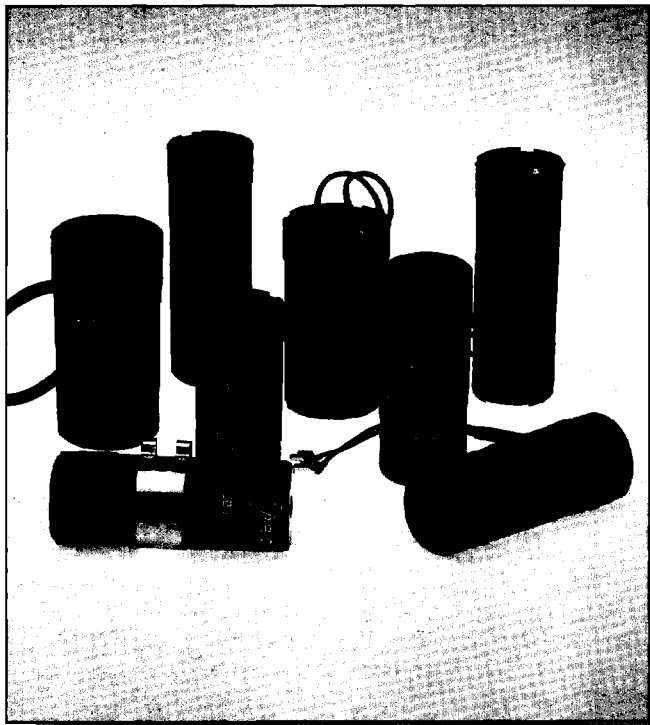


# MS/MD SERIES

## Motor Starting Capacitors

A range of aluminium electrolytic capacitors, specifically designed for a.c. operation which help to start the motor by providing a leading current to the auxiliary winding. The capacitor is not permanently connected to the winding of the motor and is switched off after starting, usually automatically.



**Capacitance range** ..... 20 $\mu$ F to 400 $\mu$ F  
(approved) - other values available

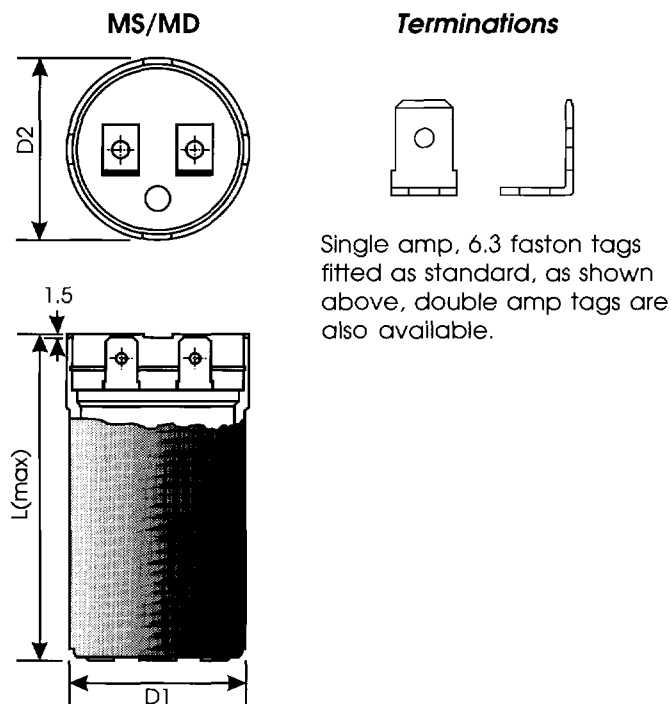
**Capacitance tolerance** ..  $\pm 10\%$  or -0 +25%

**Rated voltage** ..... MS - 120, 220 and 260 V a.c.  
MD - 120/150, 220/280 and 260/330 V a.c.

**Surge voltage** ..... 1.25 x rated voltage

**Climatic category** ..... 20/60/21

**Temperature range** ..... -20°C to +60°C



Capacitors for this application are designed for intermittent duty only, and must be capable of withstanding the a.c. voltage applied to the motor during starting. This range of capacitors is housed in a moulded case and carry approvals to VDE 560-8 and comply with the requirements of BS 5267 and IEC 252. The MS series is rated at a single voltage whereas the MD has a dual voltage rating.

