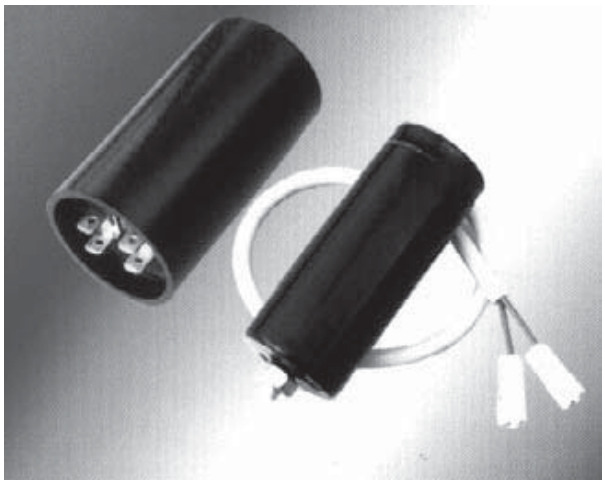
CONIS COMPANY Ltd.

CAPACITORS

EMI and RFI FILTERS

CAPACITORS

FOR MOTOR APPLICATIONS



CONTENTS

GENERAL INFORMATION

ELECTRICAL SPECIFICATIONS AND DEFINITIONS

- Dielectric:
  bi-axially oriented polypropylene
- Plates:
  self-healing metal layer Zn or Al deposited by evaporation under vacuum

Rated voltage U_R
The rms value of the sinusoidal AC voltage which can be applied to the capacitor in normal wîrking conditions.
From 250 to 500 V (see each series)

Rated current I_R
The value of the current flowing through the capacitor of rated capacitance at the rated voltage and frequency.

Duty frequency range
The capacitors can be used at a frequency range of 50-60 Hz. Use at higher frequencies is possible provided the voltage, current, temperature and power limits are complied with.

Operating temperature class
Minimum temperature - 25 ^{0}C.
Maximum temperature +70 ^{0}C or +85 ^{0}C.
In accordance with the reference standards, these temperatures are those measured on the surface of the capacitor.

Storage temperature -10 ^{0}C ... +85 ^{0}C

Capacitance tolerance
Rated tolerance ±5%; ±10%
Different tolerance values are available on request.

Dissipation factor (tgδ)
The value of the tangent of the loss factor measured at 50 Hz, 20 ^{0}C at the rated voltage is:
tgδ ² 20 x 10 $^{-4}$

Maximum permissible overloads
The capacitors can operate in the following overload conditions throughout the temperature class range:
I max = 1.3 I_R
U max = 1.1 U_R
The overload deriving from the simultaneous presence of voltage and current above the rated values, even if within the stated limits, must be such that the appàrent power Pa (Irms x Vrms) absorbed by the capacitor is:
Pa ² 1.35 x 2πf x C x U_R^2

Pulsed stress
The capacitors are capable of withstanding steep wavefronts with a maximum voltage variation speed of 20 V/μs.

Insulation resistance between terminals and case
Measured at 500 VDC, 20 ^{0}C after 30 seconds.
Ri > 1000 Mohm

Direct current operation
These capacitors can be used with a DC voltage not exceeding the peak value of the rated voltage
VDC ² 42 Vn

MECHANICAL SPECIFICATIONS
Mounting:
The capacitors may be provided with stud M8 for mounting:
The maximun torque is 5 Nm
Vibrations:
In accordance with IEC 68-2-6 standards, the capacitors pass the test with a frequency range from 10 to 55 Hz, acceleration amplitude 10 g and duration 6 h.

Operating classes and climatic categories IEC/EN 60252

Operating classes of capacitors for single phase motors are identified as follows:
a) Life expentancy

	30.000 h class A	10.000 h class B	3.000 h class C	1.000 h class D
failure % max	3%	3%	3%	3%

b) Climatic category

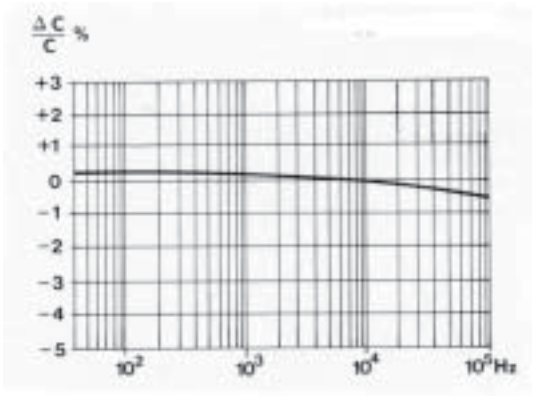
25	/	85	/	21
min. permissible temperature		max. permissible temperature		damp heat days

c) Class of safety protection

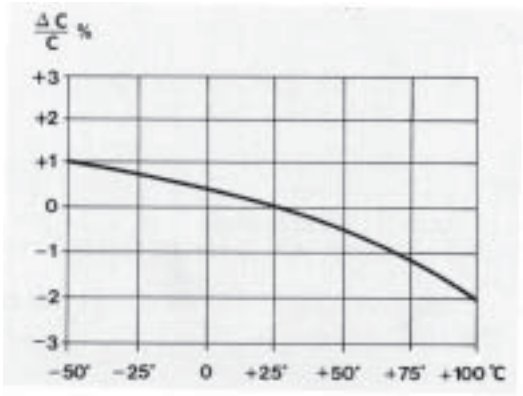
P0	Without safety protection
P1	Safety achievable by external means (fuse)
P2	With internal safety protection

Markings
Black colour. Data shown: CONIS trade mark, Series number, Capacitance in microfarad, Tolerance in %, Rated A.C. Voltage, Operating temperature range in degrees Centigrade, Coded climatic class and reliability data according to DIN 40040, Self-Healing property SH, Year and mounth of production.

