

# Exxelia Group

## *Space Qualified Products & Solutions*



## CERAMIC Capacitors

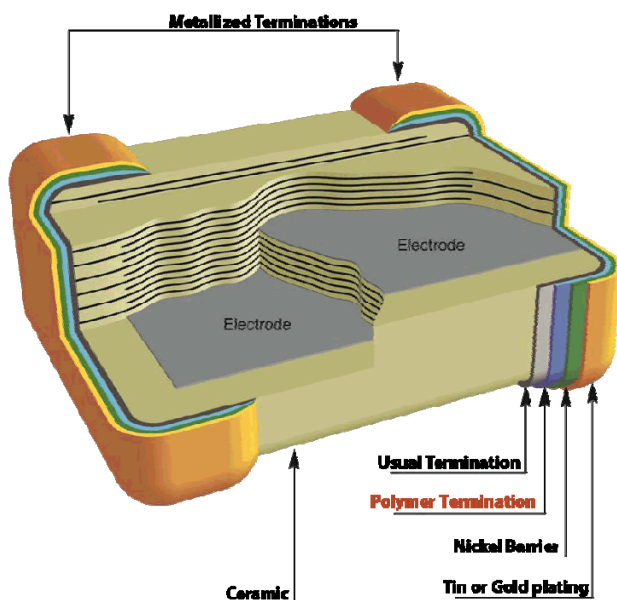
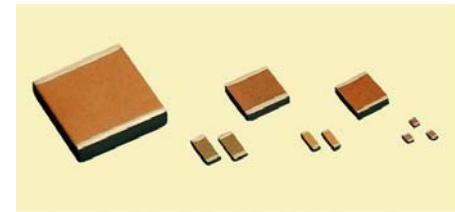


### CERAMIC Chip Capacitors

**EUROFARAD** ceramic chip capacitors have been used and qualified in Space since the early 80's (CEC and CNC ranges). Our components are available size 0603 to size 2220 and 16V to 100V, with either NPO or BX/X7R (2C1 or 2R1) dielectric material.

Noble metals like Palladium or Silver are used for electrodes.

Such technology allows **EUROFARAD** ceramic chip capacitors keeping high performance and reliability over a wide range of capacitance.



In early 2013, **EUROFARAD** introduced the CerUflex as a new qualified technology for Space applications. This new capacitor uses flexible polymer termination, offering improved performance against thermo-mechanical stress. **EUROFARAD's** CerUflex series is listed in QPL with BX/X7R dielectric, size 0603 to size 2220 and 16V to 100V.

**EUROFARAD** is now in the evaluation phase of two new types of ceramic capacitors for Space use :

- 10V range for package size 0402, 0603, 0805, 1206 and 1210.
- Size 0402 series over 10V to 100V range.

# CERAMIC Capacitors



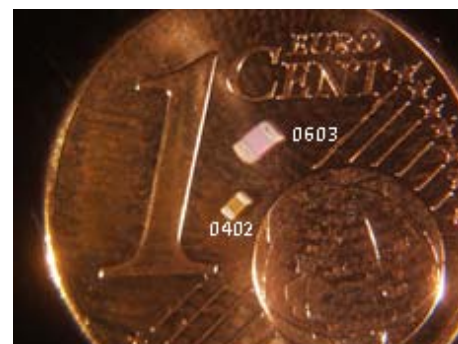
ESCC Specification	EUROFARAD Part Number	CERAMIC type	Main Electrical Characteristics	Dimensions (mm)	QPL EPPL
3009/037	CEC14	NPO	16V $\Rightarrow$ 100V 1pF $\Rightarrow$ 1nF	1,6x0,8x1max (size 0603)	QPL
3009/003	CEC2	NPO	16V $\Rightarrow$ 100V 1pF $\Rightarrow$ 2,7nF	2x1,25x1,3 max (size 0805)	QPL
3009/022	CEC12	NPO	16V $\Rightarrow$ 100V 1pF $\Rightarrow$ 6,8nF	3,2x1,6x1,8 max (size 1206)	QPL
3009/004	CEC4	NPO	16V $\Rightarrow$ 100V 10pF $\Rightarrow$ 15nF	3,2x2,5x1,8 max (size 1210)	QPL
3009/005	CEC6	NPO	16V $\Rightarrow$ 100V 100pF $\Rightarrow$ 33nF	4,5x3,2x1,8 max (size 1812)	QPL
3009/006	CEC7	NPO	16V $\Rightarrow$ 100V 470pF $\Rightarrow$ 68nF	5,7x5x1,8 max (size 2220)	QPL
3009/038	CNC14	2C1 / 2R1	16V $\Rightarrow$ 100V 10pF $\Rightarrow$ 39nF	1,6x0,8x1max (size 0603)	QPL
3009/008	CNC2	2C1 / 2R1	16V $\Rightarrow$ 100V 68pF $\Rightarrow$ 220nF	2x1,25x1,8max (size 0805)	QPL
3009/023	CNC12	2C1 / 2R1	16V $\Rightarrow$ 100V 470pF $\Rightarrow$ 390nF	3,2x1,6x2,3max (size 1206)	QPL
3009/009	CNC4	2C1 / 2R1	16V $\Rightarrow$ 100V 2,2nF $\Rightarrow$ 820nF	3,2x2,5x2,3max (size 1210)	QPL
3009/010	CNC6	2C1 / 2R1	16V $\Rightarrow$ 100V 3,9nF $\Rightarrow$ 1,8 $\mu$ F	4,5x3,2x2,3max (size 1812)	QPL
3009/011	CNC7	2C1 / 2R1	16V $\Rightarrow$ 100V 22nF $\Rightarrow$ 3,9 $\mu$ F	5,7x5x2,3max (size 2220)	QPL
3009/040	CEC14 Polymer termination	NPO	16V $\Rightarrow$ 100V 1pF $\Rightarrow$ 1nF	1,6x0,8x1max (size 0603)	
	CEC2 Polymer termination	NPO	16V $\Rightarrow$ 100V 1pF $\Rightarrow$ 2,7nF	2x1,25x1,3max (size 0805)	
	CEC12 Polymer termination	NPO	16V $\Rightarrow$ 100V 1pF $\Rightarrow$ 6,8nF	3,2x1,6x1,8max (size 1206)	
	CEC4 Polymer termination	NPO	16V $\Rightarrow$ 100V 10pF $\Rightarrow$ 15nF	3,2x2,5x1,8max (size 1210)	
	CEC6 Polymer termination	NPO	16V $\Rightarrow$ 100V 100pF $\Rightarrow$ 33nF	4,5x3,2x1,8max (size 1812)	
	CEC7 Polymer termination	NPO	16V $\Rightarrow$ 100V 470pF $\Rightarrow$ 68nF	5,7x5x1,8max (size 2220)	

