRCUITS

- Positive Guided Contactors, Type LS.
- Certified as Positive Guided Per IEC 947-5.

(See page AEG 9)



Motor F.L. Current (Amps)
Electrical Life Curve

TYPE LS
AC CONTACTORS

ECONTROLS AEG

THREE POLE CONTACTORS CE

4 pole and N.C. Pole see page AEG 64

Inductive / Resistive	Size	Horse Power Ratings 3 Phase: Motor Volts	Max HP	OPEN	ENCLOSED: NEMA 1 General Purpose	NEMA 4X ▸ Outdoor Dust Tight	NEMA 12 Dust Tight	NEMA 7 Hazard Area	NEMA 4 Metal	NEMA RATED: Comparable NEMA HP
10 A / 16 A	MINI	200V	3 HP	LS07.10	LS07.10	LS07.10	LS07.10	-	LS07.10	
		230V	**3 HP**	-◈0	-◈1	-◈4X	-◈12	-	-◈4	
		460V	3 HP					-		
		LIST		**$34**	**$60**	**$124**	**$126**		**$194**	
16 A / 20 A	00	200V	3 HP	LS4.10	LS4.10	LS4.10	LS4.10	-	LS4.10	200 V 1.5 HP
		230V	**3 HP**	-◈0	-◈1	-◈4X	-◈12	-	-◈4	230 V 1.5 HP
		460V	7.5 HP							460 V 2 HP
		600V	7.5 HP	**$90**	**$116**	**$161**	**$163**	-	**$295**	600 V 2 HP
		LIST								NEMA Size 00
20 A (T) / 25 A	0	200V	5 HP	LS7.10	LS7.10	LS7.10	LS7.10	-	LS7.10	200 V 3 HP
		230V	**5 HP**							230 V 3 HP
		460V	**10 HP**	-◈0	-◈1	-◈4X	-◈12	-	-◈4	460 V 5 HP
		600V	10 HP							600 V 5 HP
		LIST		**$115**	**$141**	**$186**	**$188**	-	**$320**	NEMA Size 0
27A / 30 A	0+	200V	5 HP	LS17.10	LS17.10	LS17.10	LS17.10	-	LS17.10	
		230V	**7.5 HP**							
		460V	**10 HP**	-◈0	-◈1	-◈4X	-◈12	-	-◈4	
		600V	15 HP							
		LIST		**$130**	**$156**	**$201**	**$203**	-	**$335**	
40 A (T)	1+	200V	7.5 HP	LS27.22▲	LS27.22	LS27.22	LS27.22	LS27.22	LS27.22	200 V 7.5 HP
		230V	**10 HP**							230 V 7.5 HP
		460V	**15 HP**	-◈0	-◈1	-◈4X	-◈12	-◈7	-◈4	460 V 10 HP
		600V	20 HP					*Contact Factory*		600 V 10 HP
		LIST		**$145**	**$171**	**$216**	**$218**		**$350**	NEMA Size 1
55 A / 62.5 A	$1^{3/4}$	200V	10 HP	LS37.22▲	LS37.22	LS37.22	LS37.22	LS37.22	LS37.22	
		230V	10 HP							
		460V	25 HP	-◈0	-◈1	-◈4X	-◈12	-◈7	-◈4	
		600V	25 HP					*Contact Factory*		
		LIST		**$173**	**$222**	**$301**	**$337**		**$663**	
90 A / 110 A	2	200V	15 HP	LS47.22	LS47.22	LS47.22	LS47.22	LS47.22	LS47.22	200 V 10 HP
		230V	**20 HP**							230 V 15 HP
		460V	**40 HP**	-◈0	-◈1	-◈4X	-◈12	-◈7	-◈4	460 V 25 HP
		600V	50 HP					*Contact Factory*		600 V 25 HP
		LIST		**$240**	**$289**	**$376**	**$419**		**$705**	NEMA Size 2
100 A / 150 A	$2^{1/2}$	200V	20 HP	LS57.22	LS57.22	LS57.22	LS57.22	LS57.22	LS57.22	
		230V	**25 HP**							
		460V	50 HP	-◈0	-◈1	-◈4X	-◈12	-◈7	-◈4	
		600V	60 HP					*Contact Factory*		
		LIST		**$290**	**$339**	**$426**	**$469**		**$755**	

(T) Also Tungsten Rating to 277 Volt (UL)

◈ COIL VOLTAGE SUFFIX

AC◈	**60HZ**	**50HZ**
-A	120V	110V
-C	208V/230V	220V
-E	480V	440V
-F	600V	550V
-D		380V
-G	24V	22V
-H	280V/277V	240V

DC◈ •	
-MTW	12VDC
-NTW	24VDC
-OTW	48VDC
-PTW	120VDC
-RTW	220VDC

•Price Addition for DC Coil.

TYPICAL ORDER ITEM

5HP 20A Contactor

LS4- AO

Open

Coil 120Volts

• **SW:** Single Winding D.C. Coil LS07.10, add $10 list each. For single winding D.C. coils see page AEG 8.

• **TW:** Two Winding D.C. Coil. Add $25 list each, for sizes LS4 thru LS77. Add $50 list each for sizes LS87 thru LS247.

For Modifications & Field Kits See Page AEG 33.

▸ TYPE 4X ENCLOSED STARTERS

Type 4X enclosed starters are UL/CSA Listed.

▲ AUXILIARY CONTACTS

1 N.O. Standard LS07-LS17

2 N.O. + 2 N.C. Standard LS27-LS450K

For Additional Auxilixries, see page AEG 24.

▲**Option,** with no auxiliaries (supplied with Power Poles Only, without auxiliaries).

LS27.00 -* 0 $133 List

LS37.00 -* 0 $155 List

CONTACTORS

TYPE LS AC CONTACTORS

NEMA RATED

Inductive / Resistive	Size	Horse Power Ratings 3 Phase (Motor Volts / Max HP)	OPEN	ENCLOSED: NEMA 1 General Purpose	ENCLOSED: NEMA 4X ▶ Outdoor Dust Tight	ENCLOSED: NEMA 12 Dust Tight	ENCLOSED: NEMA 7 Hazard Area	ENCLOSED: NEMA 4 Metal	Comparable NEMA HP
110 A 150 A	3	200V 25 HP **230V 30 HP** **460V 60 HP** 600V 75 HP LIST	LS77.22 -◇0 $380	LS77.22 -◇1 $461	LS77.22 -◇4X $539	LS77.22 -◇12 $591	LS77.22 -◇7 *Contact Factory*	LS77.22 -◇4 $877	200V 25 HP 230V 30 HP 460V 50 HP 600V 50 HP NEMA 3
110 A 150 A	3 1/2	200V 30 HP **230V 40 HP** **460V 75 HP** 600V 100 HP LIST	LS87.22 -◇0 $470	LS87.22 -◇1 $666	LS87.22 -◇4X $1,185	LS87.22 -◇12 $1,215	LS87.22 -◇7 *Contact Factory*	LS87.22 -◇4 $1,685	
150 A 180 A	4	200V 40 HP **230V 50 HP** **460V 100 HP** 600V 100 HP LIST	LS107.22 -◇0 $850	LS107.22 -◇1 $954	LS107.22 -◇4X $1,565	LS107.22 -◇12 $1,604	LS107.22 -◇7 *Contact Factory*	LS107.22 -◇4 $1,865	200V 40 HP 230V 50 HP 460V 100 HP 600V 100 HP NEMA 4
200 A 225 A	4 1/2	200V 60 HP 230V 75 HP **460V 150 HP** 600V 200 HP LIST	LS177.22 -◇0 $1,164	LS177.22 -◇1 $1,476	LS177.22 -◇4X $1,996	LS177.22 -◇12 $2,126	LS177.22 -◇7 *Contact Factory*	LS177.22 -◇4 $2,594	
320 A 350 A	5	200V 75 HP **230V 100 HP** **460V 200 HP** 600V 250 HP LIST	LS247.22 -◇0 $1,564	LS247.22 -◇1 $1,876	LS247.22 -◇4X $2,296	LS247.22 -◇12 $2,426	LS247.22 -◇7 *Contact Factory*	LS247.22 -◇4 $2,894	200V 75 HP 230V 100 HP 460V 200 HP 600V 200 HP NEMA 5
500 A 600 A	5 1/2	200V 125 HP **230V 150 HP** **460V 300 HP** 600V 400 HP LIST	LS220K.22 -◇0 $2,150	LS220K.22 -◇1 $3,450	LS220K.22 -◇4X $3,710	LS220K.22 -◇12 $3,970	LS220K.22 -◇7 *Contact Factory*	LS220K.22 -◇4 $5,738	
650 A 700 A	6	200V 150 HP **230V 200 HP** **460V 400 HP** 600V 500 HP LIST	LS280K.22 -◇0 $3,100	LS280K.22 -◇1 $4,400	LS280K.22 -◇4X $4,660	LS280K.22 -◇12 $4,920	LS280K.22 -◇7 *Contact Factory*	LS280K.22 -◇4 $8,300	
810 A 1000 A	6 1/2	230V 250 HP 460V 500 HP 600V 600 HP LIST	LS375K.22 -◇0 $3,900	LS375K.22 -◇1 $5,200					