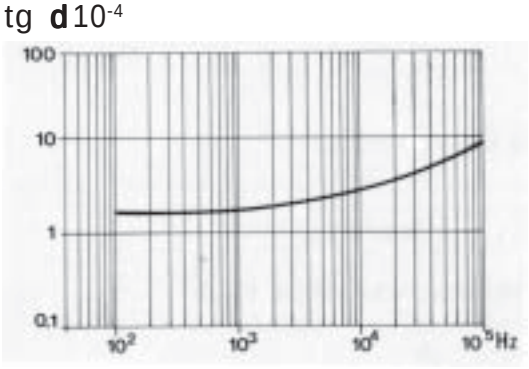
CHARACTERISTIC CURVES



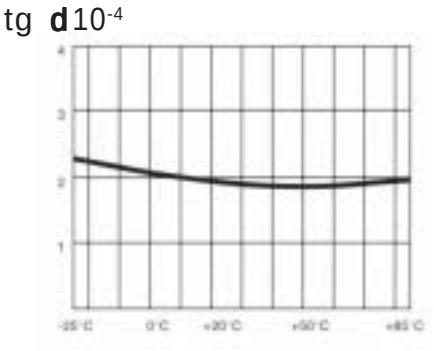
Capacitance vs. frequency



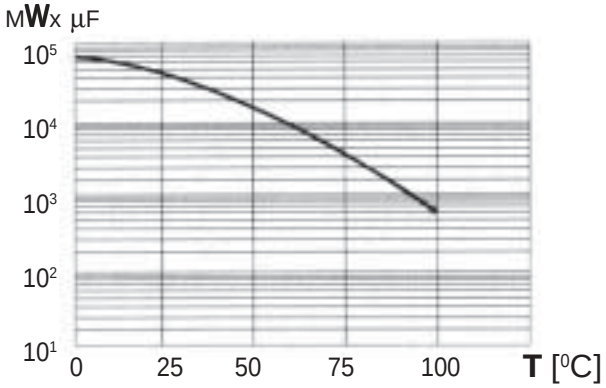
Capacitance vs. temperature at 1 kHz



Dissipation factor vs. frequency

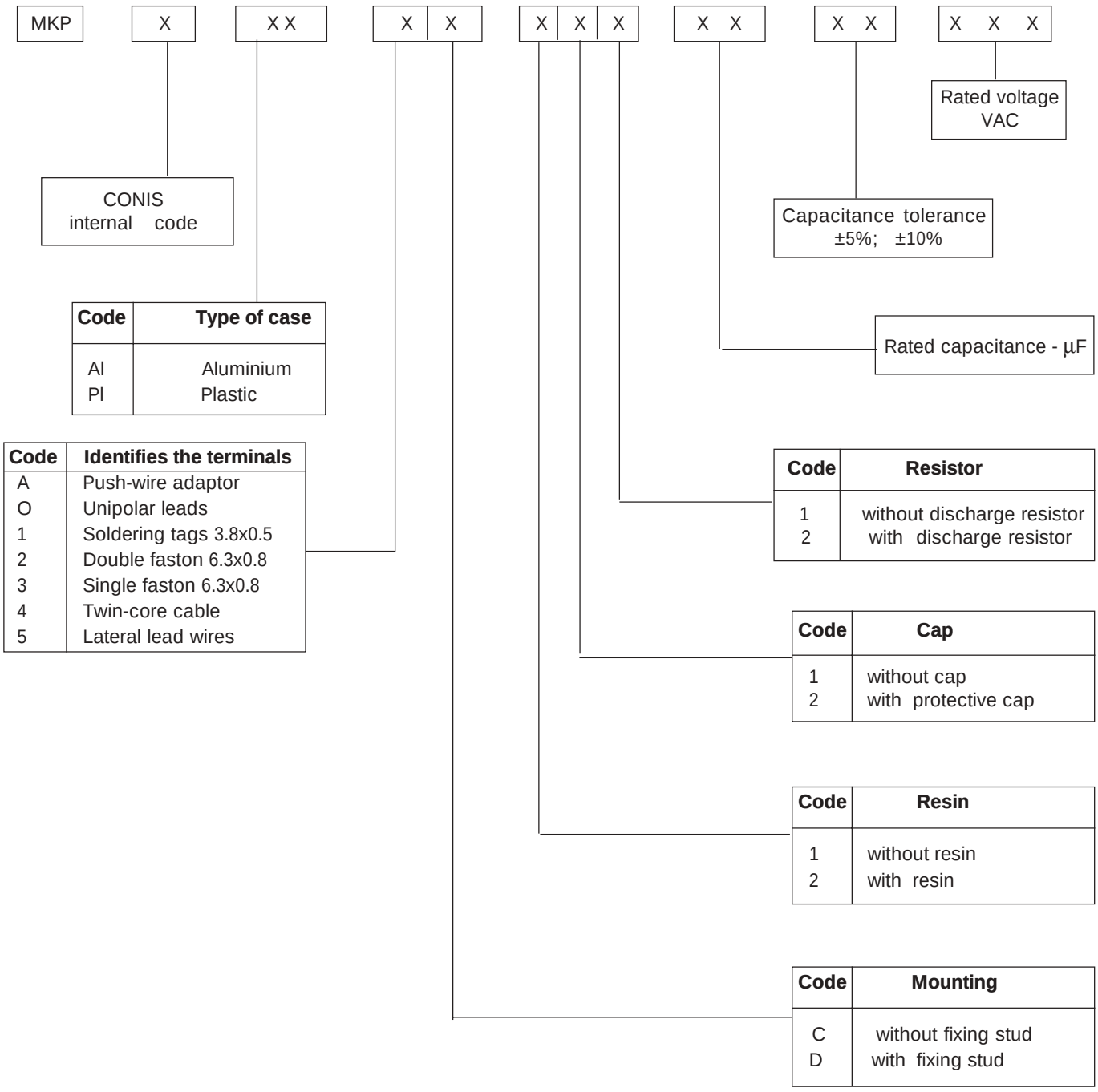


Dissipation factor vs.temperature at 1kHz



Time constant vs. temperature

ORDERING CODE



Code	Type of case
Al	Aluminium
Pl	Plastic

Code	Identifies the terminals
A	Push-wire adaptor
O	Unipolar leads
1	Soldering tags 3.8x0.5
2	Double faston 6.3x0.8
3	Single faston 6.3x0.8
4	Twin-core cable
5	Lateral lead wires

Code	Resistor
1	without discharge resistor
2	with discharge resistor

Code	Cap
1	without cap
2	with protective cap

Code	Resin
1	without resin
2	with resin

Code	Mounting
C	without fixing stud
D	with fixing stud

Example of the following code: MKP-Z-Al-1D-222 - 4 µF ±10% 250VAC describes a MKP-Z capacitor, aluminium case, soldering tags, fixing stud, discharge resistor, protective cap and resin, 4 **m**F ±10% 250VAC

APPLICATION ADVICE

Motor capacitors are operation capacitors for single-phase induction motors with auxiliary winding and three-phase motor in Steinmetz circuits.

Motor capacitors are permanently connected to the windings of the motor, so that both motor and capacitor have the same mode of operation.

Motor capacitors are self-healing capacitors, i.e. a weak point in the dielectric would become ineffective by itself since the metal coating evaporates at the weak point.

Capacitors used in this way should be carefully selected as far as voltage rating is concerned, and special attention should be paid to the method of operation (continuous or intermittent). The voltage developed across the capacitor terminals is, usually, higher than the supply voltage.

Motor capacitors are utilized mainly in the following fields:
Household and domestic appliances
Office machines
Heating and ventilation techniques
Garden and recreational equipment.

Single-phase induction motors

The single-phase motors has two windings. The main winding is supplied directly from the mains, whereas the auxiliary winding supply is provided by the capacitance of the series-connected capacitor /fig.1/.

The capacitance is selected so that the auxiliary winding is able to take up the capacitor current continuously. No switching devices are necessary for the auxiliary winding circuit, so that in respect of operating reliability the single-phase capacitor start and run motor is in no way inferior to a three-phase cage rotor motor. The motor is superior to a single-phase motor in Steinmetz connection in so far as it can be adapted to a considerable degree to the drive requirements by an appropriate winding layout. Also the capacitanse of the capacitor used here is smaller in relation to an identical motor out-put.

Single-phase capacitor start and run motors are suitable only for driving machines which do not require the full rated output of the motor for starting.

The performance requirements for the capacitor depend on the output power or torque and the design of the motor. If the capacitor is to operate in conjunction with a 220V.50 Hz single-phase motor whose main and auxiliary windings have the same number of turns, then a capacitance of aproximately 30 to 50 **m**F per kW of the rated motor output power should be used.

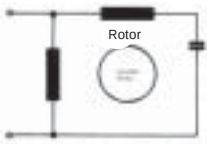


Fig. 1

Auxiliary winding motor with continuous operation capacitor

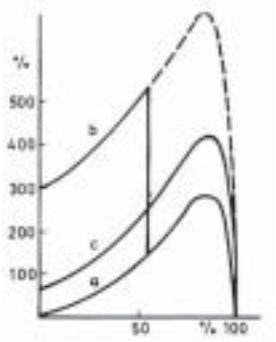


Fig. 3

Torque-Speed Characteristic
a - single-phase motor, single winding
b - single-phase motor, two windings with starting capacitor
c - singl-phase motor, two windings with continuous operation capacitor

Operation of three-phase Motors in single-phase supply

Induction motors with a three-phase stator winding can either be driven from a three-phase supply or from a single-phase supply when suitably connected with a capacitor (Steinmetz circuit, Fig. 2a and fig. 2b).

A three-phase induction motor with its stator connected in star for a 380V three-phase supply has 220V as phase voltage. The motor can therefore also run on a 220V three-phase supply when delta connected. If the motor is designed for 125/220V then its phase voltage is only 125V and the motor must be connected in star for a three-phase supply of 220V.

