

WORLDWIDE CAPACITORS





CORPORATE PROFILE

1960

CGE is established in Mexico City as an Electrical Component Manufacturer

1970

CGE merges with CentraLab (NA Philips) and expand into electromechanical components

1986

CGE is bought back from Philips

1999

Aerovox merges with CGE to manufacture Motor Start Capacitors

2001

Aerovox enters in bankruptcy and CGE is bought back once more

2001

CGE becomes "Nueva Generación Manufacturas" (NGM)

2004

NGM acquires Barker Microfarads

2005

NGM acquires assets, trademark and patents from Mallory

2006

NGM acquires assets of NORCAP and Commonwealth Sprague

2006

NGM creates a Joint Venture with Shengda and establishes NGM Yangzhou

2008

NGM buys assets of U.K. Cambridge Capacitors and Philips Advance "Process innovation and customer satisfaction have driven the development of NGM operations."

2010

NGM integrates the manufacturing of metalized polypropylene film in a Joint Venture with NUINTEK.

2013

NGM became a 3PL for contactors.

2014

NGM entered into a Joint Venture agreement with Circutor (Spain) to manufacture Low and Medium voltage PFC Capacitors and Systems and DC C Film Power Electronics Capacitors in Mexico City.

2019

NGM acquires capacitor lines manufactured and sold under the Genteq and Proline trademarks from Regal Beloit (RBC).



TABLE OF CONTENTS

6	GENERAL INFORMATION
7	A.C.MOTOR START CAPACITORS
17	A.C. MOTOR RUN CAPACITORS
20	WET METAL CASE CAPACITORS
26	WET METAL CASE DUAL CAPACITORS
28	DRY CAPACITORS
32	POWER FACTOR CORRECTION AND HARMONIC FILTERS CAPACITOR CELLS
37	GENERAL TERMS AND CONDITIONS

PURPOSE

This catalog's purpose is to provide a reference for all of NGM's standard AC motor run, start and square power factor capacitor cells. Please contact NG Sales or Customer service for further information at SalesNGM@ngm.com.mx, Tel. (52) (55) 5352-5244.

INTRODUCTION

A motor capacitor, such as a start capacitor or run capacitor, is an electrical device that boosts the current or reduce the power factor to an electric motor, used in air conditioners, water pumps, garage openers, or forced air heat furnaces.

MOTOR START CAPACITORS: are commonly used in single-phase motors to boost the value of their starting torque. Due to its advantages such as size and high capacitance value, the motor start capacitor is the best capacitor for this type of application. Once the motor has been started, the capacitor is disconnected from the circuit.

Start capacitor elements are made out of aluminum foil separated by layers of impregnated paper (Electrolyte) where the dielectric is aluminum oxide.

MOTOR RUN CAPACITORS: are designed (round or oval) for continuous duty and they are energized the entire time the motor is running. Run capacitors are rated in a wide range of μF with voltage classifications of 180V to 660V Dual run capacitors are used in some air conditioner compressor units to boost both the fan and compressor motor and reduce the power factor.

These capacitors are manufactured with a dielectric material that consists of two plates of polypropylene film with a thin layer of vacuum metal deposited on one side.



POWER FACTOR CORRECTION CAPACITOR CELLS: are used to reduce the power factor and harmonic filtration in industrial and commercial three-phase electrical installations, they also can be used in large motor machines that can affect the rest of the installation. The range is 1 to 30 Kvar, and in operating voltages from 220VAC to 1000VAC.

A.C. MOTOR START CAPACITORS

ELECTRICAL SPECIFICATIONS

Capacitance Range:
21 to 1410 Thermoplastic
21 to 1536 Phenolic

Voltage Ratings: 110, 125, 165, 220, 250 and 330 VAC (other voltages upon request)

Rated Frequency: 50/60 HZ

Operating Temperature:
-40 + 65 °C max.
(-40 +149 °F max.) Higher temp upon request.

Power Factor: 10% max. after applying working voltage for 3 sec.

MECHANICAL SPECIFICATIONS

Case: Phenolic or Thermoplastic case with a positive pressure safety vent.

Terminals: Designed to accept 1/4"; single, double and triple quick male connectors with solder lug option.

Marking: Manufacturer identification, capacitance range, rated voltage, working frequency, maximum operating temperature, manufacture week, year, and UL marking. (Special marking available on request).

AGENCY APPROVALS

-CQC

-UL

-VDE

INTERNATIONAL DIRECTIVES

-REACH

-ROHS

- CONFLICT MINERALS

-CALIFORNIA PROP 65

APPLICATIONS

Home Appliances:

- Washing Machines.
- Refrigerators
- Dishwashers

HVAC Systems

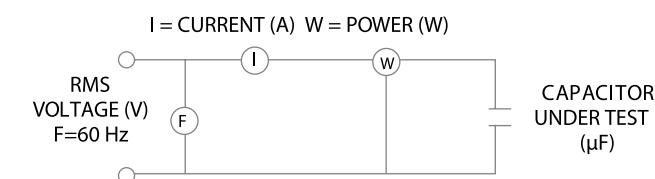
- Air Conditioning Units
- Fans
- Machine Tools
- Garage Door Openers, etc.

NORMAL SERVICES CONDITIONS

The useful life of a capacitor will be shortened by exceeding the rated voltage and/ or temperature limits. The maximum temperature of these capacitors can be affected by air circulation of radiated and conducted heat as well as any other ambient condition including the heat generated in the capacitor due to the application of voltage and current flow.

PROCEDURE FOR CAPACITANCE AND POWER FACTOR MEASUREMENT

The capacitance and power factor of AC motor start capacitors are calculated by applying 60 Hz, rated voltage to the capacitor and recording, from the circuit below, the voltage within 2 seconds, the current within 3 seconds, and the wattage within 4 seconds.



CAPACITANCE AND POWER FACTOR ARE CALCULATED WITH THE BELOW EQUATIONS:

$$C = \frac{I \times 10^6}{2\pi fV}$$

$$PF = \frac{W \times 100}{VI}$$

C=Capacitance

V = Volts (Vac)

I = Current (A)

W = Power (W)

f = Frequency (Hz)

PF = Power Factor (%)

$\pi = 3.1416$

VOLTAGE RATING

The rated and surge voltages of the capacitor must be greater than or equal to the average voltage across the capacitor terminals during the motor starting cycle. This is not necessarily the same as the motor line voltage.

The maximum recommended surge voltages for the six standard voltage ratings are as follows:

Rated Voltage (RMS)	Maximum Voltage (RMS)
110	130
125	150
165	200
220	265
250	300
330	395

FREQUENCY

These capacitors are engineered for 60 Hz application but could be operated between 47 Hz and 66 Hz without damage, provided that voltage limitations stated above are observed. (For other variations in frequency, contact NG).

CAPACITANCE RATING

The capacitance is chosen to give the necessary starting torque to the motor. The minimum capacitance value is the minimum designed capacitance. The maximum capacitance is defined by the tolerance.

MOUNTING

Vertical mounting of the capacitor with the terminals up is recommended with a range of $\pm 80^\circ$. Horizontal mounting is acceptable, however vertical mounting with the terminals down is not recommended due to that it could impair the operation of the presurre relief vent.

DUTY CYCLE

The duty cycle should be calculated for each application. It is the ratio of the time the capacitor has applied voltage to the total time of one cycle. The duty cycles for the normal performance of Type I and Type II are in accordance with the standards in EIA RS-463-B or IEC 60252 -2 or GB /T3667-2

SAFETY

Due to the watt-second value of these capacitors is high, precautions should be taken during testing and application of these devices. Discharge resistors should be specified when there is a possibility of a residual charge left on the capacitor or to protect contacts. Exceeding design limits or applying continuous AC voltage, may result in life reduction of capacitors.

CASE INSULATION TEST

The capacitors shall be capable of withstanding 2000 volts AC RMS 60 Hz for 60 seconds between the terminals and a metal foil tightly surrounding the lateral surface of the plastic case or insulating sleeve without breakdown or flashover.

VENT TEST

Capacitors shall be capable of releasing any excessive internal pressure through the vent without any violent explosion of the capacitive element or cover or emission of flame, when rated AC RMS voltage 60 Hz is applied continuously to a capacitor.

STORAGE

Capacitors are capable of being exposed with no voltage applied to temperatures from -40°C to 90°C without permanent damage for a specific time frame. The exposure time frame depends on the temperature range it is exposed to, for example, -40°C to 40°C is six years, but if exposed to 90°C the time frame is reduced to 100 hours.

SHELF LIFE

Capacitors may be stored for periods up to 2 years without detriment. But after this period the "re-forming" (switching on and off) of the film is preferable before putting the capacitor into service.

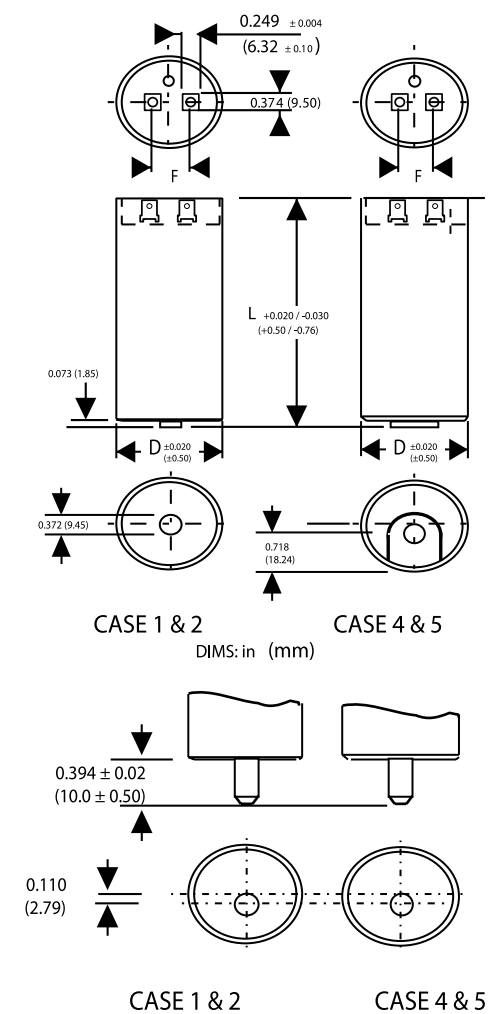
ACCELERATED LIFE TEST

Capacitors shall be capable of withstanding life test conditions per EIA463-B in a $65^\circ\text{C} \pm 3^\circ\text{C}$ ambient at rated sinusoidal voltage and frequency with current limiting and discharge resistors. A resistance equivalent to approximately 10% of the capacitor impedance shall be connected in series with each capacitor and a resistor of approximately 1000 ohms shall be connected in parallel with each capacitor.

At the conclusion of the life test, at room temperature, the capacitance shall not differ from the initial measured value by more than $\pm 25\%$ and the power factor shall not exceed 20%.