CONTACTORS ARE STOCK THROUGH 1250 AMPS

EXAMPLE OF DOLLAR SAVINGS WITH AEG CONTACTORS

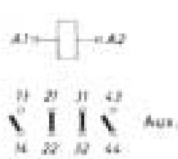
50 HP 460 VOLT LOAD	
EEC PART# LS57	$290.00 LIST
COMPETITOR NEMA SIZE 3	$600.00 LIST
DOLLAR SAVINGS	**$310.00 LIST**

30 Amp Power Auxiliary. (600 Volt)
See page AEG 24.

For **4 pole** and N.C. Pole Contactors, thru 1250 Amp, see "K" Contactors section.

AUXILIARIES SUPPLIED AS STANDARD

1 NO	2 NO / 2 NC
LS07.10	LS27.22
LS4.10	LS37.22
LS7.10	LS47-LS247.22
LS17.10	LS220K-LS375K.22



POSITIVE GUIDED VERSIONS AVAILABLE WITH 2 NO / 2NC AUX. FOR SAFETY CIRCUITS

P/N	LIST
LS4.22-*	$115.00
LS7.22-*	$125.00
LS17.22-*	$135.00
LS27.22-*	$145.00
LS37.22-*	$173.00
LS47.22-*	$240.00

Use Suffix -PG at end of part number.

For more information See Page AEG 9.

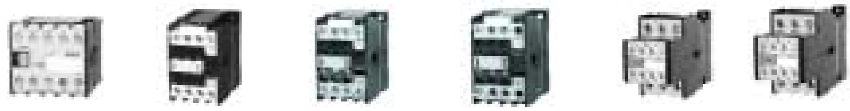
For Additional Auxiliaries See Page AEG 24.

TYPE LS CONTACTORS
TECHNICAL SPECIFICATIONS

AEG

CONTACTORS

International Ratings

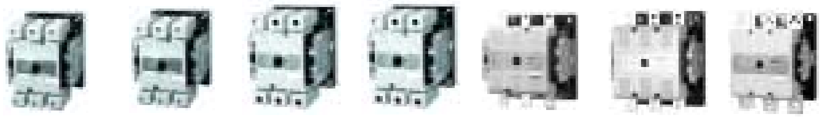


Type		LS07	LS4	LS7	LS17	LS27	LS37
Rated insulation voltage U_i, VDE 0110 IGr C	~V	380	660	660	660	660	660
Mechanical lifespan							
a.c. operated	x10^6 ops	4	10	10	10	10	10
d.c. operated	x10^6 ops	10	15[2])	15[2])	15[2])	-	15[2]
AC-1 Duty Power rating P_N	kW	s.p. **1/2**	s.p. **1/2**	s.p. **1/2**	s.p. **1/2**	s.p. **1/2**	s.p. **1/2**
Related current I_{th} = Rated operating current I_e	A	16[6])	20	25	32	40	50
Minimum cable cross sections with full rating	mm^2	2,5	2,5	4	4	6	10
Permissible practical switching frequency	ops/hr.	50	50	50	50	50	50
Rated operating current at 1000 ops/hr.	A	10[6])	20	20	25	30	40
AC-3 Duty Motor rating P_N	kW	s.p. **1/2**	s.p. **1/2**	s.p. **1/2**	s.p. **1/2**	s.p. **1/2**	s.p. **1/2**
Rated current I_e up to 3~440V	A	7,3[3]) (380V)	9,5	12	16	23	32
Permissible switching frequency at P_N and continuous operation	ops/hr.	300	1000	1000	750	750	750
AC-4 Duty Motor Rating P_N	kW	-	s.p. **1/2**	s.p. **1/2**	s.p. **1/2**	s.p. **1/2**	s.p. **1/2**
Rated current I_e with realistic contact lifespan up to 3~440V	A	-	3,7	5,3	7,3	9,3	16
Permissible switching frequency	ops/hr.	-	250	250	250	250	250
Highest permissible loading at 380V 3~ $P_N/_e$	kW/A	-	s.p. **1/2**	s.p. **1/2**	s.p. **1/2**	s.p. **1/2**	s.p. **1/2**
Capacitor switching capacity with **Single switching/Parallel operation**[10]) 3~230V	kvar	-	2,5/2,5	3/3	3/3	7/7	10 /12[9])
3~400V	kvar	-	4/4	5/5	5/5	13/13	16,7/16,7[9])
3~525V	kvar	-	4/4	6/5	6/5	17/13	25 /25[9])
3~690V	kvar	-	4/4	6/5	6/5	17/13	19 /16,7[9])
Permissible D.C. loading, with **3 poles connected in series**							
Rated current at **DC-1 Duty** (resistive load) ⎓ 24... 220V I_e	A	10	20	25	32	40	50
DC-2...DC-5 Duty (shunt and series wound motors L/R • 15 ms) ⎓ 24... 110V I_e	A	-	20	25	32	40	50
>⎓ 110... 220V I_e	A	-	4	6	8	10	16
Permissible switching frequency (DC-1 ... DC-5)	ops/hr.	50	50	50	50	50	50
Auxiliary switch Rated insul. voltage U_i VDE 0110	~V	380	660	660	660	660	660
Continuous current I_{th}	A	16[6])	20	20	20	20	20
AC-11 Duty (a.c.) Rated current I_e up to ~ 220V	A	6	10	10	10	10	10
at ~ 380V	A	4	6	6	6	6	6
at ~ 500V	A	-	4	4	4	4	4
at ~ 660V	A	-	2	2	2	2	2
DC-11 Duty (d.c.) Rated current I_e at ⎓ 24V	A	2,5(10/8[6])	16	16	16	16	16
at ⎓ 60V	A	1,2(5)	4	4	4	4	4
Values based upon 3 poles at ⎓110V	A	0,7(3)	1,5	1,5	1,5	1,5	1,5
connected in a series at ⎓220V	A	0,36(1,5)	0,5	0,5	0,5	0,5	0,5
Short-circuit protection. Highest rated fuse	(gL) A	16	16	16	16	16	16
Normal Control Transformer (VA)	Optional/Standard		25/50	25/50	25/50	50	50
Operating coil (Standard) **A.C. operated** **Power consumption (Voltage tolerance 0.75** ... 1, 1 U_S)							
Closing P_{AS}	VA	16	55	55	55	67	67
cos φ		0,88	0,71	0,71	0,71	0,72	0,72
Holding P_{HS}	VA	4,9	10	10	10	10,5	10,5
cos φ		0,45	0,27	0,27	0,27	0,27	0,27
DC operated		*	* (**)	* (**)	* (**)	* (**)	* (**)
Power consumption at 1,0 U_S Closing P_A	W	2,4[7])	6,5 130	6,5[12]) 130	6,5 130	- 170	8 170
(**Voltage tolerance** 0,85 ... 1,1 U_S)[7]) Holding P_H	W	2,4[7])	6,5 3.2	6,5[12]) 3.2	6,5 3.2	- 3.5	8 3.5
***SW, Single Winding DC Coil. (**)TW, Two Winding DC Coil**							
Switching times at 1,0 U_s (standard coil)[8])							
A.C. Operated closing delay	ms	9 ... 30	10 ... 25	10 ... 25	10 ... 25	10 ... 25	10 ... 25
opening delay	ms	5 ... 25	5 ... 16	5 ... 16	5 ... 16	5 ... 16	5 ... 16
D.C. Operated closing delay	ms	10 ... 35	45 ... 80	45 ... 80	45 ... 80	-	45 ... 80
opening delay	ms	2 ... 8	10 ... 30	10 ... 30[12])	10 ... 30	-	10 ... 30

See AEG Technical Bulletin for more complete technical data and definitions.