The Steinmetz circuit gives similar characteristics to three-phase operation but with a single-phase supply.The motor runs as a three-phase machine, if the capacitor voltage causes a symmetrical voltage star at the rotor windings as with a three-phase supply. A symmetrical voltage distribution can however only be obtained with a certain capacitor at a certain load. For all other loads an asymmetrical voltage star is formed at the rotor, so that the motor can no longer operate under optimum conditions.

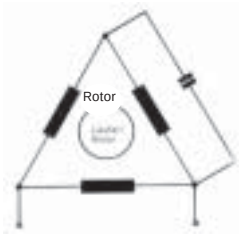
The starting torque is reduced and the heat generation in the motor can become higher at no load than at full load.

Experience has shown that with a voltage supply of 220V, 50 Hz, a capacitance of 70 **m**F/kW of motor power is necessary in order to give a starting torque of 30% of rated torque and in operation about 80% of the rated three-phase power.

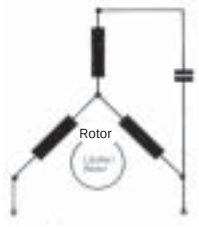
In order to obtain a higher starting torque, a starting capacitor with about double the capacitance must be connected in parallel. This must be switched off during run up to avoid overloading the motor. The direction of rotation can be reversed by connecting the capacitor to the other supply connection.

The voltage across the capacitor terminals in the “Steinmetz” circuits is, at the rated power of the motor, about the value of the supply voltage, and under no load about 15% higher.

If the “open star circuit” should be used for a special application please state this when ordering in order that the correct capacitor can be supplied. This circuit can be used when 125/220V three-phase motors are to operated from a 220V single-phase supply.



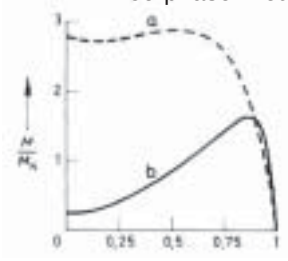
a/ Delta connection



b/ Star connection

Fig. 2

Three-phase motor on single-phase supply



Torque-Speed Characteristic
a - Three-phase motor
b - Single-phase motor in Steinmetz connection

Fig. 4

MKP CAPACITORS FOR MOTOR RUN APPLICATIONS

TECHNICAL DATA

SERIES	MKP-AL		MKP-PL
Reference standards	IEC252 EN60252 VDE 0560-8		
Storage temperature	- 10 +85 ^{0}C		
Rated AC Voltage U_R	250VAC	400 VAC	450VAC
Rated DC Voltage 42U_R	350VDC	560VDC	630VDC
Voltage rise/fall time (dv/dt) max	15V/**m**s	20V/**m**s	20V/**m**s
Test voltage between terminals	2 U_R for 2 sec		
Test voltage terminals to case	(2U_R + 1000V) but at least 2 kV for 2 sec		
Terminals	Faston 6.35x0.8 single or double; soldering tags 3.8x0.5; Twin cable		
Creepage distances	³ 7 mm		
Clearance in air	³ 5 mm		
Self discharge time Ri(M**W**) x C(**m**F)	R x C ³ 3000 sec.		
Dissipation factor (tg**d**)	² 20 x 10^{-4} at U=U_R 20 ^{0}C and 50 Hz		
Vibration strength	According to Test Fc of IEC 68-2-6 Test duration - 6h. Frequency range 10 to 55 Hz Amplitude -0.75 mm; Acceleration max - 10 g		
Max fixing torque	M8 bolt: 5 Nm		
Degree of protection (ref. EN 60529)	IP00 with faston; IP55 with protective cap		
Capacitance tolerance	± 5% or ±10% (different tolerance available upon request)		
Maximum permissible voltage (RMS)	1.1 x U_R		
Maximum permissible current (RMS)	1.3 x I_R		
Maximum permissible reactive output	1.35 x Q_R		
Rated frequency	50 Hz (60 Hz on request)		
Expected life	30 000 h cl.A	10 000 h cl.B	3 000 h cl.C / 1 000 h cl.D Failure rate max 3%
Temperature range and climatic category	-25 ^{0}C +85 ^{0}C 25/85/21		
Safety class	P0; P2 (FPU) for MKP-AL on request		

MKP CAPACITORS FOR MOTOR RUN APPLICATIONS IN PLASTIC CASE

DESIGN

DIELECTRIC: Low losses polypropylene film metallized
with Zn or Al SELFHEALING.

WINDING: Non-inductive type

CASE: Plastic materials self-extinguishing grade V2 according to UL 94 standard.

RESIN: Non polluting filling compound made of vegetable oil (non PCB) improving the protection of the winding and the functioning of the capacitor.

DECK: Plastic materials self-extinguishing,
grade V1 or V0 according to UL 94 standard.

TERMINALS:

- Faston-tinned brass 6.35 x 0.8 single or double only for D ³ 30 mm
- Unipolar leads: stiff wires or flexible wires
  copper - 0.5 mm^2; 0.75 mm^2
  length - min 80 mm, max 250 mm
  stripping - 5 mm ± 1 mm
- Twin - core cables:
  sleeve - PVC 105 ^{0}C (90 ^{0}C)
  copper - 2 x 0.75 mm^2
  length - 120; 155; 195 mm (other lengths on request)
  unsheath - 75 ± 2 mm
  stripping - 5 ± 0.5 mm - tinned

