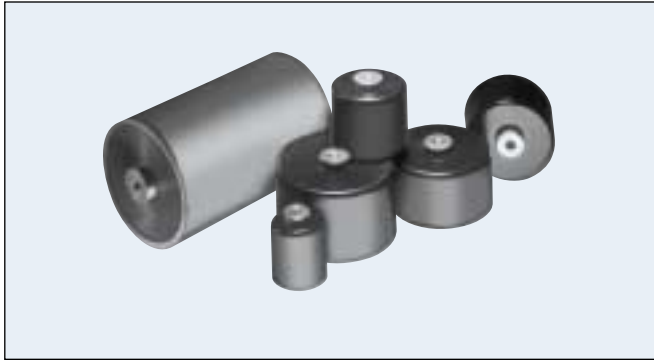


# Medium Power Film Capacitors



FPX

## PROTECTION



### APPLICATIONS

Protection of thyristors.  
Protection of gate turn-off thyristor (G.T.O.).  
Clamping (Secondary snubber).

### TECHNOLOGY

Metallized polypropylene dielectric capacitor with controlled self-healing.  
Reinforced metallization developed for high impulse currents.  
Axial connections specially developed to reduce series inductance and to provide rigid mechanical mounting.

### PACKAGING

Cylindrical in plastic case filled with thermosetting resin.  
Outputs: threaded inserts either M6 or M8.

## ELECTRICAL CHARACTERISTICS

Capacitance range $C_n$	0.5 $\mu$ F to 6 $\mu$ F
Tolerance on $C_n$	$\pm$ 5%
Rated DC voltage $V_{ndc}$	1000 to 3000 V
Peak voltage $V_{peak}$	1600 to 4000 V
Allowable overvoltage $V_s$ (for 10 s/day)	2000 to 4600 V
Stray inductance	5 to 20 nH
RMS current	$I_{rms}$ max. = up to 160 A The currents shown in the tables are maximum. It is necessary to respect the thermal limits of the dielectric 85°C see "Hot spot temperature calculation"
Insulation resistance	$R_i \times C \geq 30,000$ s
Impulse current	$I^2.t$ maxi. = up to 729 A <sup>2</sup> .s Spikes or peak currents in the capacitors may cause a deterioration of the bonding between the metallization and the connections. These bonds are capable of withstanding only a limited amount of energy for each spike. The table shows the maximum energy permitted in the form ( $I^2.t$ ), where I is in Ampere, and t is in seconds.
<b>Note:</b> The formula ( $I^2.t$ ) replaces $dV/dt$ which is less easy to use as it is not an expression of energy ( $I = C.dV/dt$ ). This type of capacitor has been designed to withstand high ( $I^2.t$ ) values.	
Variation of capacitance with temperature	$\frac{\Delta C}{C} \leq \pm 2\%$ between -40 and 85°C
Climatic category	40/085/56 (IEC 68)
Test voltage between terminals @ 25°C	$V_s$ for 10s
Test voltage between terminals and case @ 25°C	@ 4 kVrms @ 50 Hz for 1 min.

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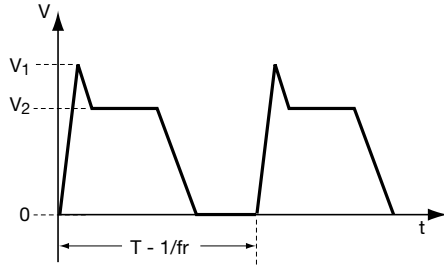
# Medium Power Film Capacitors



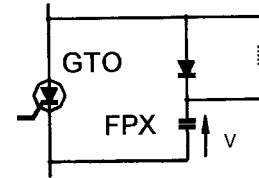
## FPX General Description / Application Notes

### PROTECTION

#### G.T.O.

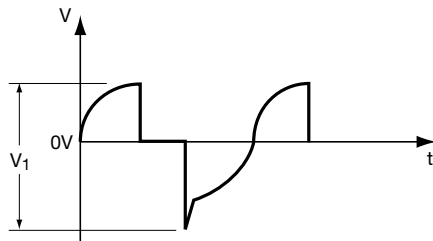


Choice of voltage:  $V_1 \leq V_{peak}$   
 $V_2 \leq V_{nDC}$



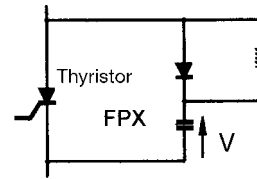
Nominal DC voltage ( $V_{nDC}$ ) and peak voltage ( $V_{peak}$ ) are given in the tables.