1) Type LS 7 C: 220/380, 500/600V 3~5/10/12,5 kVar, see page 1/12. 2)as LS37 however P_N (AC 3) 500V, 3~: 15 kW. 3) P_N (AC 3) 220V/380V/500V/600V, 3~: 3 kW/5,5 kW/5,5 kW 4) as LS27, s. S. **1/2** 5) as LS7, s. S. **1/2** 6) Pin terminal AC 1: 8A; AC 3: 220V/380V, 3~: 0,75 kW/1,1 kW, I_e = 2,8A
7) Type LS07: Voltage tolerance 8 ... 1,2 U_c, at 24V-: 1,2 W, with voltage tolerance 0,8 ... 1,7 U_c 8)These are typical values and some variation can be expected
9) 220V: 12A 10) 220V: 21A 11) ( )= Values for contactors without economy resistor (reduced power consumption). Closing delay 50 ... 85 ms, opening delay 20 ... 35 ms

TYPE LS CONTACTORS
TECHNICAL SPECIFICATIONS



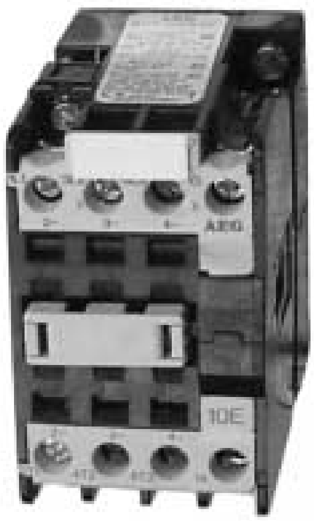
Type	Unit	LS47	LS57	LS77	LS87	LS107	LS177	LS247
Rated insulation voltage U_i, VDE 0110 IGr C	~V	1000	1000	1000	1000	1000	1000	1000
Mechanical lifespan								
a.c. operated	x10⁶ ops	10	10	10	10	10	10	10
d.c. operated	x10⁶ ops	3	3	3	3	3	3	3
AC-1 Duty Power rating P_N	kW	s.p. **1**/3	s.p. **1**/3	s.p. **1**/3	s.p. **1**/3	s.p. **1**/3	s.p. **1**/3	s.p. **1**/3
Related current I_{th} = Rated operating current I_e	A	90	100	110	110	180	225	350
Minimum cable cross sections with full rating	mm²	25	35	35	35	70	120	2x30x4
Permissible practical switching frequency	ops/hr.	50	50	50	50	50	50	50
Rated operating current at 1000 ops/hr.	A	80	90	100	100	160	200	300
AC-3 Duty Motor rating P_N	kW	s.p. **1**/3	s.p. **1**/3	s.p. **1**/3	s.p. **1**/3	s.p. **1**/3	s.p. **1**/3	s.p. **1**/3
Rated current I_e up to 3~440V	A	46	63	75	87	110	180	250
Permissible switching frequency at P_N		276	378					
and continuous operation	ops/hr.	500	500	500	500	500	500	500
AC-4 Duty Motor Rating P_N	kW	s.p. **1**/3	s.p. **1**/3	s.p. **1**/3	s.p. **1**/3	s.p. **1**/3	s.p. **1**/3	s.p. **1**/3
Rated current I_e with realistic contact lifespan up to 3~440V	A	23	32	37	46	63	73	110
Permissible switching frequency	ops/hr.	250	250	250	250	250	250	250
Highest permissible loading at 380V 3~ P_N/I_e	kW/A	s.p. **1**/3	s.p. **1**/3	s.p. **1**/3	s.p. **1**/3	s.p. **1**/3	s.p. **1**/3	s.p. **1**/3
Capacitor switching capacity with **Single switching/Parallel operation**[10]) 3~230V	kvar	17/17	24/24	24/24	28/28	35/35	58/45	87/66
3~400V	kvar	30/30	40/40	40/40	50/50	60/60	100/75	150/115
3~525V	kvar	35/35	50/50	50/50	50/50	80/66	130/90	190/145
3~690V	kvar	40/30	40/40	40/40	40/40	60/60	100/75	150/115
Permissible D.C. loading, with **3 poles connected in series**								
Rated current at **DC-1 Duty** (resistive load) ⎓ 24... 220V I_e	A	90	100	110	110	180	225	350
DC-2...DC-5 Duty (shunt and series wound motors L/R • 15 ms) ⎓ 24... 110V I_e	A	90	100	110	110	180	225	350
>⎓ 110... 220V I_e	A	25	32	40	40	80	150	200
Permissible switching frequency (DC-1 ... DC-5)	ops/hr.	50	50	50	50	50	50	50
Auxiliary switch Rated insul. voltage U_i VDE 0110	~V	1000	1000	1000	1000	1000	1000	1000
Continuous current I_{th}	A	20	20	20	20	20	20	20
AC-11 Duty (a.c.) Rated current I_e up to ~ 220V	A	10	10	10	10	10	10	10
at ~ 380V	A	8	8	8	8	8	8	8
at ~ 500V	A	6	6	6	6	6	6	6
at ~ 660V	A	6	6	6	6	6	6	6
DC-11 Duty (d.c.) Rated current I_e at ⎓ 24V	A	10	10	10	10	10	10	10
at ⎓ 60V	A	4	4	4	4	4	4	4
Values based upon 3 poles connected in a series at ⎓110V	A	2	2	2	2	2	2	2
at ⎓220V	A	1	1	1	1	1	1	1
Short-circuit protection. Highest rated fuse (gL)	A	20	20	20	20	20	20	20
Control Transformer (VA) Optional/Standard		75/100	75/100	75/100	75/100	100	150	250
Operating coil (Standard) **A.C. operated** **Power consumption (Voltage tolerance 0.75** ... 1, 1 U_S)								
Closing P_{AS}	VA	260	260	260	260	420	740	960
cos φ		0.53	0,53	0,53	0,53	0,53	0,42	0,26
Holding P_{HS}	VA	26	26	26	26	36	50	70
cos φ		0,23	0,23	0,23	0,23	0,23	0,26	0,38
DC operated (**) **Power consumption** at 1,0 U_S Closing P_A	W	170	170	170	170	280	430	400
(Voltage tolerance 0,85 ... 1,1 U_S) Holding P_H	W	4	4	4	4	4	5	6,5
(**)TW, Two Winding DC Coil								
Switching times at 1,0 U_s (standard coil)[8])								
A.C. Operated closing delay	ms	15 ... 35	15 ... 35	15 ... 35	15 ... 35	30 ... 60	30 ... 60	35 ... 60
opening delay	ms	6 ... 20	6 ... 20	6 ... 20	6 ... 20	10 ... 26	10 ... 26	12 ... 26
D.C. Operated closing delay	ms	20 ... 45	20 ... 45	20 ... 45	20 ... 45	50 ... 70	50 ... 70	50 ... 70
opening delay	ms	10 ... 30	10 ... 30	10 ... 30	10 ... 30	15 ... 35	15 ... 35	15 ... 35

8) These are typical values, and some variation can be expected
11) No potential separation
P_N - Rated Power

See AEG "K" Contactors, for larger Sizes and 4-Pole Contactors to 1,250 Amp.

