NPCT – New Parametric Current Transformer

Application
The Parametric Current transformer is used on most particles accelerators in the world to measure the average beam current. It is an essential instrument for accelerator tuning and operation. It is primarily used on particle sources, cyclotrons, medical synchrotrons, HEP research accelerators and light sources.

Operating principle
The NPCT works on the second harmonic detection principle. Two cores are modulated to deep saturation in opposite phase. A primary DC current flowing through the cores shifts the cores’ working point in opposite polarity which generates a second harmonic of the modulator frequency.

The primary current AC component is detected by an AC Hereward transformer. The two circuits are cascaded in a common feedback loop to generate a magnetic flux which always cancel the primary current flux. The NPCT output is the voltage developed by the feedback current passing through a precision resistor.

Two packaging types for the NPCT sensor

In-flange NPCT sensor to mount in the beam line

In-air NPCT sensor for installation over the vacuum chamber

NPCT Chassis with NPCT-E electronics and power supplies

DC beam current non-destructive measurement
Four ranges ± 20mA, ± 200mA, ± 2A and ± 20A
<0.5µA/√Hz noise, i.e. resolution, on option
DC to 10 kHz (-3dB) frequency response
< 0.1% linearity error
NPCT package includes spares for all electronics

The New Parametric Current Transformer is the latest evolution of the Unser Transformer, commonly called DCCT, developed at CERN in 1966 by Klaus B. Unser.

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Specifications

Full scale ranges ±20mA, ±200 mA, ±2A, ±20A
Range control 2 TTL lines on rear panel DB9
Output ±10 V
Output over range up to ±12V
Output bandwidth (-3dB) 8 kHz in 20-mA range
10 kHz in other ranges
Response time (@ 90%) < 50 us
Resolution
Standard model < 5µ Arms/sqrt(Hz)
High Resolution model < 1µ Arms/sqrt(Hz)
Very High Resolution model < 0.5µ Arms/sqrt(Hz)
Output accuracy ± 0.1% ± zero-offset

Linear error < 0.1%
Temperature coefficient < 0.5µA/K typ.
Operating temperature -40...80° C
Output impedance 100Ω
Output current 10mA max, source or sink
Output connectors Isolated BNC on rear panel and front panel
Test function Injects +100mA in sensor
Test control TTL line on rear panel (DB9)
Calibration winding 10-turn floating calibration winding on sensor from external source
Calibration current (2A max, I > 100Ω)
Calibration connectors Isolated BNC on rear panel and front panel

Sensor head

Connector DB15 male
Temperature coefficient 5µA/K typ.
Sensor baking <100° C, 212F.
Destructive level DC current: Unlimited
Pulse charge >100mC
Sensor saturation flux 10 mT (axial) typ.
2mT (radial) typ.
Sensor sensitivity to external magnetic fields 10µA/mT (axial) typ.
1mA/mT (radial) typ.

Dimensions & Ordering codes

<table>
<thead>
<tr>
<th>In-flange NPCT order code</th>
<th>Pipe OD nominal (mm)</th>
<th>Mating flange ID (mm)</th>
<th>H (axial)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPCT CF2 1/8-22.2-120-UHV</td>
<td>DN20 NW225CF</td>
<td>22.2</td>
<td>120</td>
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<td>NPCT CF2 1/4-34.9-120-UHV</td>
<td>DN40 NW433CF</td>
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</tr>
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<td>NPCT CF4 1/2-60.4-120-UHV</td>
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<td>NPCT CF6 96.0-120-UHV</td>
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<td>NPCT CF10 198.4-120-UHV</td>
<td>DN200 NW200CF</td>
<td>198.4</td>
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</tr>
<tr>
<td>In-air NPCT order code</td>
<td>OD (mm)</td>
<td>Cables</td>
<td></td>
</tr>
<tr>
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<td>9.8</td>
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<td>55</td>
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Cable

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<tr>
<th>Cxx</th>
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<td>Polypropylene FR-LS</td>
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Sensor options (In-flange NPCT only)

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Higher resolution options (applies to all sensors)

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NPCT package includes:

One NPCT sensor head
One interconnect cable
One 19” 3U RF-shielded chassis, with Two power supplies, autotrange AC input (one as spare) Two NPCT electronics cassettes (one as spare)

DISTRIBUTORS

U.S.A.: GMW Associates
www.gmw.com
sales@gmw.com

Japan: REPIC Corp.
www.repic.co.jp
sales@repic.co.jp

India: GEEBEE International
www.geebeinternational.com
info@geebeinternational.com

China: Beijing Conveyi Limited
www.conveyi.com
sales@conveyi.com

MANUFACTURER

BERGOZ Instrumentation
www.bergoz.com
Espace Allondon Ouest
01630 Saint-Gent Pouilly, France
sales@bergoz.com

Bandwidth

200-mA Range

Calibration connectors

Output accuracy: ±0.1% ± zero-offset

Output

Output current: 10mA max, source or sink

Connector

DB15 male

Temperature coefficient

5µA/K typ.

Sensor baking

<100°C, 212°F.

Destructive level

DC current: Unlimited

Pulse charge

>100mC

Sensor saturation flux

10 mT (axial) typ.

2mT (radial) typ.

Sensor sensitivity to external magnetic fields

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