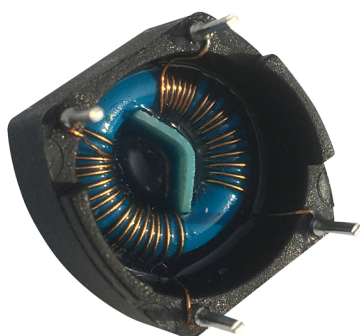
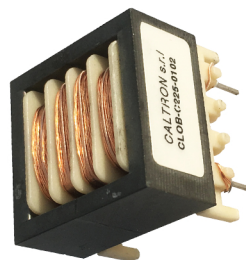
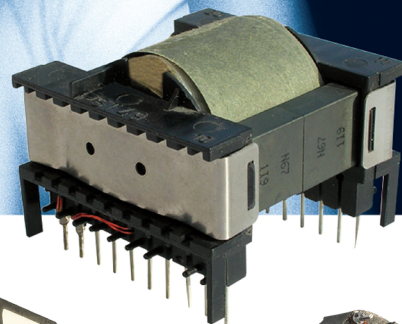
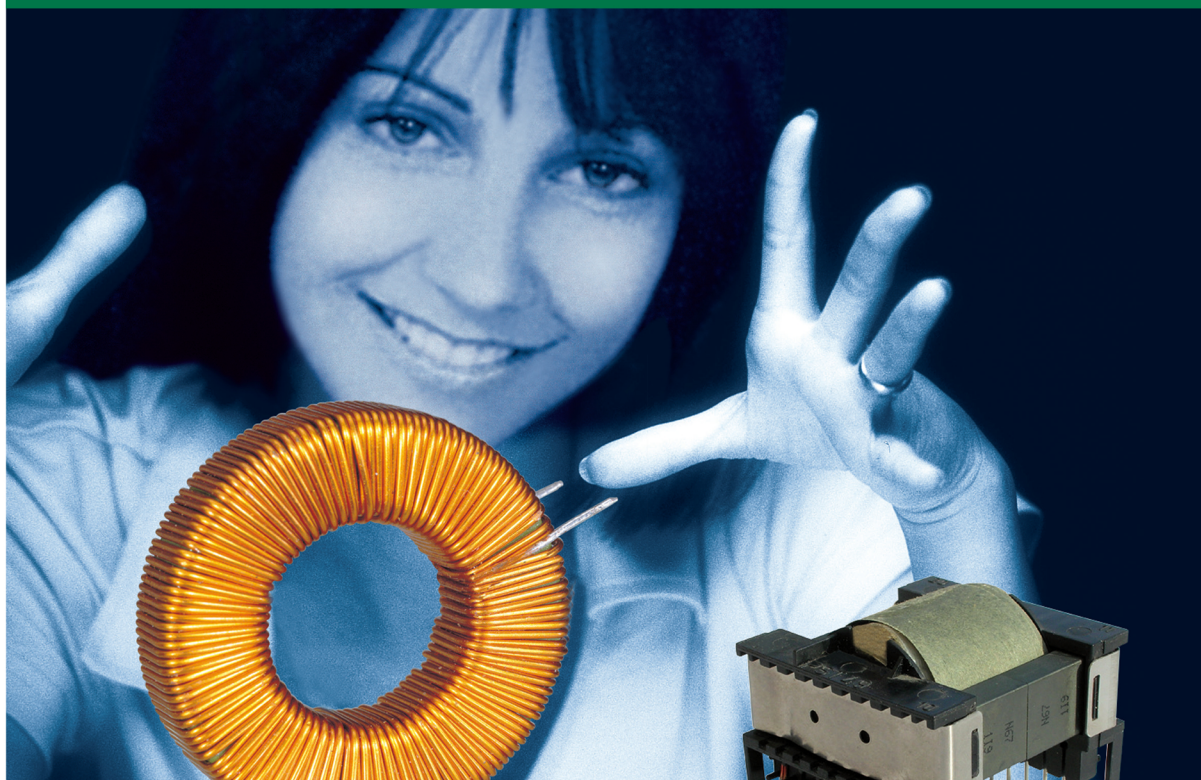


# CALTRON

ELECTRONICS

ITALIAN TECHNOLOGY

ELECTROMAGNETIC COMPONENTS



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The company CALTRON s.r.l. was founded in the year 1984. In the early years as a relatively small company CALTRON concerned itself with the production of mains transformers as well as with the manufacture of customer-specific winding materials. In the course of the time and thanks to a strong demand for EMC components the company developed into a specialist in the production of electro-magnetic components.

Thanks to a generous investment policy and the strengthening of its technical department and his area of research and development, the company has succeeded fully with the requirements and expectations of the market.

CALTRON completed the transformation to an EMC specialist company in order to be able to supply the world market with high quality industrial EMC products. A well trained and motivated team of employees also helps to live up to the requirement of the market in the field of quality assurance. As early as 1998 Caltron fulfilled the high requirements of the ISO quality system and is certified as per ISO 9002.

Caltron has implemented and maintains a Quality Management System which fulfills the requirements of the following standard: ISO 9001:2008.

All products are subjected to a 100% parameter test, a fact which guarantees high quality and faultless delivery of the components. Our research and development department is in a position to answer customer inquiries in the shortest of time and to make corresponding prototypes available.

In addition to the development of its standard industrial programme CALTRON is also interested in processing and producing customer-specific orders. Thanks to the lean company structure, the various favourable production locations and an efficient sales organisation it is possible to offer qualitatively high class components at interesting prices. We would be pleased to be able to count you amongst our world-wide group of customers and look forward with pleasure to receiving your inquiries.



# INTRODUCTION AND GENERAL INFORMATION

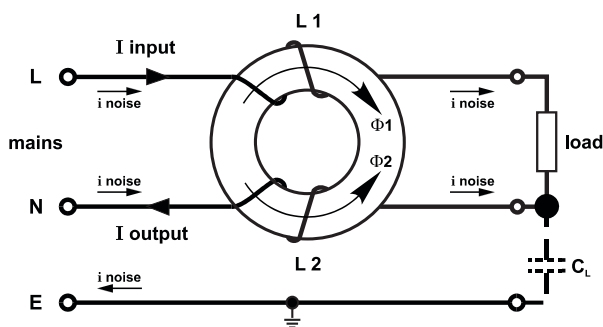
As early as the first space flights it was noticed that a reliable flight mission of these complex systems can only be achieved if sufficient account is taken of the reciprocal interference effects between the own complex and sensitive part systems. The systems must be designed compatible both with regard to the self-created (internal interference suppression) as well as with regard to the interference to be expected from outside (external interference protection). In this context the term “**Electro-magnetic compatibility**” (EMC) developed which has progressed from an originally to a major extent theoretic term into a factor that today it is hard to imagine being without even in practice.

Tested and certified according to DIN EN 60938-2  
(VDE 0565-2-1):2008-02; EN 60938-2:1999+ A1:2007; IEC 60938-2(ed.2); am1

**The electro-magnetic compatibility (EMC) is the capability of an electrical facility, installation, device, structural component to function satisfactorily in its electro- magnetic environment without influencing this environment in an unauthorised manner.**

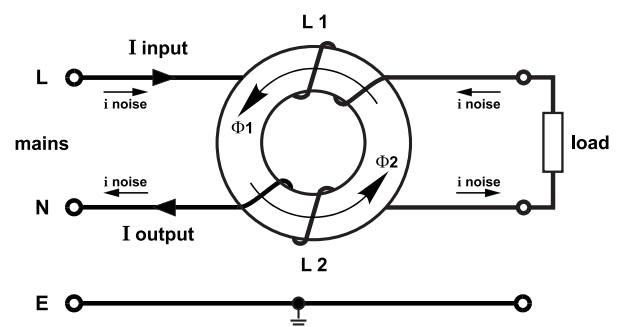
In this respect the world-wide applicable EMC regulations state that as from 1<sup>st</sup> January 1997 all electrical and electronic devices and installations may only be brought onto the market or distributed in the EU States if they are EMC conform.

## Symmetric / asymmetric interferences Current compensated chokes



**Current-compensated switched interference suppression toroidal core chokes**

The magnetic fluxes  $\Phi 1$  and  $\Phi 2$  created by the nominal current cancel each other out reciprocally. The choke will not become saturated through the nominal current  $I$  and can have a high inductance value at the same time. The full inductance which can reach high values ( $L_N = 1-100$  mH) then has an effect for all asymmetric interference components. Here only the leakage inductance (approx.  $L_N / 100$ ) has an effect with respect to symmetric interference factors. In the asymmetric interference system the current path runs via both conductors L/N through to the earth E.



**Non current-compensated switched interference suppression toroidal core chokes**

With individual windings a high flux density is achieved even with low useful currents. In this respect the permeability becomes saturated very early ( $\mu_r = 1$ ). In this area the coil only has the impedance of a similarly structured air-core coil with regard to each smallest current alteration. Consequently it is only suitable for applications with low inductance requirement. Only the relatively low inductance ( $L_N = 0.1-1$  mH) then has an effect for symmetric and asymmetric interference systems. In the symmetric interference system the current path runs exclusively between the two conductors L to N.