MECHANICAL CHARACTERISTICS PLASTIC SIZE CHART

CASE SIZE	DØ	F	L
1	1.437 (36.50)	0.500 (12.70)	2.750 (69.85)
2	1.437 (36.50)	0.500 (12.70)	3.375 (85.72)
4	1.812 (46.02)	0.630 (16.00)	3.375 (85.72)
5	1.812 (46.02)	0.630 (16.00)	4.375 (111.12)



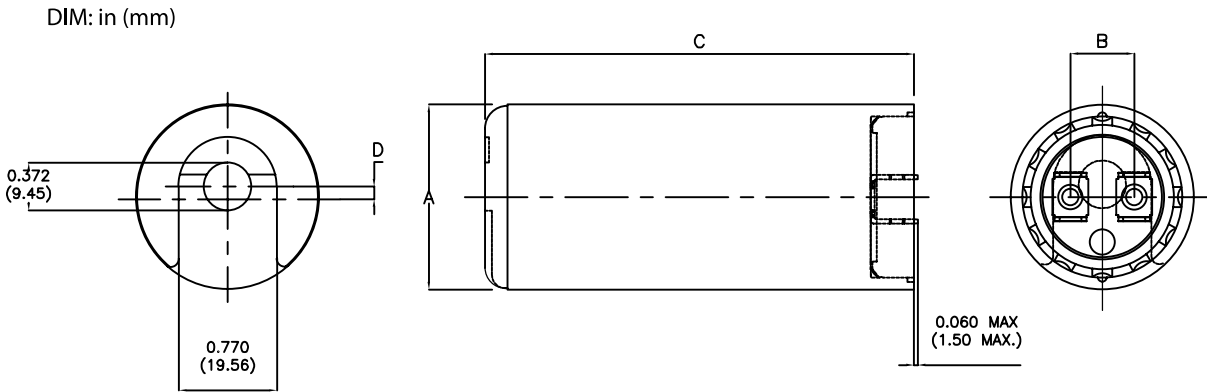
General Notes:

-Standard case size for M8 -1.25 x 10.0mm mounting stud 1,4 and 5 (available upon request).

PHENOLIC SIZE CHART

CASE SIZE	A	B	C	D
1	1.437 (36.50)	0.500 (12.70)	2.750 (69.85)	See NOTE
2	1.437 (36.50)	0.500 (12.70)	3.375 (85.72)	
4	1.812 (46.02)	0.630 (16.00)	3.375 (85.72)	0.110 (2.79)
5	1.812 (46.02)	0.630 (16.00)	4.375 (111.12)	0.110 (2.79)
6	2.062 (52.37)	0.881 (22.37)	3.375 (85.72)	0.235 (5.97)
7	2.062 (52.37)	0.881 (22.37)	4.375 (111.12)	0.235 (5.97)
8	2.562 (65.07)	0.881 (22.37)	4.375 (111.12)	0.485 (12.31)

DIM: in (mm)



General Notes:

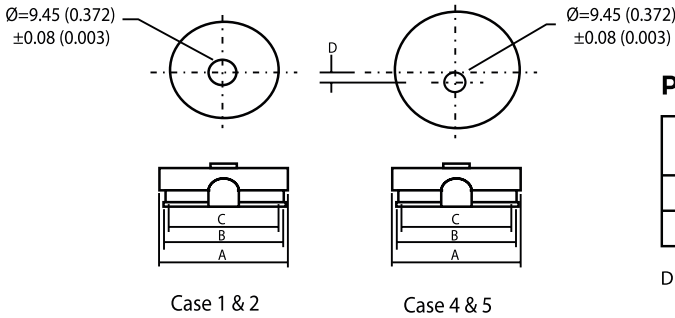
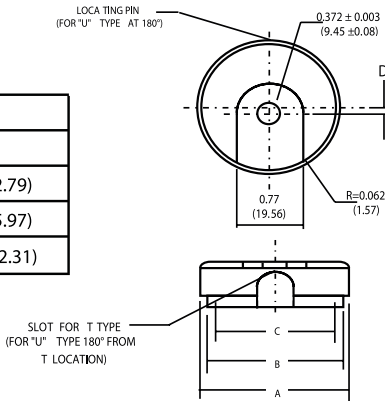
This dimension is .080 (2.03) but the center line of the .0375 (9.52) diameter pro-
tection is on the opposite side of the center line of the case from what is shown

HARDWARE ACCESSORIES

PHENOLIC END CAP

FOR CASE	A	B	C	D
1, 2 & 3	1.437 (36.50)	1.241 (31.52)	1.093 (27.56)	
4 & 5	1.812 (46.02)	1.611 (40.92)	1.468 (37.25)	0.110 (2.79)
6 & 7	2.062 (52.37)	1.866 (47.40)	1.718 (43.64)	0.235 (5.97)
8	2.562 (65.07)	2.366 (60.09)	2.218 (56.33)	0.485 (12.31)

DIM: in (mm) TOL: 0.010 (0.25)



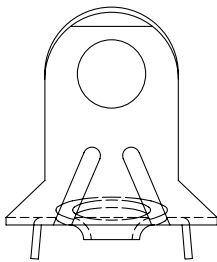
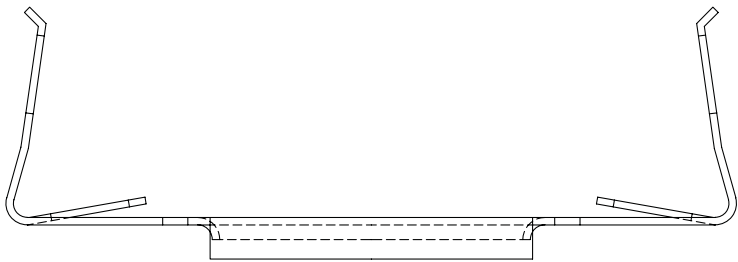
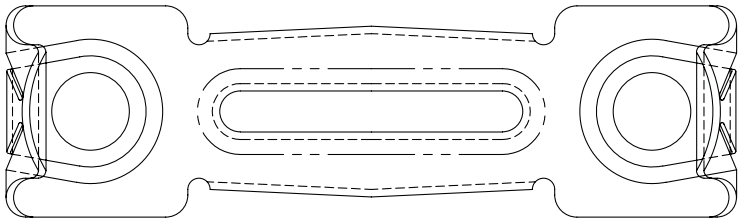
PLASTIC END CAP

FOR CASE	A	B	C	D
1 & 2	1.437 (36.50)	1.348 (34.25)	1.0240 (31.50)	
4 & 5	1.812 (46.02)	1.710 (43.45)	1.594 (40.50)	0.110 (2.79)

DIM: in (mm) TOL: 0.010 (0.25)

MOUNTING BRACKET FOR PLASTIC AND PHENOLIC

Upon request



PLASTIC SIZE / RATING CHART

TYPE I CAPACITOR (EIA)

VOLTAGE CAPACITANCE VALUE	110 CASE SIZE	125 CASE SIZE	165 CASE SIZE	220 CASE SIZE	250 CASE SIZE	330 CASE SIZE
21 - 25						1
25 - 30						1
30 - 36					1	1
36 - 43				1	1	1
43 - 52				1	1	2
47 - 56			1	1	1	2
53 - 64			1	1	1	4
53 - 64		1	1	1	1	4
53 - 64	1	1	1	1	1	4
88 - 106	1	1	1	1	1	4
108 - 130	1	1	1	1	1	5
130 - 156	1	1	1	1	1	5
145 - 175	1	1	1	1	2	5
161 - 193	1	1	1	2	2	5
189 - 227	1	1	1	2	2	
216 - 259	1	1	1	2	4	
233 - 280	1	1	2	4	4	
243 - 292	1	1	2	4	4	
270 - 324	1	1	2	4	4	
324 - 389	1	1	2	4	4	
340 - 389	1	1	2	4	4	
378 - 454	1	2	4	4	5	
400 - 480	2	2	4	5	5	
430 - 516	2	4	4	5	5	
460 - 552	2	4	4	5		
540 - 648	4	4	4	5		
590 - 708	4	4	4			
708 - 850	4	4	5			
829 - 995	4	5	5			
1000 - 1200	5	5				
1020 - 1224	5	5				
1175 - 1410	5					

PLASTIC SIZE / RATING CHART

TYPE II CAPACITOR (EIA)

VOLTAGE CAPACITANCE VALUE	110 CASE SIZE	125 CASE SIZE	165 CASE SIZE	220 CASE SIZE	250 CASE SIZE	330 CASE SIZE
21 - 25						
25 - 30						1
30 - 36						1
36 - 43					1	1
43 - 52				1	1	1
47 - 56				1	1	1
53 - 64			1	1	1	1
64 - 77			1	1	1	2
72 - 86		1	1	1	1	2
88 - 106	1	1	1	1	1	4
108 - 130	1	1	1	1	1	4
130 - 156	1	1	1	1	2	4
145 - 175	1	1	1	1	2	5
161 - 193	1	1	1	1	2	5
189 - 227	1	1	1	2	2	5
216 - 259	1	1	1	2	2	
233 - 280	1	1	1	2	4	
243 - 292	1	1	1	4	4	
270 - 324	1	1	2	4	4	
324 - 389	1	1	2	4	4	
340 - 389	1	1	2	4	4	
378 - 454	1	1	2	4	4	
400 - 480	1	2	4	4	4	
430 - 516	2	2	4	4	5	
460 - 552	2	2	4	4	5	
540 - 648	2	4	4	5	5	
590 - 708	2	4	4	5		
708 - 850	4	4	4			
829 - 995	4	4	5			
1000 - 1200	4	4	5			
1020 - 1224	4	4	5			
1175 - 1410	5	5				

PHENOLIC SIZE / RATING CHART

TYPE I CAPACITOR (EIA)

VOLTAGE	110	125	165	220	250	330
CAPACITANCE VALUE	CASE SIZE	CASE SIZE	CASE SIZE	CASE SIZE	CASE SIZE	CASE SIZE
21 - 25						
25 - 30						1
30 - 36				1	1	2
36 - 43				1	1	4
43 - 52			1	1	1	4
47 - 56			1	1	1	4
53 - 64			1	1	1	4
64 - 77		1	1	1	1	4
72 - 86	1	1	1	1	1	4
88 - 106	1	1	1	1	1	5
108 - 130	1	1	1	2	2	5
130 - 156	1	1	1	2	4	7
145 - 175	1	1	2	4	4	7
161 - 193	1	1	2	4	4	7
189 - 227	1	1	4	4	4	8
216 - 259	1	1	4	4	4	8
233 - 280	1	2	4	4	4	8
243 - 292	1	2	4	4	4	8
270 - 324	1	2	4	4	5	8
324 - 389	2	4	4	5	5	8
340 - 389	2	4	4	5	5	8
378 - 454	2	4	4	5	5	
400 - 480	2	4	4	5	7	
430 - 516	2	4	4	7	7	
460 - 552	2	4	5	7	7	
540 - 648	4	4	5	7	7	
590 - 708	4	4	5	7	8	
708 - 850	4	4	7	8	8	
829 - 995	4	5	7	8	8	
1000 - 1200	5	5	8	8	8	
1020 - 1224	5	7	8	8		
1175 -1410	5	7	8	8		