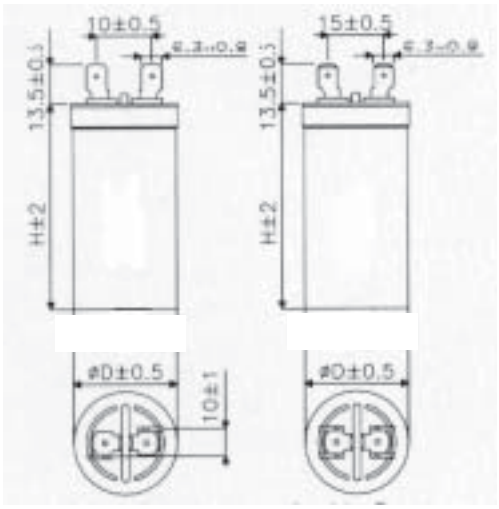
CLASS OF SAFETY PROTECTION: P0

REFERENCE STANDARDS: EN60252

APPLICATION

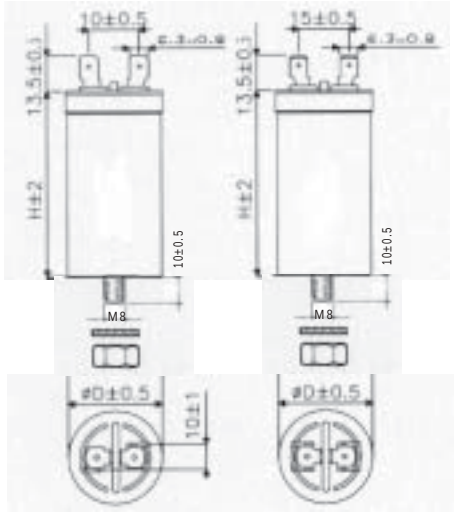
Motor run and start

AVAILABLE EXECUTIONS



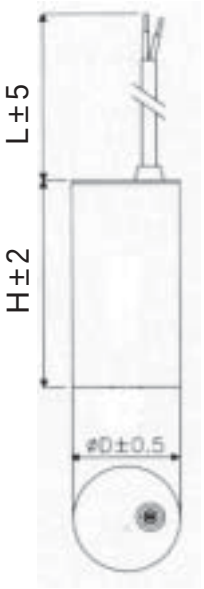
MKP-PL-3C
single faston

MKP-PL-2C
double faston

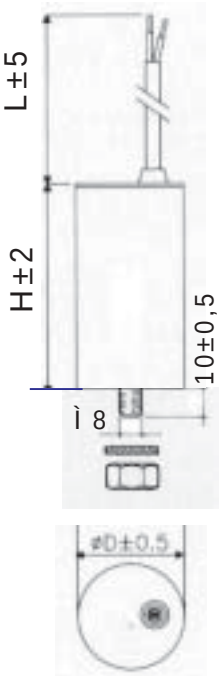


MKP-PL-3D
single faston

MKP-PL-2D
double faston



MKP-PL-4C
twin-core cable



MKP-PL-4D
twin-core cable

MKP CAPACITORS FOR MOTOR RUN APPLICATIONS IN PLASTIC CASE

SERIES / Life	MKPZ-PL				MKP-PL	
30 000 h HPF cl.A	250 VAC		400 VAC		-	
10 000 h HPF cl. B	-		450 VAC		400 VAC	
3 000 h HPF cl. C	400 VAC		500VAC		450 VAC	
1000 h HPF cl. D	450 VAC		-		500 VAC	
C /**m**F/	D	H	D	H	D	H
	mm		mm		mm	
1.5			25	55	25	55
2.0			25	55	25	55
2.5			25	55	25	55
3.0	25	55	25	55	30	55
3.5	25	55	25	55	30	55
3.75	25	55	30	55	30	55
4.0	25	55	25	55	30	55
4.5	30	55	30	55	30	55
5.0	30	55	30	55	35	55
6.0	30	55	35	55	35	55
7.0	35	55	35	55	35	73
8.0	35	55	35	55	35	73
9.0	35	55	35	55	35	73
10.0	35	55	35	73	40	73
11.0	35	73	35	73	40	73
12.0	35	73	35	73	40	73
13.0	35	73	40	73	45	73
14.0	35	73	40	73	45	73
15.0	35	73	40	73	45	73
16.0	40	73	40	73	45	73
18.0	40	73	40	73	40	93
20.0	40	73	45	73	40	93
22.0	45	73	45	73	40	93
25.0	45	73	45	93	45	93
30.0	45	73	45	93	40	128
35.0	45	93	45	93	45	128
40.0	45	93	40	128		
45.0	40	128	40	128		
50.0	45	128	45	128		
55.0	45	128				
60.0	45	128				

Other dimensions and capacitance values on request

MKP CAPACITORS FOR MOTOR RUN APPLICATIONS IN ALUMINIUM CASE

DESIGN

DIELECTRIC: Low losses polypropylene film metallized with Zn or Al SELFHEALING.

WINDING: Non-inductive type

CASE: Aluminium with/without fixing stud M8 x 10
Locking strength - 5 Nm

RESIN: Non polluting filling compound made of vegetable oil (non PCB) improving the protection of the winding and the functioning of the capacitor.

DECK: Plastic materials self-extinguishing, grade V1 or V0 according to UL 94 standard.

TERMINALS:

- Faston-tinned brass 6.35 x 0.8 single or double only for D≥30 mm
- Soldering tags - tinned steel 3.8 x 0.5
- Unipolar leads: stiff wires or flexible wires
  copper - 0.5 mm^2; 0.75 mm^2
  length - min 80 mm, max 250 mm
  stripping - 5 mm ± 1 mm
- Twin - core cables:
  sleeve - PVC 105 ^{0}C (90 ^{0}C)
  copper - 2 x 0.75 mm^2
  length - 120; 155; 195 mm (other lengths on request)
  unsheath - 75 ± 2 mm
  stripping - 5 ± 0.5 mm - tinned

PROTECTIVE CAP: Plastic materials self-extinguishing, grade V2 according to UL 94 standard.

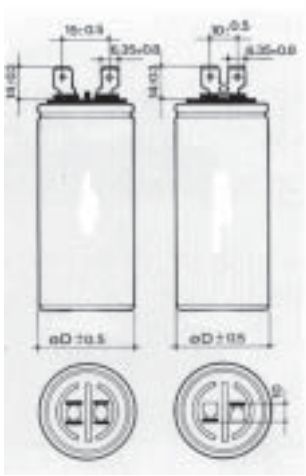
CLASS OF SAFETY PROTECTION: P0 or P2 (FPU) for D=45 mm on request.

ACCESSORIES: Protective cap
Crimp M8 and hexagonal nut M8

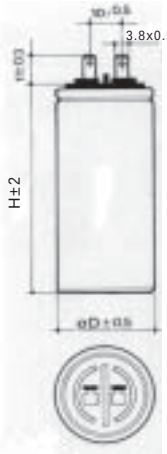
REFERENCE STANDARD:
EN60252 - for motor run capacitors

APPLICATION
Motor run and start

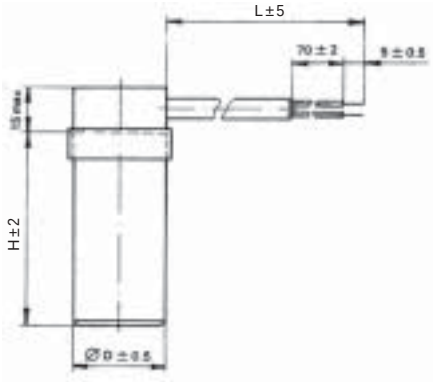
AVAILABLE EXECUTIONS



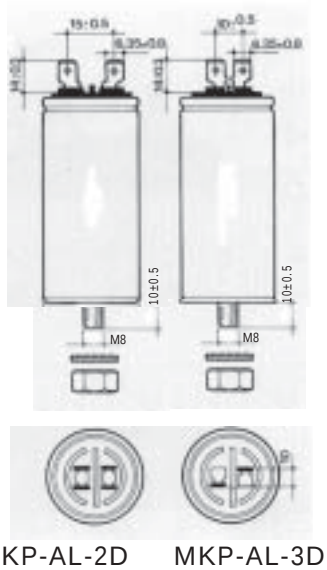
MKP-AL-2C MKP-AL-3C
double faston single faston