## Main test data for interference suppression chokes as per standard EN 60938 - 2

### Test voltage

Chokes for AC applications:

4.3 U<sub>R</sub> V<sub>DC</sub> winding - winding

2 U<sub>R</sub> +1500 V<sub>AC</sub> winding-environment

Chokes for DC applications:

3 U<sub>R</sub> V<sub>DC</sub> winding - winding

2 U<sub>R</sub> +1500 V<sub>DC</sub> winding-environment

Test duration:

2 seconds for final production test (unit check)

This test can be repeated once

e. g. during customer receipt test

60 seconds for random sample test (type check)

### Max. operating voltage

U<sub>R</sub> rated voltage or

U<sub>N</sub> nominal voltage or

U<sub>B</sub> rating voltage

All of these definitions are normal in practice depending on the testing body.

All of these values correspond to the mains voltage +10%.

The mains frequency has been determined as f = 50/60 Hz.

### Inductance test

Tolerances:

-30% +50% for current-compensated chokes

±15% for non current-compensated chokes

Measuring frequency with measuring current approx. 0.1 mA:

50 ÷ 120 Hz for L > 50 mH

10 kHz for 1 < L ≤ 50 mH

100 kHz for 10 μH < L ≤ 1 mH

Measuring frequency tolerances ±20%

Ambient measuring temperature +25°C ±3°C

### Nominal current I<sub>N</sub>

The max. current values with corresponding ambient temperature are set out in the data tables.

The following applies for compensated chokes:

I<sub>N</sub> at 40°C ambient

I = 0 on 100°C ambient

The following applies for non compensated chokes:

I<sub>N</sub> at 70°C ambient

I = 0 on 125°C ambient

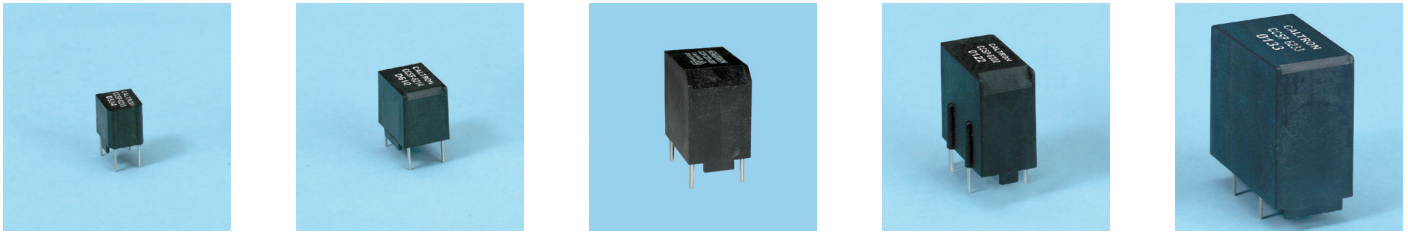
### Quality assurance QA

In the year 1998 CALTRON obtained the ISO certificate 9002. Caltron has implemented and maintains a Quality Management System which fulfills the requirements of the following standard: ISO 9001:2015

All parameters are subjected to a 100% test procedure.



# CURRENT COMPENSATED INTERFERENCE SUPPRESSION CHOKES



## CCSP - 10, 14, 20, 22, 33

## SERIES IN VERTICAL VERSION

Chokes in vertical version enable a very space economising, compact structure on the printed circuit board.

All choke types comply with the guidelines of EN 60938-2 and also bear the test label.

In combination with suitable capacitors, high quality interference suppression filters against parasite interference influences are achieved.

Main application fields are:

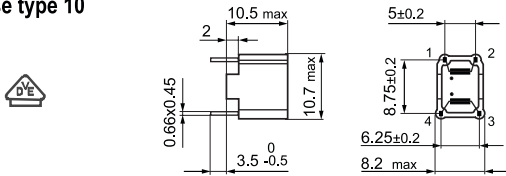
general purpose filtering of parasite disturbance factors, above all with asymmetric interferences e.g. in frequency converters, switch mode power supplies, automotive electronics, etc.

Optimum adaptation of core materials and technical design guarantee the best possible compliance with the world-wide high requirements with the smallest volume.

The simple construction enables high performance parameters with the smallest heat development and an optimum price-performance ratio. Four closed housings are complemented by one version in open structure.

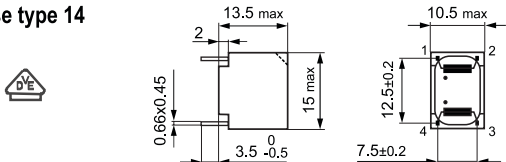
<b>Nominal current</b>	: 0,5 ÷ 6A
<b>Nominal inductance</b>	: 0,5 ÷ 39 mH
<b>Max. operating voltage</b>	: UR (See table)
<b>Test voltage</b>	: 1.8 kVAC / 2s, wdg. to wdg. (1,5 kVAC for 6210 type) 2 kVAC / 2s, wdg. to ambient
<b>Operating frequency</b>	: DC to 400 Hz
<b>Climatic class</b>	: 25/100/21 as per IEC 60068-1
<b>Inflammability</b>	: UL 94 V-0

### Case type 10



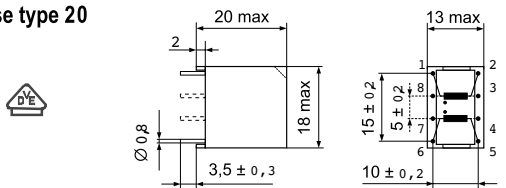
Type	I <sub>N</sub> [A] @ 9a 40°C	L <sub>N</sub> [mH] -30/+50%	R <sub>Cu</sub> [mΩ] ± 10%	P <sub>loss</sub> [W]	f <sub>res</sub> [MHz] approx.	UR [VAC]
CCSP-6210-D504	0.5	2 x 3.9	2 x 500	0.3	1.2	250
CCSP-6210-0102	0.9	2 x 2	2 x 240	0.4	1.6	250
CCSP-6210-02D5	2	2 x 0.5	2 x 50	0.4	4.5	250

### Case type 14



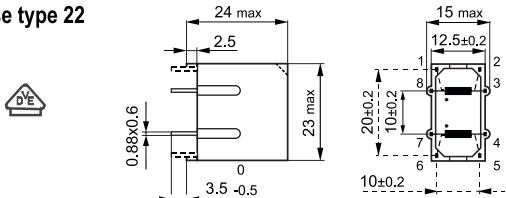
CCSP-6214-D610	0.63	2 x 10	2 x 570	0.4	0.5	250
CCSP-6214-0104	1	2 x 3.9	2 x 250	0.5	1.2	250
CCSP-6214-0201	2	2 x 1	2 x 65	0.5	2.5	250

### Case type 20



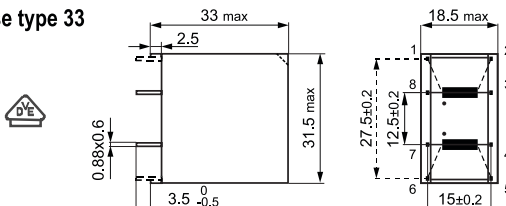
CCSP-C220-D327	0.3	2 x 27	2 x 2000	0.40	0.2	250
CCSP-C220-0107	1.2	2 x 6.8	2 x 200	0.58	0.8	250
CCSP-C220-0204	2	2 x 3.9	2 x 80	0.64	1.2	250
CCSP-C220-0402	4	2 x 2	2 x 45	1.44	0.8	250

### Case type 22



CCSP-6222-0122	1	2 x 22	2 x 500	1	0.3	250
CCSP-6222-0206	2	2 x 5.6	2 x 140	1.1	0.6	250
CCSP-6222-0402	4	2 x 1.5	2 x 36	1.2	1.5	250

### Case type 33



CCSP-6233-0133	1	2 x 33	2 x 700	1.4	0.3	250
CCSP-6233-0207	2	2 x 6.8	2 x 150	1.2	0.5	250
CCSP-6233-0602	6	2 x 2	2 x 24	1.8	1.2	250

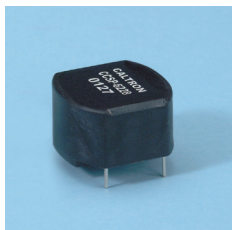
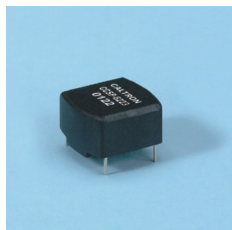
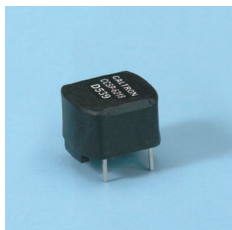
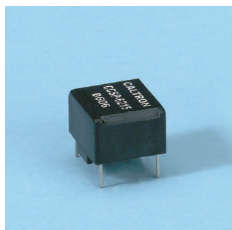
Current derating over 40°C:  $I = I_N \cdot \sqrt{(100 - 9a) / 60}$

L<sub>N</sub> measured according to EN 60938-2

R<sub>Cu</sub> measured at 25°C ambient temperature

SMD versions and customer-specific components on request

# CURRENT COMPENSATED INTERFERENCE SUPPRESSION CHOKES



## CCSP - 15, 18, 23, 28

## SERIES IN HORIZONTAL VERSION

Chokes in horizontal version enable space economising, flat printed circuit board assembly.

All choke types conform to the guidelines of EN 60938-2 and also bear the test label.

In combination with suitable capacitors, high quality interference suppression filters against parasite interference influences are achieved.

Main application fields are:

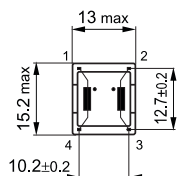
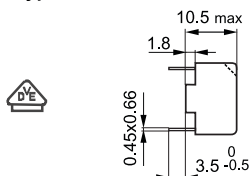
general purpose filtering of parasite disturbance factors, above all with asymmetric interferences e.g. in frequency converters, switch mode power supplies, automotive electronics, etc.