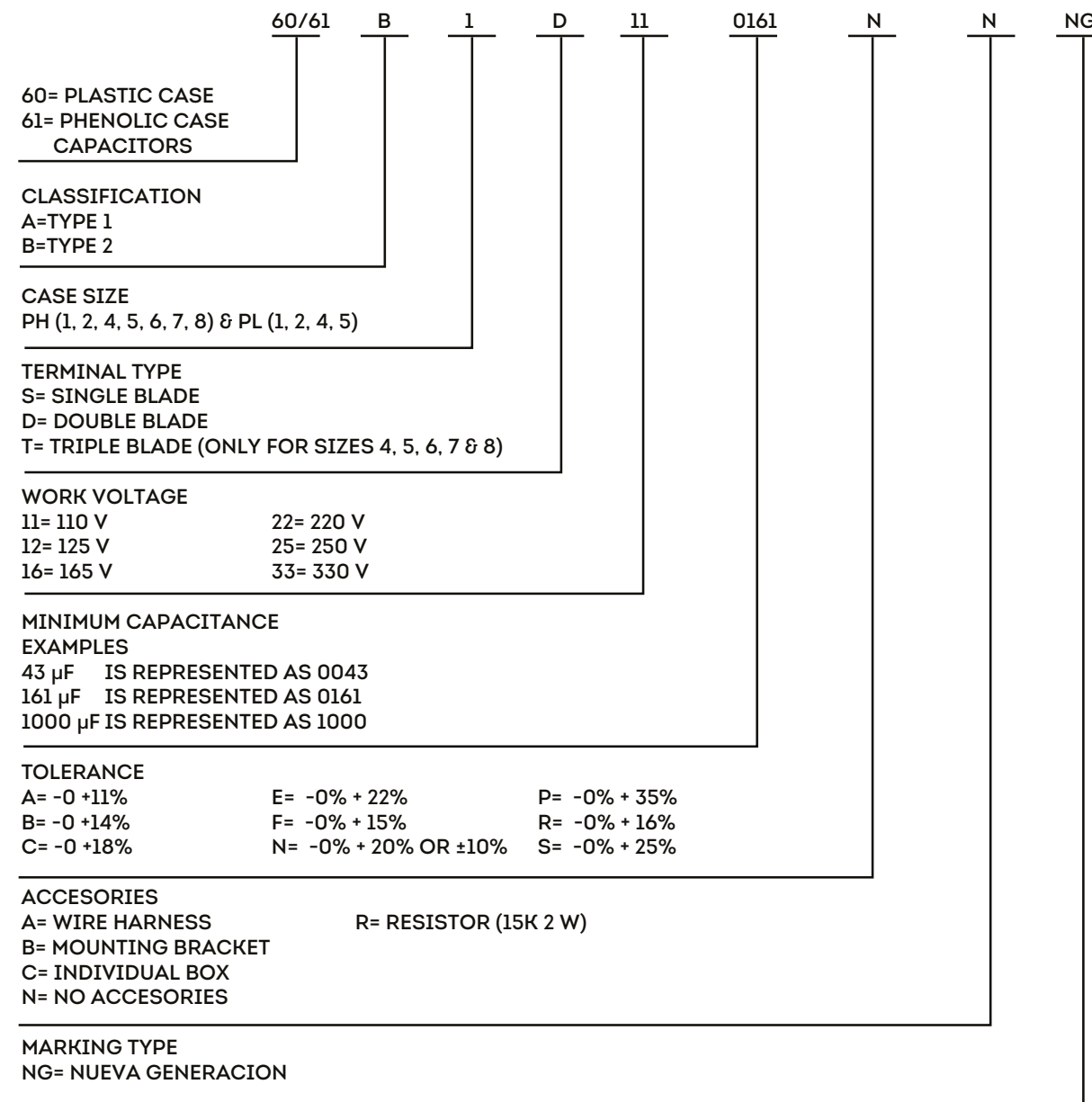
PHENOLIC SIZE / RATING CHART

TYPE II CAPACITOR (EIA)

VOLTAGE	110	125	165	220	250	330
CAPACITANCE VALUE	CASE SIZE	CASE SIZE	CASE SIZE	CASE SIZE	CASE SIZE	CASE SIZE
21 - 25						
25 - 30						1
30 - 36					1	1
36 - 43				1	1	1
43 - 52				1	1	1
47 - 56				1	1	2
53 - 64				1	1	2
64 - 77			1	1	1	4
72 - 86		1	1	1	1	4
88 - 106	1	1	1	1	1	4
108 - 130	1	1	1	1	2	4
130 - 156	1	1	1	2	2	5
145 - 175	1	1	1	2	2	5
161 - 193	1	1	2	2	4	5
189 - 227	1	1	2	4	4	5
216 - 259	1	1	2	4	4	7
233 - 280	1	1	4	4	4	7
243 - 292	1	1	4	4	4	8
270 - 324	1	2	4	4	4	8
324 - 389	1	2	4	4	4	8
340 - 389	1	2	4	4	5	8
378 - 454	2	4	4	4	5	8
400 - 480	2	4	4	5	5	
430 - 516	4	4	4	5	5	
460 - 552	4	4	4	5	7	
540 - 648	4	4	5	5	7	
590 - 708	4	4	5	7	7	
708 - 850	4	4	5	7	8	
829 - 995	4	5	7	8	8	
1000 - 1200	5	5	7	8	8	
1020 - 1224	5	5	7	8	8	
1175 - 1410	5	5	8	8		

A.C. MOTOR RUN CAPACITORS

PART NUMBERING SYSTEM



The A.C. MOTOR RUN CAPACITORS are manufactured with a dielectric material that consists of two plates of metallized polypropylene film. and the dielectric medium is made of vegetable oil. Each element has a thin layer of vacuum deposited metal on one side that is bonded by a metallized endspray. The endspray operates as a termination point for internal connections. This construction minimizes the possibility of the current concentrating in one point of the electrode.

These capacitors are self-healing, a property of the metallized film that restores itself to when a dielectric breakdown occurs during a fault condition during operation.

During the fault condition the thin metal layer around the fault point will act like a low current carrying fuse. The current will cause the metal endspray around the fault point to evaporate (self healing). This is accomplished by special frame work of the film with a specific ohmic resistivity and low melting point temperature the evaporation of the electrode.

As a safety measure to prevent case rupture during the self healing event. NG capacitors are manufactured with a internal protective device (interrrupter) or with Segmented film.

- Internal protective device: this internal device is pressure sensitive also known as an interrupter. The interrupter will disconnect tabs to the element, which cuts off the flow of voltage/current to the capacitor.

- Segmented Film (Dry Caps) : by the use of fuses (segmentation) in the film, it isolates the damage during the self healing event. which also cuts off the flow of voltage/current to the capacitor.

Single Run capacitors: are rated in a wide range of μ F with voltage classifications of 180VAC to 660VAC. Single phase electric motors need a capacitor to shift the current in the winding, to simulate the operation of a two-phase motor and compensate the inductance of the winding. The inadequate sizing of a run capacitor can cause the motor become noisy, increase energy consumption, cause performance to drop.



Dual run capacitors: are commonly used for air conditioning, to help in the starting of the compressor and the condenser fan motor and compensate the inductance of the winding. It can also support two electric motors, such as in a large air conditioner unit with both a fan motor and a compressor motor in the outdoor heat pump.

The dual capacitor has 3 terminals, labeled "C" or "FAN" or "HERM" for the common, fan, and hermetic electric lines.

SAFETY PROTECTION

Degree of safety protection (according to the IEC-60252-1) is identified by one of three codes to be marked on the capacitor:

(S3) indicates that the capacitor is of segmented film construction and is protected against fire and shock hazard

(S2) indicates that the capacitor type has been designed to fail in the open-circuit mode only and is protected against fire or shock hazard.

(S1) indicates that the capacitor type **may** fail in the open-circuit or short-circuit mode and is protected against fire or shock hazard.

(S0) indicates that the capacitor type has no specific failure protection.

By UL810 the degree of safety protection is internally protected 10,000 AFC

SHELF LIFE

Motor run capacitors may be stored for periods up to 7 years without detriment. After this time is the preferable to test the capacitor before putting them to service to confirm that the capacitance rated within tolerance range.

MOUNTING

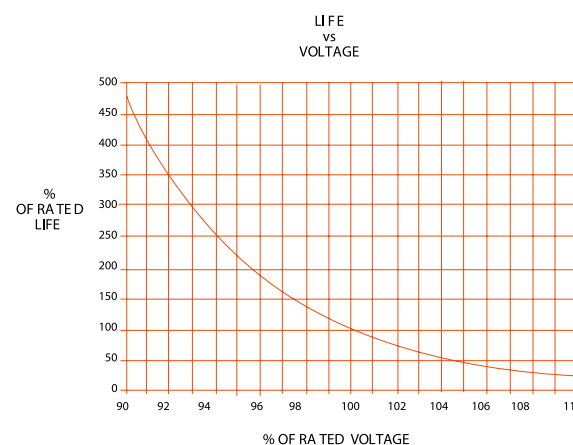
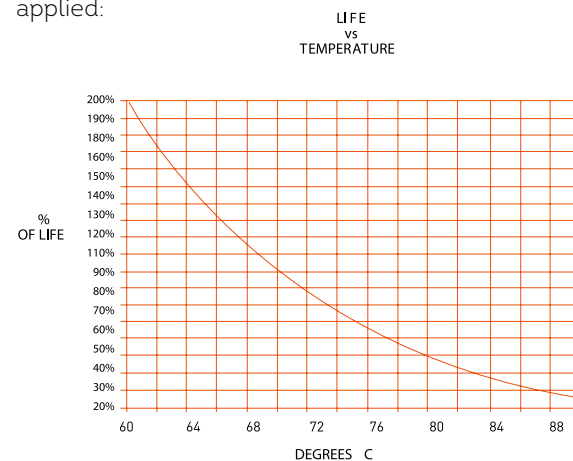
The mounting position of the capacitors will not affect the operation of the interrupter. To ensure proper operation, capacitors must be installed with a minimum of 0.5 inches (12.7 mm) of clearance between terminals or cover and any external restriction.

PERFORMANCE AND SERVICE LIFE

Rated Life. NG Capacitors are designed to have a life expectancy of 60,000 hours per EIA 456.

The useful life of a capacitor will be shortened by exceeding the rated voltage and/or temperature limits. Acceleration voltage are now under extensive study.

