

New

LNF series

Capacitor specifications visible on the units:

- Unit 1 (Left):** LNF-P3X-130-70
 $C = 130 \mu F \pm 5\%$
 $U_w = 700 V$
 $U_{rms} = 500 V$
 NOPCB 99-24
 MADE IN ITALY
 EICAR
- Unit 2 (Middle):** LNF-P3X-200-70
 $C = 200 \mu F \pm 5\%$
 $U_w = 700 V$
 $U_{rms} = 500 V$
 NOPCB 99-17
 MADE IN ITALY
 EICAR
- Unit 3 (Right):** LNF-P3X-130-38
 $C = 130 \mu F \pm 5\%$
 $U_w = 380 V$
 $U_{rms} = 270 V$
 NOPCB 99-14
 MADE IN ITALY
 EICAR
- Unit 4 (Front):** LNF-P3X-100-40
 $C = 100 \mu F \pm 5\%$
 $U_w = 400 V$
 $U_{rms} = 280 V$
 NOPCB 99-15
 MADE IN ITALY
 EICAR

50V-250V-500V-1000V-1600V-2500V-5000V

**METALLIZED POLYPROPYLENE
AC FILTERING CAPACITORS**

EICAR
Technology looking ahead





Via Isonzo 10, 20052 Monza (Mi) Italy

Applications

Most applications of AC inverters prefer a sine-wave rather than a square wave output.

For instance a standard induction motor shows vibrations and overheating caused by a not sinusoidal waveshape.

In conflict with this we are faced with the fact that any semiconductor device is essentially a switch, and switching a DC gives square waves. In fact the great efficiency of modern inverters it is mainly due to the fact that last generation of semiconductors (like IGBT) switches very quickly from the full off to the full on mode.

Sine-wave output waveform may be obtained by means of LC filter.

The LNF capacitors are especially designed for this application, either in voltage resonant converters (PWM) or current resonant converter. Typical application are in industrial drives, traction equipment's, unbreakable power supplies (UPS).

With the new LNF series a new level of safety for the AC capacitors has been reached:

- ❑ **Active safety:** When the capacitor is stressed within the specifications, the new patented metalization is designed to bring capacitor to an open circuit at the end of life.
- ❑ **Passive safety:** In case of failure the gas generated is not trapped in a sealed aluminium case but has a safe way out given by breaking of the casting resin. The risk of explosion is then dramatically reduced.
- ❑ **Fire prevention:** Casting resin and case material are UL approved

LNF Series

Dry type self extinguishing metallized polypropylene film capacitors.

Output A.C. Filtering for UPS and Inverters.

- ❑ **Series "30":** $U_{rms} = 300 \text{ V}$ ($U_N = 420 \text{ V}$).
- ❑ **Series "50":** $U_{rms} = 500 \text{ V}$ ($U_N = 700 \text{ V}$).
- ❑ **M6 or M10 screw terminals.**
- ❑ **Up to 40 Amp rms. Current.**

DEFINITIONS

C_N	Rated Capacitance.
U_N	Rated (repetitive peak) voltage.
U_{rms}	Rated rms. voltage.
U_S	Surge (not repetitive) peak voltage.
I_{max}	Maximum rms. current value for continuous operation.
F	Fundamental frequency.
R_S	Series resistance i.e. the resistance responsible for the current heat losses ($I^2 R_S$) in the capacitor.
$\tan \delta_0$	Dielectric dissipation factor. It can be considered as constant in the normal working frequency range. Typical value for polypropylene is $2 \cdot 10^{-4}$.
$\tan \delta$	Dissipation factor calculated as: $\tan \delta_0 + 2 \cdot \pi \cdot C \cdot F \cdot R_S$.
dv/dt	Maximum slope of the voltage waveshape.
I_{PK}	Peak current $I_{PK} = C \cdot dv/dt$.
P	Total power dissipated in the capacitor.
R_{th}	Thermal resistance between the hot-spot in the winding and the environment (natural cooling), so that: $P = (\vartheta_h - \vartheta_0) / R_{th}$
ϑ_h	Hottest point in the capacitor winding.
ϑ_0	Operating ambient temperature. It is the air temperature measured under steady conditions, measured at 0,1 m from capacitor case.
L_0	Expected life at rated voltage U_0 and hot-spot temperature of 60°C
L	Expected life at the actual working conditions, obtained from the enclosed graph.
L_S	Self inductance of the capacitor. It is due to the internal connections, terminals, winding characteristics and physical dimensions.