Optimum adaptation of core materials and technical design guarantee the best possible compliance with the world-wide high requirements with the smallest volume.

The simple construction enables high performance parameters with the smallest heat development and an optimum price-performance ratio. The customer has a choice of four closed housings.

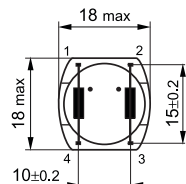
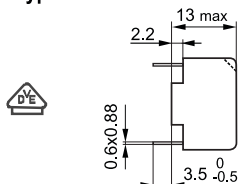
<b>Nominal current</b>	: 0,5 ÷ 4A
<b>Nominal inductance</b>	: 0,5 ÷ 39 mH
<b>Max. operating voltage</b>	: UR (See table)
<b>Test voltage</b>	: 1.8 kVAC / 2s, wdg. to wdg. 2 kVAC / 2s, wdg. to ambient
<b>Operating frequency</b>	: DC to 400 Hz
<b>Climatic class</b>	: 25/100/21 as per IEC 60068-1
<b>Inflammability</b>	: UL 94 V-0

### Case type 15



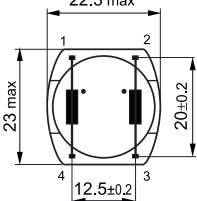
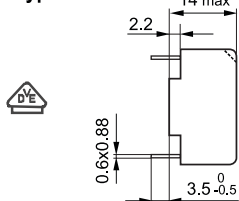
Type	$I_N$ [A] @ 9a 40°C	$L_N$ [mH] -30/+50%	$R_{Cu}$ [mΩ] ± 10%	$P_{loss}$ [W]	$f_{res}$ [MHz] approx.	UR [VAC]
CCSP-6215-D606	0.63	2 x 5.6	2 x 380	0.3	0.8	250
CCSP-6215-0103	1	2 x 3.3	2 x 240	0.5	1.2	250
CCSP-6215-0201	1.5	2 x 1	2 x 90	0.4	2.5	250

### Case type 18



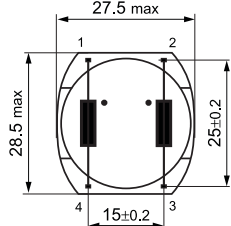
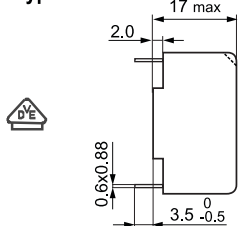
CCSP-6218-D539	0.5	2 x 39	2 x 1200	0.6	0.1	250
CCSP-C218-0107	1.2	2 x 6.8	2 x 200	0.58	0.8	250
CCSP-6218-0203	1.5	2 x 3.3	2 x 110	0.5	1.2	250
CCSP-6218-04D7	4	2 x 0.7	2 x 18	0.6	2.5	250

### Case type 23



CCSP-6223-0122	1	2 x 22	2 x 500	1	0.3	250
CCSP-6223-0206	2	2 x 5.6	2 x 140	1.1	0.6	250
CCSP-6223-0402	4	2 x 1.5	2 x 36	1.2	1.5	250

### Case type 28



CCSP-C228-0127	1	2 x 27	2 x 400	0.8	0.1	250
CCSP-C228-0207	2	2 x 6.8	2 x 120	1	0.3	250
CCSP-C228-0403	4	2 x 2.7	2 x 48	1.5	0.5	250
CCSP-C228-0402	4	2 x 1.5	2 x 36	1.2	1.5	250

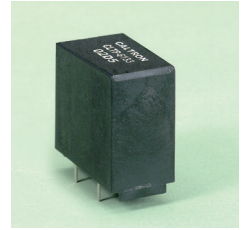
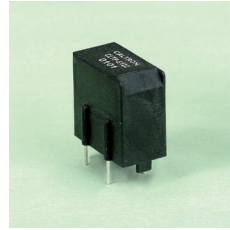
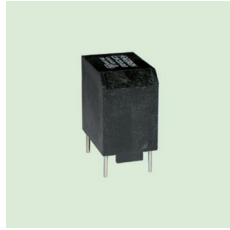
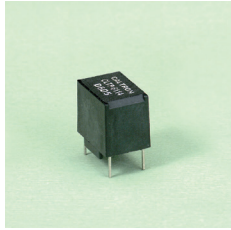
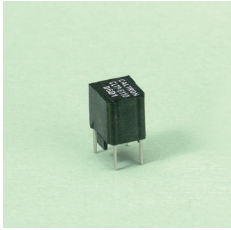
Current derating over 40°C:  $I = I_N \cdot \sqrt{(100 - 9a) / 60}$

$L_N$  measured according to EN 60938-2

$R_{Cu}$  measured at 25°C ambient temperature

SMD versions and customer-specific components on request

# NON COMPENSATED (LINEAR) INTERFERENCE SUPPRESSION CHOKES



## CLTP - 10, 14, 20, 22, 33

## SERIES IN VERTICAL VERSION

Chokes in vertical version enable space economising, compact printed circuit board assembly.

All choke types comply with the guidelines of EN 60938-2.

In combination with suitable capacitors, high quality interference suppression filters against parasite interference influences are achieved. Main application fields are:

general purpose filtering of parasite disturbance factors above all with symmetric interferences e.g. in frequency converters, switch mode power supplies, automotive electronics etc.

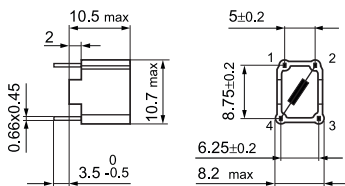
Frequently they are also used in combination with current compensated interference suppression chokes.

Optimum adaptation of core materials and technical design guarantee the best possible compliance with the world-wide high requirements with the smallest volume.

The simple construction enables high performance parameters with the smallest heat development and an optimum price-performance ratio. Four closed housings are complemented by one version in open structure.

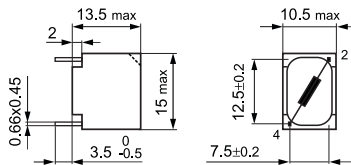
<b>Nominal current</b>	<b>: 0,63 ÷ 4 A</b>
<b>Inductance at <math>I_N = 0</math></b>	<b>: 47 ÷ 1000 <math>\mu</math>H</b>
<b>Inductance drop at <math>I_N</math></b>	<b>: approx. 30%</b>
<b>Max. operating voltage</b>	<b>: <math>U_R</math> 600 V<sub>DC</sub></b>
<b>Operating frequency</b>	<b>: up to 20 kHz</b>
<b>Test voltage</b>	<b>: 2 kV<sub>AC</sub> / 2s, wdg. to ambient</b>
<b>Climatic class</b>	<b>: 40/125/21 as per IEC 60068-1</b>
<b>Inflammability</b>	<b>: UL 94 V-0</b>

### Case type 10



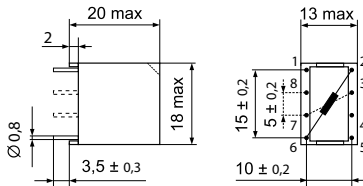
Type	$I_N$ [A] @ 9a 70°C	$L_0$ [ $\mu$ H] ± 15%	$R_{Cu}$ [m $\Omega$ ] ± 10%	$P_{loss}$ [W]	$f_{res}$ [MHz] approx.
CLTP-6110-D6D1	0.63	100	600	0.3	9
CLTP-6110-01C5	1	47	270	0.3	16

### Case type 14



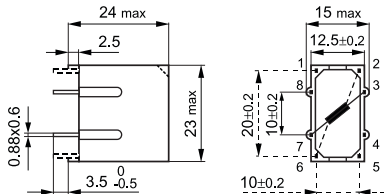
CLTP-6114-D6D5	0.63	470	750	0.3	1.5
CLTP-6114-01D2	1	180	245	0.3	3
CLTP-6114-02C5	2	47	60	0.3	11

### Case type 20



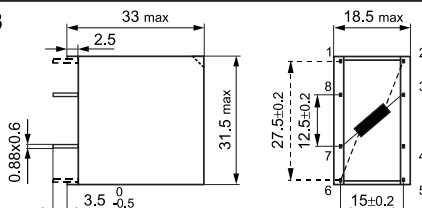
CLTP-6120-D6D7	0.63	680	700	0.3	0.9
CLTP-6120-02D1	1.5	120	140	0.3	3.5
CLTP-6120-03C3	3.15	27	30	0.3	16

### Case type 22



CLTP-6122-0101	1	1000	650	0.7	1.6
CLTP-6122-02D3	2	270	170	0.7	2
CLTP-6122-04C7	4	68	35	0.6	9

### Case type 33



CLTP-6133-02D5	2	470	290	1.2	2
CLTP-6133-03D2	3.15	180	90	0.9	4
CLTP-6133-04D1	4	120	52	0.9	6.5

Current derating over 70°C:  $I = I_N \cdot \sqrt{(125 - 9a) / 55}$

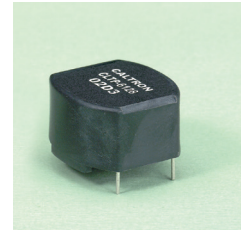
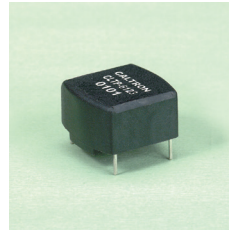
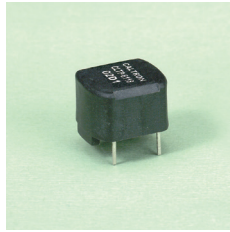
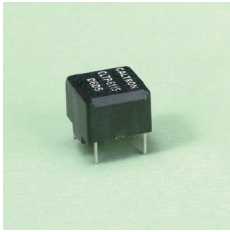
$L_0$  measured according to EN 60938-2

$R_{Cu}$  measured at 25°C ambient temperature

SMD versions and customer-specific components on request



# Non COMPENSATED (LINEAR) INTERFERENCE SUPPRESSION CHOKES



## CLTP - 15, 18, 23, 28

## SERIES IN HORIZONTAL VERSION

Chokes in horizontal version enable space economising, flat printed circuit board assembly.