The next graphs illustrate the variation of life expectancy regarding the voltage and temperature applied:



VOLTAGE TEST

Between Terminals. Capacitors are capable of withstanding the applications of 1.75 times for 10 seconds at rated alternating voltage.

Terminals to Case. Capacitors are capable of withstanding the application of two times the rated alternating voltage plus 1000 volts for a period of 1 minute.

Surge Voltage. The maximum peak transient surge voltage will not exceed 315% of the nominal 60 Hz rms voltage.

ACCELERATED LIFE TEST

The accelerated life test may be performed by capacitor users to confirm life expectancy.

Room Temperature Life Test Capacitor shall be operated at 135% of rated voltage at room temperature for a period of 120 hours.

High Temperature Life Test Capacitor shall be capable of withstanding the accelerated life test, by applying 125%.

NG Capacitors shall be capable of stable operation with decreased life at 110% of rated voltage at frequencies up to 66 Hz (Sinusoidal) provided the case temperature does not exceed the maximum rated case temperature.

High transient of voltage, frequency, temperature or any combination of the three may be encountered in some applications therefore, the complete information regarding to magnitude, duration and frequency should be provided to NG in order to design and recommend the proper capacitor for a particular application.

Capacitance and Tolerance: the capacitance of all capacitors are within specified tolerance limits when measured at a temperature of +25°C without changes above -5% to 2% (capacitance value, 60Hz)

Dissipation Factor The dissipation factor does not exceed 0.1% when measured at a frequency of 60 Hz and a case temperature of +25oC.

Leakage Current. When 115 VAC 60 Hz is applied between the shorted capacitor terminals and the bare case, the leakage current will not exceed the values shown on the following table:

NOMINAL CAPACITANCE (μF)	LEAK AGE CURRENT (μA)
0 - 14	60
14.1 - 20	70
20.1 - 35	100
35 1 up	150

Technical standards of reference to design and evaluate the performance of the NG AC Capacitors are the following: EIA-456, IEC 60252, UL 310, UL 810, C22.2 No.190,IEC 60831 and GBT 3667-1

NG Capacitors are RoHS compliant. Reference to the Directive 2011/65/EU

NG Capacitors are REACH Article 67 compliant in hardware, electrical and electronic equipment.

NG participates in the Conflict - Free Sourcing initiative and provides CFSI conflict report.

CERTIFICATIONS AND APPROVALS

SERIES	AGENCY APPROVALS	VOLTAGE	NO.FILE
325P	UL and CUL	Up to 660	E229850
	VDE	370	134246
		440	135494
		480	135492
	CE	180 to 660	N/A
315P & 319P	QCO	440	19006211545
			19006211547
315P & 319P	UL	Up to 660	E229850
	CE	Up to 660	N/A
33 (PFC Cells)	UL and CUL	180 to 660	E229850
	CSA	180 to 660	89486
	CE	180 to 660	N/A
28 (Segmented film)	UL and CUL	Up to 440	E229850
	CE	Up to 440	N/A
28P	UL	150 to 450	E130758
	CE	150 to 450	N/A
27 (Segmented film)	UL and CUL	180 to 600	E229850
	CE	180 to 600	N/A
27	UL and CUL	200 to 480	E130758
	CE	200 to 480	N/A

WET METAL CASE CAPACITORS

WET METAL CASE FEATURES

- Maximum Fault current 10,000 Amps.
- Internally Protected (Pressure Interrupter)
- Meets EIA -456 ,UL310,UL810 GBT3767, IEC 60252, C-22.2.N190 standards
- Integral mounting options available for easy installation.
- Casing: Round or Oval
- Type: Single / Dual
- 60,000 hours of operational life
- Self-healing metallized polypropylene film
- 100% end of line tested
- 100% serialized and end of line data captured

ELECTRICAL TESTING

Test programs are run continuously at NG and at third party laboratories to monitor production and for design improvements. These tests confirm the reliable performance of NG capacitors used within rated conditions.

Ongoing tests include: accelerated life, over voltage, mechanical, terminal to terminal voltage, and terminal to case voltage tests.

MARKING

- Manufacturer's name, trade name, trademark or file number
- Manufacturer's type designation
- The date or other dating period of manufacture
- A distinctive part number or the equivalent
- The rated capacitance in microfarads and tolerance as percentage
- The voltage rating
- The frequency in Hertz
- The temperature rating
- The maximum fault current
- Marked Internally Protected or Protected
- Approval Mark if applicable
- Discharge device if applicable
- Class of Safety Protection
- Filling Material
- Class of Operation
- Self Healing (SH)



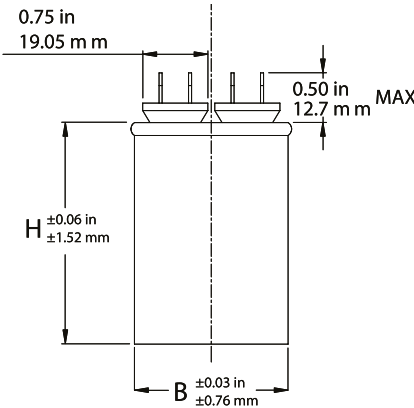
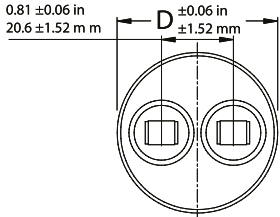
WET METAL CAPACITORS ROUND CASE ELECTRICAL SPECIFICATIONS

Capacitance Range	From 1 to 200 µF
Voltage Range	Up to 660Vac at 50/60Hz Other voltages upon request
Tolerance:	6% Standard. Other tolerances upon request
Dissipation Factor:	0.1% Max. at 60Hz and 25°C, 1% at 1kHz and 25°C
Operating Temperature:	-40°C +70°C. (Upon request and certified by UL up to +90°C) Other temperatures upon request.
100% end of line tested:	Terminal to Terminal = 1.41x[1.75 x VAC (rated)] as a DC voltage Terminal to Case = 1.41x[2 x VAC (rated) + 1 KVAC] as a DC voltage D.F. measured at 120Hz at 25°C ±5°C Other measured frequencies upon request
100% serialized and 100% end of line data capture:	Capacitance measured at 120Hz and 25°C ±5°C D.F. measured at 120Hz and 25° ± 5°C Capacitance end of life is = -3% loss of capacitance

WET METAL CASE CAPACITORS
SINGLE CAPACITORS

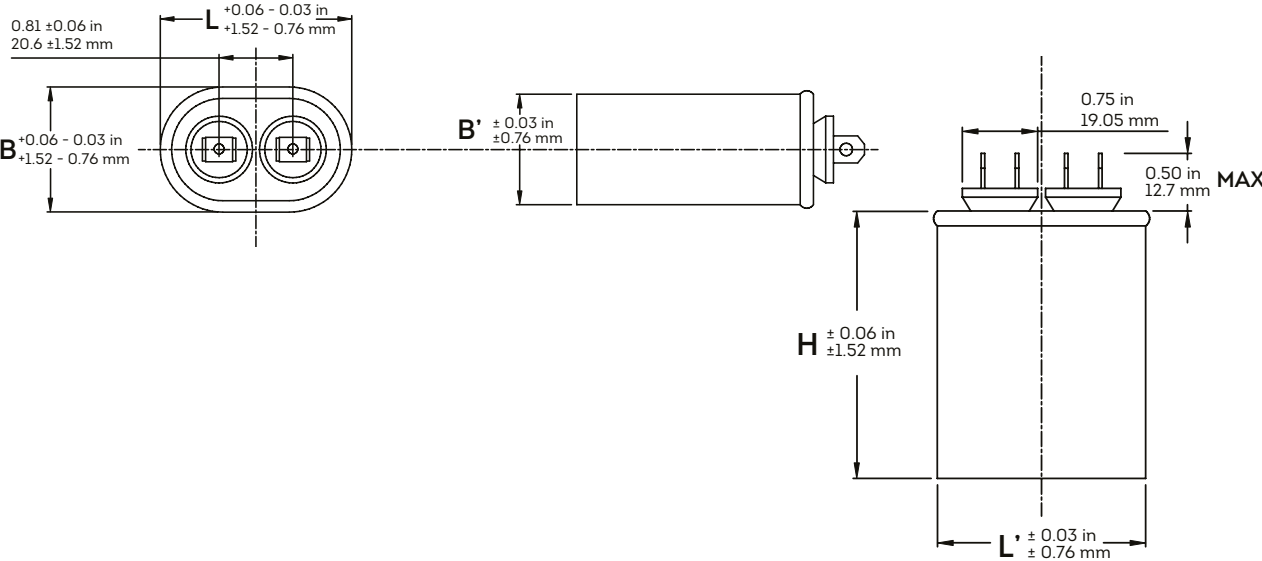
MECHANICAL SPECIFICATIONS / MAXIMUM CAPACITANCE PER ROUND CAN

MAXIMUM CAPACITANCE PER CAN [μF]								
Diameter	Can Height (H)		240	300	370	440	480	660
	in	mm	[Vac]	[Vac]	[Vac]	[Vac]	[Vac]	[Vac]
Ø 1 3/4" [44.5mm] (Size M)	2.000	50.80	33	21	14	10	8	3.5
	2.375	60.32	47	30	20	15	11	
	2.625	66.67	54	34	23	17	13	5.5
	2.750	69.85	61	39	26	19	14	
	3.000	76.20	67	43	29	21	16	7
	3.375	85.72	81	52	35	26		
	3.750	95.25	95	61	41	30	23	10
	4.000	101.60	100	65	44	32	25	
Ø 2.0" [50.8mm] (Size N)	2.375	60.32	64	41	27	20	15	
	2.625	66.67	74	47	32	23	18	8
	3.000	76.20	93	59	40	29	22	10
	3.375	85.72	111	71	48	35		
	3.750	95.25	130	83	57	42	32	14
	4.000	101.60	139	89	61	45	34	
	4.250	107.95		101	69	51		
	4.750	120.65			78	57	43	19.5
Ø 2.5" [63.5mm] (Size P)	2.625	66.67	123	78	53	39	29	13
	3.000	76.20	154	98	67	49	37	16.5
	3.375	85.72	185	118	80			
	3.750	95.25	216	138	94	67	53	23.5
	4.000	101.60	232	148	100	74	57	
	4.250	107.95		168	115	84		
	4.750	120.65		188	129	95	72	32