SELECTING THE CORRECT CAPACITOR (OPERATING LIMITS)

1. VOLTAGE

The surge voltage U_S , the rated voltages U_N and U_{rms} should be not higher than the operating value. It is possible to work above the rated voltage but with a reduction of expected life (see graph) .

2. CURRENT LIMITATION

The I_{rms} current must not exceed the maximum current I_{max} .

3. THERMAL CHECK

The power losses consist of the dielectric losses and series losses ($R_S \cdot I_{rms}^2$) in the armature, in the connection and contact area (end spraying metallization).

The total power can be calculated as follows:

$$P = 2 \cdot \pi \cdot F \cdot C \cdot U_{rms}^2 \tan \delta_0 + R_S \cdot I_{rms}^2$$

The hot spot temperature can be calculated as: $\vartheta_h = R_{th} \cdot P + \vartheta_0$.

4. RELIABILITY

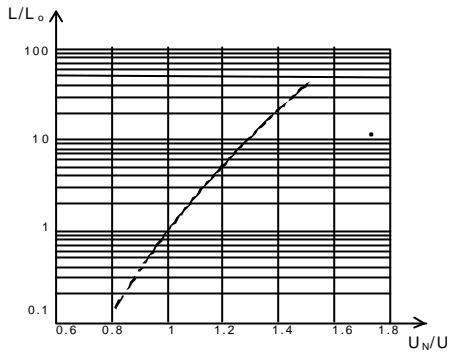
At 60°C hot spot temperature and rated voltage the useful life for these capacitors is calculated as 100000 hrs, with a failure rate of 300 FIT. See graph for life calculation at different temperatures and voltages.

5. REMARKS

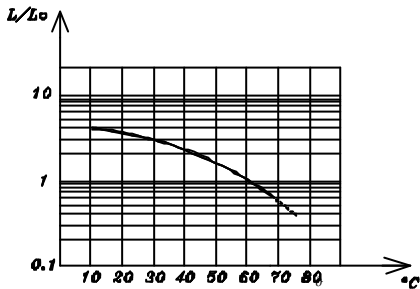
Thermal check supposes that only the heat generated into the capacitor is transmitted into the environment through the case surface. In case of localised overheating (poor connections, hot components in the nearby, etc) the risk of premature failure will become probable.



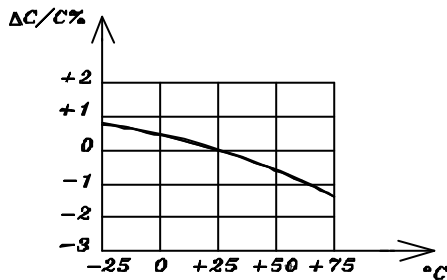
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Useful life versus voltage
 L_0 : Expected life at rated voltage U_N
 L : Expected life at voltage U



Useful life versus temperature
 L_0 : Expected life at hot-spot temp. 60°C
 L : Expected life at temperature ϑ



Capacitance variation versus temperature

LNF SERIES ICAR CAPACITORS General Technical Characteristics

Environmental:

Operating temperature: ϑ_{\min} : - 25°C
 ϑ_{\max} : + 55°C

Ratings:

Capacitance tolerance: $\pm 5\%$
 Useful life (at 60°C hot-spot): 100000 hrs.
 Reliability: 300 FIT.

Casing:

Self extinguishing, low smoke plastic material.

Fixing :