## CERAMIC Capacitors



ESCC Specification	EUROFARAD Part Number	CERAMIC type	Main Electrical Characteristics	Dimensions (mm)	QPL EPPL
3009/039	CNC14 Polymer termination	2C1 / 2R1	16V $\Rightarrow$ 100V 10pF $\Rightarrow$ 100nF	1,6x0,8x1max (size 0603)	QPL
	CNC2 Polymer termination	2C1 / 2R1	16V $\Rightarrow$ 100V 68pF $\Rightarrow$ 390nF	2x1,25x1,8max (size 0805)	QPL
	CNC12 Polymer termination	2C1 / 2R1	16V $\Rightarrow$ 100V 470pF $\Rightarrow$ 1 $\mu$ F	3,2x1,6x2,3max (size 1206)	QPL
	CNC4 Polymer termination	2C1 / 2R1	16V $\Rightarrow$ 100V 2,2nF $\Rightarrow$ 820nF	3,2x2,5x2,3max (size 1210)	QPL
	CNC6 Polymer termination	2C1 / 2R1	16V to 100V 3,9nF $\Rightarrow$ 1,8 $\mu$ F	4,5x3,2x2,3max (size 1812)	QPL
	CNC7 Polymer termination	2C1 / 2R1	16V $\Rightarrow$ 100V 22nF $\Rightarrow$ 3,9 $\mu$ F	5,7x5x2,3max (size 2220)	QPL

**EUROFARAD** ceramic chip capacitors are present on all major European Space programs, including Galileo, Spot, Helios, Eutelsat, Insight...



## CERAMIC Capacitors

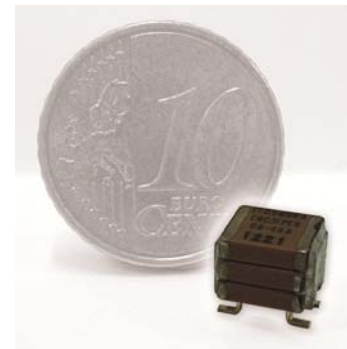


### CERAMIC Capacitors for Switch Mode Power Supplies (SMPS)

**EUROFARAD** ceramic capacitors are available in stacked configurations, offering high capacitance for power applications like Switch Mode Power Supplies, DC-DC converters...

Five ranges of components are **ESA** qualified :

- CNC3X series from 16V to 25V
- CNC5X series from 50V to 500V

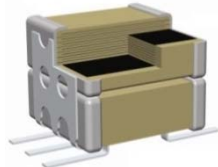


The following series are not qualified but used in Space : TCN83E, CNC82RE and CNC83RE series from 50V to 400V.

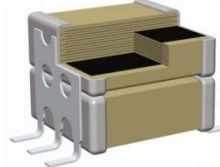
Different terminations are available :



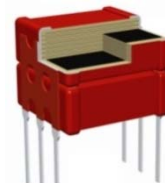
*PE*  
termination



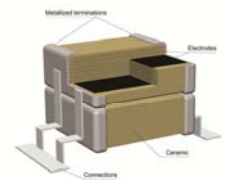
*PLE*  
termination



*LE*  
termination



*NE*  
termination



*RE*  
termination

ESCC Specification	EUROFARAD Part Number	CERAMIC type	Main Electrical Characteristics	Dimensions (mm)	QPL EPPL
3001/037	CNC31	2C1 / 2R1	16V $\Rightarrow$ 25V 1,2 $\mu$ F $\Rightarrow$ 12 $\mu$ F	7,5x6x7,5max (size 2220)	<b>QPL</b>
	CNC32	2C1 / 2R1	16V $\Rightarrow$ 25V 1,8 $\mu$ F $\Rightarrow$ 15 $\mu$ F	8x8x7,5max (size 2528)	<b>QPL</b>
	CNC33	2C1 / 2R1	16V $\Rightarrow$ 25V 3,3 $\mu$ F $\Rightarrow$ 33 $\mu$ F	10x9,2x10max (size 3333)	<b>QPL</b>
	CNC34	2C1 / 2R1	16V $\Rightarrow$ 25V 5,6 $\mu$ F $\Rightarrow$ 68 $\mu$ F	12,5x12x10max (size 4040)	<b>QPL</b>

## CERAMIC Capacitors



### CERAMIC Capacitors for Switch Mode Power Supplies (SMPS)

ESCC Specification	EUROFARAD Part Number	CERAMIC type	Electrical Characteristics	Dimensions (mm)	QPL EPPL
3001/038	CNC53	2C1 / 2R1	50V ⇒ 500V 0,1µF ⇒ 12µF	9x9,2x16max (size 3033)	QPL
	CNC54	2C1 / 2R1	50V ⇒ 500V 0,22µF ⇒ 22µF	12x11,5x16max (size 3740)	QPL
	CNC55	2C1 / 2R1	50V ⇒ 500V 0,33µF ⇒ 39µF	14,9x13,8x16max (size 5550)	QPL
	CNC56	2C1 / 2R1	50V ⇒ 500V 0,47µF ⇒ 68µF	16,8x21,6x16max (size 6080)	QPL
	CNC65	2C1 / 2R1	50V ⇒ 500V 0,47µF ⇒ 68µF	21,6x16,6x16max (size 8060)	
	CNC57	2C1 / 2R1	50V ⇒ 500V 0,82µF ⇒ 82µF	12x38,2x16max (size 40140)	
	CNC58	2C1 / 2R1	50V ⇒ 500V 2,7µF ⇒ 180µF	24x40,6x16max (size 80150)	
3001/028	CNC82RE	2C1 / 2R1	50V ⇒ 400V 1,0µF ⇒ 47µF	22x19,5x30max (moulded part)	
	CNC83RE	2C1 / 2R1	50V ⇒ 400V 0,22µF ⇒ 22µF	15,5x11,5x12max (size 5440)	
3001/027	TCN83E	2C1 / 2R1	50V ⇒ 400V 2,7µF ⇒ 47µF	18,5x17x26max (size 6560)	

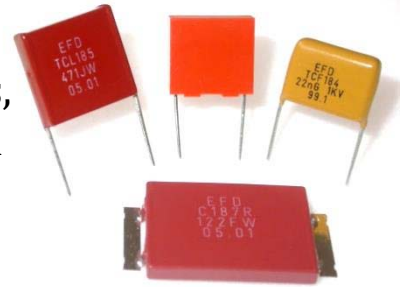


## CERAMIC Capacitors

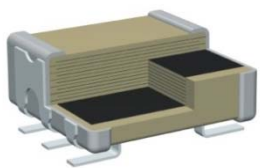


### CERAMIC Capacitors for High Voltage

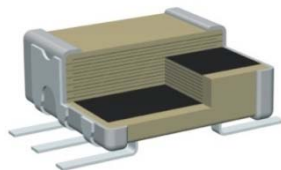
**EUROFARAD** has a wide range of ceramic capacitors used but not qualified in High Voltage Space applications, using either NPO dielectric for improved stability or X7R dielectric for higher energy density.