All choke types comply with the guidelines of EN 60938-2.

In combination with suitable capacitors high quality interference suppression filters against parasite interference influences are achieved. Main application fields are:

general purpose filtering of parasite disturbance factors above all with symmetric interferences e.g. in frequency converters, switch mode power supplies, automotive electronics etc.

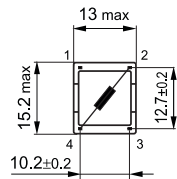
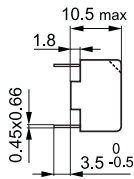
Frequently they are also used in combination with current compensated interference suppression chokes.

Optimum adaptation of core materials and technical design guarantee the best possible compliance to the world-wide high requirements with the smallest volume.

The simple construction enables high performance parameters with the smallest heat development and an optimum price-performance ratio. The customer can select between four closed housings.

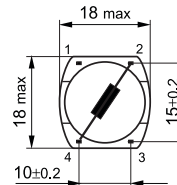
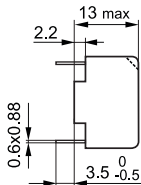
<b>Nominal current</b>	: 0,63 ÷ 4A
<b>Inductance at <math>I_N = 0</math></b>	: 27 ÷ 1000 $\mu$ H
<b>Inductance drop at <math>I_N</math></b>	: approx. 30%
<b>Max. operating voltage</b>	: UR 600 VDC
<b>Operating frequency</b>	: up to 20 kHz
<b>Test voltage</b>	: 2 kVAC / 2s, wdg. to ambient
<b>Climatic class</b>	: 40/125/21 as per IEC 60068-1
<b>Inflammability</b>	: UL 94 V-0

### Case type 15



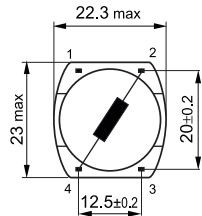
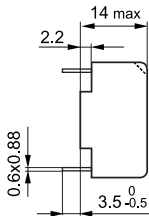
Type	$I_N$ [A] @ 9a 70°C	$L_0$ [ $\mu$ H] ± 15%	$R_{Cu}$ [m $\Omega$ ] ± 10%	$P_{loss}$ [W]	$f_{res}$ [MHz] approx.
CLTP-6115-D6D5	0.63	470	750	0.3	1.5
CLTP-6115-01D2	1	180	245	0.3	3

### Case type 18



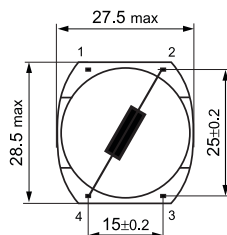
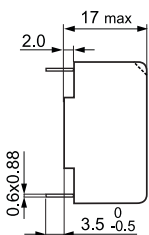
CLTP-6118-D6D7	0.63	680	700	0.3	0.9
CLTP-6118-02D1	1.5	120	140	0.3	3.5
CLTP-6118-03C3	3.15	27	30	0.3	16

### Case type 23



CLTP-6123-0101	1	1000	650	0.7	1.6
CLTP-6123-02D3	2	270	170	0.7	2
CLTP-6123-04C7	4	68	35	0.6	9

### Case type 28



CLTP-6128-02D3	2	330	170	0.7	2
CLTP-6128-03D2	3.15	150	70	0.7	5
CLTP-6128-04D1	4	100	42	0.7	6

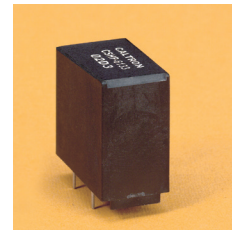
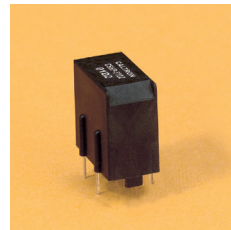
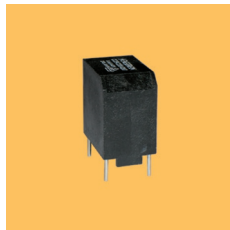
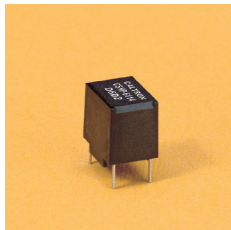
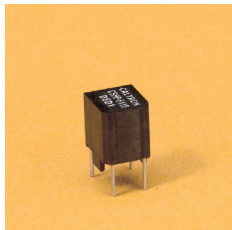
Current derating over 70°C:  $I = I_N \cdot \sqrt{(125 - 9a) / 55}$

$L_0$  measured according to EN 60938-2

$R_{Cu}$  measured at 25°C ambient temperature

SMD versions and customer-specific components on request

# ENERGY STORAGE CHOKES



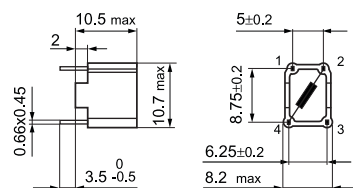
## CSHP - 10, 14, 20, 22, 33

## SERIES IN VERTICAL VERSION

Chokes in vertical version enable very space economising, compact printed circuit board assembly. Storage chokes are used in switching power supplies (switch mode regulators) as intermediate energy storage. These modern supply units offer fundamental advantages compared with older linear regulators: small construction size, low power losses, good efficiency and best no load operation behaviour. In order to achieve these advantages, only high quality materials must be used as toroidal core. CALTRON storage chokes achieve their super qualities above all through the use of the special material Molypermalloy, an 80% nickel-iron compound. Compared with the iron powder core material the thermal behaviour at high switching frequencies (<200kHz) is excellent. The chokes have an almost constant inductance even with high alternating field modulation and high DC pre-magnetising current. The simple construction enables high performance parameters with low heat development and an optimum price-performance ratio. Four closed housings are complemented by one version in open structure.

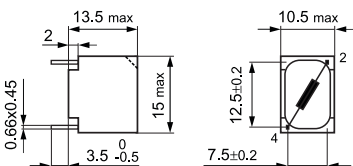
<b>Nominal current</b>	: 0,63 ÷ 4A
<b>HF current ripple</b>	: $\Delta I = 20\% I_N$
<b>Inductance at <math>I_N = 0</math></b>	: 15 ÷ 390 $\mu\text{H}$
<b>Inductance drop at <math>I_N</math></b>	: max. 20%
<b>Max. operating voltage</b>	: UR 600 VDC
<b>Operating frequency</b>	: up to 200 kHz
<b>Test voltage</b>	: 2 kVAC / 2s, wdg. to ambient
<b>Climatic class</b>	: 40/125/21 as per IEC 60068-1
<b>Inflammability</b>	: UL 94 V-0

### Case type 10



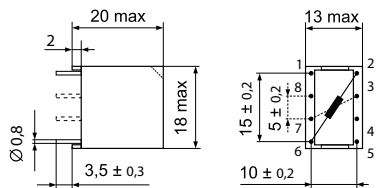
Type	$I_N$ [A] @ 9a 70°C	$L_o$ [ $\mu\text{H}$ ] $\pm 15\%$	$R_{Cu}$ [m $\Omega$ ] $\pm 10\%$	$P_{loss}$ [W]	$f_{res}$ [MHz] approx.
CSHP-6110-D6D1	0.63	100	550	0.2	10
CSHP-6110-01C4	1	39	280	0.3	18

### Case type 14



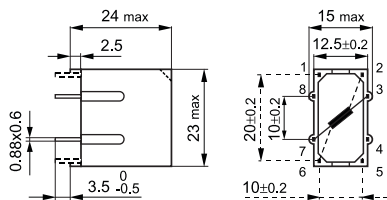
CSHP-6114-D6D2	0.63	150	300	0.1	7
CSHP-6114-01C6	1	56	100	0.1	12
CSHP-6114-02C2	2	15	27	0.1	31

### Case type 20



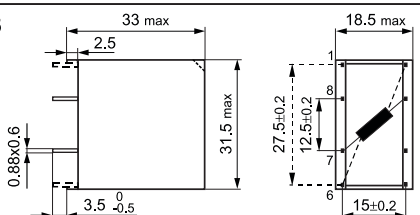
CSHP-6120-D6D5	0.63	470	360	0.2	3
CSHP-6120-01D1	1.3	120	92	0.2	6.5
CSHP-6120-02C5	2	47	37	0.2	12

