CWCT & BCM-CW-E

High-resolution current measurement of CW beams or macropulses

Beam repetition frequency 15 to 200 MHz

Average current with 1 µA rms resolution
With Low Current Option: ≤8 nA rms resolution

Fast beam loss interlock 1 µs
Linearity error <1.5 %
Beam loss resolution <1 %

Independent of bunch shape and width
Low temperature dependence, EMI immune

Operating principle

CWCT and BCM-CW-E

The CWCT is a current transformer with strict limits on lower and upper cut-off frequencies, tailored to the beam structure. Its lower cut-off frequency is tuned to get a high enough droop to allow fast differentiation while retaining a stable baseline between bunches. Its upper cut-off frequency is high enough to properly distinguish individual bunches. Yet, it is low enough to remove high frequency noise.

The BCM-CW-E is the electronics module processing the CWCT output signal. By applying fast sample-and-hold techniques it measures the average beam current with microsecond response time.
Properly adjusted signal amplification and filtering improves the resolution of small beam current fluctuations.

Low Currents Option (LC)

To measure beams with tens of nanoamperes intensity, a shielded front-end electronics can be directly attached to the sensor.
This front-end consists of a Low-Noise Amplifier and specially tuned filters.

With the LC-CWCT and BCM-CW-E, a few nanoamperes resolution can be reached.

Performance

Typical performance of the 100 Hz output signal

	Standard CWCT			LC-CWCT (CWCT with LC option)		
BCM-CW-E Gain	0 dB	20 dB	40 dB	0 dB	20 dB	40 dB
Maximum measurable current	100 mA	20 mA	2 mA	50 µA	20 µA	2 µA
Resolution	100 µA rms	10 µA rms	1 µA rms	250 nA rms	25 nA rms	8 nA rms

MANUFACTURER

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CWCT & BCM-CW-E

Inputs / Outputs specifications

Outputs for beam current measurement

BCM Output (SMA)

Nominal range	-1 V … +1 V
Bandwidth	350 kHz (-3 dB)
Readout impedance	50 Ω
Response time	<1 µs (10 %-90 %)

Output View (BNC)

Nominal range	-4 V … +4 V
Bandwidth	350 kHz (-3 dB)
Readout impedance	High impedance
Response time	<1 µs (10 %-90 %)

"DB9,3" Output

Nominal range	-4 V … +4 V
Bandwidth	100 Hz (-3 dB)
Readout impedance	High impedance
Response time	<3.5 ms (10 %-90 %)

"DB9,8" Output

Nominal range	-4 V … +4 V
Bandwidth	10 kHz (-3 dB)
Readout impedance	High impedance
Response time	<35 µs (10 %-90 %)

Other Inputs / Outputs

Trigger in (SMA)	External RF clock input
Bandwidth	15 MHz.. 200 MHz
Amplitude range	Sine wave: -25 dBm… 0 dBm Square wave: 20 mVpp… 200 mVpp
Input impedance	50 Ω

Timing View (BNC)	Internal delayed clock output
Nominal range	40 mVp-p (Square Wave)
Readout impedance	50 Ω

Signal View (BNC)	CWCT signal after amplification
Nominal range	-0.5 V… +0.5 V
Readout impedance	50 Ω

"DB9,6" & "DB9,2" inputs
Gain selection (0 dB/20 dB/40 dB)
TTL compatible

USB 2.0
Gain selection (0 dB/20 dB/40 dB);
Digital readout of measured current
Delay line settings

Order codes

CWCT dimensions

In-flange CWCT sensor order code	Pipe OD	Mating flange	ID (mm)
CWCT-CF3"3/8-22.2-40-UHV	1"	DN/NW50CF	22.2
CWCT-CF4"1/2-34.9-40-UHV	1.5"	DN/NW63CF	34.9
CWCT-CF4"1/2-38.0-40-UHV	40 mm	DN/NW63CF	38.0
CWCT-CF6"-47.7-40-UHV	2"	DN/NW100CF	47.7
CWCT-CF6"-60.4-40-UHV	2.5"	DN/NW100CF	60.4
CWCT-CF6"3/4-96.0-40-UHV	4"	DN/NW130CF	96.0
CWCT-CF8"-96.0-40-UHV	4"	DN160/NW150CF	96.0
CWCT-CF10"-147.6-40-UHV	6"	DN/NW200CF	147.6
CWCT-CF12"-198.4-40-UHV	8"	DN/NW250CF	198.4
		Axial length (mm)	40.0

Cables

BCM-C-xx: Coaxial cable with PTFE connector dielectric, xx meters

BCM-RHC-xx: Radiation-tolerant coaxial cable with Radox insulation, PEEK connector dielectric, xx meters

BCM-C400-xx: LMR400 cable or similar cable, xx meters

BCM-CW-E electronics

BCM-CW-E: Eurocard format 100 x 160mm, 20mm wide
To be plugged into BCM-RFC chassis station

BCM-RFC chassis

BCM-RFC/xx: 19"x3U RF-shielded chassis with xx wired stations (max. 10)
AC mains 90-125 Vac or 220-245 Vac
Switch selectable 50/60 Hz

Options

LC-	Low Currents Option (resolution ≤8 nA rms)
-H	Radiation-tolerant sensor
-316LN	AISI 316LN instead of AISI 304 SS
-ARB#xx	Arbitrary shape aperture
-BK150C	150 °C (300 °F) bakeable

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