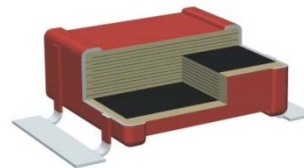
Our high voltage ceramic capacitors are available in multilayer type with nickel barrier and tin/lead coating. Other connection & coating types (*moulded & epoxy dipped*) are also available, in addition to below termination options :



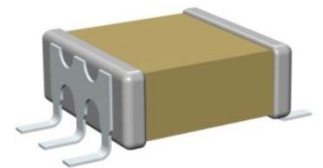
PS  
termination



PLS  
termination



RS  
termination



LS  
termination

EUROFARAD PART NUMBER	CERAMIC TYPE	CAPACITANCE VALUES
TKD179S	NPO	12pF ⇒ 3,3nF
TKD180S	NPO	15pF ⇒ 3,3nF
TKD181S	NPO	22pF ⇒ 5,6nF
TKD182S	NPO	47pF ⇒ 15nF
TKD183S	NPO	68pF ⇒ 22nF
TKD184S	NPO	120pF ⇒ 33nF
TKD185S	NPO	180pF ⇒ 56nF
C179 / TCK179S / TCF179S	NPO	10pF ⇒ 5,6nF
C180 / TCK180S / TCF180S	NPO	10pF ⇒ 8,2nF
C181 / TCK181S / TCF181S	NPO	18pF ⇒ 18nF

## CERAMIC Capacitors



### CERAMIC Capacitors for High Voltage

EUROFARAD PART NUMBER	CERAMIC TYPE	CAPACITANCE VALUES
C182 / TCK182S / TCF182S	NPO	33pF ⇔ 33nF
C183 / TCK183S / TCF183S	NPO	10pF ⇔ 56nF
C184 / TCK184S / TCF184S	NPO	22pF ⇔ 82nF
C185 / TCK185S / TCF185S	NPO	47pF ⇔ 180nF
TKD279S	X7R	180pF ⇔ 39nF
TKD280S	X7R	270pF ⇔ 82nF
TKD281S	X7R	390pF ⇔ 1μF
TKD282S	X7R	390pF ⇔ 1μF
TKD283S	X7R	680pF ⇔ 470nF
TKD284S	X7R	1,5nF ⇔ 680nF
TKD285S	X7R	2,2nF ⇔ 1,2μF
C279 / TCK279S / TCF279S	X7R	100pF ⇔ 220nF
C280 / TCK280S / TCF280S	X7R	150pF ⇔ 390nF
C281 / TCK281S / TCF281S	X7R	150pF ⇔ 820nF
C282 / TCK282S / TCF282S	X7R	330pF ⇔ 1,5μF
C283 / TCK283S / TCF283S	X7R	270pF ⇔ 2,7μF
C284 / TCK284S / TCF284S	X7R	390pF ⇔ 2,7μF
C285 / TCK285S / TCF285S	X7R	1nF ⇔ 4,7μF



## FILM Capacitors



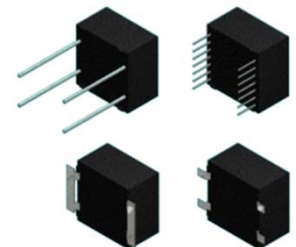
**EUROFARAD** Film Capacitors are widely used in different high performance demanding applications in Space, Defense and Aeronautic markets. With many years of heritage in the component field, **EUROFARAD** has developed and memorized practically all the techniques associated with film capacitor technologies. **EUROFARAD** film capacitors are widely used in space power electronics applications due to their good compromise between energy density, good integration factor and electrical robustness. The light weight of film capacitors and their flexible structure give them good capabilities to withstand harsh environments: large range of temperature, shock, vibration, pressure, vacuum, etc.

### METALLIZED POLYESTER FILM TECHNOLOGY

For many years **EUROFARAD** has improved its own experience and handled PET film capacitor in harsh electrical and mechanical environment of space applications. Beginning with MKTS and PM96S series, passing through well-known PM90S, PM94S, **EUROFARAD** reached finally the PM907S and PM948S series which present high level of miniaturization. PM ranges are widely embedded in space programs.

The light weight and self-healing properties of this technology propose excellent technical solution for the filtering, energy storage or fast discharge functions. The no loss of capacitance versus applied voltage and the low drift versus temperature participate in the stability of the filters.

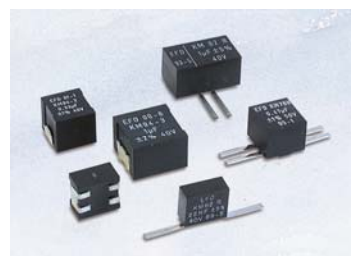
Having wide capacitance and voltage ranges, but also different sizes and terminations, **EUROFARAD** PET series are particularly suitable for different space applications.



### METALLIZED PC OR PPS FILM TECHNOLOGIES

Known for its high stability and low temperature coefficient, these technologies allow the manufacturing of precision capacitors having low capacitance tolerances up to  $\pm 1\%$ . They meet severe technical requirements and have excellent electrical and thermo-mechanical properties.

**EUROFARAD** capacitors KM111S, KM94S, etc. have low dissipation factor and its performance versus frequency provide excellent performance in high reliable filters. **EUROFARAD** KM ranges are widely used in space programs, but also in aeronautic and military applications.

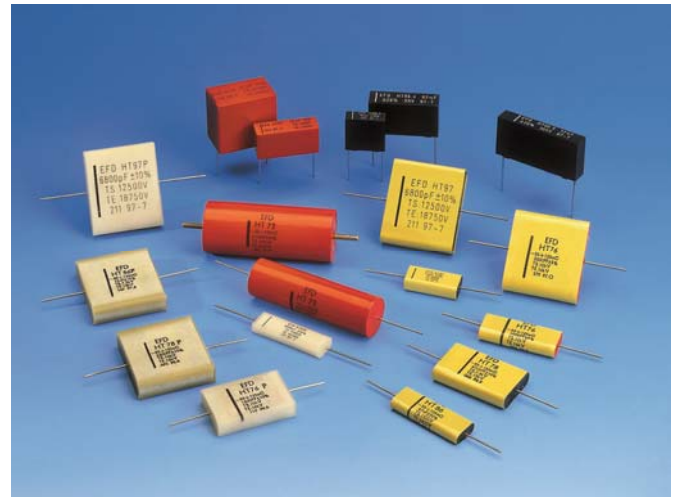


## FILM Capacitors



### RECONSTITUTED MICA CAPACITOR TECHNOLOGY

Different advantages of reconstituted mica capacitors make them suitable for diverse applications. One of their success factors is the high reliability, due to their electrical and mechanical performances. Having a solid impregnated structure and low level of partial discharges, mica paper technology is well adapted for high voltage domain. Thanks to their metal foil electrodes, the reconstituted mica capacitors can accept high discharge current. The low ESR and ESL make them well-adapted in some space, military and aeronautic applications (radar systems, thrusters, missile exploding devices, aeronautic ignition systems, etc.)