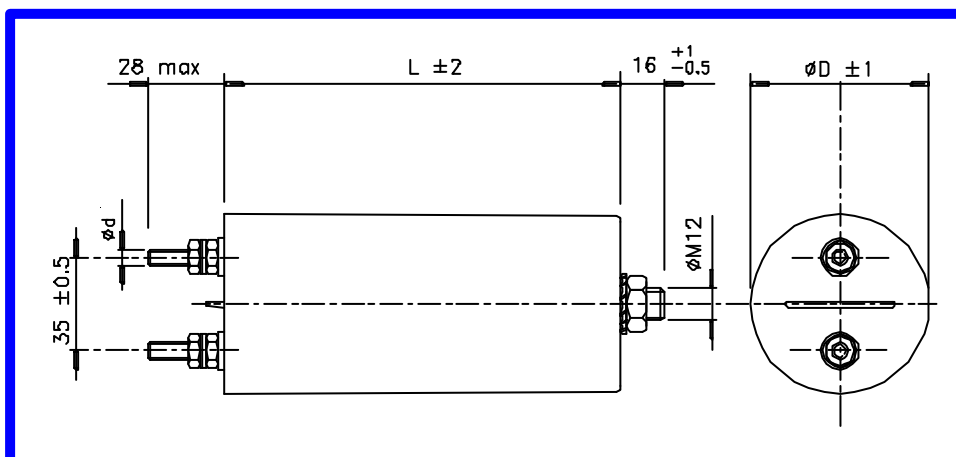
M12 Aluminium screw, tightening torque 10N/m.

Filler / impregnant:

Self extinguishing resin.

Standard of reference:

IEC 1071-1 ; EN 61071 - 1 ; IEC 384-1 ;
 IEC 68 - 2





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Model	Urms (V)	C _N (μF)	dv/dt (V/μs)	L _S (nH)	R _S (mΩ)	R _{th} (°C/W)	I _{max} (A)	D (mm)	d (mm)	L (mm)
D.C. Voltage test between terminals 1700 Vdc / 10 s										
LNF-P3Y-100-30	300	100	25	80	6.04	6.0	25	50	M6	140
LNF-P3Y-130-30	300	130	20	80	4.74	5.6	30	60	M6	140
LNF-P3Y-150-30	300	150	20	80	4.16	5.5	30	60	M6	140
LNF-P3Y-200-30	300	200	20	80	3.21	5.2	35	75	M10	140
LNF-P3Y-250-30	300	250	30	80	2.65	5.0	40	85	M10	140
LNF-P3Y-500-30	300	500	30	90	1.89	4.0	50	100	M10	155
D.C. Voltage test between terminals 2700 Vdc / 10 s										
LNF-P3Y-40-50	500	40	30	80	9.24	6.0	20	50	M6	140
LNF-P3Y-60-50	500	60	30	80	6.24	5.5	25	60	M6	140
LNF-P3Y-100-50	500	100	30	80	3.92	4.9	40	75	M10	140
LNF-P3Y-200-50	500	200	30	90	2.72	4.0	40	100	M10	155

WARNING

DO NOT MISAPPLY CAPACITORS FOR POWER ELECTRONICS

Icar spa is not responsible for any kind of possible damages to persons or things, derived from the improper installation and application of Power Electronics capacitors.

Most common misapplication forms:

- Ripple current or voltage above specification.
- Application voltages beyond surge voltage specified.
- Working or storage temperature beyond the specified limits.
- Unusual service conditions as :
 - mechanical shock and vibrations,
 - corrosive or abrasive conductive parts in cooling air,
 - oil or water vapour or corrosive substances,
 - explosive gas or dust,
 - radioactivity,
 - excessive and fast variations of ambient conditions,
 - service areas higher than 2000 m above sea level.

Personal Safety :

Electrical or mechanical misapplication of Power Electronics Capacitors may become hazardous. Personal injury or property damage may result from disruption of the capacitor and consequent expulsion of melted material.

Before using the capacitors in any application, please read carefully the technical information contained in this catalogue.

The energy stored in a capacitor may become lethal, to prevent any chance of shock the capacitor should be descharged before handling.

Special attention must be taken to make sure the capacitors are correctly used for each application and that warnings and instructions are followed.

In case of doubt in choice or in performances of the capacitors Icar technical service MUST be contacted.

The technical characteristics given in this catalogue are not binding and can be modified without notice.



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ICAR PRODUCTS

ICAR provides a first class service in the following products:

- ❑ **Power Electronics Capacitors;**
- ❑ **Metallized polypropylene film capacitors for lighting and motor running;**
- ❑ **Power factor correction capacitors low and high voltage;**
- ❑ **Automatic power factor correction banks with harmonics filtering;**
- ❑ **Coupling capacitors and Capacitive Voltage Transformers (CVT);**
- ❑ **Energy storage and pulse capacitors;**
- ❑ **RFI / EMI Filters.**

ICAR spa
Via Isonzo 10
20052 MONZA (Milano) ITALY
Tel : ++39-039-83951 Fax : ++39-039-833227
e-mail: icar@askesis.it