TYPE LS DIMENSIONS
AC POWER CONTACTORS

Space Saving Dimensions



Type LS7 Contactor with 3 Auxiliary Contacts

3 Pole Contactor Dimensions

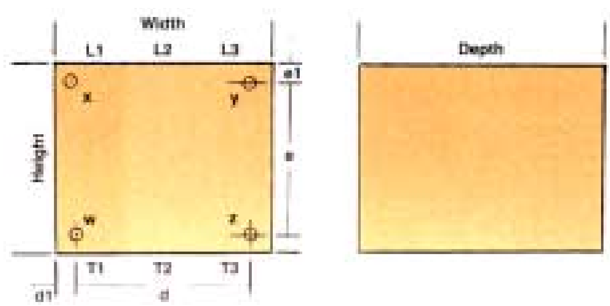
OVERALL DIMENSIONS (Inches Approximate)

Dimensions	LS07	LS4	LS7	LS17	LS27	LS37	LS47	LS57	LS77 LS87	LS107	LS177	LS247	LS220/280K
SIZE	MINI	00	00	0	1	$1^{3/4}$	2	$2^{1/2}$	3	$3^{1/2}$	$4^{1/2}$	5	$5^{1/2}$
Height	1.54	3.07	3.07	3.07	3.35	3.4	4.8	4.8	4.8	5.91	7.09	7.9	8.6
Width	1.77	1.77	1.77	1.77	1.77	2.0	3.5	3.5	3.5	4.72	5.31	5.7	7.2
Depth *	1.65	2.90	2.90	2.90	4.29	4.73	5.0	5.0	5.0	6.06	6.77	7.7	9.
Depth **		3.93	3.93	3.93	3.22	3.62							
Depth ▲ DC (SW Coils)		4.4	4.4	4.4		5.2							
Depth ▲▲		3.75	3.75	3.75		4.3							

* Depth with top deck auxiliary set. *(Includes DC - TW Coils)* **Unit with no auxiliary (.00).
▲ = with top deck aux. *(DC Single Winding)* ▲▲ = No top mount Aux.

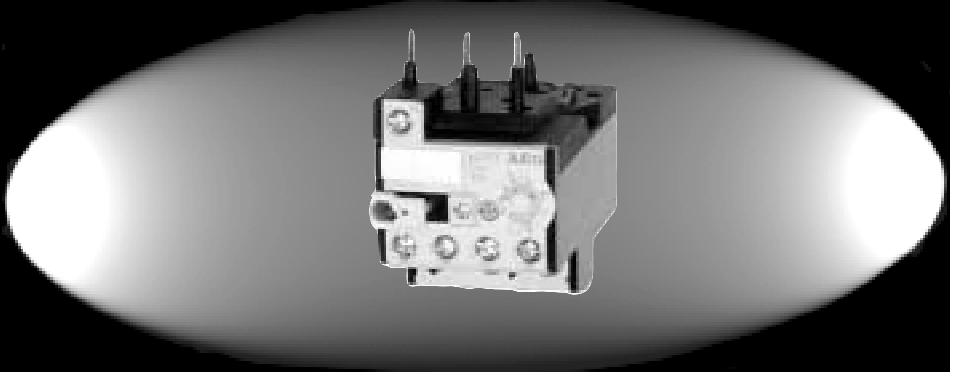
MOUNTING DIMENSIONS (Inches Approximate)

Mounting Hole	y,z	w,y	w,y	w,y	w,y	w,y	y,w	y,w	y,w	z,y,z	x,y,z	z,y,z	z,y,z
d	1.4	1.38	1.38	1.38	1.38	1.38	3.1	3.1	3.1	3.94	4.33	4.7	3.9
d1	0.2	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.39	0.49	0.5	1.5
e		2.36	2.36	2.36	2.95	2.95	4.3	4.3	4.3	5.12	6.30	7.1	7.9
e1		0.3	0.3	0.3	.2	.22	.26	.26	.26	0.39	0.39	0.4	0.6



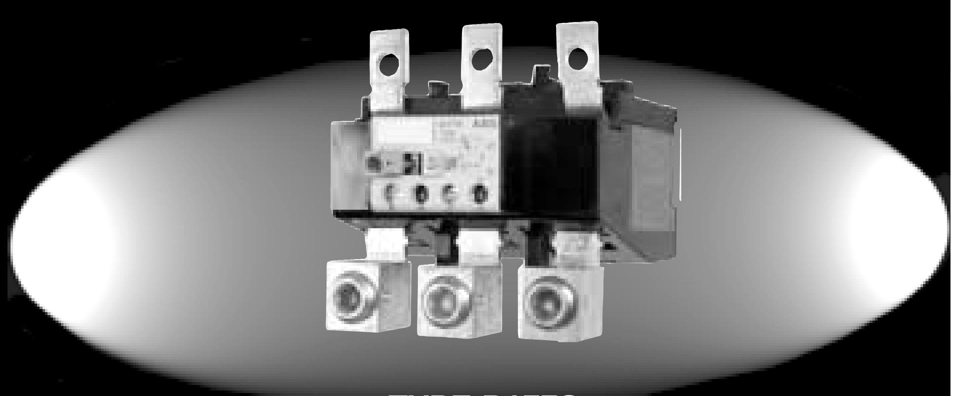
BULLETIN OL-1

THERMAL OVERLOAD RELAYS



TYPE B27T
FOR CONTACTOR ATTACHMENT

TYPE B27T
FOR INDIVIDUAL MOUNTING



TYPE B177S
TO 180 AMPS

Electrical & Electronic Controls
7 West Cross Street, Hawthorne, N.Y. 10532
(914) 769-5000 FAX (914) 769-3641

RELIABLE MOTOR PROTECTION WITH THESE FEATURES

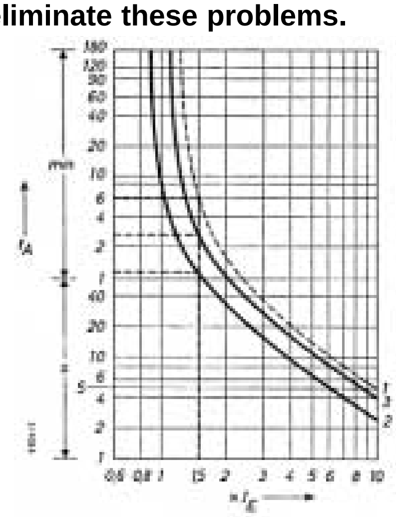
- Differential single-phasing protection
- Consistent operation with direct heated bimetals
- Precise factory set and tested heaters
- Protected heaters (not as open to dust and contamination)
- Ambient compensated overloads from -20°C to + 60°C, permitting no false tripping
- Sealable setting overloads with epoxy or paint for critical applications
- NEMA Class 10 design for “T” Frame Motors
- Both N.O. (“alarm”) and N.C. (“trip”) contacts
- Plug-on/bolt-on to contactor design
- Optional high inertia start overloads

STOP COSTLY DOWNTIME

Old fashioned O.L. heaters cause user problems, resulting in costly downtime. They also require field heater installation, resulting in these problems:

- Trip point varies due to (1) screw tightness, (2) heater position in relation to bimetal and (3) open design, with dust and contamination problems.
- No single phasing protection

EEControls Overload Relays eliminate these problems.