Eurofarad reconstituted mica capacitors are space qualified and used for many years in space projects in Europe and in the world. The HT86PS, but also HT97PS and other specific series, are widely embedded in space programs. Eurofarad proposes a large range of capacitance and voltages with different standard products in reconstituted mica technology.



Space Application – On Board TWT Radar  
 Custom design integrating 25 capacitors  
 with 13kV total rated voltage  
 Dimensions 102x25,5x70,5 mm Weight < 280 g

Thanks to his rich experience, Eurofarad had developed and preserve mastership in reconstituted mica technology. The technological knowledge allowed the miniaturization of the products during the years and their adaptation to the environmental constraints.

Eurofarad is recognized for development of custom design products, proposing know-how in the domain of reliable packaging, adapting the characteristics to the using conditions.

Our company proposes the reconstituted mica technology up to 100kV rated voltages.

Different high temperature solutions have been developed on the base of reconstituted mica technology. Using adapted materials and especially different resins for impregnation, Eurofarad extends the range of temperature to -65°C / 200°C. Some recent tests have been performed with success at +250°C.

## FILM Capacitors



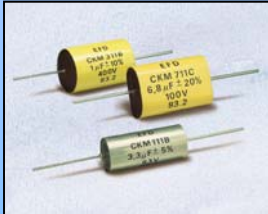
### SOME PRODUCT REFERENCES FOR FILM CAPACITORS

STANDARD SERIES		CUSTOM DESIGN	
EUROFARAD PART NUMBER	DETAIL SPECIFICATION	EUROFARAD PART NUMBER	DETAIL SPECIFICATION
MKT S	ESCC 3006/019 EFD 557.98.390	SP 1923 S	EFD 465.92.390
CKM 111 S	ESCC 3006/007	SP 2009 SP 2009-1	RA.0107.002.XX RA.0107.006.XX
CKM 501 S	EFD 432.92.390	SP 2161 S	EFD 491.94.390
KM 78 TS	EFD 589.01.390	SP 2256 S	ESCC 3006/006 EFD 513.95.390
KM 94 S	ESCC 3006/023 EFD 563.99.390	SP 2654-4 S	EFD 602.02.390
PM 90 S	ESCC 3006/020 EFD 516.95.390	SP 2667 S	EFD 621.03.390
PM 94 S	ESCC 3006/024 EFD 573.00.390	SP 2792 S	EFD 656.04.390
PM 96 S	EFD 512.95.390	SP 2810 S	EFD 678.04.390
PM 96 ST	EFD 580.00.390	SP 2851 S	EFD 678.04.390
PM 907 ST	EFD 748.09.390	SP 2852 S	EFD 678.04.390
PM 948 ST	EFD 741.09.390	SP 2854 S	RA.0107.005.XX
HT 78 PS	ESCC 3006/018	SP 2954 S	EFD 713.07.390
HT 86 PS	ESCC 3006/022 EFD 421.91.390	SP 3032 S	EFD 732.08.390
HT 97 PS	EFD 606.02.390	SP 3129 S	EFD 774.10.390

# FILM Capacitors



**KM 111 S**



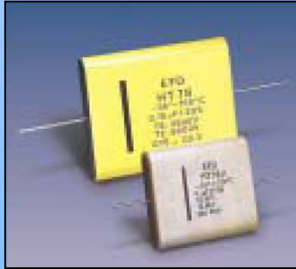
**PC CAPACITORS**  
ESA/SCC 3006/007

**KM 94 S**

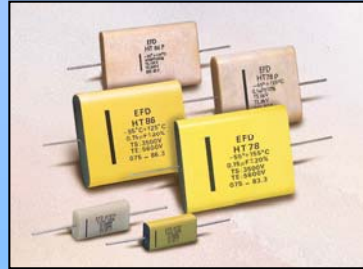


**PPS Capacitors**  
ESA/SCC 3006/023

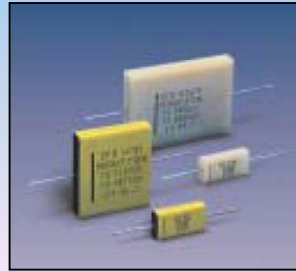
**HT 78 PS**



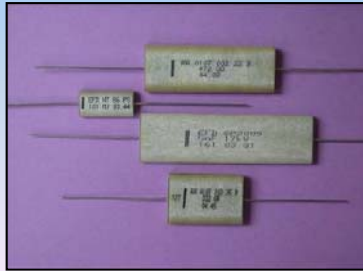
**HT 86 PS**



**RECONSTITUTED MICA CAPACITORS**  
ESA/SCC 3006/ (018, 022, ETC.)



**HT 97 PS**



**SP 2009 / SP 2009-1**

**PM 94 S**



**PM 948 S**



**PM 96 S (T)**



**METALLIZED POLYESTER FILM CAPACITORS**  
ACCORDING TO ESA/SCC 3006/ (019, 020, 024, ETC.)



**PM 90 S**



**PM 907 S**



**MKT S**



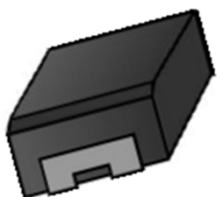
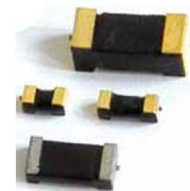
## TANTALUM Capacitors



**FIRADEC** Solid and Wet Tantalum capacitors comply with ESCC recommendations and have been listed in ESA EPPL for decades. Thanks to their high capacitance and low ESR characteristics, **FIRADEC** Tantalum capacitors are particularly suitable for spacecraft systems like EPC, DC/DC converters or energy storage.