### APPROVAL CERTIFICATE DETAILS

Voltage		VDE Approval No
MS	MD	MS and MD
120	-	89732
220	220/280	79124
260	260/330	79125

### DIMENSIONS (sleeved) mm

CASE CODE	D1 $\pm 0.5$	D2 $\pm 0.5$	L MAX	END CAP
AA	38	39	75	1981
AB	38	39	90	1981
AC	38	39	116	1981
BB	46	49	90	1980
BC	46	49	116	1980

### Accessories

The following accessories are also available:-  
Cables, Discharge Resistors, End Caps, Clamps, Stud Mountings.

## Motor Starting Capacitors

### TECHNICAL DATA

#### Capacitance

Motor start capacitors are tested as recommended in BS5267 - 'Capacitance shall be determined by measuring the current through the capacitor at the rated voltage and rated frequency of the capacitor.' The current should be read within 3 seconds after energising.'

$$\text{Capacitance } \mu\text{F at 50Hz} = \frac{3180 \times I}{V}$$

Where: I = current in amperes  
V = applied voltage in volts

#### Voltage rating (a.c.)

Due to the presence of the auxiliary start winding, the voltage appearing on the motor start capacitor is usually higher than that of the motor or line voltage. The voltage generally rises with the speed of the motor and varies with the motor load during start-up. Unloaded conditions can give voltages of 15% more than that of loaded.

It is essential that the capacitor is disconnected before the voltage exceeds its maximum voltage rating.

Rated voltage r.m.s.	Maximum cut-off voltage r.m.s.
120	150
220	275
260	325
280	350
330	413

#### Dual Voltage Rating

The MD range of BHC Aerovox capacitors is designed with a dual voltage rating. The lower voltage rating relates to a duty cycle of 1.67% and the upper voltage rating relates to a duty cycle of 0.55%.

#### Power Factor

The tangent of the loss angle for motor start capacitors shall not exceed 0.1 and shall be calculated as follows:

$$\tan \delta = \frac{W}{V \times I} = \frac{\text{true watts}}{\text{apparent watts}}$$

#### Duty cycle

The standard rating is 1.67% or 1/60th full time and corresponds to a maximum duty of 20 starts, each of three seconds duration per hour. It is expressed following BS5267: 1967 and IEC publication 252: 1975, as 3/1.67 (a 3 minute cycle with 1.67% duration during which the capacitor may be energised). If the same capacitor is to be used for a duty cycle of 60 starts per hour the cycle duration will be 1 minute. The operation time per cycle will then have to be reduced to 1.67% of 1 minute (ie 1 second). Alternative duty cycles are available on request. Most popular are 0.55% and 1%.

#### Presence of a run capacitor

When the motor is fitted with both starting and run capacitors, consideration should be given to fitting of the appropriate discharge resistor to the starting capacitor. This is to protect the run capacitor from damage through discharge of the starting capacitor.

#### Container form

Cylindrical mouldings, meeting creepage and clearance distances, according to IEC 335-1 and flammability ratings according to UL94-V2 and V0.

#### Discharge resistors

A discharge resistor may be fitted to a motor start capacitor to prevent electrical overstress of the capacitor and or for safety reasons. In accordance with BS5267 and IEC 252, the resistor value should be such that it reduces the voltage on the capacitor, from the line voltage to less than 50V within 60 secs.