Tripping characteristic curve of three-pole thermal overload relays.
1: two-pole characteristic, relay without single phasing feature
2: two-pole characteristic, relay with single phasing feature
3: three-pole characteristic

AEG41

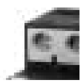
AEG

OVERLOAD RELAYS
Type B

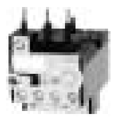
AEG

Thermal overload relays with standard trip characteristic

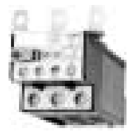
For individual mounting

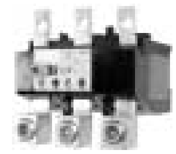


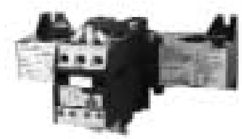
Contactor attached (either plug-in, or by separate connectors)



B27T

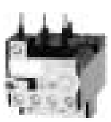






Type	B 27T	B 77S	B 177S	B 375K
Relay settings:				
Low range, from/toA	0.12/0.18	11/17	55/80	175/280
High range, from/toA	15/23	63/80	150/180	430/700
SIngle phasing prevention				
X-yes	X	X	X	X
Temperature compensation				
Effective from/to deg. C	-25/+60	-20/+60	-20/+60	-25/+60
Attachable to contactor Type	LS4, 7, 17, 27, 37	LS27, 37	LS87*, 107	
plug-in, or	SP4, 17, 27, 37	LS 47, 57, 77, 87	LS 107, 177	
bus connectors	OR Type K Contactors	OR Type K Contactors	OR Type K Contactors	
Standard Contacts, Isolated	NO/NC	NO/NC	NO/NC	
			* To 80 Amp	

D.C. Type B overloads can be used in D.C. systems with 3 poles in series.

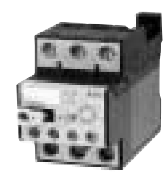


TYPE B 27T Plug-On Mount

(For Plug-On to Contactors LS4, LS7, LS17, LS27, 37)
LS4K, 5K, 7K, 11K, 15K, 18K

TYPE B 27T Separate Mount

(Overload & Separate Mount Adapter as an Assembly)



O.L., Relay Setting Range (Amps)	Catalog No. Suffix	List	Catalog No.	List
0.12-0.18	B27T-A	$55.00	B 27T-AS	$67.00
0.18-0.28	B27T-B	$55.00	B 27T-BS	$67.00
0.28-0.4	B27T-C	$55.00	B 27T-CS	$67.00
0.4-0.6	B27T-D	$55.00	B 27T-DS	$67.00
0.56-0.8	B27T-E	$55.00	B 27T-ES	$67.00
0.8-1.2	B27T-F	$55.00	B 27T-FS	$67.00
1.2-1.8	B27T-G	$55.00	B 27T-GS	$67.00
1.8-2.8	B27T-H	$55.00	B 27T-HS	$67.00
2.8-4	B27T-I	$55.00	B 27T-IS	$67.00
4-6	B27T-K	$55.00	B 27T-KS	$67.00
5.6-8	B27T-L	$55.00	B 27T-LS	$67.00
8-12	B27T-M	$55.00	B 27T-MS	$67.00
11-17	B27T-N	$55.00	B 27T-NS	$67.00
15-23	B27T-O	$65.00	B 27T-OS	$71.00
20-32	B77S-P-32A	$67.00	B 77-PS	$81.00

Adaptors to Separate Mount B27T Overloads.

Catalog No.	List
B 27T-AD (910-391-281)	**$12**
Adapter to Separate Mount B77S Overloads. B77-AD (910-391-268)	**$20**

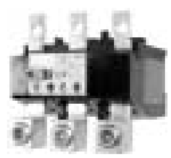
OVERLOAD RELAYS
OVERLOAD RELAY CONNECTORS

Type B 77S
11-80A

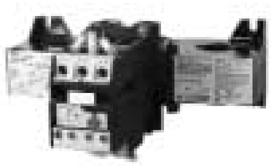
B77S

B177S
55-180A

B177S



B 375
175-700A



Catalog No.	Relay Setting range (Amps)	Max. Back-up fuse rating (A delayed)	List
For separate mounting and for mounting on contactors LS37-77 & LS22K-37K Bus Links are included with overload. See below for BUS LINKS to bus connect special combination overloads to contactors.			
B 77S-17A	11-17A		$67.00
B 77S-25A	16-25A	50	67.00
B 77S-32A	20-32A	63	67.00
B 77S-50A	32-50A	100	103.00
B 77S-63A	50-63A	100	103.00
B 77S-80A	63-80A	125	117.00
B 77-AD Adapter to Separate Mount B 77S Overload			20.00
For separate mounting and for mounting on contactors Types LS 87*, LS 107, LS 177, LS 247			
B 177S-80A*	55-80	125	$117.00
B 177S-110A	80-110	200	117.00
B 177S-135A	110-135	315	145.00
B 177S-160A	135-160	315	185.00
B 177S-180A	150-180	315	185.00
NO extra bus links are required to connect to LS 107, 177.			
*Only useable to 80 Amp with LS 87			
B 375K-280A ▲	175-280	**Buss Links Sold Separately See Below**	$420.00
B 375K-400A ▲	250-400		$540.00
B 375K-500A ▲	315-500		$540.00
B 375K-700A ▲	430-700		$540.00

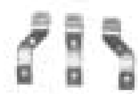
▲ B375K Buss includes brackets to direct mount to contactor. B375K Buss Link must be ordered separately. See below.

LED TRIP INDICATOR for visual indication of O.L. contact trip. Cat. No. LS-B-LA2 $13.00

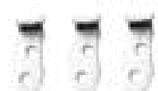
Overloads-Connections
Overload Relay Combinations with Contactors

OL Type	Amp Rating	Contactor	Catalog No. Bus Link (set of 3)		List	
B05	0-14	LS07(mini), LS05		*		
B27T	0-23A	LS4, 7, 17, 27 SP4, 7, 17, 27 LS4K - LS18K		* * *		
B77S-P-32A		LS, SP27	BL-269	**	$ 8	
B77S	11-32A	LS37, SP37	BL-271	**	8	
	15-80A ▲old ▲new	LS47, 57, 77, SP47, 57, 77, 87	BL-270 BL-273	** **	10 10	
	ALL	LS15K, 18K	BL-284		10	
	ALL	LS22K, 30K, 37K	BL-283		10	
B177S	55-80A	LS87	BL-274		10	
	80-180A	LS107, 177	BL-275	*	10	
		LS45K, 55K	BL-285		10	
		LS75K, 90K		*		
B375K	175-700A	LS110K-LS160K LS220K, 280K LS375K	hard wired BL-280 BL-375		 65 65	Must order separately

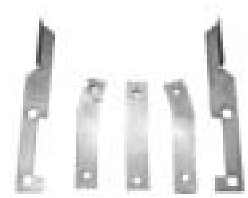
BL-271



BL-274



BL-275



BL-375

***Direct Connect Overload to Contactors Listed. No extra parts needed.**
** **BL-271** is included with B77S from 11-32 Amps. **BL-270** use in contactors without Finger Touch Guards, 32-80A **BL-269** is included with B77S-P-32A.
** **BL-273** is included with B77S from 32-80 Amps. New contactors, LS47,57,77,87 with Finger Touch Guards require **BL-273** for Bus Connection to O.L.
** **B177S** Overload. No extra Bus Links are required to connect B177 **to Contactors LS107, 177.**
** **BL-283** is required to mount B77S to LS22K - LS37K
Note: For other Contactor/Overload Connections, overload must be separate wired to contactors.

▲ Old - Designed pre 1993
▲ New - 1993 to present

OVERLOAD RELAYS
Type B
Standard, with Single Phasing Protection

Design and function of thermal overload relays

AEG thermal overload relays have three bimetal strips combied with a snap-action operating mechanism enclosed with a moulded plastic casing. As an overload current develops, the direct-heated strips heat up and deflect. At a present current marked on the relay setting scale, the snap-action mechanism releases, and actuates a change-over contact.

Tripping characteristics

Thermal relays always release with a certain delay period, t_A. This latter period varies inversely with the load current. The trip characteristic curves apply to overload tripping from the cold motor state. When warmed up to the final selected-current temperature, tripping already occurs with some 25% to 30% of the diagram-listed values.

The lowest reponse current starts with the cold-state figure,1.05 x I_E, and should not initiate tripping in less than two hours. After warming up, the current setting, 1.2 x I_E must have caused tripping within two hours while in operation.

Tripping delay from “cold” for a 6 x I_E reponse value serves to define relay differentials in regard to diverse tripping characteristics.