### SOLID Tantalum:

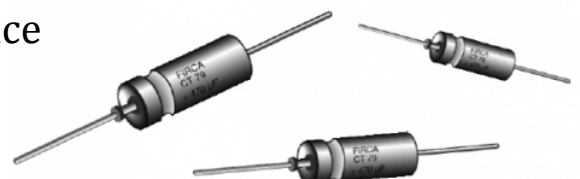
**CTC1** series is available in 8 different case sizes and offers a wide range of termination : gold plating for epoxy bonding and soldering paste, additional gold plating for ultrasonic or ball-bonding, electrolytic tinning. **CTC1** small size makes it particularly suitable for low voltage digital applications.



**CTC21** series has the lower ESR and the highest capacitance per single case on the market. These features, combined with a very high proven reliability (0.001% per 1000 hours), allow our **CTC21** series bringing significant flight heritage over the last 15years.

### WET Tantalum:

**FIRADEC CT79** family allows higher Capacitance and Voltage per case than Solid Tantalum capacitors. Wet Tantalum series is a perfect alternative for systems requiring high capacitance or high energy storage.



## TANTALUM Capacitors



ESCC Specification	FIRADEC Part Number	EPPL / QPL	Main Electrical Characteristics	Dimensions
ESCC3011/001	CTC1 A		4 → 50V 0,1 → 2,2μF	2,54x1,27x1,27 mm
ESCC3011/002	CTC1 B		4 → 50V 0,22 → 4,7μF	3,81x1,27x1,27 mm
ESCC3011/003	CTC1 C		4 → 50V 0,47 → 6,8μF	5,08x1,27x1,27 mm
ESCC3011/004	CTC1 D		4 → 50V 0,68 → 10μF	3,81x2,54x1,27 mm
ESCC3011/005	CTC1 E		4 → 50V 1 → 15μF	5,08x2,54x1,27 mm
ESCC3011/006	CTC1 F		4 → 50V 1,5 → 33μF	5,59x3,43x1,78 mm
ESCC3011/007	CTC1 G		4 → 50V 3,3 → 68μF	6,73x2,79x2,79 mm
ESCC3011/008	CTC1 H		4 → 50V 4,7 → 100μF	7,24x3,81x2,79 mm
ESCC3012/002	CTC21	EPPL1	6,3 → 63V 5,6 → 330μF	C: 11x9x4,5 mm D: 11x12,5x5,5 mm
ESCC3012/003	CTC21E	EPPL2	6,3 → 100V 10 → 680μF	C: 11x9x4,5 mm D: 11x12,5x5,5 mm
ESCC3003/005	CT79/CT79E	EPPL2	6,3 → 150V 1,7 → 2200μF	A: 18x5,6 mm    B: 23x7,4 mm C: 26x10,1 mm    D: 34x10,1 mm
ESCC3003/006	ST79	EPPL2	25 → 125V 68 → 1800μF	A: 18x5,6 mm    B: 23x7,4 mm C: 26x10,1 mm    D: 34x10,1 mm
ESCC3002/003	CTS21E		6,3 → 63V 47 → 330μF	C: 18,2x7,5 mm D: 20,8x9,1 mm

### **Some Programs flying FIRADEC Tantalum capacitors :**

SENTINEL, COSMO SkyMed 1, 2, 3 & 4, GALILEO, TELSAT, GLOBALSTAR...

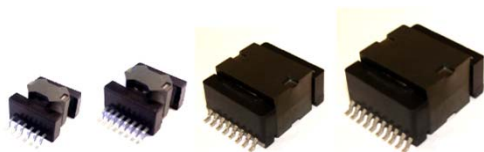
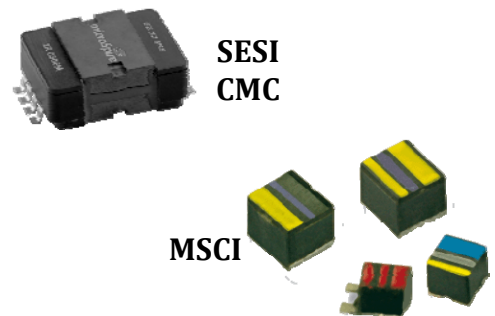


## Inductors & Transformers



As a leader in design and manufacturing of magnetic components for severe environment, **MICROSPIRE** has more than 30 years heritage in Space. A wide wide range of **MICROSPIRE**'s inductors and transformers are available according to ESCC generic specification No. 3201, or detailed specifications No. 3201/008, /009 and /010.

Several families of products have entries in **ESA QPL** (MSCI-Miniature Chip Inductors, SESI-SMD Energy Storage Inductors, CMC-Common Mode Chokes) or **EPPL** (Data Bus Transformers).



CCM : Chameleon Concept Magnetics

In addition to QPL & EPPL series, MICROSPIRE is on the way to receive ESA's Capability Approvals for its Toroidal Transfer Moulded Technology and Chameleon Concept Magnetics (CCM).

Typical Space applications for **MICROSPIRE** products include : Common mode chokes, SMD filtering chokes, PFC chokes, Current transformers, Gate Drive transformers, Flyback transformers, Forward transformers, Push-Pull transformers...

## Inductors & Transformers



ESCC Specification	MICROSPIRE Product Range & P/N	Main Electrical Characteristics	EPPL / QPL
ESCC3201/008	Miniature Chip Inductors (MSCI)		
	<b>10K</b>	0,01 $\Rightarrow$ 10 $\mu$ H 2, 5 and 10 % tolerance 750-87 mA DC current	QPL
	<b>12K</b>	12 $\Rightarrow$ 1000 $\mu$ H 2, 5 and 10 % tolerance 110-15 mA DC current	QPL
	<b>20K</b>	0,010 $\Rightarrow$ 1000 $\mu$ H 10 % tolerance 1000-25 mA DC current	QPL
	<b>H01</b>	0,38 $\Rightarrow$ 100 $\mu$ H 15 % tolerance 1500-100 mA DC current	QPL
ESCC3201/009	SMD Energy Storage Inductors (SESI)		
	<b>SESI 9.1</b>	0,6 $\mu$ H 6 A $\Rightarrow$ 700 $\mu$ H 0,2 A	QPL
	<b>SESI 14</b>	2,3 $\mu$ H 5,8 A $\Rightarrow$ 260 $\mu$ H 0,57 A	QPL
	<b>SESI 15</b>	0,9 $\mu$ H 14 A $\Rightarrow$ 800 $\mu$ H 0,4 A	QPL
	<b>SESI 18</b>	4,2 $\mu$ H 9,8 A $\Rightarrow$ 231 $\mu$ H 1,34 A	QPL
	<b>SESI 22</b>	3,8 $\mu$ H 18,9 A $\Rightarrow$ 1760 $\mu$ H 0,8 A	QPL
	<b>SESI 32</b>	4,7 $\mu$ H 27 A $\Rightarrow$ 4700 $\mu$ H 0,5 A	QPL
ESCC3201/010	Common Mode Chokes (CMC)		
	<b>CMC 15</b>	0,052mH 5,2 A $\Rightarrow$ 4mH 0,5 A	QPL
	<b>CMC 18</b>	0,06mH 7,7 A $\Rightarrow$ 4,9mH 0,7 A	QPL
	<b>CMC 22</b>	0,06mH 7,7 A $\Rightarrow$ 4,9mH 0,7 A	QPL
	<b>CMC 22</b>	0,06mH 11 A $\Rightarrow$ 3,3mH 1,4 A	QPL