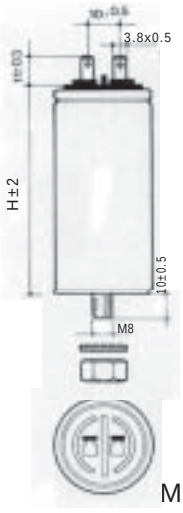
MKP-AL-1C
soldering tags



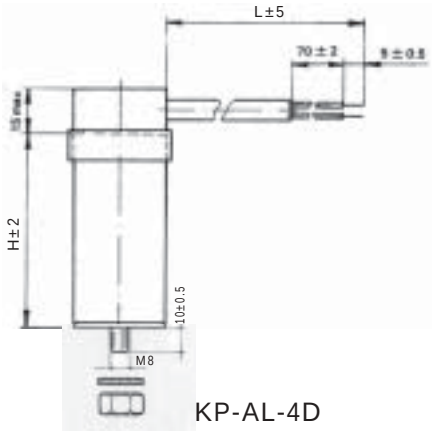
MKP-AL-4C
twin-core cable



MKP-AL-2D MKP-AL-3D
double faston single faston



MKP-AL-1D
soldering tags



KP-AL-4D
twin-core cable

MKP CAPACITORS FOR MOTOR RUN APPLICATIONS IN ALUMINIUM CASE

SERIES / Life	MKPZ-AL						MKP-AL	
30 000 h HPF cl. A	250 VAC		400 VAC		450 VAC		-	
10 000 h HPF cl. B HSF	-		450VAC		500 VAC		400 VAC	
3 000 h HPF cl. C HSF	400 VAC		500VAC≥ 25mF		-		450 VAC	
1000 h HPF cl. D	450 VAC		500VAC>25mF		-		500 VAC	
C /mF/	D	H	D	H	D	H	D	H
	mm		mm		mm		mm	
2.0	25	60	25	60	25	60	25	60
3,0	25	60	25	60	30	60	30	60
3,5	25	60	25	60	30	60	30	60
3,75	25	60	25	60	25	78	25	78
4.0	25	60	30	60	25	78	25	78
4.5	25	60	30	60	25	78	25	78
5.0	30	60	30	60	35	60	35	60
6.0	30	60	35	60	35	60	35	60
7.0	35	60	35	60	35	78	35	78
8.0	35	60	35	60	35	78	35	78
9.0	35	60	35	78	35	78	35	78
10.0	35	60	35	78	40	78	40	78
11.0	35	78	35	78	40	78	40	78
12.0	35	78	35	78	40	78	40	78
14.0	35	78	40	78	45	78	45	78
15.0	35	78	40	78	45	78	45	78
16.0	35	78	40	78	40	98	40	98
18.0	40	78	40	78	40	98	40	98
20.0	40	78	40	98	45	98	45	98
22.0	45	78	40	98	45	98	45	98
25.0	45	78	40	98	45	98	45	98
30.0	45	78	45	98	45	132	45	132
32.0	45	78	45	98	45	132	45	132
35.0	45	98	45	98	50	132	50	132
40.0	45	98	40	132	50	132	50	132
45.0	40	132	45	132	50	132	50	132
50.0	45	132	50	132	55	132	55	132
55.0	45	132	55	132	55	132	55	132
60.0	45	132	55	132				

*D ≥ 50 mm only for design with twin core cable or unipolar leads.
Other capacitance values and other dimensions on request

MKP-TLS CAPACITOR WITH STARTING DEVICE FOR ASYNCHRONOUS MOTORS

APPLICATION

MKP-TLS capacitors are used for starting of single-phase asynchronous motors or three-phase motors in a single-phase net.

MKP-TLS consists of two elements - MKP selfhealing capacitor with metallized polypropylene for dielectric and an electronic device TLS.

The electronic device turns off the starting capacitor after attainment of 75 up to 100% of the nominal revolutions of the motor but not later than Tmax.

The constructive features of the motors (quality of steel, scheme of coils winding, number of motor poles and supply voltage frequency) don't influence on the operation of MKP-TLS.

A centrifugal breaker is not necessary when a capacitor with a starting device is used.

Advantages of MKP-TLS:

- Simplification of the motor construction and reduction of its overall dimensions.
- Possibility of operating of the motor at heavier conditions - high humidity, availability of vibrations etc.
- Reliability increase
- Motor cost price decrease

TECHNICAL CHARACTERISTICS

Nominal voltage	**110; 220 VAC**
Nominal capacitance of start-up capacitor	**10 up to 120 mF**
Nominal voltage of start-up capacitor	**250; 450 VAC**
Nominal frequency	**42 up to 60 Hz**
Working temperature range	**-25°C + 85°C**
Nominal current	**6A; 16A; 25A; 40A**
Maximum starting regime Tmax	**3 sec; 5 sec (other times are available at request)**
Recovery time for the second time switching on	**1 - 2 sec**
Overall dimensions	**see table 1**
Terminals	**three-core cable 3x0,75mm^2 , PVC 105°C**
- length	**120; 150; 250 mm (other lengths are available at request)**
- bared outside insulation	**35 ± 5 mm**
- stripped and tinned wire	**5 ± 0,5 mm**

MKP-TLR CAPACITOR WITH A STARTING - REGULATIVE DEVICE FOR ASYNCHRONOUS MOTORS

APPLICATION

MKP-TLR capacitors are used for starting of single-phase asynchronous motors or three-phase motors in a single-phase net.

MKP-TLR consists of two elements - MKP selfhealing capacitor with metallized polypropylene for dielectric and an electronic device TLR.

The electronic device is with a regulator which turns off the starting capacitor after attainment of 75 up to 100% of the nominal revolutions of the motor but not later than Tmax. If a reduction of the speed < 75% happens, due to shaft load, the capacitor automatically switches on itself so to recover the motor regime.

The constructive features of the motors (quality of steel, scheme of coils winding, number of motor poles and supply voltage frequency) don't influence on the operation of MKP-TLR.

A centrifugal breaker is not necessary when a capacitor with a starting device and a regulator is used.

Advantages of MKP-TLR:

- Simplification of the motor construction and reduction of its overall dimensions.
- Possibility of operating of the motor at unstable supply voltage and heavier conditions- high humidity, availability of vibrations etc.
- Reliability increase
- Motor cost price decrease

MKP-TLR are suitable for use at motors with irregular load or power supply networks with high variations of the nominal voltage.

TECHNICAL CHARACTERISTICS

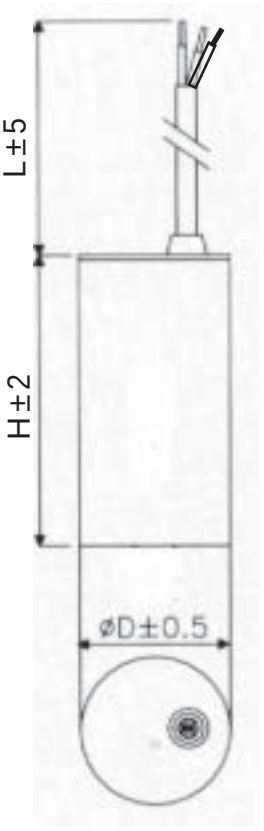
Nominal voltage	110; 220 VAC
Nominal capacitance of start-up capacitor	10 up to 120 **m**F
Nominal voltage of start-up capacitor	250; 450 VAC
Nominal frequency	42 up to 60 Hz
Working temperature range	-25°C + 85°C
Nominal current	6A; 16A; 25A; 40A
Maximum starting regime Tmax	3 sec; 5 sec (other times are available at request)
Recovery time for the second time switching on	1 - 2 sec
Overall dimensions	see table 1
Terminals	three-core cable 3x0,75mm^2, PVC 105°C
- length	120; 150; 250 mm (other lengths are available at request)
- bared outside insulation	35 ± 5 mm
- stripped and tinned wire	5 ± 0,5 mm

MKP CAPACITORS FOR MOTOR START APPLICATIONS

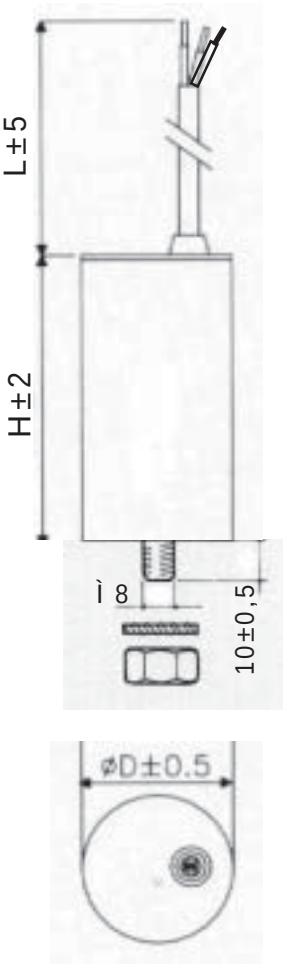
Table 1

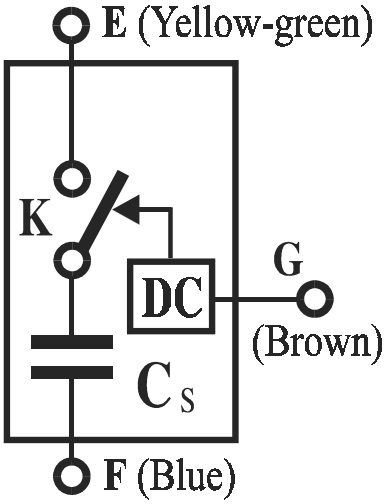
Capacitance	Case	Capacitance	Case
mF	D x H	mF	D x H
10	45 x73	60	45 x128
20	45 x 73	70	50 x 94
30	45 x 73	80	50 x 119
35	45 x 93	85	50 x 119
40	45 x 93	90	55 x 119
45	45 x 128	100	55 x 119
50	45 x 128	120	60 x 119

