Power Electronic Measurements

ROGOWSKI CURRENT WAVEFORM TRANSDUCERS

INSTRUCTIONS FOR USE

CWTUM-F & CWTUMHF-F

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INTRODUCTION

The CWT Ultra-Mini-F & CWTUMHF-F (CWT) Rogowski Current Waveform Transducer from PEM combines high bandwidth performance with minimal disruption to the circuit under test. These instructions must be followed whenever the CWT is used. They are intended to help you obtain the best and safest performance from the transducer. Retain these instructions in a safe place for future use.

Throughout these instructions there are a number of warnings which must be observed to ensure safe operation of this CWT. These warnings are identified by the following symbol:

CAUTION

The intended use is for the measurement of AC current. PEM accepts no responsibility for any damage resulting from careless use, or failure to observe these instructions.

PEM shall not be liable for any consequential damages, losses, costs or expenses arising from the use or misuse of this product however caused.

TECHNICAL SPECIFICATION

Peak Current	Refer to ID Label
Peak Output Voltage	±6V (corresponding to ±Peak Current Rating)
Output Cable	0.5m BNC to BNC 50Ω cable Functional Earth. It is recommended that the BNC terminal be connected to earthed equipment.
Output Load	≥ 100kΩ (for rated accuracy – recommend DC1MΩ on scope) = 50Ω (CWT can drive a 50Ω load if necessary) NB. A load of 50Ω will reduce the CWT sensitivity by half its normal value **and** limit the peak output voltage to ±2V.
Bandwidth (-3dB)	Refer to the datasheet
Operating Temp. Range	0°C to +40°C *(Integrator electronics)* -40°C to +125°C *(Coil and cable)*

Measurement Category	CAT II 300V, 1.2kV Peak

Absolute di/dt Ratings	100kA/µs peak | 1.0kA/µs rms

Accuracy (typ.)	**(5% to 100% Peak Current)**
Calibration	Nominally ±0.2% with the conductor central in the Rogowski loop. See the calibration certificate for further details.
Positional Accuracy	±2% variation of accuracy with conductor position in the loop (see 'Obtaining The Best Measurement')
Linearity	±0.05% of reading
Noise (Typ)	Refer to datasheet

Max Coil Separation	14mm (Coil Mid-Point)

Environmental	Indoor use / Altitude up to 2000m Pollution Degree 2. Max. Rel. Humidity: 80% up to 31°C Decreasing Linearly to 50% at 40°C

Operation with External Adaptor	
DC Supply Voltage	12Vdc (+/-10%)
DC Quiescent Current	60mA @12VDC – '**B'** version Standard Alkaline Battery 130mA @12VDC – '**R**' version NiMH Rechargeable Battery
DC Socket Type	1.3mm x 3.5mm Jack Socket, Centre Positive Tip

Adaptor Supply Voltage	100 – 240VAC
Adaptor Supply Frequency	50 - 60Hz
Adaptor Supply Current	450mA Max @ 100VAC Input
Supply Voltage Fluctuation	up to 10%
PEM Recommends FRIWO, FW8002/12 available from PEM or authorised distributors.	

Operation with Battery	
'B' version: 4 x 1.5V AA Alkaline	Typical Life: 25 hours
'R' version: 4 x 1.2V NiMH Rechargeable	Typical Life: 10hrs typ. (based on a 2000mAh cell) Typical Recharge Time: 40 hrs