### Case type 22



CSHP-6122-01D2	1.3	220	160	0.3	4.5
CSHP-6122-02D1	2	100	75	0.3	6.5
CSHP-6122-03C4	3.15	39	32	0.3	14

### Case type 33



CSHP-6133-02D3	2	330	140	0.6	3.5
CSHP-6133-03D2	3.15	150	40	0.4	5
CSHP-6133-04D1	4	100	35	0.6	6.5

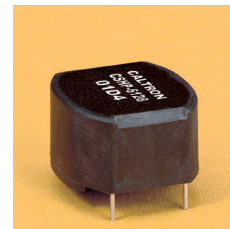
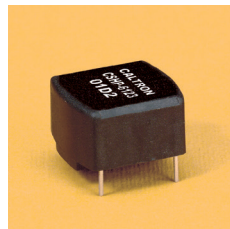
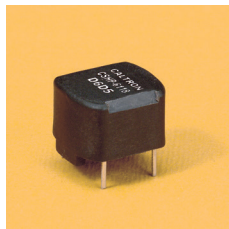
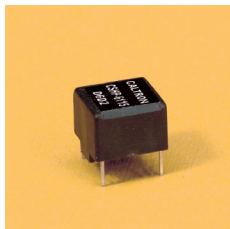
Current derating over 70°C:  $I = I_N \cdot \sqrt{(125 - 9a) / 55}$

$L_o$  measured according to EN 60938-2

$R_{Cu}$  measured at 25°C ambient temperature

SMD versions and customer-specific components on request

# ENERGY STORAGE CHOKES



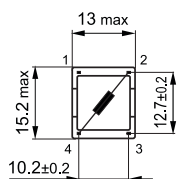
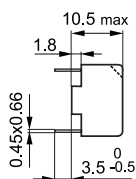
## CSHP - 15, 18, 23, 28

## SERIES IN HORIZONTAL VERSION

Chokes in horizontal version enable space economising, flat printed circuit board assembly. Storage chokes are used in switching power supplies (switch mode regulators) as intermediate energy storage. These modern supply units offer fundamental advantages compared with older linear regulators: small construction size, low power losses, good efficiency and best no load operation behaviour. In order to achieve these advantages only high quality materials must be used as toroidal core. CALTRON storage chokes achieve their super qualities above all through the use of the special material Molypermalloy, an 80% nickel-iron compound. Compared with the iron powder core material the thermal conduct at high switching frequencies (<200kHz) is excellent. The chokes have an almost constant inductance even with high alternating field modulation and high DC pre-magnetising current. The simple construction enables high performance parameters with low heat development and an optimum price-performance ratio. The customer can select between four closed housings.

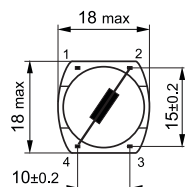
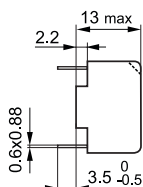
<b>Nominal current</b>	: 0,63 ÷ 4A
<b>HF current ripple</b>	: $\Delta I = 20\% I_N$
<b>Inductance at <math>I_N = 0</math></b>	: 39 ÷ 470 $\mu\text{H}$
<b>Inductance drop at <math>I_N</math></b>	: max. 20%
<b>Max. operating voltage</b>	: UR 600 V <sub>DC</sub>
<b>Operating frequency</b>	: up to 200 kHz
<b>Test voltage</b>	: 2 kV <sub>AC</sub> / 2s, wdg. to ambient
<b>Climatic class</b>	: 40/125/21 as per IEC 60068-1
<b>Flammability</b>	: UL 94 V-0

### Case type 15



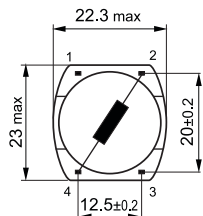
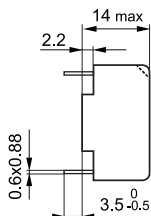
Type	$I_N$ [A] @ 9a 70°C	$L_o$ [ $\mu\text{H}$ ] ± 15%	$R_{Cu}$ [m $\Omega$ ] ± 10%	$P_{loss}$ [W]	$f_{res}$ [MHz] approx.
CSHP-6115-D6D2	0.63	150	300	0.1	6.5
CSHP-6115-01C6	1	56	100	0.1	11

### Case type 18



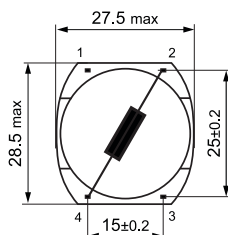
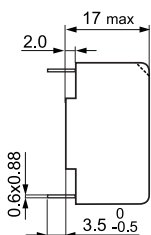
CSHP-6118-D6D5	0.63	470	360	0.2	3
CSHP-6118-01D1	1.3	120	92	0.2	6.5
CSHP-6118-02C5	2	47	37	0.2	12

### Case type 23



CSHP-6123-01D2	1.3	220	160	0.3	4.5
CSHP-6123-02D1	2	100	75	0.3	6.5
CSHP-6123-03C4	3.15	39	32	0.3	14

### Case type 28



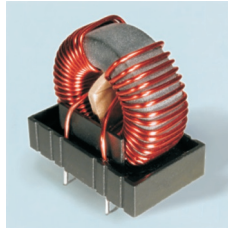
CSHP-6128-01D5	1.3	470	250	0.5	2.5
CSHP-6128-02D2	2	220	110	0.5	3.5
CSHP-6128-04C5	4	47	26	0.5	10

Current derating over 70°C:  $I = I_N \cdot \sqrt{(125 - 9a) / 55}$

$L_o$  measured according to EN 60938-2

$R_{Cu}$  measured at 25°C ambient temperature

SMD versions and customer-specific components on request



**CCST - 31**

**OPTIMA SERIES**

## General Information

Chokes in vertical version enable a very space economizing, compact structure on the printed circuit board. All choke types comply with the guidelines of EN 60938-2.

In combination with suitable capacitors, high quality interference suppression filters against parasite interference influences are achieved.

Main application fields are:

General purpose filtering of parasite disturbance factors, above all with symmetric interferences in frequency converters, switch mode power suppliers, automotive electronics, etc.

Optimum adaption of core materials and technical design guarantee the best possible compliance to the world wide high requirement with the smallest volume.

The simple construction enables high performance parameters with the smallest heat development and an optimum price-performance ratio.

## Technical data

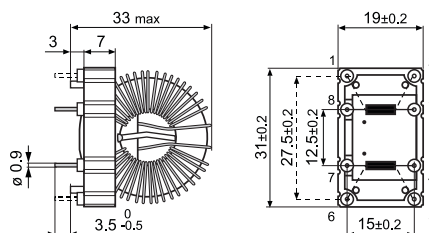
Type	$I_N$ [A] @ 9a 40°C	$L_N$ [mH] -30+50%	$R_{Cu}$ [mΩ] ± 10%	$P_{loss}$ [W]	$f_{res}$ [MHz] approx.	$U_R$ [VAC]
CCST-6231-0139	1	2 x 39	2 x 690	1.4	0.08	440
CCST-6231-0210	2	2 x 10	2 x 270	1.8	0.25	440
CCST-6231-0602	6	2 x 2.2	2 x 27	1.9	1.2	440
CCST-6231-0801	8	2 x 1.2	2 x 16	2	1.6	440

Other ratings can be supplied upon request

Test voltage wdg.--wdg. : U 1800 Vac/2s  
 Operating frequency : DC to 400kHz  
 Climatic class(IEC60068--1) : 25/100/21  
 Inflammability : UL 94 V--0

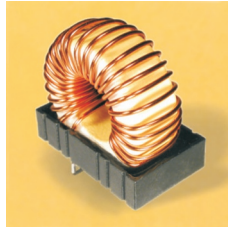
Current derating over 40°C:  $I = I_N \cdot \sqrt{(100 - 9a) / 60}$   
 $L_N$  measured according to EN 60938-2  
 $R_{Cu}$  measured at 25°C ambient temperature

## Mechanical Dimensions



**Case Type 31**

# NON COMPENSATED (LINEAR) INTERFERENCE SUPPRESSION CHOKES



**CLTT - 31**

**OPTIMA SERIES**

## General Information

Chokes in vertical version enable space economizing, compact printed circuit board assembly. All choke types comply with the guidelines of EN 60938-2.

In combination with suitable capacitors, high quality interference suppression filters against parasite interference influences are achieved.

Main application fields are:

General purpose filtering of parasite disturbance factors, above all with symmetric interferences in frequency converters, switch mode power suppliers, automotive electronics, etc.

Often they are also used in combination with current compensated interference suppression chokes.

Optimum adaption of core materials and technical design guarantee the best possible compliance to the world wide high requirement with the smallest volume.

The simple construction enables high performance parameters with the smallest heat development and an optimum price-performance ratio.

