

**CONTACTORS
FOR CAPACITOR
SWITCHING
TYPE LSKCW**

KVAR Rated to 100 KVAR at 600VAC
Operation Temp -25°C - 55°C

**8 Sizes Available
Ranging from 25A - 140Amp**

Application Usages:

- Power Factor Correction
- Discharge Lamps
- Incandescent Lamps
- Thyristor Drives
- Resistance Furnaces
- Electric Heaters
- Resistance Welding Machines

Positive Design Operation

The key for positive operation is one assembly on one armature guide, all factory manufactured and 100 percent tested. An extra set of line contacts, 3 poles, is part of the main armature guide. These are designed into the head of the contactor, along with a current limiting inductance to reduce the inrush. This is one assembly and part of the contactor. When the contactor is turned ON, as the armature closes, the three extra poles are early make, before the main poles make to reduce the inrush current. Most important, these early make poles, then mechanically open as the armature picks up so the main poles only carry the continuous current.

Type LS16 KCW
CONTACTOR



Type LS45 KCW
CONTACTOR

**CAPACITOR SWITCHING
CONTACTORS**

Type LS KCW

(power factor correction contactors)

For larger sizes thru 600KVAR/1250 Amps use standards LS-K contactors

Conformity to Standards

IEC 947
VDE 0660
EN 60947
BS 5424



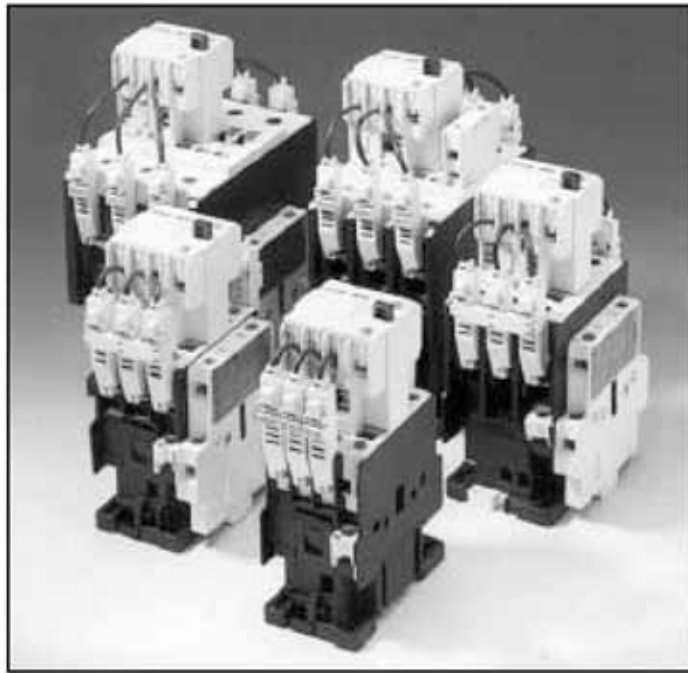
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CAPACITOR SWITCHING CONTACTORS

Type LS KCW



LS12 KCW



LS45 KCW

Amp lth	KVAR Rating (UL/CSA)			Part Number	List Price
	230V	460V	600V		
25	7.5	15	18	LS 12KCW.11-*	\$109
32	10	20	25	LS 16KCW.11-*	\$123
45	12.5	25	30	LS 20KCW.10-*	\$150
45	15	30	35	LS 25KCW.10-*	\$182
60	20	40	50	LS 30KCW.10-*	\$246
90	25	55	65	LS 45KCW.10-*	\$364
110	35	70	80	LS 55KCW.10-*	\$417
140	45	90	100	LS 70KCW.10-*	\$535

* Includes 1 N.O. Auxiliary Contact, 10 Amp 600Volt except sizes LS12 and LS16 which have 1 N.O. plus 1 N.C. Auxiliary Contacts.