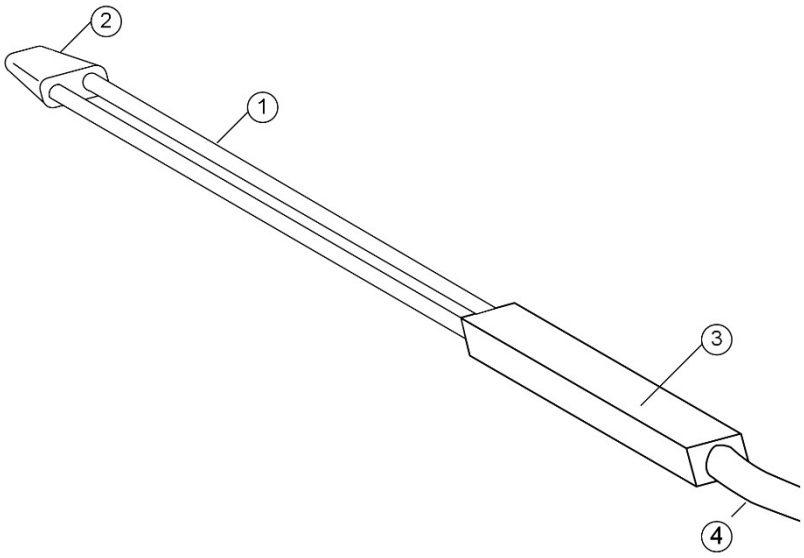
STANDARDS AND APPROVALS

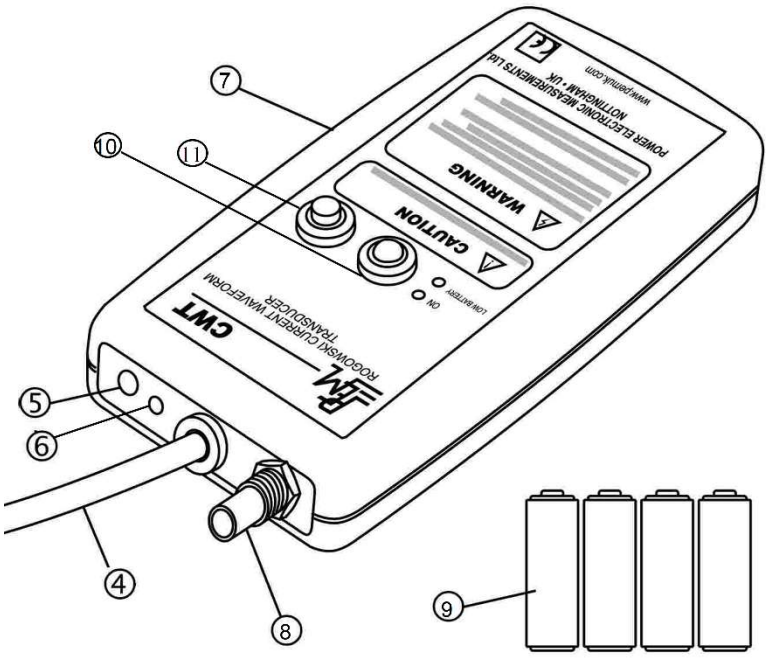
EMC Approvals	EN61326-1:2021 FCC Title 47 (CFR:2010, Part 15b)
Safety Approvals	EN61010-1:2010 EN61010-2-032:2012
Quality System	IS09001:2015

MEASUREMENT CATEGORIES

Category	Location
II	For measurements performed on MAINS socket outlets and similar points in the MAINS installation.
III	For measurements performed on the MAINS distribution parts of a building.
IV	For measurements performed on the source of the MAINS installation.

OVERVIEW: CWTUM-F & CWTUMHF-F





1. **Rogowski Coil** (Probe)
2. **Parallel Endcap**
3. **Ferrule**
4. **Connecting Cable**
5. **DC Power Socket**
6. **DC Power Status LED**
7. **Enclosure**
8. **BNC Output Socket**
9. **4 x AA batteries**
10. **Status Indicator LED**