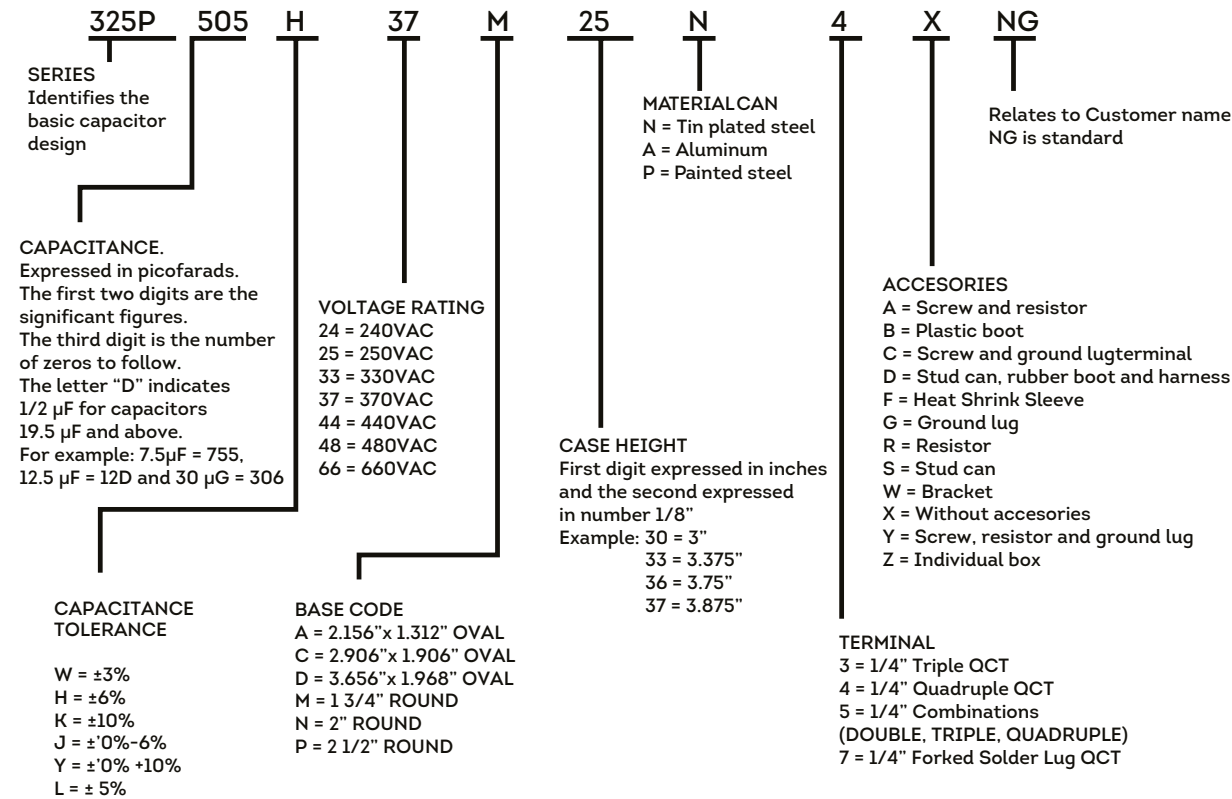
MECHANICAL SPECIFICATIONS / MAXIMUM CAPACITANCE PER OVAL CAN

MAXIMUM CAPACITANCE PER CAN [μF]								
Diameter	Can Height (H)		240	300	370	440	480	660
	in	mm	[Vac]	[Vac]	[Vac]	[Vac]	[Vac]	[Vac]
1 1/4" [31.75mm] (30.73 X 52.32) (1.21X 2.06) (Size A)	1.5(14)	38.100	12	7.5	5	3.5	3	1
	1.625(15)	41.275	15	10	6	5	3.5	1.5
	2.000	50.800	15	10	7	5	3.5	
	2.375	60.325	22	14	9	7	5	
	2.625	66.675	25	16	11	8	6	2.5
	2.750	69.850	29	18	12	9	7	
	3.000	76.200	32	20	14	10	7	3.5
	3.375	85.725	38	24	16	12		
	3.750	95.250	45	28	19	14	11	4.5
	4.000	101.600	48	31	21	15	11	
	4.250	107.950		35	24	17		
	4.750	120.650			27	19	15	6.5
1 3/4" " [44.45mm] (45.87 x 71.27) (1.806 x 2.806) (Size C)	2.375	60.32	63	40	27	19	15	
	2.625	66.67	72	46	31	22	17	7
	3.000	76.20	90	57	39	28	22	9
	3.375	85.72	108	69	47	34		
	3.750	95.25	126	81	55	40	31	13
	4.000	101.60	136	87	59	43	33	
	4.250	107.95		98	67	49		
	4.750	120.65			75	55	42	18
2" [50.8mm] (47.75 x 90.42) (1.88 x 3.56) (Size D)	2.625	66.67	116	74	50	36	28	12
	3.000	76.20	145	93	63	46	35	15
	3.375	85.72	175	112	76	56		
	3.750	95.25	200	130	89	65	50	22
	4.000	101.60	219	140	96	70	54	
	4.250	107.95		159	109	80		
	4.750	120.65			122	89	68	30
	5.125	130.18	290	186	126	92	70	



PART NUMBERING SYSTEM FOR WET METAL CASE SINGLE RUN CAPACITORS

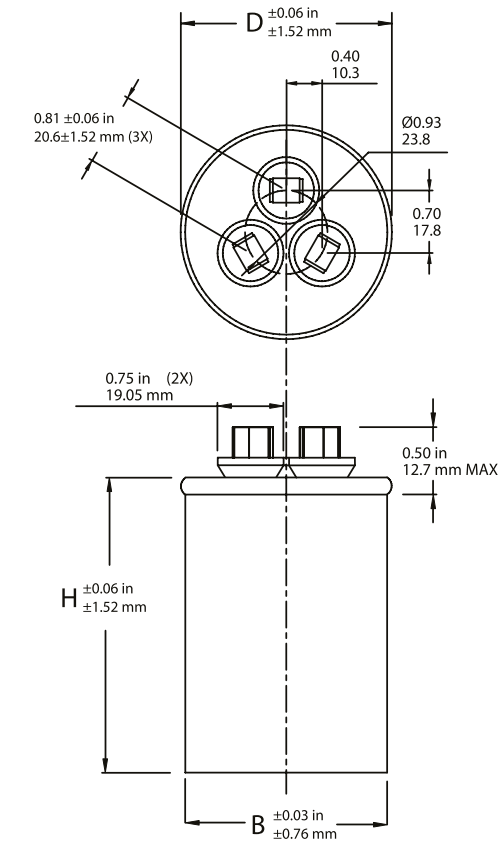
NOMENCLATURE BREAKDOWN



MECHANICAL SPECIFICATIONS / MAXIMUM CAPACITANCE PER ROUND CAN

MAXIMUM CAPACITANCE PER CAN [μ F]								
Diameter	Can Height (H)		240	300	370	440	480	660
	in	mm	[Vac]	[Vac]	[Vac]	[Vac]	[Vac]	[Vac]
$\varnothing 2.0"$ [50.08 mm] Size N	3.125	79.375	93	59	40	29	22	10
	3.875	98.425	130	83	57	42	32	14
	4.750	120.65			78	57	43	19.5
$\varnothing 2.5"$ [66.5 mm] Size P	3.125	79.375	154	98	67	49	37	16.5
	3.750	98.425	216	138	94	67	53	23.5
	4.750	120.65		188	129	95	72	32

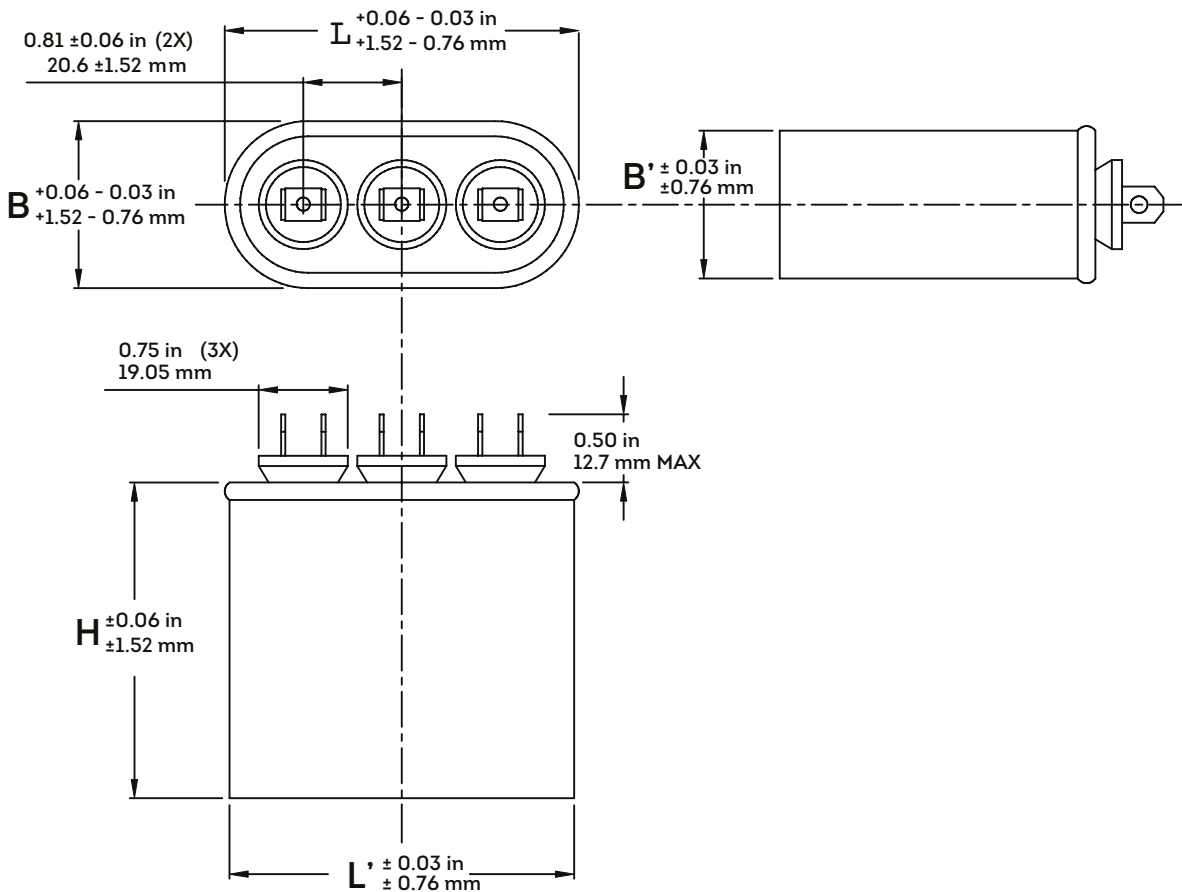
To determinate the size of the round can, add both capacitances (Capacitance Herm + Capacitance Fan).
For example a dual capacitor rated at 50 + 10 μ F/440 Vac = 60 μ F/440 Vac and it can use the can P37 (2.5" x 3.875 height).