## Technical data

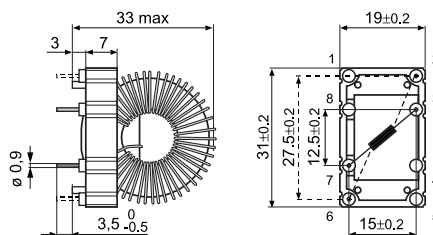
Type	$I_N$ [A] @ 9a 70°C	$L_o$ [μH] ± 15%	$R_{Cu}$ [mΩ] ± 10%	$P_{loss}$ [W]	$f_{res}$ [MHz] approx.	$U_R$ [VDC]
CLTT-6131-02D5	2	560	265	1	2.5	600
CLTT-6131-03D2	3.15	220	105	1	3.5	600
CLTT-6131-04D1	4	150	65	1	5.5	600
CLTT-6131-06C6	6.3	56	30	1.2	14	600

Other ratings can be supplied upon request

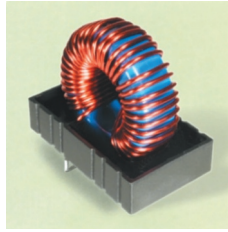
Inductance drop at I : approx. 30%  
 Operating frequency : up to 20 kHz  
 Climatic class(IEC 60068-1) : 40/125/21  
 Inflammability : UL 94 V-0

Current derating over 70°C:  $I = I_N \cdot \sqrt{(125 - 9a) / 55}$   
 $L_o$  measured according to EN 60938-2  
 $R_{Cu}$  measured at 25°C ambient temperature

## Mechanical Dimensions



**Case Type 31**



**CSHT - 31**

**OPTIMA SERIES**

## General Information

Chokes in vertical version enable space economizing, compact printed circuit board assembly. Storage chokes are used in switching power supply (switch mode regulators) as intermediate energy storage. These modern supply units offer big advantages compared with older linear regulators: Small construction size, low power losses, good efficiency and best no load operation behavior. In order to achieve these advantages only high quality materials must be used as toroidal core. CALTRON storage chokes achieve their super qualities above all through the use of the special material Molypermalloy, an 80% nickel-iron compound. Compared with the iron powder core material the thermal behavior at high switching frequencies (<200 kHz) is excellent. The chokes have an almost constant inductance even with high alternating field modulation and high DC pre-magnetizing current. The simple construction enables high performance parameters with low heat development and an optimum price/performance ratio.

## Technical data

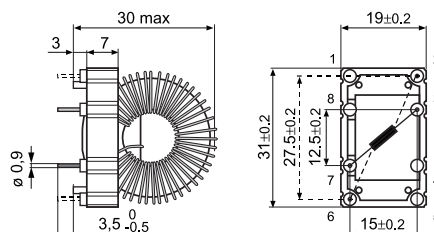
Type	$I_N$ [A] @ 9a 70°C	$L_o$ [μH] ± 15%	$R_{Cu}$ [mΩ] ± 10%	$P_{loss}$ [W]	$f_{res}$ [MHz] approx.	$U_R$ [VDC]
CSHT-6131-02D3	2	390	155	0.6	3	600
CSHT-6131-03D2	3.15	180	55	0.6	5.5	600
CSHT-6131-04D1	4	120	37	0.6	7	600
CSHT-6131-06C4	6.3	39	16	0.6	15	600

**Other ratings can be supplied upon request**

HF-current ripple :  $\Delta I$  max. 20% I  
 Inductance drop at I : approx. 20%  
 Climatic class(IEC 60068-1) : 40/125/21  
 Inflammability : UL 94 V-0

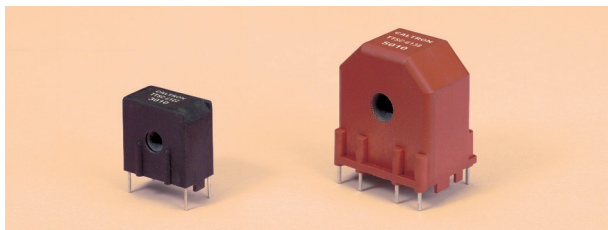
Current derating over 70°C:  $I = I_N \cdot \sqrt{(125 - 9a) / 55}$   
 $L_o$  measured according to EN 60938-2  
 $R_{Cu}$  measured at 25°C ambient temperature

## Mechanical Dimensions



**Case Type 31**

# 50/60 Hz CURRENT TRANSFORMERS



## TTSC AND TTHC - 22, 38

## SERIES IN VERTICAL VERSION

Current transformers in vertical version enable space economising, compact printed circuit board assembly. The simple construction enables high performance parameters with low heat development and an optimum price-performance ratio.

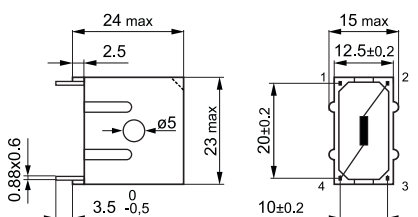
The customer has a choice between two closed housings.

Current transformers are simple, passive components for the purpose of converting high operating currents into rather smaller measuring currents. A distinction is made between the types Universal (TTSC) with 3% accuracy and High Performance (TTHC) with 1% precision.

With the ideal "galvanic separation" resulting from the structure and construction the safety requirements of industry are fulfilled in full.

<b>Primary current <math>I_N</math></b>	: up to 50 Amp. AC 50 / 60 Hz
<b>Resolution</b>	: 3% TTSC types, 1% TTHC types
<b>Isolation stability</b>	: 4 kVAc
<b>Operating temperature</b>	: - 40°C up to +70°C
<b>Climatic class</b>	: 40/70/21 as per IEC 60068-1
<b>Inflammability</b>	: UL 94 V-0

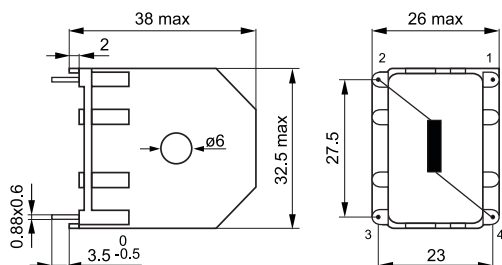
### Case type 22



Type	Turn ratio [N]	$I_N$ prim. [A]	U output <sup>①</sup> [V]	R burden [ $\Omega$ ]	Resolution [%]
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TTSC-6122-3010	1 : 1000	30	1	33.3	3
TTHC-6122-1010	1 : 1000	10	1	100	1

### Case type 38



TTSC-6138-5010	1 : 1000	50	1	20	3
TTHC-6138-3010	1 : 1000	30	1	33.3	1

① @ 50 Hz / 25°C

R burden : secondary meas. resistor

## Explanations

The pulse transformer (IT) is used above all as drive module from the control electronics to the power part. In almost all applications a control pulse is transformed, galvanically separated, to the high voltage potentials. Whether with the ignition of thyristors and triacs or when driving modern components such as FET's or IGBT's, the pulse transformer is used everywhere.

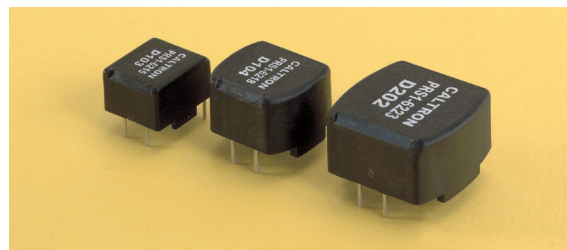
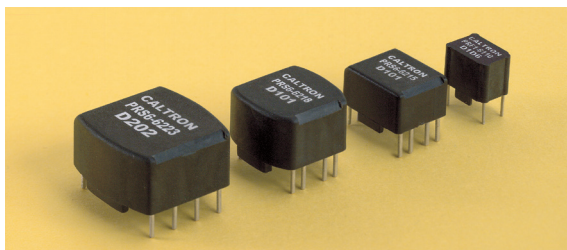
It is also used in telecommunications as a galvanic separating element in data transmission devices. Compared with the solution using opto couplers a simplified switching structure and direct energy transfer are possible (no auxiliary supply necessary). Pulse transformers have an almost unlimited life span, this is a further major advantage compared with the optical solutions with relatively low MTBF values.

## Definitions:

- N** : turn ratio or voltage ratio between primary and secondary windings.
- $\int Udt$**  : voltage-time area ( $V\mu s$ )  
This is the product of impulse height and pulse width measured at half impulse height.
- $t_r$**  : Pulse rise time ( $\mu s$ )  
This time is measured from 10% ÷ 90% of the pulse height.
- $I_f$**  : Firing current (A)  
Max. available pulse current.
- $L_p$**  : Primary inductance (mH)  
Measured as per EN 60938 ( signal 0.1mA, tolerance -30 +50%).
- $C_c$**  : Coupling capacity (pF)  
Measured between primary and secondary winding.  
Is heavily dependent on the winding structure.
- $U_R$**  : Maximum operating voltage (V).
- $U_p$**  : Test voltage (kV)  
Measured between primary and secondary winding  
Also dependent on the winding structure.  
Measurement 100% in the final test (up to 3.5 kV AC for 2 seconds).
- $U_G$**  : Glow discharge voltage (V)  
Determines the life expectancy of the IT's in operation with excessive operating voltage.  
At least 50% higher than the max. operating voltage.
- $P_d$**  : Maximum power loss at 50°C ambient temperature.



# PULSE TRANSFORMERS



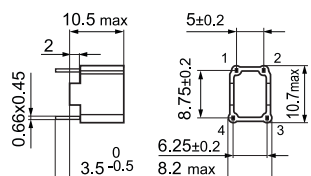
## PRS AND PRF - 10, 15, 18, 23

## SERIES IN HORIZONTAL VERSION

Pulse transformers in horizontal version enable space economising, flat printed circuit board assembly. The simple construction enables high performance parameters with low heat development and an optimum price-performance ratio. The customer has a selection of four closed housings.