See **LS-K Contactor** section for additional Aux. Contacts and Accessories

* COIL SUFFIX (Bold type - commonly used coils)		
*AC	60 HZ	50 HZ
-G	24V	24V
-A	120V	110V
-B	208V	200V
-C	220V	220V
-H	277V	230V
-E	480V	380V
-F	600V	500V

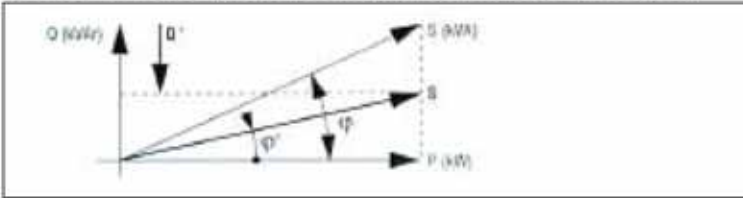
For Larger Sizes thru 600KVAR / 1250AMP, use standard LS-K Contactors.
Check with main office for specific P.F. Switching Ratings.

Complete Part # Example: LS12KCW.11-A

GENERAL DESCRIPTION

Power Factor Correction

To correct or improve the power factor, it is necessary to connect capacitors at certain points of the network. In practice, inductive components including transformers, motors, etc. clearly dominate in electrical networks. So, to reduce the amount of reactive power in electrical supplies, it is necessary to connect one or more capacitor banks in parallel to the installation. The reactive energy produced by the capacitors, reduce the amount of reactive power supplied to the consumers, correcting the power factor, increasing the value of Cos φ.



After power factor correction, for existing installations, an adequate power factor provides a decrease in voltage drops and joule losses and, an increase in the induction motor starting torque without altering its power. For new installations an adequate power factor is going to decrease the initial investment cost and the required installation kVA. Additionally, certain power companies provide discounts for power factor correction.

Example of typical power factors

Induction Motors (50%) Load	<100kW (125HP)	0.6 - 0.8
	>250kW (300HP)	0.8 - 0.9
Discharge lamps		0.4 - 0.6
Incandescent lamps		0.9 - 1
Mercury lamps		0.5 - 0.6
Thyristor drives		0.7
Resistance furnaces		0.9 - 1
Electric heater		0.9 - 1
Arc Furnaces		0.8
Resistance welding machines		0.8 - 0.9
Induction furnaces		0.2 - 0.6

Power Factor

The total operating power, termed **Apparent Power (S)**, is the result of multiplying $U \times I$, however the real power is reduced by a factor $\text{COS } \phi$ termed **Power Factor**. In a three-phase systems, the real power of the circuit, termed **Active Power** is expressed as:

$$P = U \times I \times \text{Cos } \phi$$

and by analogy, the **Reactive Power** is expressed as:

$$Q = U \times I \times \text{Sine } \phi$$

The **Power Factor** represents the relationship between the Active Power and the **Apparent Power**

$$\text{Cos } \phi = \frac{\text{Active Power (kW)}}{\text{Apparent Power (kVA)}}$$

A system with a low Power Factor may generate:

- Losses on the system
- Excessive energy consumption
- Oversized installations

Application Solution and Problem Analysis

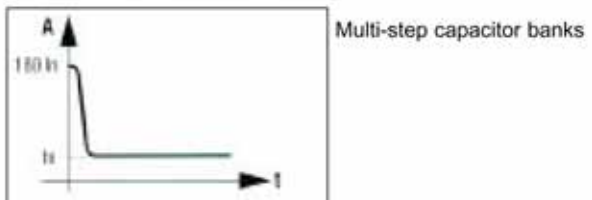
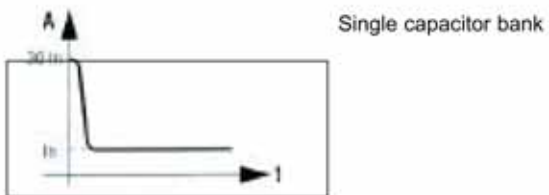
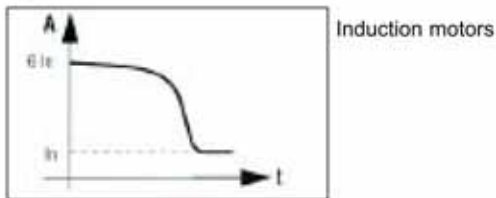
To reduce the peak current, it is necessary to insert inductances in the circuit or to use AEG special contactors types LS "KCW" designed for this application with a built-in set of current limiting resistance.