The resistor value may be approximated as follows:

$$R \text{ (K } \Omega \text{) max} = \frac{T}{\text{Rated capacitance } \mu\text{F}}$$

Rated V d.c.	T
120	50,000
220	32,000
260	30,000
280	28,000
330	26,000

#### STANDARD RESISTOR VALUES

VALUE - OHMS	WATTAGE
5.6K	2W
15K	2W
33K	0.5W
56K	1W
82K	2W
100K	1W

#### Shelf life

Capacitors may be stored for periods up to 2 years without detriment, but after longer periods it is a safe guard to test them before putting into service. In service the oxide film, which is the dielectric of the capacitor, is maintained in good condition because any imperfections permit a current to pass and the resulting electrolysis forms a new oxide layer. Deterioration of the film takes place if the capacitor is stored for long periods and it is preferable for the 'reforming' of the film to be brought about before the capacitor is subject to its full duty. If a motor start capacitor is already connected to the motor the reforming can be achieved by freeing the motor from its load and switching on several times.

#### Capacitor Marking

The capacitors are marked with all the items from the following list as a minimum:

1. Rated capacitance in  $\mu\text{F}$
2. Rated voltage a.c.
3. Duty cycle
4. Frequency
5. Temperature range
6. Date code
7. BHC Aerovox part number
8. Climatic category
9. Approvals

# MS/MD SERIES

## Motor Starting Capacitors

	Cap	Case Size	Type number		
	µF	D1 x L	Tolerance -0 +25%	Tolerance ±10%	
120V r.m.s. Rated voltage (150V surge) Duty cycle 1.67%	25	38 x 75	025MS12AAMA0STD	025MS12AAMK0STD	
	30	38 x 75	030MS12AAMA0STD	030MS12AAMK0STD	
	35	38 x 75	035MS12AAMA0STD	035MS12AAMK0STD	
	40	38 x 75	040MS12AAMA0STD	040MS12AAMK0STD	
	50	38 x 75	050MS12AAMA0STD	050MS12AAMK0STD	
	60	38 x 75	060MS12AAMA0STD	060MS12AAMK0STD	
	80	38 x 75	080MS12AAMA0STD	080MS12AAMK0STD	
	100	38 x 75	100MS12AAMA0STD	100MS12AAMK0STD	
	120	38 x 75	120MS12AAMA0STD	120MS12AAMK0STD	
	125	38 x 75	125MS12AAMA0STD	125MS12AAMK0STD	
	150	38 x 75	150MS12AAMA0STD	150MS12AAMK0STD	
	160	38 x 75	160MS12AAMA0STD	160MS12AAMK0STD	
	180	38 x 90	180MS12ABMA0STD	180MS12ABMK0STD	