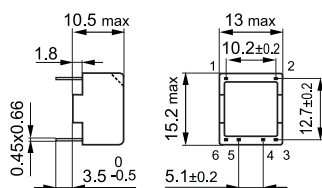
<b>Turns ratios</b>	: 1 : 1 - 2 : 1 - 1 : 1 : 1
<b>Voltage-time area <math>\int Udt</math></b>	: 25 to 400 $V\mu s$
<b>Pulse rise time <math>t_r</math></b>	: 0.05 to 1.5 $\mu s$
<b>Max. operating voltage <math>U_R</math></b>	: 600 VAC (380 VAC for 6110 type)
<b>Test voltage</b>	: $U_p$ (See table)
<b>Glow discharge voltage <math>U_G</math></b>	: 1.5 x max. $U_R$
<b>Climatic class</b>	: 25/100/21 as per IEC 60068-1
<b>Inflammability</b>	: UL 94 V-0

### Case type 10



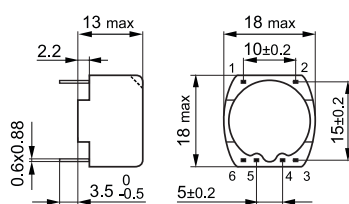
Connections	Type	Turn ratio [N]	$\int Udt$ [ $V\mu s$ ]	$t_r$ [ $\mu s$ ]	$I_r$ [A]	$R_L$ [ $\Omega$ ]	$L_p$ [mH]	$R_p$ [ $\Omega$ ]	$R_s$ [ $\Omega$ ]	$C_c$ [pF]	$U_p$ [kVAC]	$P_d$ [W]
	PRF1-6110-D1D6	1 : 1	50	0.3	0.1	100	0.6	0.4	0.4	10	2.2	0.3
	PRF2-6110-D1D6	2 : 1	25	0.1	0.1	100	0.6	0.4	0.2	10	2.2	0.3

### Case type 15



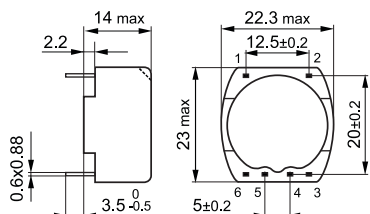
	PRS1-6215-D103	1 : 1	200	1.5	0.1	100	3.2	1	1	20	3.5	0.4
	PRS2-6215-D105	2 : 1	150	1	0.1	100	5	1	0.5	20	3.5	0.4
	PRS6-6215-D101	1 : 1 : 1	150	1	0.1	100	1.2	0.5	0.5	20	3.5	0.4

### Case type 18



	PRS1-6218-D104	1 : 1	300	1.5	0.1	100	3.7	0.7	0.7	20	3.5	0.6
	PRF1-6218-D104	1 : 1	300	0.05	0.1	100	3.7	0.7	0.7	90	3.2	0.6
	PRS2-6218-D106	2 : 1	250	1	0.1	100	6.8	1	0.5	20	3.5	0.6
	PRF2-6218-D106	2 : 1	250	0.05	0.1	100	5.6	1	0.5	70	3.2	0.6
	PRS6-6218-D101	1 : 1 : 1	250	1	0.1	100	1.8	0.5	0.5	20	3.5	0.6
	PRF6-6218-D101	1 : 1 : 1	250	0.05	0.1	100	1.4	0.5	0.5	70	3.2	0.6

### Case type 23



	PRS1-6223-D202	1 : 1	400	1.5	0.15	68	2.4	0.4	0.4	20	3.5	0.8
	PRF1-6223-D502	1 : 1	400	0.15	0.5	20	2.4	0.4	0.4	100	3.2	0.8
	PRS2-6223-D207	2 : 1	350	1.5	0.15	68	7.2	0.8	0.4	20	3.5	0.8
	PRF2-6223-D507	2 : 1	350	0.5	0.5	20	7.2	0.8	0.4	90	3.2	0.8
	PRS6-6223-D202	1 : 1 : 1	350	1.5	0.15	68	1.8	0.4	0.4	20	3.5	0.8
	PRF6-6223-D502	1 : 1 : 1	350	0.5	0.5	20	1.8	0.4	0.4	90	3.2	0.8

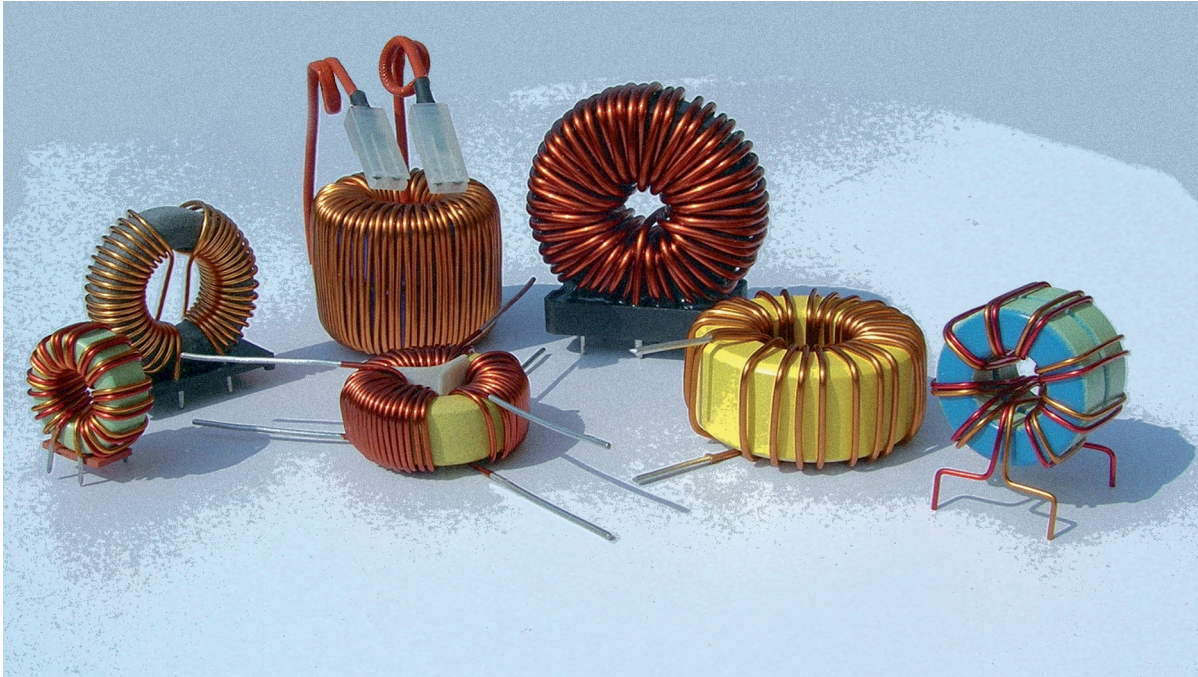
Power dissipation derating over 50°C:  $P = P_d \cdot (100 - 9a) / 50$

$L_N$  measured according to EN 60938 - 2

$R_{cu}$  measured at 25°C ambient temperature

SMD versions and customer-specific components on request

# HIGH CURRENT TOROIDAL CORE CHOKES



In the broad product field of winding materials, particularly in the special area “toroidal core chokes” CALTRON is in a position to develop and even to produce components for applications with high nominal currents, high nominal output power. Suitable toroidal winding machines as well as pulling machines, so-called “pull winders” help make it possible to execute this type of products. In addition to our standard programme we can offer components for the following areas of application:

- Frequency converters
- UPS systems
- Motor drives
- Switching power supplies

We specialise in the following products:

- **Compensated multiple chokes; P+N; 3P; 3P+N**

Nominal current : up to 100 Amp.  
Nominal inductance : up to 20 mHenry  
Operating voltage : up to 560 VAC  
Test voltage : up to 1800 VAC / 2 seconds, winding to winding

- **Non-compensated chokes (linear chokes)**

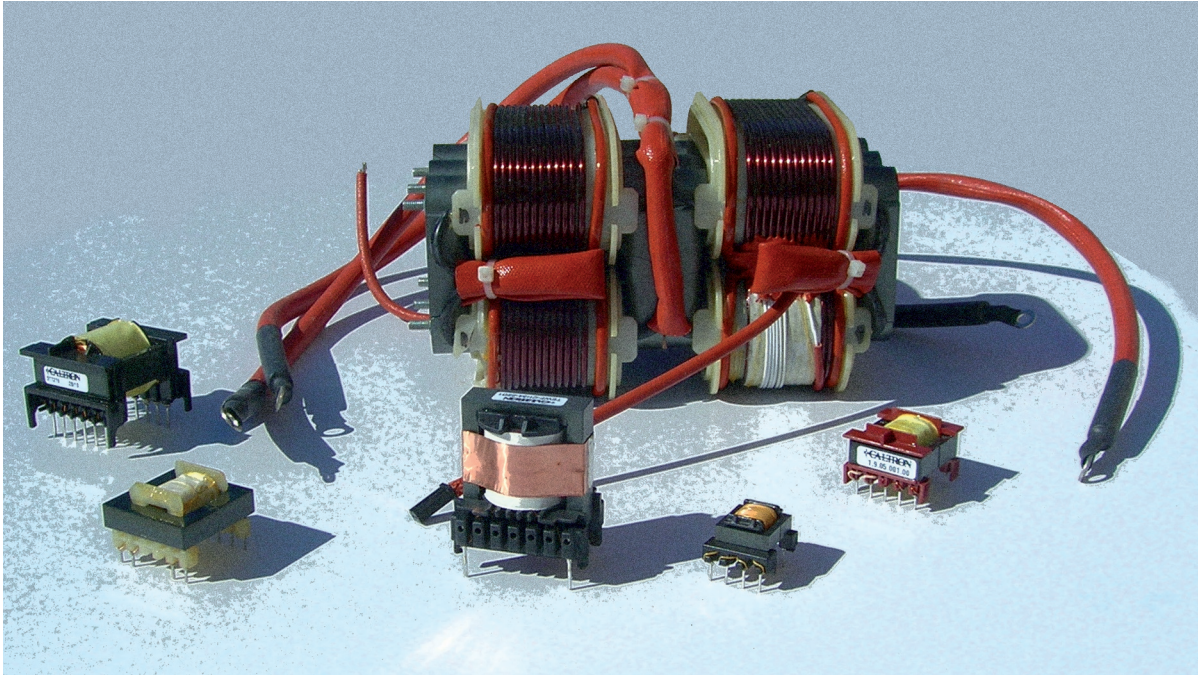
Nominal current : up to 100 Amp.  
Nominal inductance : up to 1'000  $\mu$ Henry  
Operating voltage : up to 600 VDC  
Operating frequency : up to 20 kHz

- **Energy storage chokes**

Nominal current : up to 50 Amp.  
Nominal inductance : up to 500  $\mu$ Henry  
Operating voltage : up to 600 VDC  
Operating frequency : up to 1 MHz (depending on core material)

All of these special chokes are developed and produced in accordance with customer wishes. They are frequently recommended in an open construction in horizontal or vertical version. We shall gladly study your component problem and prepare an optimum offer at short time. CALTRON is able to contribute well over 20 years of engineering experience in this field.