#### THYRISTOR



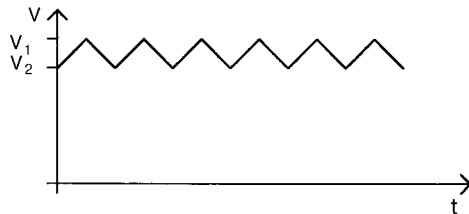
Choice of voltage:  $V_1 \leq V_{peak}$

Note that  $V_1$  is the voltage peak to peak and cannot be symmetrical vs 0 V

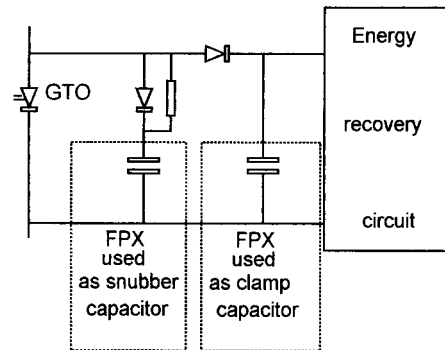


Peak voltage is given in the tables.

#### CLAMPING



Choice of voltage:  $V_1 \leq V_{peak}$   
 $V_2 \leq V_{nDC}$



Nominal DC voltage ( $V_{nDC}$ ) and peak voltage ( $V_{peak}$ ) are given in the tables.

PROTECTION

# Medium Power Film Capacitors



## FPX Table of Values

### PROTECTION

Dimensions: millimeters (inches)