	200	38 x 90	200MS12ABMA0STD	200MS12ABMK0STD	
	230	38 x 90	230MS12ABMA0STD	230MS12ABMK0STD	
	250	38 x 90	250MS12ABMA0STD	250MS12ABMK0STD	
	300	38 x 90	300MS12ABMA0STD	300MS12ABMK0STD	
	310	38 x 116	310MS12ACMA0STD	310MS12ACMK0STD	
	315	38 x 116	315MS12ACMA0STD	315MS12ACMK0STD	
	350	38 x 116	350MS12ACMA0STD	350MS12ACMK0STD	
400	38 x 116	400MS12ACMA0STD	400MS12ACMK0STD		
220V r.m.s. Rated voltage (275V surge) Duty cycle 1.67%	30	38 x 75	030MS22AAMA0STD	030MS22AAMK0STD	
	40	38 x 75	040MS22AAMA0STD	040MS22AAMK0STD	
	40	38 x 90	040MS22ABMA0STD	040MS22ABMK0STD	
	50	38 x 75	050MS22AAMA0STD	050MS22AAMK0STD	
	50	38 x 90	050MS22ABMA0STD	050MS22ABMK0STD	
	60	38 x 75	060MS22AAMA0STD	060MS22AAMK0STD	
	60	38 x 90	060MS22ABMA0STD	060MS22ABMK0STD	
	70	38 x 90	070MS22ABMA0STD	070MS22ABMK0STD	
	80	38 x 90	080MS22ABMA0STD	080MS22ABMK0STD	
	100	38 x 116	100MS22ACMA0STD	100MS22ACMK0STD	
	125	38 x 116	125MS22ACMA0STD	125MS22ACMK0STD	
	260V r.m.s. Rated voltage (325V surge) Duty cycle 1.67%	25	38 x 75	025MS26AAMA0STD	025MS26AAMK0STD
		30	38 x 75	030MS26AAMA0STD	030MS26AAMK0STD
35		38 x 75	035MS26AAMA0STD	035MS26AAMK0STD	
40		38 x 75	040MS26AAMA0STD	040MS26AAMK0STD	
40		38 x 90	040MS26ABMA0STD	040MS26ABMK0STD	
50		38 x 75	050MS26AAMA0STD	050MS26AAMK0STD	
50		38 x 90	050MS26ABMA0STD	050MS26ABMK0STD	
60		38 x 75	060MS26AAMA0STD	060MS26AAMK0STD	
60		38 x 90	060MS26ABMA0STD	060MS26ABMK0STD	
70		38 x 90	070MS26ABMA0STD	070MS26ABMK0STD	
70		38 x 116	070MS26ACMA0STD	070MS26ACMK0STD	
80		38 x 90	080MS26ABMA0STD	080MS26ABMK0STD	
80		38 x 116	080MS26ACMA0STD	080MS26ACMK0STD	
90		38 x 90	090MS26ABMA0STD	090MS26ABMK0STD	
90		38 x 116	090MS26ACMA0STD	090MS26ACMK0STD	
100		38 x 90	100MS26ABMA0STD	100MS26ABMK0STD	
100		38 x 116	100MS26ACMA0STD	100MS26ACMK0STD	
100		46 x 90	100MS26BBMA0STD	100MS26BBMK0STD	
125		38 x 116	125MS26ACMA0STD	125MS26ACMK0STD	
125		46 x 90	125MS26BBMA0STD	125MS26BBMK0STD	
125	46 x 116	125MS26BCMA0STD	125MS26BCMK0STD		
150	46 x 90	150MS26BBMA0STD	150MS26BBMK0STD		
150	46 x 116	150MS26BCMA0STD	150MS26BCMK0STD		
200	46 x 116	200MS26BCMA0STD	200MS26BCMK0STD		