# HIGH FREQUENCY POWER TRANSFORMERS



Compared with conventional 50/60 Hz mains transformers, high frequency power transformers offer the following advantages:

- **Reduced volume and weight**

- **High efficiency degree**

Power transformers are used in many modern power supply applications. Specifically switchings such as Flyback, Forward, Push-Pull and AC/DC or DC/DC converters can be named as main areas of use. Ferrite materials in various forms are used, depending on the application these can be toroidal or EE/EF/ETD and EFD standard cores.

EE/EF cores are the types most widely used in very high volumes.

ETD cores are preferred if simple winding technology and a compact structure are required.

EFD cores are used for extremely flat power transformer structures.

## Technical threshold data:

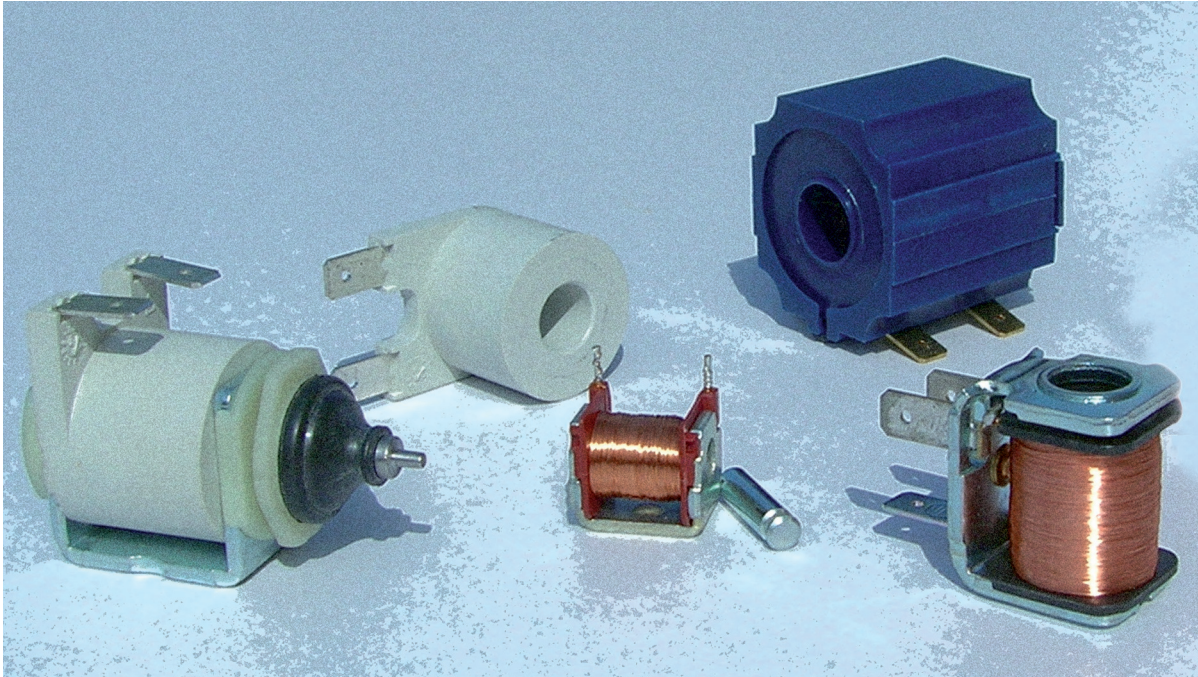
- Power transformer output : up to 1.000 Watt
- Operating frequency : up to 1 MHz (depending on the ferrite material)
- Isolation strenght : up to 4.000 VAC/50Hz /1min.
- Operating temperature : -25°C ÷ +85°C
- Inflammability : as per UL94V-0

Depending on the core form a vertical or horizontal structure is possible.

The windings are wound with copper wire, HF stranded wire or triple isolated wire depending on the requirements. The safety standard conforms to EN 60950.

We shall be pleased to develop and produce your special power transformer in accordance with your specifications. CALTRON is in a position to prepare a prototype with data sheet in the shortest of time.

# SOLENOIDS



Our product range offers extensive line of AC and DC linear Solenoids. They are transducer devices that convert energy into linear motion. Applications are solenoids valve ; either pneumatic or hydraulic valve. Also solenoid switch which is a specific type of Relay.

• **Technical threshold data :**

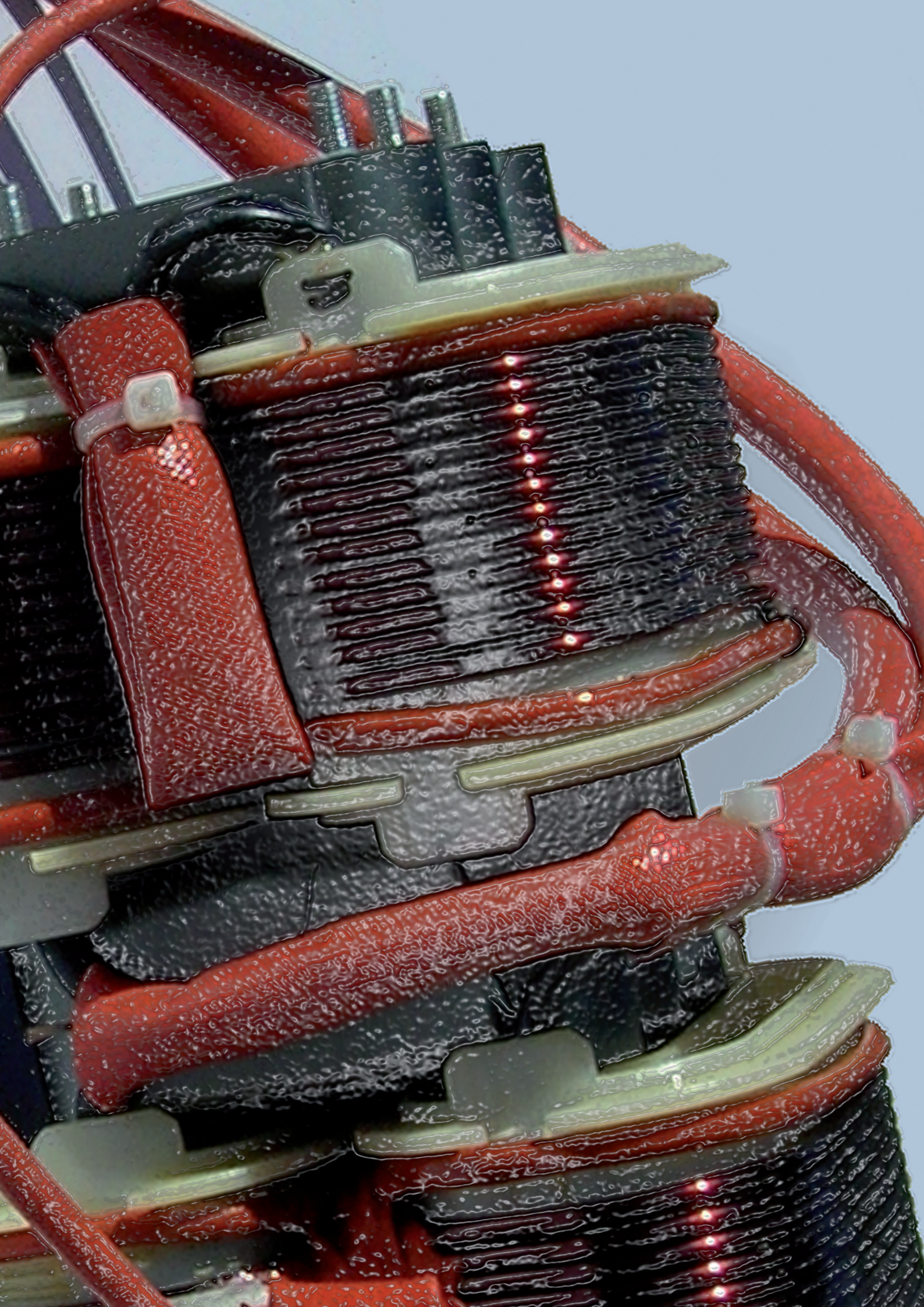
Surge Test : up to 2'500

Operating Temperature : up to 125°C

Inflammability : UL94 V-0

We shall also be pleased to develop and produce components for special application in accordance with your own specifications.

CALTRON is in a position to prepare a prototype with data sheet in the shortest time.







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