# Inductors & Transformers

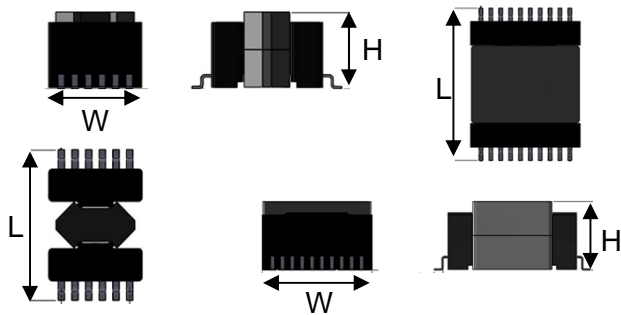
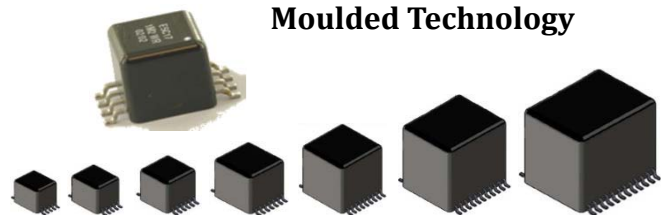


MICROSPIRE Product Range & P/N	Main Electrical Characteristics	EPPL / QPL
MIL-STD-1553 Data Bus Transformers	Impedance $\geq 3k\Omega$ , Leakage inductance $\leq 6 \mu H$	
<b>DBIT-X-7P10</b>	$H_{max}$ : 17 mm Through hole	EPPL
<b>DBIT-X-3S</b>	$H_{max}$ : 3,81 mm SMD	EPPL
<b>DBIT-X-5S</b>	$H_{max}$ : 5 mm SMD	EPPL
<b>DBIT-X-7S</b>	$H_{max}$ : 7 mm SMD	EPPL
<b>DBIT-X-7P</b>	$H_{max}$ : 11 mm Through hole	EPPL

## ESA Capability Approvals :

MICROSPIRE is in the final path to receive a first Capability Approval for its Toroidal Transfer Moulded Technology manufacturing process.

Toroidal Transfer Moulded Technology



CCM : Chameleon Concept Magnetics

A second Capability Approval will be granted soon to MICROSPIRE's CCM technology (*Chameleon Concept Magnetics*). This brand new epoxy transfer moulding process allows custom designed Transformers and Chokes with **+30% increased power density...**

## EMI Filters



**Eurofarad** manufactures miniature EMI filters based on ceramic capacitors and sometimes ferrite inductors in order to prevent disturbances generated by an appliance or to protect sensitive devices against those interferences. Eurofarad's filters are well known for their high reliability, robustness and electrical performances. Moreover, they reach the ESCC requirements and have been referenced in ESA EPPL for many years.

- **Feedthrough EMI filters:**

Many different kinds of filtering solutions are proposed such as C, L,  $\Pi$  or T cells. Linked to the targeted performance, 14 specifications have been designed from diameter 30 to 100. Many variants are available to configure the internal components, the case plating (Gold, Steel, Kovar), the threading, the sealing and the terminations.



- **Surface Mount EMI filters:**

These products are created to be mounted on a PCB. They are clearly based on the same design than the tubular feedthrough filters with a shielded package. 4 specifications are proposed for Space applications (C, L,  $\Pi$  or T cells with diameter 35).



- **Customized EMI filter**

Eurofarad added value is to reach any customer requirements owing to their mechanical division so that multiways feedthrough filters can be implemented to optimize installation and housing.



## EMI Filters



ESCC Specification	Eurofarad Part Number	EPPL / QPL		Main Electrical Characteristics	Dimensions
		EPPL	QPL		
3008/020	SFC030	EPPL	QPL	« C » cell, 25V to 200V, 470pF to 22nF, 1A to 5A, Variant 1 to 12	Feedthrough h Ø 3mm
3008/031	SFC035	EPPL	QPL	« C » cell, 25V to 200V, 470pF to 22nF, 10A, Variant 1 to 6	Feedthrough h Ø 3.5mm
3008/032	SFC040	EPPL	QPL	« C » cell, 25V to 200V, 470pF to 22nF, 10A, Variant 1 to 12	Feedthrough h Ø 4mm
3008/026	SFC060 Herm.	EPPL	QPL	« C » cell, 25V to 200V, 680pF to 22nF, 10A, Variant 1 to 6	Feedthrough h Ø 6mm
3008/033	SFC060 Non-herm	EPPL	QPL	« C » cell, 25V to 200V, 680pF to 22nF, 10A, Variant 1 to 12	Feedthrough h Ø 6mm
3008/027	SFC100	EPPL	QPL	« C » cell, 25V to 200V, 1nF to 1µF, 10A, Variant 1 to 6	Feedthrough h Ø 10mm
3008/029	SFL100	EPPL	QPL	« L » cell, 40V to 300V, 17.6nF to 1,6µF, 5A 10A 15A, Variant 1 to 48	Feedthrough h Ø 10mm
3008/025	SFP035	EPPL	QPL	« Π » cell, 35V to 200V, 2.4nF to 35.2nF, 10A, Variant 1 to 20	Feedthrough h Ø 3.5mm
3008/014	SFP040	EPPL	QPL	« Π » cell, 70V to 250V, 750pF to 44,8nF, 10A, Variant 1 to 40	Feedthrough h Ø 4mm
	SFP040xV			« Π » cell, 70V to 250V, 750pF to 44,8nF, 10A	Feedthrough h Ø 4mm
3008/021	SFP060 Herm	EPPL	QPL	« Π » cell, 35V to 500V, 2.4nF to 89.6nF, 10A, Variant 1 to 14	Feedthrough h Ø 6mm
3008/030	SFP060 Non-herm.	EPPL	QPL	« Π » cell, 35V to 500V, 2.4nF to 89.6nF, 10A, Variant 1 to 28	Feedthrough h Ø 6mm
3008/028	SFP100	EPPL	QPL	« Π » cell, 50V to 300V, 160pF to 1312nF, 10A, Variant 1 to 6	Feedthrough h Ø 10mm
	SFT100			« T » cell, 50V, 10A	Feedthrough h Ø 10mm
3008/034	SFCMS 35 C			« C » cell, 25V to 200V, 470pF to 22nF, 10A, Variant 1 to 6	SMD Ø 3.5mm
3008/036	SFCMS 35 L			« L » cell, 100V, 680pF to 17.6nF, 10A, Variant 1 to 2	SMD Ø 3.5mm
3008/037	SFCMS 35 Pi			« Π » cell, 35V to 200V, 2.4nF to 35.2nF, 10A, Variant 1 to 4	SMD Ø 3.5mm
3008/035	SFCMS 35 T			« T » cell, 50V, 10A	SMD Ø 3.5mm