Characteristic T II = trips after 5 s
for 6 x I_E

When a relay responds much later than 5 seconds, its delay period is added to the designation T II e.g.TII/30 s = trips within 30 seconds for 6 x I_E full-load current.

The majority of all thermal relays work to grade T II for all practical purposes. Standard drive motors are thereby afforded a good measure of protectionduring a safe run-up.

Temperature compensation

Variations of ambient temperature over the range from -20°C to +60°C (with types b 05, b 27, b77 and b 177: -20°C to +60°C) do not effect the release timing because of the inbuilt temperature compensating feature provided with all thermal overload relays. The prevailing ambient temperature is that measured close to the contactor.

NOTE: In position A or H the auxiliary contact 95-96 cannot inadvertently be opened.

Single Phasing Mode of Operation

A three-phase bimetal overload relay having no loss-of-phase protection is equipped with only one slide #1 (as in Fig. 1). This slide component lies **ahead** of the bimetal strips and transmits their deflection onto the the trip mechanism. The thermal relays equipped with **single-phasing protection** are fitted with a second similar slide #2 (as in Fig. 1) set **behind** the bimetal strips. This is linked with a two-armed trip lever #3.

Given a three-pole overload trip (as under Fig. 1(b), all three bent strips will have shifted from their “cold state” setting k, to the “three-pole warm” position, w 3. This motion makes slide #2 give way to the bimetal strips right-handed motion, and the hinged lever #3 is shifted accordingly. The resulting travel s2 of lever #3 and of slides #1 and #2 equals in this case the bimetals travelled distance s1, and so effects tripping on reaching point S.

Given a two-pole trip operation however (as illustrated in Fif. 1 (c), the one unheated bimetal strip in the middle blocks any movement of slide #2. However, the lever-arm ratio of u enlarges the distance s1 so travelled by the two bending bimetal strips to their “two-pole warm” end position w2, changing into s2 as traveled by two armed lever #3. In other words, the two-pole overload makes for quicker tripping of a thermal relay with single phasing protection as compared to a regualr three-phase state of overloading.

Should the loss of a single phase happen to a so far three-pahse loaded drive relay system with a single phasing protection, then the affected bimetal strip will cool down. In doing so, it straightens and returns the bottom slide #2 to it’s cold-starting position. In this case, also, the overload trips more quickly.

TYPE B27T	MULTI-FUNCTION BUTTON - R -			
	FUNCTION POSITION			
Effect of operating button	H	HAND	AUTO	A
Resetting the overload relay	●	●		
Opening auxiliary contact [illegible] 95-96		●	●	
Closing auxiliary contact [illegible] 97-98		●	●	
	Hand - reset		Auto - reset	
Adjustment limits [illegible]		[illegible]	[illegible]	[illegible]

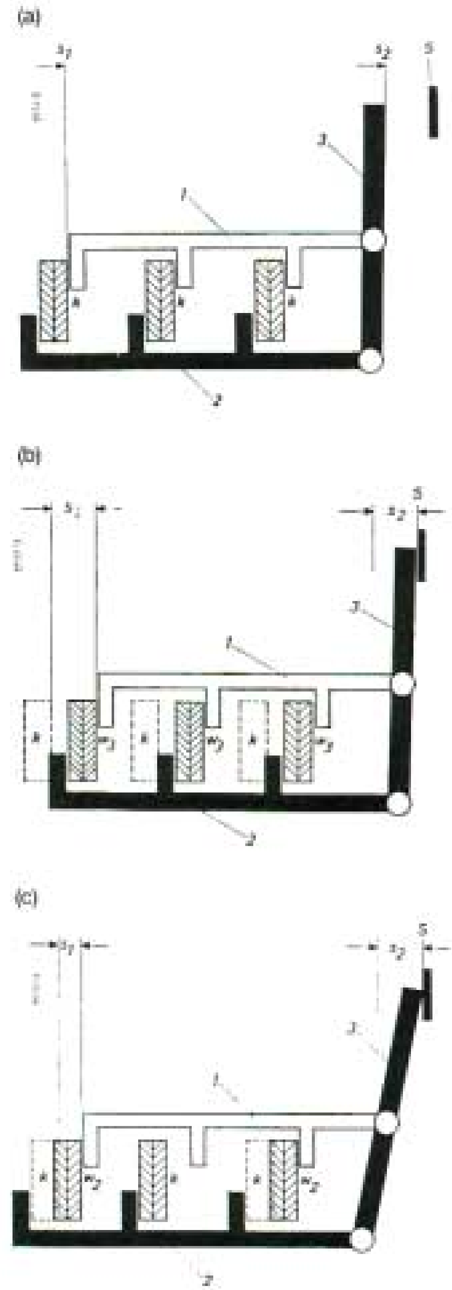


Fig. 1: Mode of operation of thermal overload relay fitted with single-phasing protection.

(a) **Unexcited**
bimetal strips cold:
$s_2 = s_1 = 0$

(b) **Three-phase tripping**
3 strips warm:
$s_2 = s_1$

(c) **Two-phase excited**
midway strip cold,
outer strips warm:
$s_2 = ü \cdot s_1$

where:
k = bimetal “cold” position
w_3 = bimetal “warm, 3-pole” position
w_2 = bimetal “warm, 2-pole” position
1 = top slide 1
2 = bottom slide 2
3 = two-armed lever
S = tripping point
s_1 = bimetals travel to trip
s_2 = lever 3 travels to trip
ü = two-armed lever ratio

BULLETIN CR

CONTROL RELAYS

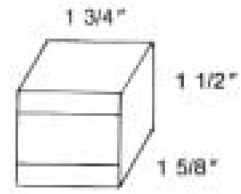
MINI POWER RELAY
TYPE SH04

CONTROL RELAY
TYPE SH4

CONTROL RELAY
TYPE SH8

Electrical & Electronic Controls
7 West Cross Street, Hawthorne, N.Y. 10532
(914) 769-5000 FAX (914) 769-3641

MINI RELAY
Type SH04
Mini Design CE



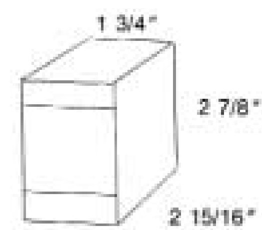
Rating: 16 AMP
600 Volt
AC or DC Coils

Pole Combinations
- 4 pole N.O.
- 3 pole N.O., 1 N.C.
- 2 pole N.O., 2 N.C.
- 1 pole N.O., 3 N.C.

Connection Options
- Pressure Wire Terminals
- Spade (Plug-On)
- Wire Wrap (for PC's)

For MINI STARTERS
See Type XLS07

CONTROL RELAY
Type SH4
Compact Design CE



Rating: 20 AMP/30 AMP
600 Volt
30,000,000 Operations

4 to 10 Poles
AC or DC Operation
Extreme Long Life
Protected Coil/Contacts
Rail Mounting

Field Flexible
- Add on Poles
- Add on Timer Kit
- Add on Latch Kit

Internationally Accepted
UL, IEC, S+, BS, VDE CE

AEG

TYPE SH04
MINI-RELAYS

AEG

SH04

SH04F

SH05

AC & DC OPERATED

With Pressure Wire Screws Terminals

	CONTACTS NO	CONTACTS NC	AC OPERATED LIST	DC OPERATED LIST
SH04.22-◇	2	2	**$34**	**$44**
SH04.31-◇	3	1	**34**	**44**
SH04.40-◇	4	0	**34**	**44**
SH04.13-◇	1	3	**34**	**44**

With Flat Plug (Spade) Connectors

	CONTACTS NO	CONTACTS NC	AC OPERATED LIST	DC OPERATED LIST
SH04F.22-◇	2	2	**$34**	**$44**
SH04F.31-◇	3	1	**34**	**44**
SH04F.40-◇	4	0	**34**	**44**
SH04F.13-◇	1	3	**34**	**44**

With Terminal Wire Pin Connectors (IX 0.6mm for soldering to p.c.'s)

	CONTACTS NO	CONTACTS NC	AC OPERATED LIST	DC OPERATED LIST
SH04L.22-◇	2	2	**$34**	**$44**
SH04L.31-◇	3	1	**34**	**44**
SH04L.40-◇	4	0	**34**	**44**
SH04L.13-◇	1	3	**34**	**44**

RELAY TIMERS

MINI RELAYS - POSITIVE GUIDED DESIGN

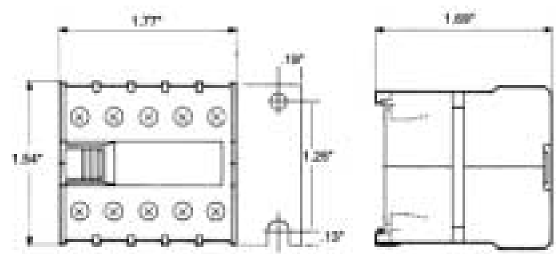
FOR SAFETY CIRCUITS (See page AEG 67)

Type SH04 Minirelays are applied for auxiliary wiring and remote control schemes. Taking as little as 1.2W to pick up, the *24 Volt DC* Minirelay SH04 and Minicontactor LS07 are ideal for operation of most electronic control systems as an interface relay.