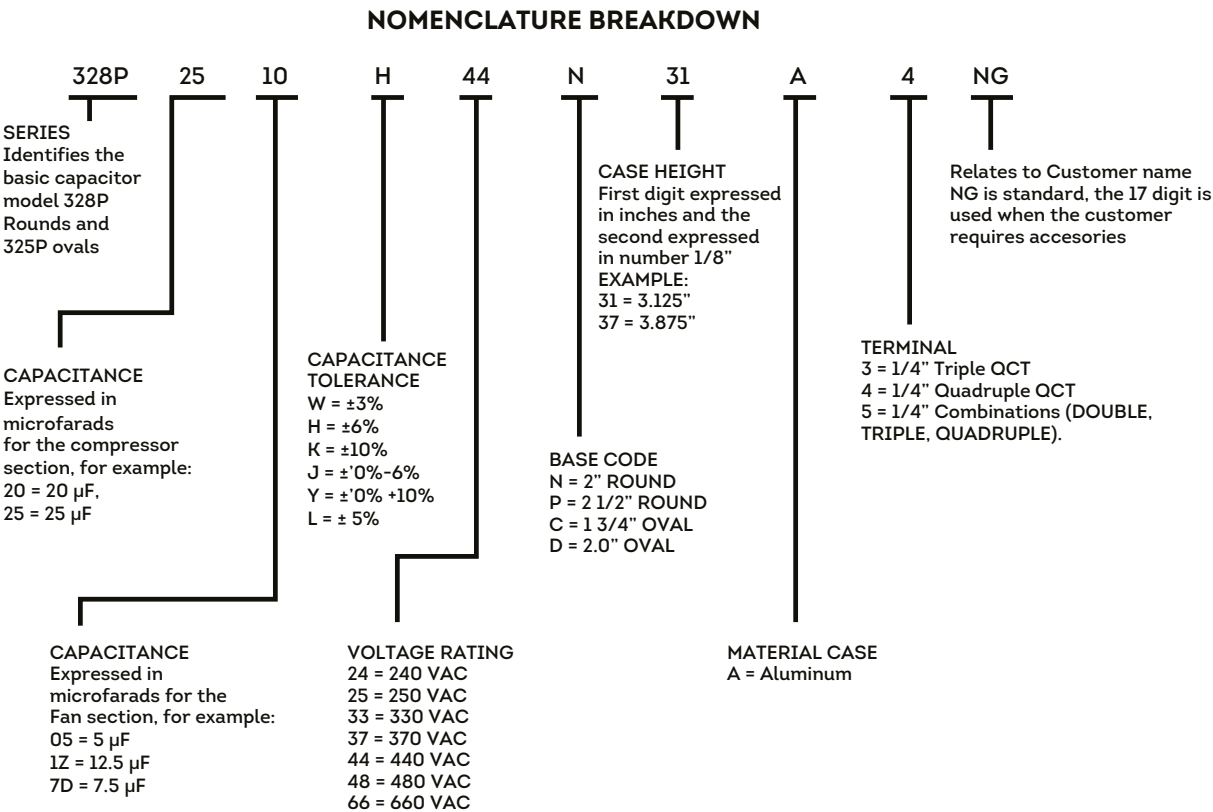
MAXIMUM CAPACITANCE PER OVAL CAN / MECHANICAL SPECIFICATIONS

MAXIMUM CAPACITANCE PER CAN [µF]														
Diameter	Can Height		240Vac		300 Vac		370 Vac		440 Vac		480 Vac		660 Vac	
	in	mm	Herm [µF]	Fan [µF]	Herm [µF]	Fan [µF]	Herm [µF]	Fan [µF]	Herm [µF]	Fan [µF]	Herm [µF]	Fan [µF]	Herm [µF]	Fan [µF]
(B x L) 1.9" x 2.9" [48.51 x 73.91 mm] (Size C)	2.625	66.675	36	36	23	23	15.5	15.5	11	11	8.5	8.5	3.5	3.5
	3.000	76.20	45	45	28.5	28.5	19.5	19.5	14	14	11	11	4.5	4.5
	3.750	95.25	63	63	40.5	40.5	27.5	27.5	20	20	15.5	15.5	6.5	6.5
	4.750	120.65					37.5	37.5	27.5	27.5	21	21	9	9
(B x L) 1.968" x 3.656" [49.99 x 92.86 mm] (Size D)	3.000	76.200	72.5	72.5	46.5	46.5	31.5	31.5	23	23	17.5	17.5	7.5	7.5
	3.750	95.250	100	100	65	65	44.5	44.5	32.5	32.5	25	25	11	11
	4.750	120.65					61	61	44.5	44.5	35	35	15	15

(2.5" x 3.875 height).



PART NUMBERING SYSTEM FOR WET METAL CASE DUAL RUN CAPACITORS



DRY CAPACITORS

28

FEATURES

- Non-corrosive, flame-retardant UL 94V-2
- Meets EIA standards
- Integral mounting options available for easy installation
- 60,000 hours operational life
- Self-healing metallized polypropylene film
- Automated assembly for consistent results
- Light weight and cost effective

APPLICATIONS

NG dry A.C. motor run capacitors are designed to be used mainly in outdoor applications due to its noncorrosive plastic case. They are used as part of the current limiting circuit for power factor correction. The A.C. capacitors provide direction by shifting the current in the windings so that the motor simulates the operation of a two-phase motor. These motor run capacitors are designed specifically to be used with permanent splitphase capacitor motors in swimming pool and spa applications.

ELECTRICAL TESTING

NG dry motor run capacitors are designed to meet performance testing outlined in the EIA-456 standard. These test programs are run continuously at NG and at third party laboratories to monitor production and for design improvements. These tests confirm the reliable performance of NG capacitors used within rated conditions. Ongoing tests include: accelerated life, over voltage, mechanical, terminal to terminal voltage, and terminal to case voltage tests.



MARKING

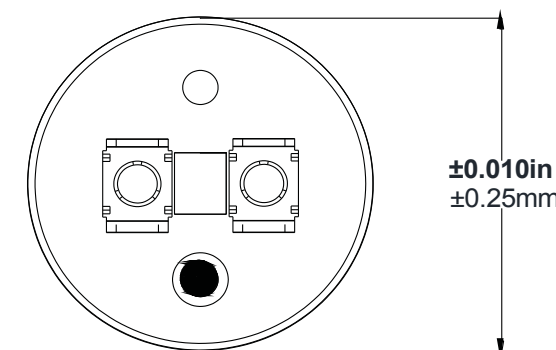
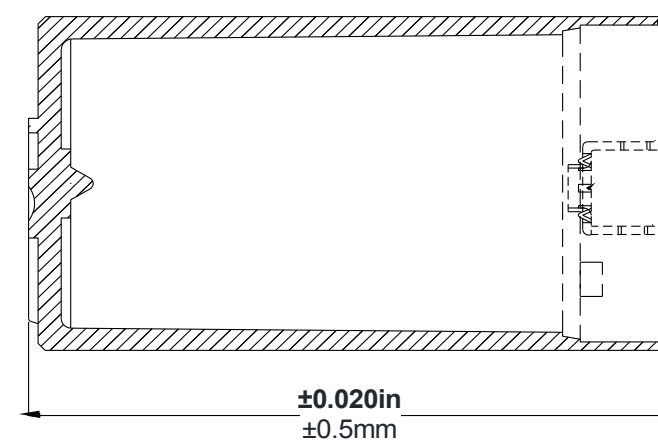
- Manufacturer's name, file number, authorized or trademark
- The part number or the equivalent
- The capacitance in microfarads (uF)
- Voltage rating
- The frequency in HERTZ
- Temperature rating
- Manufacturing Date
- Manufacturer's type designation
- Climatic category
- SH for self-healing capacitors
- Discharge device
- Class of safety protection
- Filling material
- Class of operation or life duration

DRY CAPACITORS ELECTRICAL SPECIFICATIONS

Capacitance Range	From 1 to 200 μ F
Voltage Range	Up to 660Vac at 50/60Hz Other voltages upon request
Tolerance:	6% Standard. Other tolerances upon request
Dissipation Factor:	0.1% Max. at 60Hz and 25°C, 1% at 1kHz and 25°C
Operating Temperature:	-40°C +70°C. (Upon request and certified by UL up to +90°C) Other temperatures upon request.
100% end of line tested:	Terminal to Terminal = $1.41 \times [1.75 \times \text{VAC (rated)}]$ as a DC voltage Terminal to Case = $1.41 \times [2 \times \text{VAC (rated)} + 1 \text{ KVAC}]$ as a DC voltage D.F. measured at 120Hz at 25°C \pm 5°C Other measured frequencies upon request
100% serialized and 100% end of line data capture:	Capacitance measured at 120Hz and 25°C \pm 5°C D.F. measured at 120Hz and 25°C \pm 5°C Capacitance end of life is = -3% loss of capacitance

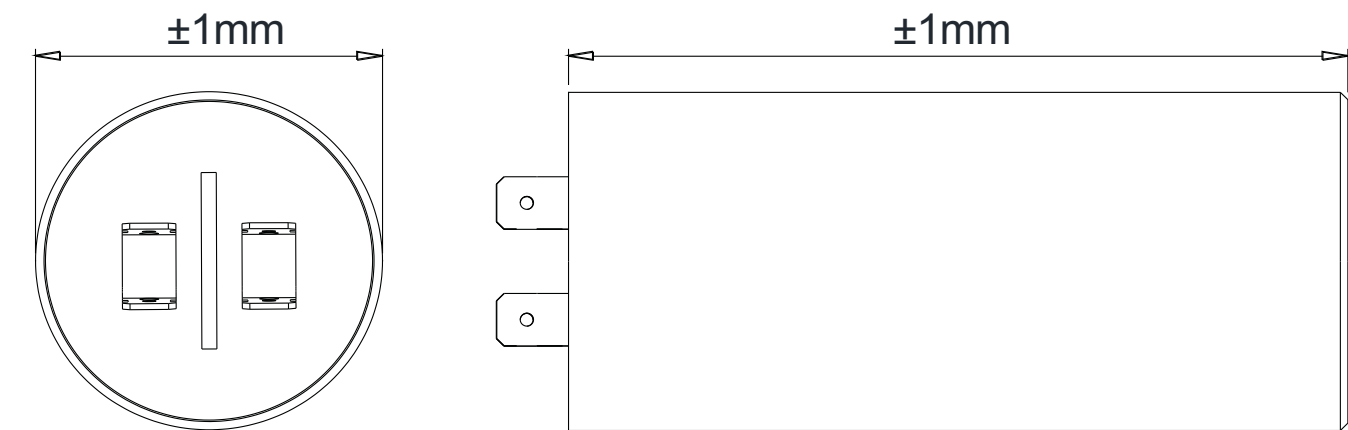
MECHANICAL SPECIFICATIONS / MAXIMUM CAPACITANCE PER THERMOPLASTIC CASE (BLACK)