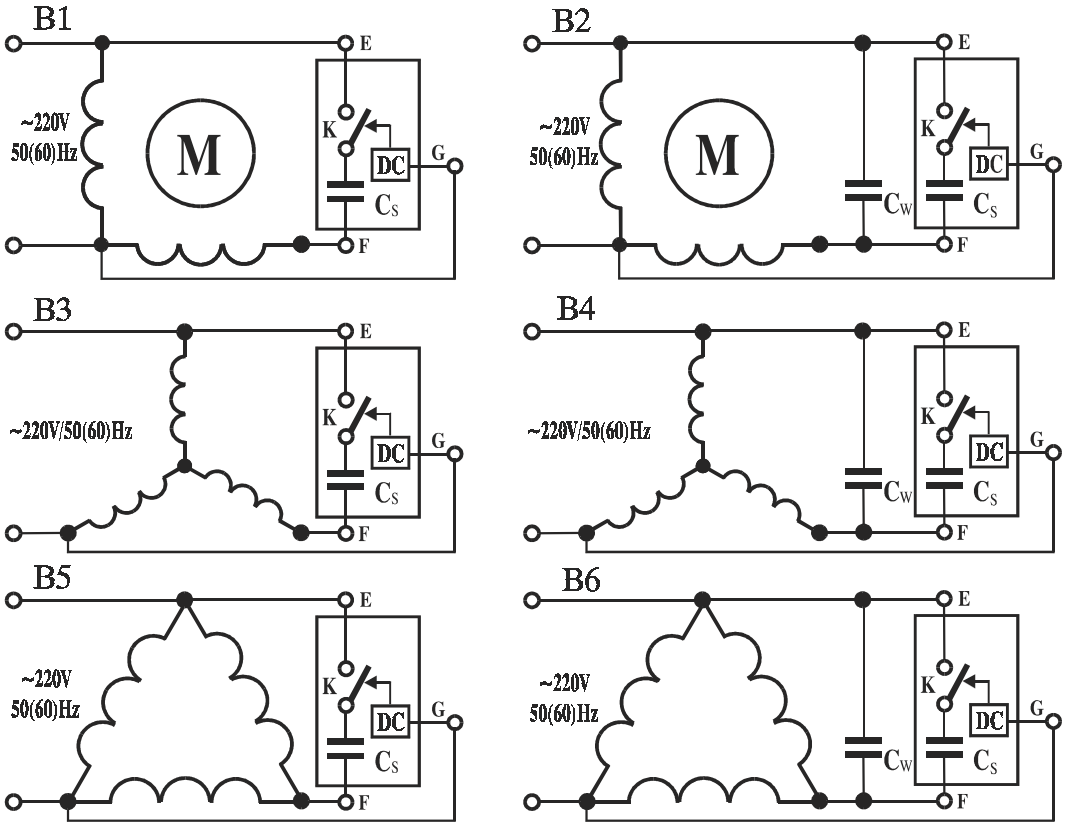
MKP-TLS-PL-4C
MKP-TLR-PL-4C



MKP-TLS-PL-4D
MKP-TLR-PL-4D







EAS-A SERIES
EAS-B SERIES
EAS-C SERIES

EAS SERIES AC MOTOR - START CAPACITORS

*For single-phase motor starting (air conditioners, water pumps, refrigerators and similar applications)

SPECIFICATION

ITEM	EAS-A	EAS-B	EAS-C
Operating temperature range	- 15 to +60 ^{0}C	- 15 to +60 ^{0}C	- 15 to +60 ^{0}C
Rated working voltage range Ur	125 to 320 VAC	125 to 320 VAC	125 to 320 VAC
Capacitance range	30 to 500 **m**F	30 to 500 **m**F	30 to 500 **m**F
Dissipation factor at 20^{0}C 50 to 60 Hz	0.16	0.14	0.12
Duty cycle	AB 0.55% ED (Twenty applications per hour with duration 1 sec.)	AB 1% ED (Twenty applications per hour with duration 2 sec.)	AB 1.7% ED (Twenty applications per hour with duration 3 sec.)