The UL/CSA approved KVAR and current ratings on Type LS KCW contactors are designed and applied for capacitor switching currents. Additionally, there is no derating for adding multi step capacitor banks.

P - Active Power (Real Power kW)
Q - Reactive Power (KVAR)
U - Line Voltage
UCC - Short Circuit Voltage (%)

Analysis of Inrush Currents and Capacitor Currents

The phenomenon to switch capacitors in parallel with an inductive circuit creates transition current peaks of high frequency (15kHz) which may reach 180 times the capacitor nominal current.



Contactors used to switch capacitor banks must be able to carry the presence of harmonic currents in addition to the nominal current (with a permissible coefficient: 1.3 I_n) of the capacitor banks. According to the capacitor manufacturers, the power capacitors may be over dimensioned 10% due to the internal capacitor tolerance (permissible coefficient: 1.1 I_n). Contactors used for switching capacitor banks must be rated to carry a thermal current 1.43 times (1.3 $I_n \times 1.1 I_n$) the nominal current of the capacitor.

$$I_{th} = 1.43 \times I_n$$

Therefore, contactors used to switch capacitor banks must:



- be able to carry a rated permanent current of 1.43 times the capacitor bank rated current.
- be able to carry transition peak in rush currents on the making capacitor.

The peak of current which must be carried by the contactors decreases with the following conditions:

- circuit inductance are high
- line transformer ratings are low
- the UCC transformer is high

			LS12 KCW	LS16 KCW	LS20 KCW	LS25 KCW	LS30 KCW	LS45 KCW	LS55 KCW	LS70 KCW
Main Circuit (poles)										
Rated operational voltage	(V)		690	690	690	690	690	690	690	690
Rated insulation voltage according to IEC947	(V)		1000	1000	1000	1000	1000	1000	1000	1000
Rated thermal current	(A)		25	25	45	45	60	90	110	140
Max. power utilization	230V	(kVAR)	7,5	10	12.5	15	20	25	35	45
UL/CSA	460V	(kVAR)	15	20	25	30	40	55	70	90
	600V	(kVAR)	18	25	30	35	50	65	80	100
Max. peak current	(A)		1000	1000	1000	1000	2500	3500	3500	3500
Electrical endurance	(Ops.)		280,000	280,000	250,000	250,000	200,000	150,000	150,000	100,000
Max. Ops./hour	(Ops./hour)		350	350	350	240	240	200	200	200
Control circuit										
Standard voltages	50Hz	(V)	24-690	24-690	24-690	24-690	24-690	24-690	24-690	24-690
	60Hz	(V)	24-600	24-600	24-600	24-600	24-600	24-600	24-600	24-600
Consumption										
Coil	Pick up	(VA)	45	45	48	48	88	191	191	198
	Holding	(VA)	6	6	7	7	9	15.5	15.5	17

Note: Standard LS/K Contactors are also available with Capacitor Switching Ratings to 1250 Amp, 600 KVAR. Check with main office for specific rating.

Terminal capacity and tightening torque					
	Solid, stranded and finely stranded without end sleeve (mm ²)	1x 0.5-2.5 1x 2.5-6	1x 0.5-2.5 1x 2.5-10	Max. 16	Max. 50-4 Max. 25-16
AWG wires	1x 20-12	1x 20-8	Max. 6	Max. 2-12 Max. 4-4	Max. 1
Tightening torque	1.6 Nm 15 Lb x in	2.2 Nm 20 Lb x in	1.8 Nm 16 Lb x in	4 Nm 35 Lb x in	5.6 Nm 50 Lb x in

Typical Applications