VOLTAGE [VAC]			240 & 250	300	330 & 370	400, 440 & 450	480
Diameter	Capacitor Height (H)		C. Max. (μ F)	C. Max. (μ F)	C. Max. (μ F)	C. Max. (μ F)	C. Max. (μ F)
	in	mm					
1.437" (36.50mm)	(1) 2.75	69.85	25.0	15.0	10.0	8.0	5.0
	(2) 3.365	85.72	30.0	22.0	12.0	12.0	10.0
1.812" (46.02mm)	(4) 3.365	85.72	60.0	40.0	25.0	20.0	14.0
	(5) 4.365	111.12	80.0	60.0	35.0	25.0	20.0



MECHANICAL SPECIFICATIONS / MAXIMUM CAPACITANCE PER ROUND THERMOPLASTIC SIZES (SNAP)

VOLTAGE [VAC]			240 & 250	300	330 & 370	400, 440 & 450	480
Diameter	Capacitor Height (H)		C. Max. (µF)	C. Max. (µF)	C. Max. (µF)	C. Max. (µF)	C. Max. (µF)
	in	mm					
0.984" [25 mm]	(C) 2.204	56.00	8	5	3	3	2
	(D) 2.342	59.50	8	5	3	3	2
1.181" [30mm]	(E) 2.303	58.50	13	8	6	4	3
	(F) 2.814	71.50	21	13	9	7	5
	(G) 3.759	95.50	29	17	11	9	7
1.377" [35mm]	(H) 2.303	58.5	19	12	8	6	5
	(J) 2.814	71.5	32	20	13	10	8
	(K) 3.759	95.5	44	25	17	14	10
1.574" [40mm]	(L) 2.814	71.50	44	28	19	14	11
	(M) 3.759	95.50	60	35	24	19	14
1.771" [45mm]	(N) 2.814	71.50	58	37	25	19	14
	(O) 3.759	95.50	80	46	31	25	18
	(P) 4.783	121.50	104	70	48	35	25
1.968" [50mm]	(Q) 3.72	94.50	102	59	40	32	23
	(R) 4.704	119.50	140	89	61	45	32

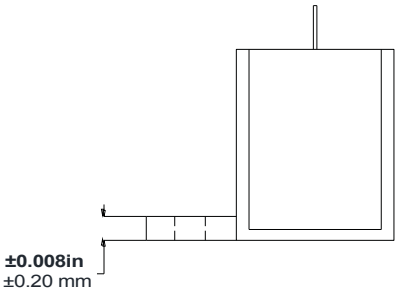
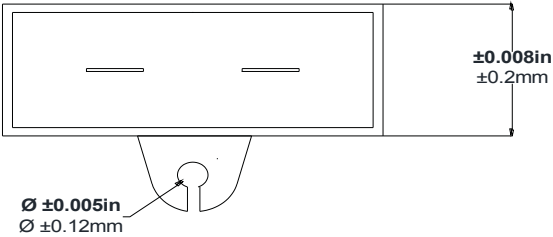
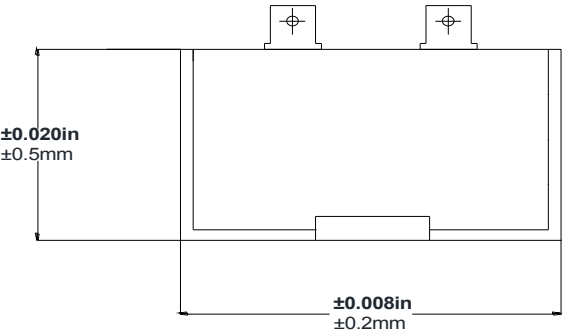


ELECTRICAL SPECIFICATIONS (for Plastic Boxes)

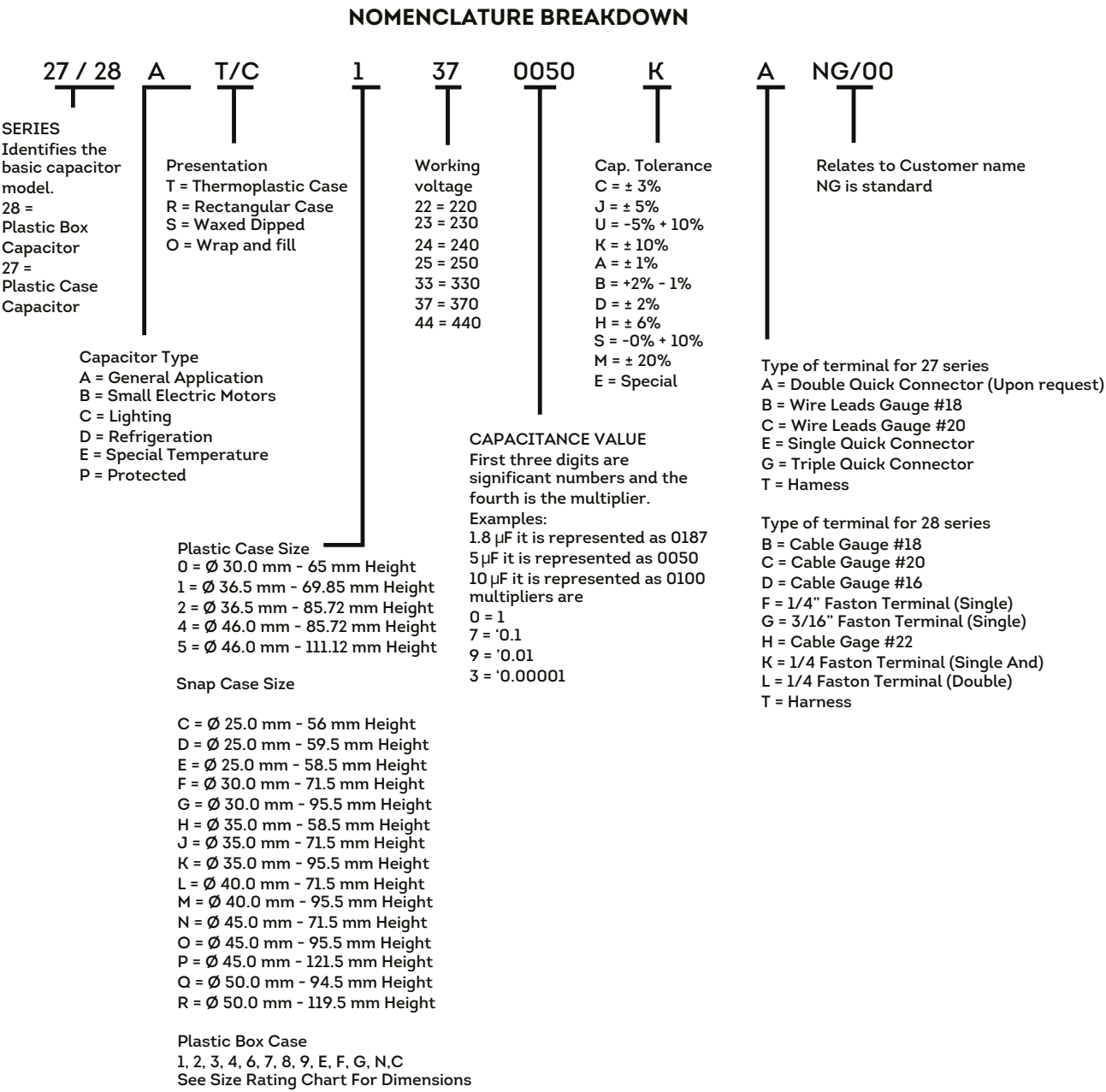
Capacitantes Range:	1 to 25 µF (Upto 32 µF under 250VAC)
Tolerance:	± 3%, ±5%, -5% + 10%, ±10 %
Voltage Range:	Higher voltages without UL recognition 180VAC to 450VAC
Operating Temperature: (under special requests)	-40° ~ + 70° C (-40° ~ 158° F) (Standard)
	-40° ~ + 85° C (-40° ~ 185° F)
	-40° ~ + 90° C (-40° ~ 194° F)
Dissipation Factor:	0.1% maximum at 25° C, 60 Hz
Rated Frequency:	50 - 60 HZ
Dielectric Strength:	Terminals to case: Capacitors shall be capable of withstanding the application of 2 x rated AC voltage plus 1,000 volts for one second. Between terminals: Capacitors shall be capable of withstanding the application of 1.75 x rated AC voltage for one second.

MECHANICAL SPECIFICATIONS / MAXIMUM CAPACITANCE PER PLASTIC BOXES

VOLTAGE				240 & 250 Vac	300 & 330 Vac	370 & 400 Vac	440 & 450 Vac	480 Vac	Mounting Ear
Size	CASE DIMENSIONS FOR PLASTIC			C. Max. [μF]	C. Max. [μF]	C. Max. [μF]	C. Max. [μF]	C. Max. [μF]	
	LENGTH (L)	HEIGHT (H)	WIDTH (W)						
# 1	1.449 (36.8)	0.984 (25)	0.472 (12)	3.5	2.5	1.5	1.5	1	Yes
# 2	1.441 (36.6)	1.024 (26)	0.575 (14.6)	5	3.5	2	2	1	No
# 3	1.445 (36.75)	1.029 (26.15)	0.575 (14.6)	5	3.5	2	2	1	Yes
# 4	1.606 (40.80)	1.075 (27.3)	0.874 (22.2)	10	6	3	2.5	2	No
# 6	2.106 (53.50)	1.258 (31.95)	0.878 (22.3)	20	12.5	6	6	4	No
# 7	2.229 (58.40)	1.366 (34.72)	0.936 (23.78)	17.5	6	5.5	5	4.5	Yes
# 7	2.278 (57.85)	1.366 (34.70)	0.911 (23.15)	25	15	8	8	6	Yes
# 8	2.229 (58.40)	1.616 (41.05)	1.150 (29.20)	32	25	15	12	8	Yes
# 9	1.539 (38.92)	1.189 (30.25)	0.862 (21.9)	10	7	4	3.5	2.5	Yes
"E"	2.291 (58.2)	1.340 (35.5)	0.929 (23.6)	25	15	8	8	6	No
"F"	2.299 (58.40)	1.632 (41.15)	1.150 (29.2)	30	25	15	12	9	No
"G"	1.457 (37)	1.150 (29.2)	0.748 (19)	10	6	3.5	3	2	No
"N"	1.539 (39.1)	1.260 (32)	0.862 (21.9)	12	7.5	4.5	4	3	Yes
"C"	2.102 (53.38)	1.260 (32)	0.870 (22.1)	15	10	6	4.5	3	Yes



PART NUMBERING SYSTEM



POWER FACTOR

CAPACITOR CELLS

34

INTRODUCTION

Power Factor Capacitor Cells made from metallized polypropylene film manufactured by NG offer improved performance and proven reliability in applications requiring power factor correction or harmonic filtering which are an essential part of modern electric power systems.