All items above are VDE approved

# MS/MD SERIES

## Motor Starting Capacitors

	Cap µF	Case Size D1 x L	Type number	
			Tolerance -0 +25%	Tolerance ±10%
120V r.m.s. Rated voltage (150V surge)	25	38 x 75	025MD12AAMA0STD	025MD12AAMK0STD
	30	38 x 75	030MD12AAMA0STD	030MD12AAMK0STD
Duty cycle 1.67%	35	38 x 75	035MD12AAMA0STD	035MD12AAMK0STD
	40	38 x 75	040MD12AAMA0STD	040MD12AAMK0STD
150V r.m.s. Rated voltage (188V surge)	50	38 x 75	050MD12AAMA0STD	050MD12AAMK0STD
	60	38 x 75	060MD12AAMA0STD	060MD12AAMK0STD
Duty cycle 0.55%	80	38 x 75	080MD12AAMA0STD	080MD12AAMK0STD
	100	38 x 75	100MD12AAMA0STD	100MD12AAMK0STD
	120	38 x 75	120MD12AAMA0STD	120MD12AAMK0STD
	125	38 x 75	125MD12AAMA0STD	125MD12AAMK0STD
	150	38 x 75	150MD12AAMA0STD	150MD12AAMK0STD
	160	38 x 75	160MD12AAMA0STD	160MD12AAMK0STD
	180	38 x 90	180MD12ABMA0STD	180MD12ABMK0STD
	200	38 x 90	200MD12ABMA0STD	200MD12ABMK0STD
	230	38 x 90	230MD12ABMA0STD	230MD12ABMK0STD
	250	38 x 90	250MD12ABMA0STD	250MD12ABMK0STD
	300	38 x 90	300MD12ABMA0STD	300MD12ABMK0STD
	310	38 x 116	310MD12ACMA0STD	310MD12ACMK0STD
	315	38 x 116	315MD12ACMA0STD	315MD12ACMK0STD
	350	38 x 116	350MD12ACMA0STD	350MD12ACMK0STD
	400	38 x 116	400MD12ACMA0STD	400MD12ACMK0STD
	<hr/>			
220V r.m.s. Rated voltage (275V surge)	30	38 x 75	030MD22AAMA0STD	030MD22AAMK0STD
	40	38 x 75	040MD22AAMA0STD	040MD22AAMK0STD
Duty cycle 1.67%	<b>40</b>	<b>38 x 90</b>	<b>040MD22ABMA0STD</b>	<b>040MD22ABMK0STD</b>
	50	38 x 75	050MD22AAMA0STD	050MD22AAMK0STD
280V r.m.s. Rated voltage (350V surge)	50	38 x 90	050MD22ABMA0STD	050MD22ABMK0STD
	60	38 x 75	060MD22AAMA0STD	060MD22AAMK0STD
Duty cycle 0.55%	<b>60</b>	<b>38 x 90</b>	<b>060MD22ABMA0STD</b>	<b>060MD22ABMK0STD</b>
	70	38 x 90	070MD22ABMA0STD	070MD22ABMK0STD
	<b>80</b>	<b>38 x 90</b>	<b>080MD22ABMA0STD</b>	<b>080MD22ABMK0STD</b>
	100	38 x 116	100MD22ACMA0STD	100MD22ACMK0STD
	125	38 x 116	125MD22ACMA0STD	125MD22ACMK0STD
	<hr/>			
260V r.m.s. Rated voltage (325V surge)	25	38 x 75	025MD26AAMA0STD	025MD26AAMK0STD
	30	38 x 75	030MD26AAMA0STD	030MD26AAMK0STD
Duty cycle 1.67%	35	38 x 75	035MD26AAMA0STD	035MD26AAMK0STD
	40	38 x 75	040MD26AAMA0STD	040MD26AAMK0STD
330V r.m.s. Rated voltage (413V surge)	<b>40</b>	<b>38 x 90</b>	<b>040MD26ABMA0STD</b>	<b>040MD26ABMK0STD</b>
	50	38 x 75	050MD26AAMA0STD	050MD26AAMK0STD
Duty cycle 0.55%	50	38 x 90	050MD26ABMA0STD	050MD26ABMK0STD
	60	38 x 75	060MD26AAMA0STD	060MD26AAMK0STD
	<b>60</b>	<b>38 x 90</b>	<b>060MD26ABMA0STD</b>	<b>060MD26ABMK0STD</b>
	70	38 x 90	070MD26ABMA0STD	070MD26ABMK0STD
	70	38 x 116	070MD26ACMA0STD	070MD26ACMK0STD
	<b>80</b>	<b>38 x 90</b>	<b>080MD26ABMA0STD</b>	<b>080MD26ABMK0STD</b>
	80	38 x 116	080MD26ACMA0STD	080MD26ACMK0STD
	90	38 x 90	090MD26ABMA0STD	090MD26ABMK0STD
	90	38 x 116	090MD26ACMA0STD	090MD26ACMK0STD
	100	38 x 90	100MD26ABMA0STD	100MD26ABMK0STD
	100	38 x 116	100MD26ACMA0STD	100MD26ACMK0STD
	100	46 x 90	100MD26BBMA0STD	100MD26BBMK0STD
	125	38 x 116	125MD26ACMA0STD	125MD26ACMK0STD
	125	46 x 90	125MD26BBMA0STD	125MD26BBMK0STD
	125	46 x 116	125MD26BCMA0STD	125MD26BCMK0STD
	150	46 x 90	150MD26BBMA0STD	150MD26BBMK0STD
150	46 x 116	150MD26BCMA0STD	150MD26BCMK0STD	
200	46 x 116	200MD26BCMA0STD	200MD26BCMK0STD	

The items highlighted in bold are VDE approved