Cn (μF)	Case Type	Dimensions				I <sup>2</sup> .t max. (A <sup>2</sup> .s)	I <sub>rms</sub> max. (A)	R <sub>s</sub> (mΩ)	R <sub>th</sub> (°C/W)	Part Number
		H* ±0.5 (±0.020)	h ±2 (±0.079)	D max.	d ±0.1					
<b>FPX 2000 V</b>										
		<b>V<sub>ndc</sub> = 1000 V</b>		<b>V<sub>peak</sub> = 1600 V</b>		<b>V<sub>rms</sub> = 560 V</b>		<b>V<sub>s</sub> = 2000 V</b>		
1	Plastic case M6/6	52 (2.072)	5 (0.197)	40 (1.575)	18 (0.709)	2	15	2.4	14	FPX66N0105J--
2	Plastic case M8/8	52 (2.072)	5 (0.197)	60 (2.362)	22 (0.866)	8	30	1.2	6.1	FPX86N0205J--
3	Plastic case M8/8	52 (2.072)	5 (0.197)	72 (2.835)	22 (0.866)	18	45	0.9	4.5	FPX86N0305J--
3.5	Plastic case M8/8	52 (2.072)	5 (0.197)	72 (2.835)	22 (0.866)	25	50	0.85	4.5	FPX86N0355J--
4	Plastic case M8/8	52 (2.072)	5 (0.197)	82 (3.228)	22 (0.866)	32	60	0.75	3.5	FPX86N0405J--
5	Plastic case M8/8	52 (2.072)	5 (0.197)	82 (3.228)	22 (0.866)	50	70	0.65	2.5	FPX86N0505J--
<b>FPX 2500 V</b>										
		<b>V<sub>ndc</sub> = 1300 V</b>		<b>V<sub>peak</sub> = 2000 V</b>		<b>V<sub>rms</sub> = 700 V</b>		<b>V<sub>s</sub> = 2500 V</b>		
0.5	Plastic case M6/6	52 (2.072)	5 (0.197)	40 (1.575)	18 (0.709)	1	15	3	14	FPX66P0504J--
1	Plastic case M8/8	52 (2.072)	5 (0.197)	60 (2.362)	22 (0.866)	3	20	2.3	10.5	FPX86P0105J--
1.5	Plastic case M8/8	52 (2.072)	5 (0.197)	60 (2.362)	22 (0.866)	7	30	1.5	6.1	FPX86P0155J--
2	Plastic case M8/8	52 (2.072)	5 (0.197)	72 (2.835)	22 (0.866)	12.7	40	1.1	4.5	FPX86P0205J--
2.5	Plastic case M8/8	52 (2.072)	5 (0.197)	72 (2.835)	22 (0.866)	20	60	0.89	3.7	FPX86P0255J--
3	Plastic case M8/8	52 (2.072)	5 (0.197)	82 (3.228)	22 (0.866)	28	60	0.85	3.2	FPX86P0305J--
3.5	Plastic case M8/8	52 (2.072)	5 (0.197)	82 (3.228)	22 (0.866)	39	65	0.78	2.9	FPX86P0355J--
<b>FPX 3500 V</b>										
		<b>V<sub>ndc</sub> = 2000 V</b>		<b>V<sub>peak</sub> = 2400 V</b>		<b>V<sub>rms</sub> = 850 V</b>		<b>V<sub>s</sub> = 3500 V</b>		
2	Plastic case M8/8	62 (2.441)	5 (0.197)	72 (2.835)	22 (0.866)	23	41	1.24	6.1	FPX86X0205J-
3	Plastic case M8/8	62 (2.441)	5 (0.197)	92 (3.622)	22 (0.866)	50	62	0.92	3.9	FPX86X0305J--
3.5	Plastic case M8/8	62 (2.441)	5 (0.197)	92 (3.622)	22 (0.866)	70	72	0.83	3.4	FPX86X0355J--
4	Plastic case M8/8	62 (2.441)	5 (0.197)	92 (3.622)	22 (0.866)	85	80	0.78	3.1	FPX86X0405J--
<b>FPX 4500 V</b>										
		<b>V<sub>ndc</sub> = 2500 V</b>		<b>V<sub>peak</sub> = 3200 V</b>		<b>V<sub>rms</sub> = 1130 V</b>		<b>V<sub>s</sub> = 4500 V</b>		
1	Plastic case M8/8	62 (2.441)	5 (0.197)	72 (2.835)	22 (0.866)	15	38	1.4	6.2	FPX86Z0105J--
2	Plastic case M8/8	62 (2.441)	5 (0.197)	92 (3.622)	22 (0.866)	70	75	0.85	3.1	FPX86Z0205J--
<b>FPX 4600 V</b>										
		<b>V<sub>ndc</sub> = 3000 V</b>		<b>V<sub>peak</sub> = 4000 V</b>		<b>V<sub>rms</sub> = 1400 V</b>		<b>V<sub>s</sub> = 4600 V</b>		
0.68	Plastic case M8/8	62 (2.441)	5 (0.197)	72 (2.835)	22 (0.866)	14	35	1.59	6.2	FPX86Y0684J--
1.25	Plastic case M8/8	62 (2.441)	5 (0.197)	92 (3.622)	22 (0.866)	50	65	1	3.3	FPX86Y1254J--
1.5	Plastic case M8/10	79 (3.110)	6 (0.236)	97 (3.819)	-	32	60	1.4	8.3	FPX86Y0155J--
1.7	Plastic case M8/10	79 (3.110)	6 (0.236)	97 (3.819)	-	40	70	1.3	7.4	FPX86Y0175J--
2	Plastic case M8/10	79 (3.110)	6 (0.236)	97 (3.819)	-	56	80	1.1	6.3	FPX86Y0205J--
2.5	Plastic case M8/10	118 (4.646)	6 (0.236)	97 (3.819)	-	200	130	0.8	3.3	FPX86Y0255J--
2.7	Plastic case M8/10	118 (4.646)	6 (0.236)	97 (3.819)	-	232	140	0.7	3.2	FPX86Y0275J--
3	Plastic case M8/10	143 (5.630)	6 (0.236)	97 (3.819)	-	128	100	0.9	4.4	FPX86Y0305J--
3.5	Plastic case M8/10	143 (5.630)	6 (0.236)	97 (3.819)	-	170	110	0.8	4.2	FPX86Y0355J--
4	Plastic case M8/10	143 (5.630)	6 (0.236)	97 (3.819)	-	224	115	0.8	4.0	FPX86Y0405J--
4.5	Plastic case M8/10	163 (6.417)	6 (0.236)	97 (3.819)	-	522	120	0.6	5.0	FPX86Y0455J--
5	Plastic case M8/10	163 (6.417)	6 (0.236)	97 (3.819)	-	600	130	0.6	5.0	FPX86Y0505J--
6	Plastic case M8/10	163 (6.417)	6 (0.236)	97 (3.819)	-	729	160	0.5	5.0	FPX86Y0605J--