## Slip Rings and Potentiometers

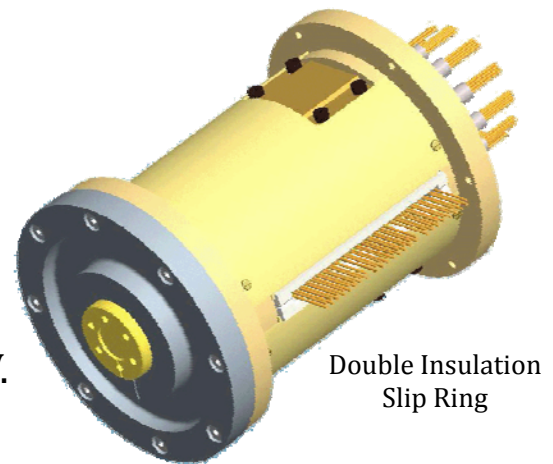


**EUROFARAD** developed its first Slip Ring and Potentiometer assembly in 1998 for the PROTEUS Solar Array Drive Mechanism (SADM) family.

15 years later, **EUROFARAD** Slip Rings and Potentiometers have been used on multiple scientific and commercial missions, with more than 75 years global in-orbit heritage.

- **Key Design Features**

**EUROFARAD** slip rings only use noble metals contacts, and can be equipped with qualified Double Insulation features for ESD purposes. Electrical transfer capability goes up to 12 kW.



Redundant Precision Potentiometer

Our proprietary plastic film and wirewound potentiometers provide robust and reliable solutions for all kind of actuation mechanisms.

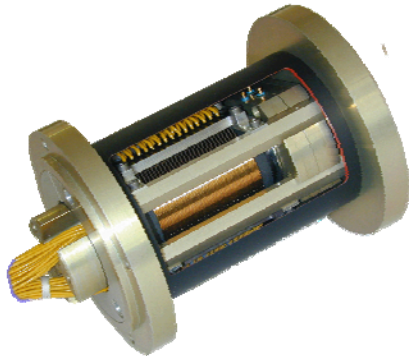
When combined, **EUROFARAD** slip rings and potentiometer assemblies offer unique dual function compact designs for SADMs, or scanning mechanisms.

- **Applications & Flight Heritage**

Typical applications for **EUROFARAD** Slip Rings or Potentiometers include : SADMs, Antenna actuators (Pointing, Deployment, Trimming), Radiometers, scanning mechanisms, CMG's, Robotics, Hexapods... Our strong heritage includes multiple Qualification tests and in-orbit life in several spacecraft like Jason 1&2, Smart 1, CALIPSO, Skynet 5, Eutelsat, Inmarsat, Intelsat, Astra, GALILEO...

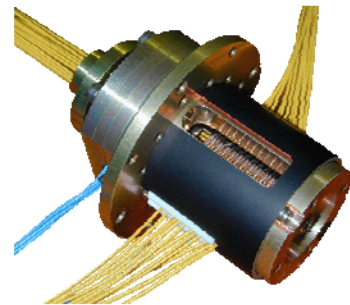


**Slip Rings and Potentiometers**



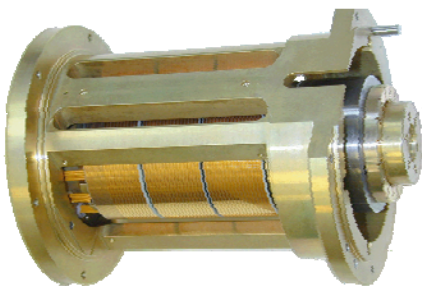
**Slip-Ring & Potentiometer for SEPTA® 31 SADM PROTEUS platform**

**Slip Ring** : 60 x 1.5 Amp  
**Potentiometer** : wirewound, Redundant, 0.1% linearity



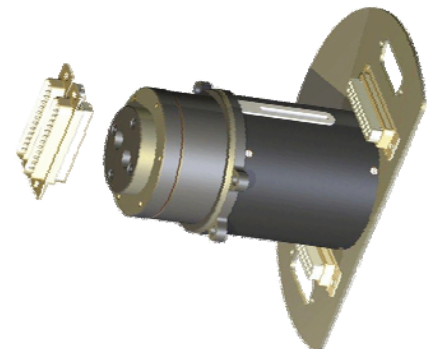
**Slip-Ring & Potentiometer for SEPTA® 41 SADM MYRIADE platform**

**Slip Ring** : 24x 1.5 Amp  
**Potentiometer** : plastic film, Redundant, 0.1% linearity



**Slip-Ring & Potentiometer for SEPTA® 32 SADM**

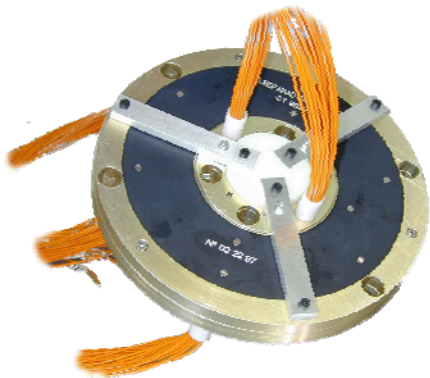
**Slip Ring** : 42 x 5 A – 12 x 1,5 A  
**Potentiometer** : plastic film, Redundant, 0.1% linearity



**Slip Ring for PROTEUS Mk2 platform**

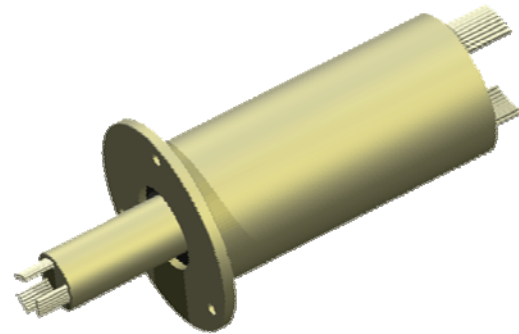
3 kW Power  
 24 circuits, 1 → 5 A  
Double Insulation