Type SH05 Mini Relay is available to 8 pole.

Mini relay SH04 is certified as a Positive Guided Design per IEC 947-5 and independent Test Laboratory Certified per IEC 947-5.

DIMENSIONS (Inches Approximate)



◇COIL VOLTAGE SUFFIX

AC	60Hz	50Hz	DC•
-A	120V	110V	-MSW 12VDC
-C	208/230V	220V	-NSW 24VDC
-D		380V	-OSW 48VDC
-E	480V	440V	-PSW 120VDC
-G	24V	22V	

•SW - Single Winding

Technical Data Type SH04

Rated insulation voltage 600V — 16 Amp continuous

Mechanical life endurance — For AC operation: 4 million operation cycles; For DC operation: 10 million operation cycles

AC 1 duty resistive — Admissible operation frequecy: 50 operations/hour; Contact life expectation under full load and rated operational current: 150,000 ops (16 Amp)

AC 11 duty heavy pilot duty 10 Amp — Rated make/break capacity up to 200 V 60 Amp; Allowed frequency of operations at full load and uninterrupted duty: 6500 ops/h

DC 11 duty standard duty — Max. back-up fuse: 16 A slow

Coil ratings

For AC operation (working range 0.8 to 1.1V):
Pick-up/sealing 16VA/4.9VA
14W/2.2W
pf 0.88/0.45

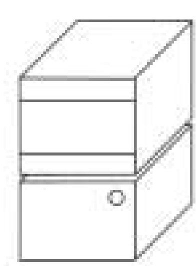
For DC operation (working range 0.8 to 1.2V):
Pick-up/sealing 2.4W
(for 24V: 1.2W; for operationg range 0.8 to 1.7V)

Switching times for 1.0V

For AC operation closing delay 9 to 30 millisecs opening delay 5 to 25 millisecs
For DC operation closing delay 10 to 35 millisecs opening delay 2 to 8 millisecs

MINI STARTERS TYPE 07

with Type B05 Overloads - "The Reliable" Motor Protectors



Check with factory for details
See pages AEG 12, 13

TYPE SH4 / SH8 / SH10 POSITIVE GUIDED RELAYS

E C CONTROLS — AEG

Space Saving Dimensions
4 Pole, 8 Pole, 10 Pole

Full Approvals - woldwide acceptance

UL N CSA IEC S S D BS CE

AC Contact Rating Per Pole SH4, SH8, SH10 Relays			
Maximum Voltage	Amperes		Continuous Carrying Current Only (Amperes)
	Make	Break	
120	60	6.00	20
240	30	3.00	20
480	15	1.50	20
600	12	1.20	20
Maximum DC Contact Rating Per Pole			
125	5.0	1.1	20
250	5.0	0.55	20

⟐COIL VOLTAGE SUFFIX

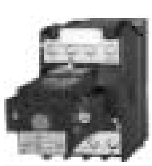
AC	60Hz	50Hz	DC•
-A	120V	110V	-MSW 12VDC
-C	208/230V	220V	-NSW 24VDC
-D		380V	-OSW 48VDC
-E	480V	440V	-PSW 120VDC
-F	600V	550V	-RSW 220VDC
-G	24V	22V	
-H	277/280V	240V	

•SW - Single Winding

PEUMATIC TIMER MODULE KIT

Field added to relays type SH4, LS4, LS7, LS17
Timer has 1 NO & 1 NC timed contact
6 AMP 500 Volt

		List
On Delay	0.3-40 sec. Type TP 40 D	$80
	10-180 sec. Type TP 180 D	80
Off Delay	0.3-40 sec. Type TP 40 I	80
	10-180 sec. Type TP 180 I	80



MECHANICAL LATCH KIT

Field added to Relays Type SH4 (only)

with 120 Volt AC Coil Type WB30-120V $73

NOTE: For silent operation without latch, consider SH17 with 4 NC Power Poles (30 Amp).

Positive Guided Relays, 20 Amp.
Type SH4, SH8, SH10

For critical safety circuits, self-checking duplicate circuits can be required. The following type SH multipole relays have positive action on the contacts. This positive guided design assures that no normally open contact can close before any normally closed contact can open. The normally open contact will have a 0.5mm contact gap.*

In the event one of the contacts welds closed, the other contacts are prevented from changing state (a N.C. contact will not open/and a N.O. contact is prevented from closing).

"Positive Guided" contacts are not positive break or positive open contacts.

*Per IEC safety standard IEC 947-5-1
See pages AEG 7, 9, 10 for additional data on Positive Guidance.

Enclosed Protected Designs
The type SH Relays are more enclosed and protected from dusts and corrosive atmostpheres, thereby being preferred for the more difficult environments.

Reliable Operation
Historically, the dominant users of Type SH4 and SH8 have been difficult-environment and process industries where extra designed protections from harsh environments yield the most reliable operation. This type of industry is also highly capital intensive where down time costs cannot be tolerated. To satisfy the need for reliable operation all ratings are conservative and extra capacity is designed into each unit.

Each type SH unit includes:
- Din Rail Mount
- High impact, fungus inert, and moisture resistant housings
- 100% stainless stell springs
- Permanent air-gap kotch in "E" magnets for dependable drop out
- High temperature capability: 60ºC ambient
- 10,000,000 to 30,000,000 operation mechaical life

Catalog # Ordering Example: SH4-40-NSW			AC Coil	DC Coil
Rating: 20 AMP 600 Volt	**Poles**		**List**	**List**
Basic 4 Pole	**NO**	**NC**		
SH4-40-⟐	4	0	**$62**	**$90**
SH4-31-⟐	3	1	**62**	**90**
SH4-22-⟐	2	2	**62**	**90**
Adder poles to above relays...Add up to 3 poles max				
HS17.10 (10 Amp)	1	-	**$13**	**$13**
HS17.01 (10 Amp)	-	1	**13**	**13**
Basic 8 Pole 30,000,000 Operations				
SH8-80-⟐	8	0	**$104**	**$132**
SH8-62-⟐	6	2	**104**	**132**
SH8-44-⟐	4	4	**104**	**132**
Basic 10 Pole				
SH10-55-⟐	5	5	**$120**	**$148**
SH10-73-⟐	7	3	**120**	**148**
SH10-10-⟐	10	0	**120**	**148**
Note: SH4 also available in Two Winding				

DIMENSIONS

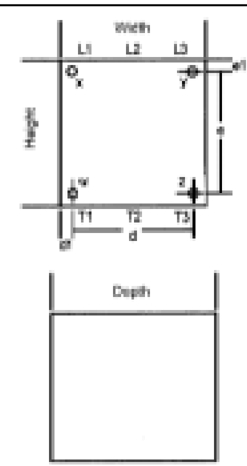
OVERALL DIMENSIONS (inches approximate)

Dimensions	SH04	SH4	SH8
SIZE		**MINI**	
Height	1.54	3.07	3.07
Width	1.77	1.77	1.77
Depth	1.65	2.90	3.94
Depth*		3.62	