\* Tol: +0 / -3mm for H ≥ 118mm

PROTECTION

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## FPX

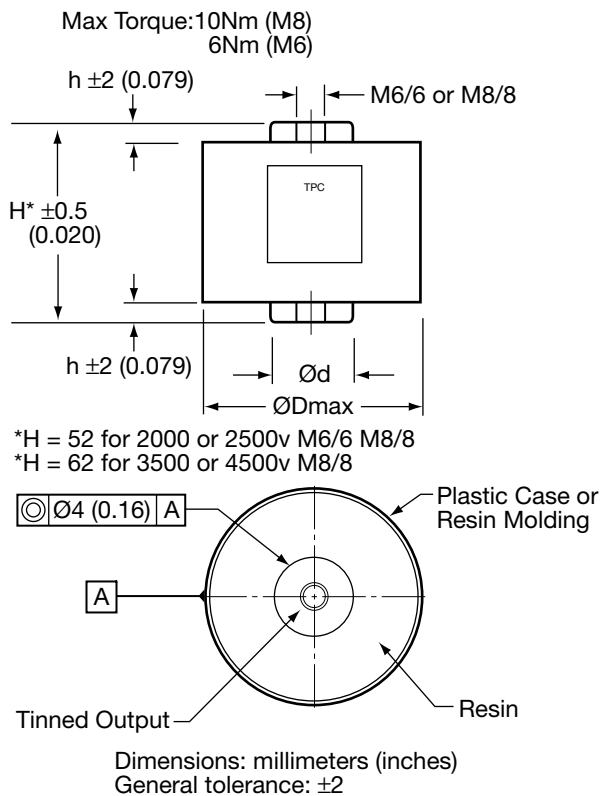
### PROTECTION MARKING

Logo  
Withstanding surge voltage  
Capacitance and tolerance in clear

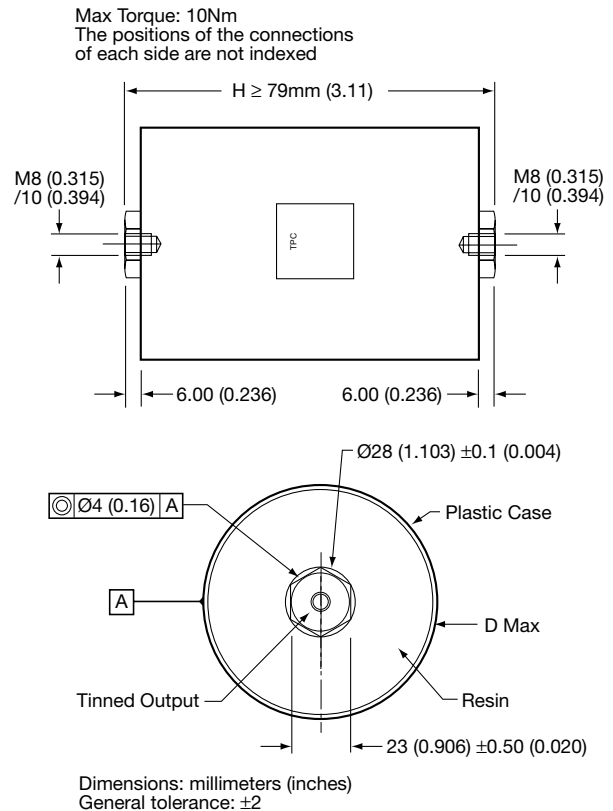
Nominal DC voltage in clear  
RMS current in clear  
Date of manufacture (IEC coding)

### DESIGN

#### Plastic Case M6 / 6 or M8 / 8



#### Plastic Case M8 / 10



PROTECTION

### HOT SPOT TEMPERATURE CALCULATION

$$\theta_{\text{hot spot}} = \theta_{\text{terminals}} + (P_d + P_t) \times R_{\text{th}}$$

with

$$P_d \text{ (Dielectric losses)} = Q \times \text{tg} \delta_0$$

$$\Rightarrow \left[ \frac{1}{2} \times C_n \times (V_{\text{peak to peak}})^2 \times f \right] \times (2 \times 10^{-4})$$

$$P_t \text{ (Thermal losses)} = R_s \times (I_{\text{rms}})^2$$

where

- $C_n$  in Farads
- $V$  in Volts
- $I_{\text{rms}}$  in Amperes
- $R_s$  in Ohms
- $f$  in Hertz
- $\theta$  in °C
- $R_{\text{th}}$  in °C/W

Due to the design of the capacitor and its technology, the thermal impedance between the terminations and the core of the capacitor is low, it is necessary to take care that the capacitor is never overheated by use of incorrect sized connections.

In the case where the series diodes are screwed to the capacitor, cooling of the diodes must be taken in account.

Do not use the capacitor as a heat sink.

Due to the complexity of the diode/capacitor thermal exchanges, we recommend that thermal measurements shall be made on the different components. We would be pleased to advise you on specific problems.

### WORKING TEMPERATURE

(according to the power to be dissipated) -40°C to +85°C

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