EAS-1

CASE: Without end cap
Without fixing stud

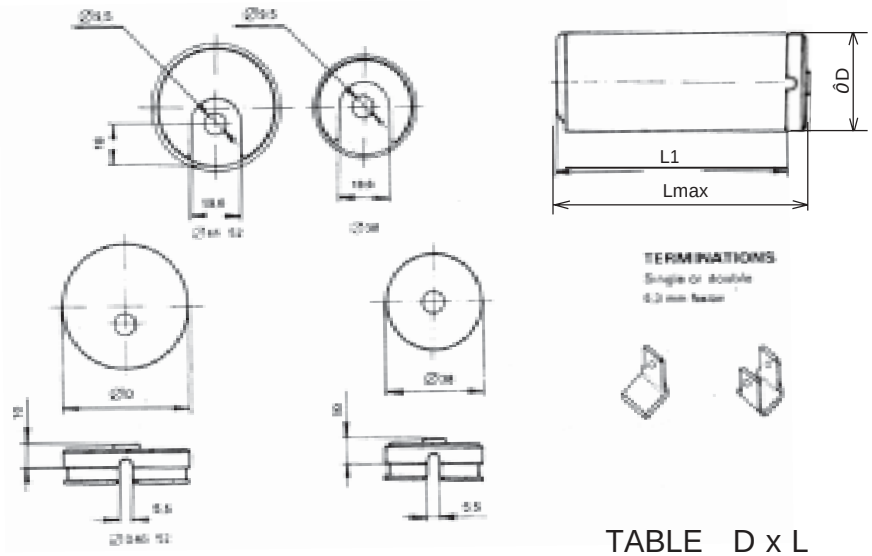


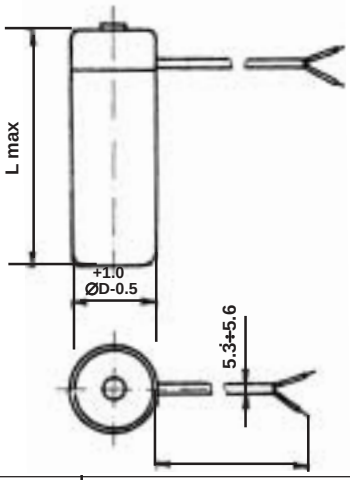
TABLE D x L

µF	VAC	EAS - A1			EAS - B1			EAS - C1		
		ØD	L1	Lmax	ØD	L1	Lmax	ØD	L1	Lmax
60 - 80	125	38	70	82	38	70	82	38	70	82
80 - 100		38	70	82	38	70	82	38	70	82
100 - 120		38	70	82	38	70	82	38	70	82
120 - 150		38	70	82	38	70	82	38	70	82
150 - 200		38	70	82	38	70	82	38	70	82
200 - 250		46	85	98	46	85	98	46	85	98
250 - 315		46	85	98	46	85	98	46	85	98
315 - 400		46	85	98	46	85	98	46	85	98
400 - 500		46	85	98	46	85	98	46	85	98
60 - 80	160	38	70	82	38	70	82	38	70	82
80 - 100		38	70	82	38	70	82	38	70	82
100 - 120		38	70	82	38	70	82	46	85	98
120 - 150		46	85	98	46	85	98	46	85	98
150 - 200		46	85	98	46	85	98	46	85	98
200 - 250		46	85	98	46	85	98	46	85	98
250 - 315		46	85	98	46	85	98	46	85	98
315 - 400		46	85	98	46	85	98	46	85	98
400 - 500		46	85	98	52	105	123	52	105	123
30 - 40	220	38	70	82	38	70	82	38	70	82
40 - 50		38	70	82	38	70	82	38	70	82
50 - 60		38	70	82	38	70	82	46	85	98
60 - 80		38	70	82	38	70	82	46	85	98
80 - 100		46	85	98	46	85	98	46	85	98
100 - 120		46	85	98	46	85	98	46	85	98
120 - 150		46	85	98	46	85	98	46	85	98
150 - 200		46	85	98	46	85	98	46	85	98
200 - 250		46	85	98	46	85	98	52	105	123
30 - 40	280	38	70	82	38	70	82	38	70	82
40 - 50		38	70	82	38	70	82	38	70	82
50 - 60		38	70	82	46	85	98	46	85	98
60 - 80		46	85	98	46	85	98	46	85	98
80 - 100		46	85	98	46	85	98	46	85	98
100 - 120		46	85	98	46	85	98	46	85	98
120 - 150		46	85	98	46	85	98	46	85	98
150 - 200		46	85	98	46	85	98	46	85	98
200 - 250		46	85	98	52	105	123	52	105	123
30 - 40	320	38	70	82	38	70	82	38	70	82
40 - 50		38	70	82	38	70	82	38	70	82
50 - 60		46	85	98	46	85	98	46	85	98
60 - 80		46	85	98	46	85	98	46	85	98
80 - 100		46	85	98	46	85	98	46	85	98
100 - 120		46	85	98	46	85	98	46	85	98
120 - 150		46	85	98	46	85	98	46	85	98
150 - 200		46	85	98	46	85	98	52	105	123
200 - 250		52	105	123	52	105	123			

Note: Capacitors are available with other sizes by customer's request

EAS-2

CASE: With end cap
Without fixing stud



DIMENTIONS [mm]

TABLE D x L

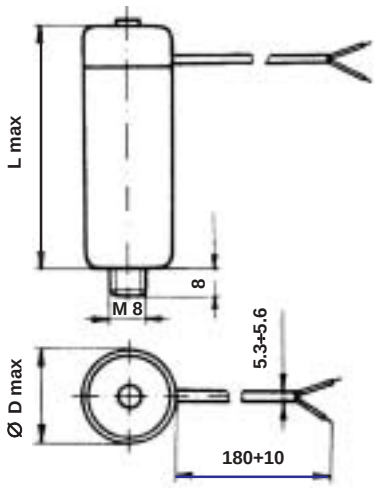
µF	VAC	EAS - A2	EAS - B2	EAS - C2
60 - 80	125	38x87	38x87	38x87
80 - 100		38x87	38x87	38x87
100 - 120		38x87	38x87	38x87
120 - 150		38x87	38x87	38x87
150 - 200		38x87	38x87	38x87
200 - 250		38x98	38x98	38x98
250 - 315		38x98	38x98	38x98
315 - 400		43x98	43x98	43x98
400 - 500		43x98	43x98	43x98
60 - 80	160	38x87	38x87	38x87
80 - 100		38x87	38x87	38x87
100 - 120		38x87	38x87	38x98
120 - 150		38x87	38x87	38x98
150 - 200		38x87	38x98	38x98
200 - 250		38x98	43x98	43x98
250 - 315		38x98	43x98	43x98
315 - 400		43x98	43x98	43x98
400 - 500		43x98	43x98	43x128
30 - 40	220	38x87	38x87	38x87
40 - 50		38x87	38x87	38x87
50 - 60		38x87	38x87	38x87
60 - 80		38x87	38x87	38x87
80 - 100		38x87	38x87	38x98
100 - 120		38x87	38x98	38x98
120 - 150		38x87	38x98	43x98
150 - 200		43x98	43x98	43x98
200 - 250		43x98	43x98	43x128
250 - 315		43x98	43x98	43x128
315 - 400		43x128	43x128	43x128
400 - 500		43x128	43x128	43x128
30 - 40	280	38x87	38x87	38x87
40 - 50		38x87	38x87	38x87
50 - 60		38x87	38x87	38x87
60 - 80		38x87	38x87	38x87
80 - 100		38x87	38x98	38x98
100 - 120		38x98	38x98	43x98
120 - 150		38x98	43x98	43x98
150 - 200		43x98	43x98	43x98
200 - 250		43x98	43x98	43x128
250 - 315		43x98	43x98	43x128
315 - 400		43x128	43x128	43x128
400 - 500		43x128	43x128	43x128
30 - 40	320	38x87	38x87	38x87
40 - 50		38x87	38x87	38x87
50 - 60		38x87	38x87	38x87
60 - 80		38x87	38x87	38x87
80 - 100		38x87	38x98	38x98
100 - 120		38x98	38x98	43x98
120 - 150		38x98	43x98	43x98
150 - 200		43x98	43x98	43x128
200 - 250		43x98	43x128	43x128

Note: Capacitors are available with other sizes by customer's request

EAS-3

CASE: With end cap

With fixing stud M8 x 10



DIMENTIONS [mm]

TABLE D x L

µF	VAC	EAS - A3	EAS - B3	EAS - C3
60 - 80	125	38x90	38x90	38x90
80 - 100		38x90	38x90	38x90
100 - 120		38x90	38x90	38x90
120 - 150		38x90	38x90	38x90
150 - 200		38x90	38x90	38x90
200 - 250		38x100	38x100	38x100
250 - 315		38x100	38x100	38x100
315 - 400		43x100	43x100	43x100
400 - 500		43x100	43x100	43x100
60 - 80	160	38x90	38x90	38x90
80 - 100		38x90	38x90	38x90
100 - 120		38x90	38x90	38x100
120 - 150		38x90	38x90	38x100
150 - 200		38x90	38x90	38x100
200 - 250		38x100	43x100	43x100
250 - 315		38x100	43x100	43x100
315 - 400		43x100	43x100	43x100
400 - 500		43x100	43x100	43x130
30 - 40	220	38x90	38x90	38x90
40 - 50		38x90	38x90	38x90
50 - 60		38x90	38x90	38x90
60 - 80		38x90	38x90	38x90
80 - 100		38x90	38x90	38x100
100 - 120		38x90	38x90	38x100
120 - 150		38x90	38x90	38x100
150 - 200		43x100	43x100	43x100
200 - 250		43x100	43x100	43x130
250 - 315		43x100	43x100	43x130
315 - 400		43x130	43x130	43x130
400 - 500		43x130	43x130	43x130
30 - 40	280	38x90	38x90	38x90
40 - 50		38x90	38x90	38x90
50 - 60		38x90	38x90	38x90
60 - 80		38x90	38x90	38x90
80 - 100		38x90	38x100	38x100
100 - 120		38x100	38x100	43x100
120 - 150		38x100	43x100	43x100
150 - 200		43x100	43x100	43x100
200 - 250		43x100	43x100	43x130
250 - 315		43x100	43x100	43x130
315 - 400		43x130	43x130	43x130
400 - 500		43x130	43x130	43x130
30 - 40	320	38x90	38x90	38x90
40 - 50		38x90	38x90	38x90
50 - 60		38x90	38x90	38x90
60 - 80		38x90	38x90	38x90
80 - 100		38x90	38x100	38x100
100 - 120		38x100	38x100	43x100
120 - 150		38x100	43x100	43x100
150 - 200		43x100	43x100	43x130
200 - 250		43x100	43x100	43x130

Note: Capacitors are available with other sizes by customer's request

EAS-TLS CAPACITOR WITH A STARTING DEVICE FOR ASYNCHRONOUS MOTORS

APPLICATION

EAS-TLS capacitors are used for starting of single-phase asynchronous motors or three-phase motors in a single-phase net.

EAS-TLS consists of two elements - Electrolytic motor-start capacitor EAS and an electronic device TLS.

The electronic device turns off the starting capacitor after attainment of the nominal revolutions but not later than Tmax.