MOUNTING DIMENSIONS (inches approximate)

Holes	y.z	w.y	w.y
d	1.4	1.38	1.38
d1	0.2	0.3	0.3
e		2.36	2.36
e1		0.3	0.3

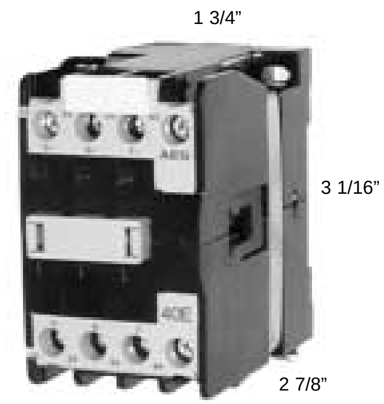
*Depth with top deck auxiliary set



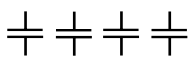
DC CONTROLS

TYPE SH17
30 AMP SPECIALTY CONTACTORS

SPECIAL CONTACTORS



TYPE SH17-40
4 Pole Normally Open



TYPE SH17-44
8 Pole, 4 Normally Closed
4 Normally Open

- **2 to 8 Poles**
- **Normally Open 30 Amp**
- **Normally Closed 30 Amp**
- **UL/CSA RATINGS 600 VOLT AC**
- **30 Amp General Purpose**
- **30 Amp Discharge Lamps**
- **LIGHTING CONTACTORS RATINGS**
- **20 Amp Tungsten Lamps (25 Amp CSA)**
- **AC or DC Coils**

Catalog #	Poles NO	Poles NC	AC Coil List
2 Pole			
SH17-20-◈	2	0	**$75**
3 Pole			
SH17-30-◈	3	0	**$88**
4 Pole			
SH17-40-◈	4	0	**$94**
SH17-04-◈	0	4	**$100**
SH17-22-◈	2	2	**$100**
SH17-31-◈	3	1	**$100**
Auxiliary Contacts			
(3 extra can be added to the above 4 pole contactors)			
HS17.10	1	-	**$13**
HS17.01	-	1	**$13**
Six Pole			
SH17-60-◈	6	0	**$106**
SH17-42-◈	4	2	**$106**
AC, or DC Type SW only ▲			
Eight Pole			
SH17-80-◈	8	0	**$131**
SH17-44-◈	4	4	**$131**
AC, or DC Type SW only ▲ (DC add $28 list)			

▲ **DC Power Plant** Add $28 List
Type SW (Single Winding) Design

AC Coil Burden Pick up 55 VA
Hold in 10 VA

DC Coil Burden (5W) 6.5 Watt

Enclosures

Metal NEMA 1 General Purpose
Add suffix-M01 Add $35 List

Non-Metal Type 4X Outdoor
Add suffix-4X Add $98 List

◈COIL VOLTAGE SUFFIX

AC	60Hz	50Hz	DC•
-A	120V	110V	-MSW 12VDC
-C	208/230V	220V	-NSW 24VDC
-D		380V	-OSW 48VDC
-E	480V	440V	-PSW 120VDC
-F	600V	550V	-RSW 220VDC
-G	24V	22V	(Add $28 List)
-H	277/280V	240V	

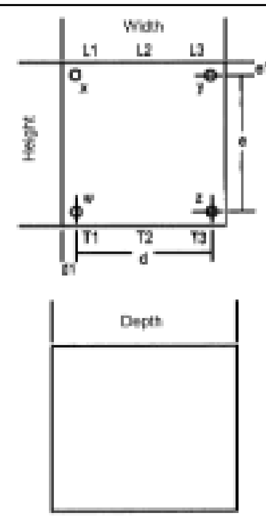
•SW - Single Winding

DIMENSIONS

OVERALL DIMENSIONS (inches approximate)

Dimensions	SH17-2P, 3P, 4P	SH17-6P, 8P
SIZE (with AC coil)		
Height	3.07	3.07
Width	1.77	1.77
Depth*	2.90	3.94
Depth**	3.62	
MOUNTING DIMENSIONS (inches approximate)		
Holes	w.y	w.y
d	1.38	1.38
d1	0.3	0.3
e	2.36	2.36
e1	0.3	0.3

*Depth with HS17 top deck auxiliary set.
**Unit with o auxiliary (00).
All SH17 are suitable for DIN rail mount.



Low DC Coil Burden

A Positive Guided design per IEC 947-5

(Also usable on Safety Circuits, see page AEG 7)

Application: DC Power plants are available in the full range of AEG Relays & Contactors through 6,000 Amps.

Very low coil burden magnet systems are recommended for electric systems which frequently use 24 Volt control power. Specifically designed for these applications are AEG Type LS07, LS4, LS17, and LS37 contactors through 20 HP, 60 Amp, and Type SH04, SH4, and SH8 power relays. Larger contactors use the tapped coil system. No bulky economizing resistor is needed.

Type SH04 Mini Relays, 4 Pole

Type SH04 Mini Contacts
Rated: 16 Amp, 600 Volt AC

DC OPERATED

With pressure wire screws terminals

	Contacts NO	Contacts NC	DC List
SH04.22-◈	2	2	$44
SH04.31-◈	3	1	44
SH04.40-◈	4	0	44
SH04.13-◈	1	3	44
With Flat Plug (Spade) Conectors			
SH04F.22-◈	2	2	44
SH04F.31-◈	3	1	44
SH04F.40-◈	4	0	44
SH04F.13-◈	1	3	44

Coil burden (Watts)
Pick up 2.4 Watt*
Hold in 2.4 Watt*

*1.2 Watt with 24 Volt Coil

◈DC COIL VOLTAGE SUFFIX

-MSW 12VDC
-NSW 24VDC
-OSW 48VDC
-PSW 120VDC
-RSW 220VDC

DC CONTROLS

Types SH4, SH8 Power Relays

Contacts Rated 20 Amp, 600 Volt AC

Catalog #	Poles NO	Poles NC	DC Operated List
Basic 4 Pole			
SH4-40-◈	4	0	$90
SH4-31-◈	3	1	90
SH4-22-◈	2	2	90
Adder poles to above relays...Add up to 3 poles max			
HS17.10	1	-	$13
HS17.01	-	1	13
Basic 8 Pole 30,000,000 Operations			
SH8-80-◈	8	0	$132
SH8-62-◈	6	2	132
SH8-44-◈	4	4	132

Coil Burden (Watts)
Pick up 6.5W
Hold in 6.5W

◈DC COIL VOLTAGE SUFFIX

-MSW 12VDC
-NSW 24VDC
-OSW 48VDC
-PSW 120VDC
-RSW 220VDC

Type SH8 Contacts Rated 20 Amp, 600 Volt AC

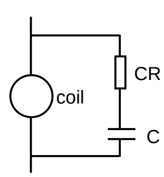
Surge Suppressors

AC Suppressors

Design

A series connected resistor and capacitor, contained in a small molding, are conected in parallel with the control relay coil.

RC-Elemets mount onto LS4, LS7, LS17, LS27, and LS37 contactors ad SH4, SH8, and SH8 power relays. Module snaps into top of contactor.

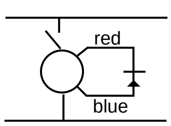


Catalog #	Description	List
RC-A02/48	(24...48V) for LS07 to LS37	$20
RC-A02/220	(110...220V) for LS07 to LS37	20
LRC-V2-6.8	(24V) for LS47-107	26
LRC-V2-0.68	(120V) for LS47-107	26

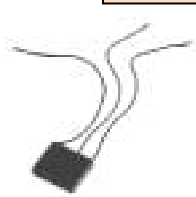
DC Suppressors

Design

The diode which is enclosed in a small molding is connected in parallel with the relay coil.



Catalog #	Description	List
LG-A02	(24...220V) for LS4 to LS37 (SH04)	$20
LD-V1-3A/1000	(24...220V) for LS47 to LS247	23



For COMPLETE SELECTION of Surge Suppressors, see page: DE 9.