**Slip Rings and Potentiometers**



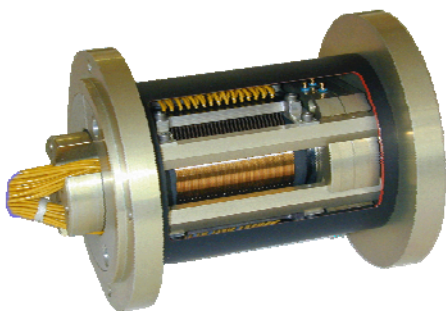
**CT 9931**  
**Flat Pancake High Power**  
**12 kW Slip-Ring**

24 x 10 Amp  
 High Temperature Life Test



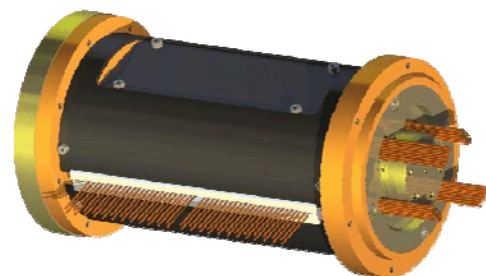
**CT 9911**  
**Low Power**  
**36 circuits slip ring**

36 x 1,5 Amp  
100 Million cycles Life Test



**CT 9701-01**  
**Qualification Slip Ring**  
**for JASON 2 Extended life**  
**Test Requirements (15 years)**

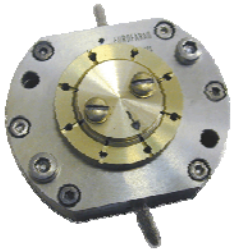
60 x 1,5 Amps



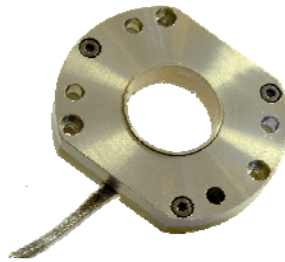
**CT 0828-01**  
**Medium Power**  
**Slip Ring for ESD Tests**

6 kW – 42 x 5 Amps  
Double Insulation

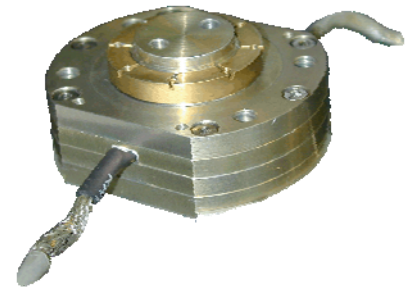
**Slip Rings and Potentiometers**



**SP 02011 dual rotary Pancake Potentiometer**  
**HDRA Rotary Actuator**  
 Plastic film,  
 Redundant, 0.1% linearity



**SP 99051 Pancake Potentiometer**  
**Beagle 2 Robotic Arm**  
 Plastic film, 0.1% linearity



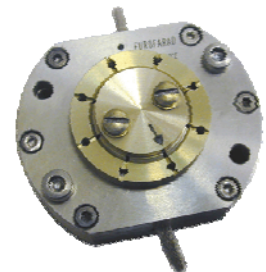
**SP 02038 dual rotary Pancake Potentiometer**  
**Septa@233 CSSADM**  
 Plastic film, 0.1% linearity



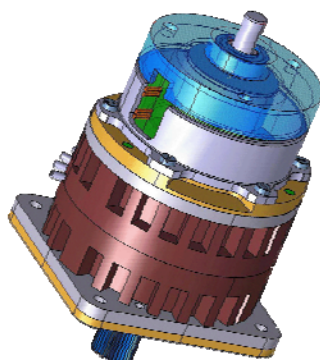
**Linear motion miniature Plastic Film Potentiometer for AMOS 3**  
 Plastic film, 0.1% linearity,  
 Repeatability 10 µm



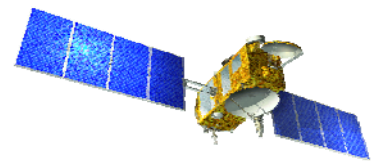
**SP 02011 dual rotary Pancake Potentiometer**  
**SARA@21 Rotary Actuator**  
 Plastic film, 0.1% linearity



**SP 05043 dual rotary Pancake Potentiometer**  
**Eurostar 3000 Platforms**  
 Plastic film,  
 Redundant, 0.1% linearity



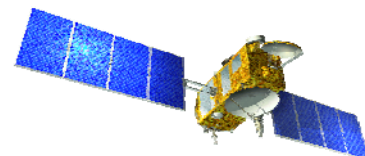
**Precision Potentiometer + Stepper Motor Assembly**  
**SKYNET 5**  
 Plastic film,  
 Redundant, 0.1% linearity



## SOME SPACE PROJECT & CUSTOMERS REFERENCES

A5B	CESASAT	HISPASAT	METEOSAT-2	SHB
AGE	CHINASAT	HOTBIRD 4	MSG	SICRAL
AGSTENTOR	CLUSTER (1&2)	HUYGENS	MTSAT	SILEX
ALOS 2	COMSAT	Inmarsat-4	NAHUEL	SKYNET 5 A, B, C
ALPHABUS	CoRoT	INMAR-TLC2	NEUROLAB	SMART 1
ALPHASAT	COSMO SkyMed	INTELSAT-7	NILSAT	SMOS
AMAZONAS	DEMETER	INTELSAT-X	Nimiq	SPACELAB
AMOS-5	Akspress-AM4	INTEGRAL	NuSTAR	SPIRALE
ANIK	EMS	IRS	PARASOL	SPOT (4&5)
APSTAR	EMS2	IRRIDIUM	PICARD	STENTOR
AR2	ENVISAT1	ISS	PLANCK	TDE
ARABSAT	EOSAT	ITALSAT	PMT	TDF
ARGOS	ERS	JASON 1, 2	POSEIDON	TELECOM2
ARIANE 4	EUTELSAT-F6	Ka-Sat	PPF	TELSAT
ARIANE 5	FIRST	LOCSTAR	PROTEUS	TERRA-SAR
ARTEMIS	GAIA	LOUTCH	PTG	THURAYA
ASTRA 1K	GALILEO	MAB	RADARSAT	TR6
ASIASAT	GLOBALSTAR	MARS Express	RAPIDEYE	TURKSAT
ASTRO 15	GLONASS	MASAS	ROSETTA	VEGETATION
ATV	GOCE	MELFI	SENTINEL	XMM
BEPI COLOMBO	HELIOS	METEOSAT	SARLUPE	XSAR
CALIPSO	HERSCHEL	METOP	SARSAT	YahSat
CASSINI		MPLM		WORLDSTAR
				...





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