The main function of these capacitors cells are to minimize energy loss and to correct load power factor which increases the power quality and reduces power factor penalties

FEATURES

- Capacitors are self-healing. Vacuum deposited conductors on a polypropylene dielectric act as electrodes
- Each three-phase capacitor is manufactured with a U.L. recognized, pressure sensitive interrupter. The interrupter will disconnect all three phases at the same time to maintain a balanced circuit
- Capacitors are contained in hermetically sealed steel cans to prevent atmospheric contaminants from reducing life expectancy
- The dielectric material exhibits a loss of less than 0.5 Watts per KVAR
- Encapsulation medium (Resin) allows the pressure interrupter to activate
- Individual capacitor cells are covered by a 1-year limited warranty
- All capacitor cell terminals are threaded terminals for secured connection
- All three-phase capacitors comply with cUL, C.S.A., and CE
- Continuous Operation up to 135% rated (nameplate) KVAR including the effects of 110% rated voltage (121% KVAR), 15% capacitance tolerance and harmonic voltages over the rated frequency (60Hz)

CONSTRUCTION FEATURES

Terminals:

12-24 NC-2A threaded studs to ensure superior contact through compression. See figures 2-1 and 2-2.

Tolerance:

Capacitor cell KVAR tolerance is 0% to +5%.

Cell Housing

Constructed from a plated steel, the cell is hermetically sealed to prevent contamination.

Dielectric / Electrode

Constructed of metallized polypropylene film a self healing, low loss material that results in low operating temperature and minimal loss of capacitance over the life of the cell.

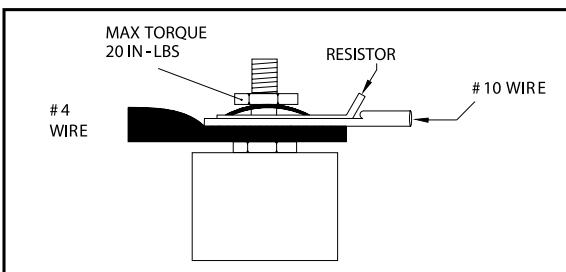


Figure 2-1: Cell Termination Connection 1

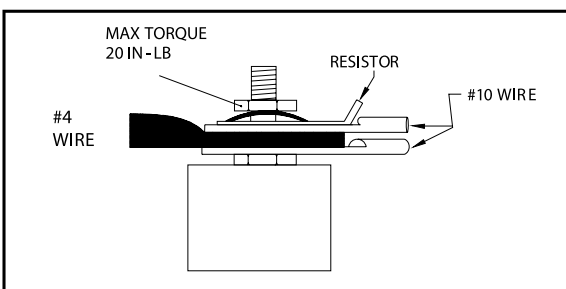


Figure 2-2: Cell Termination Connection 2

Note: Wire size shown is for example only. Wire should be sized according to each application.

Three-Phase Construction

Internally connected in a three-phase delta connection to ensure three-phase operation under all conditions and minimize external wiring.

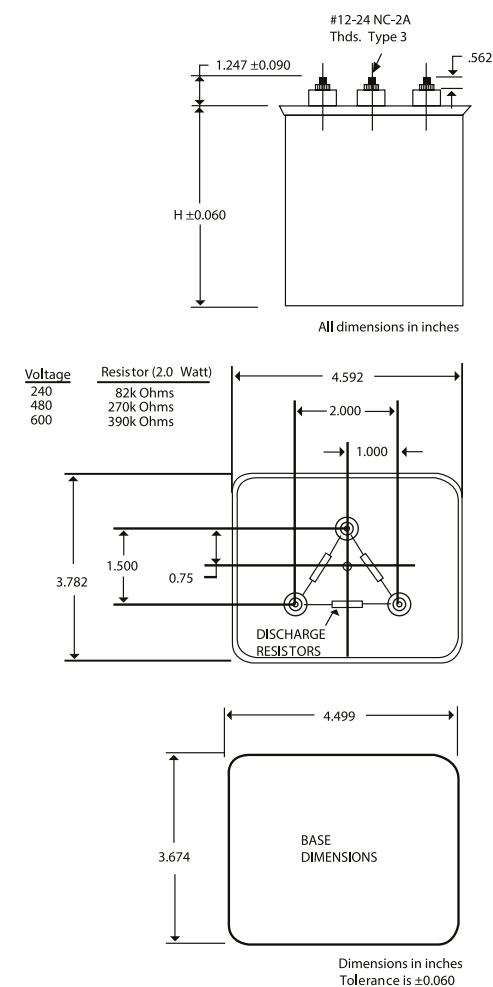
Three-Phase Pressure Interrupters

U.L. Recognized device (10,000 amps fault current) to disconnect all three phases if a fault occurs thus preventing single phase operation.

PERFORMANCE CHARACTERISTICS

Performance characteristics and design life of NG capacitors cells are referenced in the IEC- 60831 standard.

DIMENSIONS

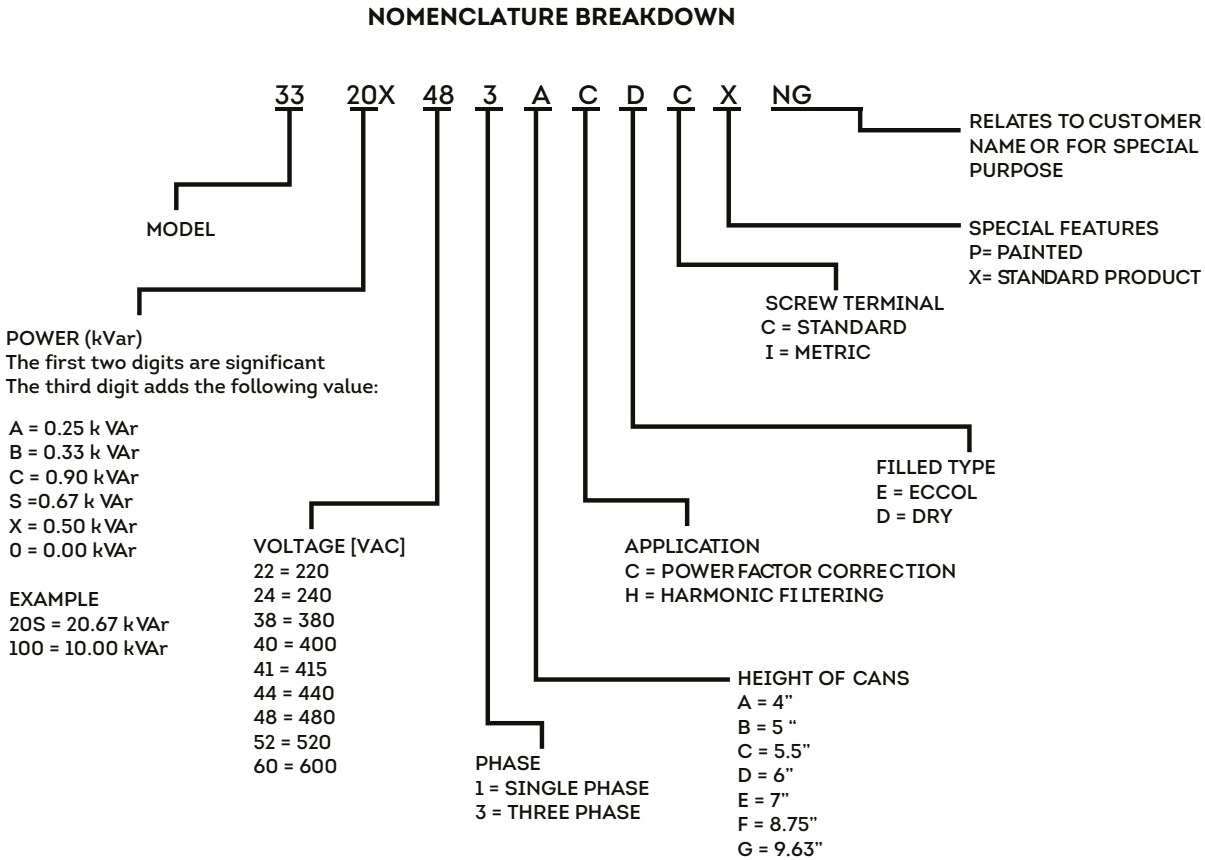


35

NOTES

TABLE 1: CAN SIZES AVAILABLE - POWER FACTOR CORRECTION CELLS									
CAN DIMENSIONS				230 Vac	240 Vac	440 Vac	480 Vac	600 Vac	660 Vac
Length	Width	Height (in)	Height (mm)	(KVAR) Max.	(KVAR) Max.	(KVAR) Max.	(KVAR) Max.	(KVAR) Max.	(KVAR) Max.
4.59 116.58mm	3.78 69 mm	4.0 (A)	101.6	4.4	4.8	8.2	7.5	7.5	6.3
		5.0 (A)	127	6.9	7.5	12.8	11.7	11.7	9.8
		5.5 (C)	139.7	8.9	9.7	16.6	15.0	15.0	12.7
		6.0 (D)	152.4	11.1	12.1	20.7	18.9	18.9	15.7
		7.0 (E)	177.8	11.9	12.1	22.0	20.0	20.0	16.8
		8.75 (F)	222.2	14.3	15.6	26.4	24.1	24.1	20.2
		9.63 (G)	244.6	17.9	19.5	33.1	30.2	30.2	25.4
TABLE 2: CAN SIZES AVAILABLE - HARMONIC FILTERING CELLS									
4.59 116.58mm	3.78 69mm	4.0 (A)	101.6	2.2	2.4	4.9	4.8	5.2	
		5.0 (A)	127	3.4	3.8	7.7	7.4	8	
		5.5 (C)	139.7	4.5	4.9	9.9	9.6	10.4	
		6.0 (D)	152.4	5.6	6.1	12.4	12	13	
		7.0 (E)	177.8	6	6.5	13.2	12.8	13.8	
		8.75 (F)	222.2	7.2	8	16	15.4	16.7	
		9.63 (G)	244.6	9	9.8	19.9	19.3	21	

PART NUMBERING SYSTEM



NGM (hereafter called Company), warrants to the purchaser that capacitors manufactured by the Company are free from defects in materials, workmanship and title from one year from date of shipment; and this warranty is conditional based on proper installation, use and maintenance.

NO OTHER WARRANTIES ARE MADE, EITHER EXPRESSED OR IMPLIED (INCLUDING, WITHOUT LIMITATION WARRANTIES AS TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE). PURCHASER RETAINS RESPONSIBILITY FOR THE APPLICATION AND FUNCTIONAL ADEQUACY OF THE CAPACITOR.

LIMITS OF LIABILITY. Under no circumstances will the Company be liable for consequential, incidental or exemplary damages; and the Company liability for any claim shall not exceed Purchaser's cost from the Company of specific capacitor(s) that generates such claim.



Tel. +52 (55) 5354 4626 Fax. +52 (55) 5352 5385
Tezozomoc 239, Fracc. Ind. San Antonio
Azcapotzalco México 02760 DF
www.ngm.com.mx