The constructive features of the motors (quality of steel, scheme of coils winding, number of motor poles and supply voltage frequency) don't influence on the operation of EAS-TLS. A centrifugal breaker is not necessary when a capacitor with a starting device is used.

Advantages of EAS-TLS.

- Simplification of the motor construction and reduction of its sizes
- Possibility of operating at heavier conditions - unstable supply voltage, high humidity, availability of vibrations etc.
- Prevent the motor from burning
- Reliability increase
- Motor cost price decrease

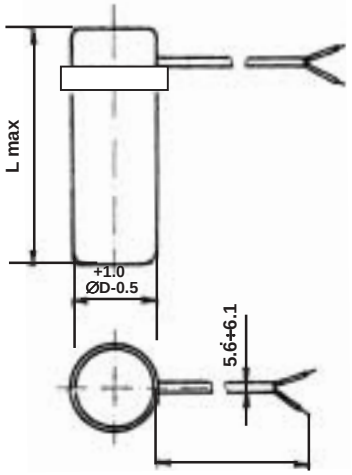
TECHNICAL CHARACTERISTICS

Nominal supply voltage	110; 220 VAC
Nominal capacitance of start-up capacitor	30 up to 500 **m**F
Nominal voltage of start-up capacitor	125 up to 320 VAC
Nominal frequency	42 up to 60 Hz
Working temperature range	-15°C + 60°C
Nominal current	6A; 16A; 25A; 40A
Maximum starting regime Tmax	**3 sec; (other times are available at request)**
Recovery time for the second time switching on	3 min
Dimensions	see table 1 and 2
Terminals	three-core cable 3x0,75mm^2, 105°C, PVC
- length	120; 150; 250 mm (other lengths are available at request)
- bared outside insulation	35 ± 5 mm
- stripped and tinned wire	5 ± 0,5 mm

EAS-TLS CAPACITOR WITH A STARTING DEVICE FOR ASYNCHRONOUS MOTORS

EAS-TLS

CASE: With end cap
Without fixing stud



DIMENTIONS [mm]

TABLE 1 /D x L/

µF	VAC	EAS-TLS - A2	EAS-TLS - B2	EAS-TLS - C2
60 - 80	125	45x107	45x107	45x107
80 - 100		45x107	45x107	45x107
100 - 120		45x107	45x107	45x107
120 - 150		45x107	45x107	45x107
150 - 200		45x107	45x107	45x107
200 - 250		45x107	45x107	45x107
250 - 315		45x107	45x107	45x107
315 - 400		45x142	45x142	45x142
400 - 500		45x142	45x142	45x142
60 - 80	160	45x107	45x107	45x107
80 - 100		45x107	45x107	45x107
100 - 120		45x107	45x107	45x107
120 - 150		45x107	45x107	45x107
150 - 200		45x107	45x107	45x107
200 - 250		45x107	45x107	45x142
250 - 315		45x107	45x142	45x142
315 - 400		45x142	45x142	45x142
400 - 500		45x142	45x142	45x142
30 - 40	220	45x107	45x107	45x107
40 - 50		45x107	45x107	45x107
50 - 60		45x107	45x107	45x107
60 - 80		45x107	45x107	45x107
80 - 100		45x107	45x107	45x107
100 - 120		45x107	45x107	45x107
120 - 150		45x107	45x107	45x142
150 - 200		45x142	45x142	45x142
200 - 250		45x142	45x142	45x142
250 - 315		45x142	45x142	45x142
315 - 400		45x142	45x142	45x142
400 - 500		45x142	45x142	45x142
30 - 40	280	45x107	45x107	45x107
40 - 50		45x107	45x107	45x107
50 - 60		45x107	45x107	45x107
60 - 80		45x107	45x107	45x107
80 - 100		45x107	45x107	45x107
100 - 120		45x107	45x107	45x107
120 - 150		45x107	45x107	45x142
150 - 200		45x142	45x142	45x142
200 - 250		45x142	45x142	45x142
250 - 315		45x142	45x142	45x142
315 - 400		45x142	45x142	45x142
400 - 500		45x142	45x142	45x142
30 - 40	320	45x107	45x107	45x107
40 - 50		45x107	45x107	45x107
50 - 60		45x107	45x107	45x107
60 - 80		45x107	45x107	45x107
80 - 100		45x107	45x107	45x107
100 - 120		45x107	45x107	45x142
120 - 150		45x107	45x142	45x142
150 - 200		45x142	45x142	45x142
200 - 250		45x142	45x142	45x142

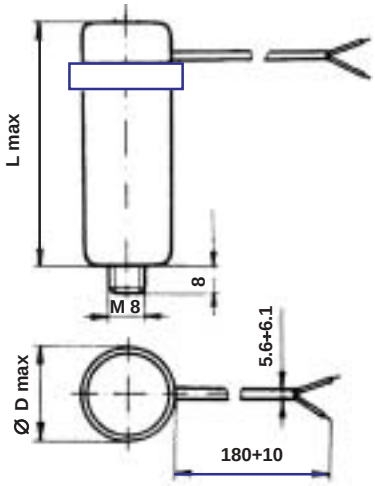
Note: Capacitors are available with other sizes by customer's request

EAS-TLS CAPACITOR WITH STARTING DEVICE FOR ASYNCHRONOUS MOTORS

EAS-TLS

CASE: With end cap

With fixing stud M8 x 10



DIMENTIONS [mm]

TABLE 2 /D x L/

µF	VAC	EAS-TLS - A3	EAS-TLS - B3	EAS-TLS - C3
60 - 80	125	45x107	45x107	45x107
80 - 100		45x107	45x107	45x107
100 - 120		45x107	45x107	45x107
120 - 150		45x107	45x107	45x107
150 - 200		45x107	45x107	45x107
200 - 250		45x107	45x107	45x107
250 - 315		45x107	45x107	45x107
315 - 400		45x142	45x142	45x142
400 - 500		45x142	45x142	45x142
60 - 80	160	45x107	45x107	45x107
80 - 100		45x107	45x107	45x107
100 - 120		45x107	45x107	45x107
120 - 150		45x107	45x107	45x107
150 - 200		45x107	45x107	45x107
200 - 250		45x107	45x107	45x142
250 - 315		45x107	45x142	45x142
315 - 400		45x142	45x142	45x142
400 - 500		45x142	45x142	45x142
30 - 40	220	45x107	45x107	45x107
40 - 50		45x107	45x107	45x107
50 - 60		45x107	45x107	45x107
60 - 80		45x107	45x107	45x107
80 - 100		45x107	45x107	45x107
100 - 120		45x107	45x107	45x107
120 - 150		45x107	45x107	45x142
150 - 200		45x142	45x142	45x142
200 - 250		45x142	45x142	45x142
250 - 315		45x142	45x142	45x142
315 - 400		45x142	45x142	45x142
400 - 500		45x142	45x142	45x142
30 - 40	280	45x107	45x107	45x107
40 - 50		45x107	45x107	45x107
50 - 60		45x107	45x107	45x107
60 - 80		45x107	45x107	45x107
80 - 100		45x107	45x107	45x107
100 - 120		45x107	45x107	45x107
120 - 150		45x107	45x107	45x142
150 - 200		45x142	45x142	45x142
200 - 250		45x142	45x142	45x142
250 - 315		45x142	45x142	45x142
315 - 400		45x142	45x142	45x142
400 - 500		45x142	45x142	45x142
30 - 40	320	45x107	45x107	45x107
40 - 50		45x107	45x107	45x107
50 - 60		45x107	45x107	45x107
60 - 80		45x107	45x107	45x107
80 - 100		45x107	45x107	45x107
100 - 120		45x107	45x107	45x142
120 - 150		45x107	45x142	45x142
150 - 200		45x142	45x142	45x142
200 - 250		45x142	45x142	45x142

Note: Capacitors are available with other sizes by customer's request