    GREEN = ON

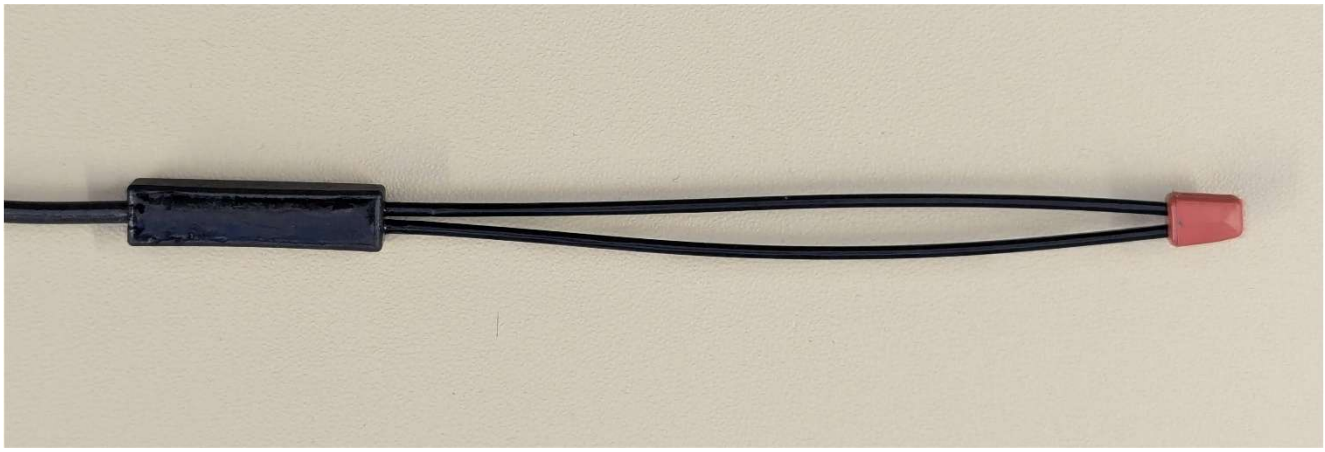
    RED = Battery LOW

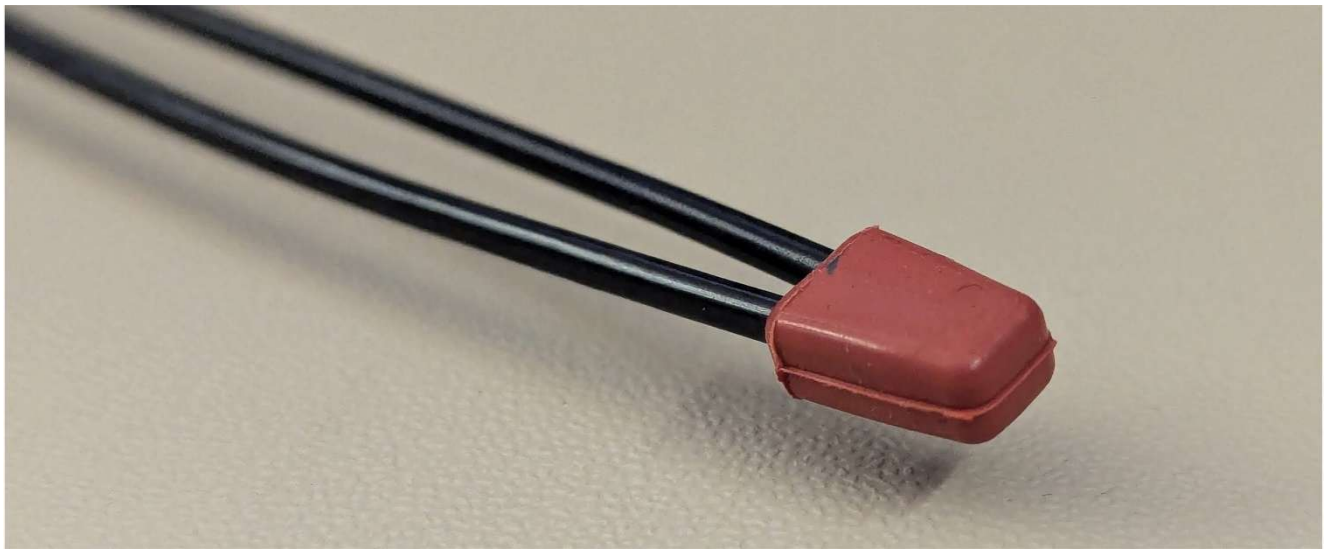
11. **Power Button**

HANDLING INSTRUCTIONS

Every effort has been made to ensure that the CWT is as robust as possible. To achieve such an extremely thin Rogowski coil the CWT is necessarily delicate.

To prolong the life of the coil please observe the following handling instructions.





Never force the free end of the coil into the cap.
This may damage the coil insulation.

Take care not to put any force onto the cable attached to the coil.
This may damage the coil.

When not in use return the coil to its protective case.

The maximum separation of the coils at the mid-point is 14mm (Coil Mid-Point)

SAFETY AND PRE-USE CHECKS

The CWT does not provide protection of the user from electric shock whilst applying or removing the probe from HAZARDOUS LIVE conductors.

The probe must only be applied to or removed from **de-energised** circuits.

The Rogowski coil must not be used if the coil is damaged.

If the CWT is used in a manner not specified by the manufacturer the protection provided by the equipment may be impaired.

THE ROGOWSKI COIL

The insulation around the Rogowski coil must be VISUALLY INSPECTED before use, and the CWT must **NOT BE USED** if there are signs of damage.

When bending the flexible coil around a conductor, avoid bending the coil and sharp edges that could damage the coil.

The safe PEAK working voltage of the Rogowski is clearly labelled on the coil. Never use at voltages greater than this value.

Voltage ratings are only valid if the ‘free end’ of the coil is fully inserted into the end-cap and remains fully inserted during use. The coil has a friction fit, the coil is fully inserted when the user feels they can ease the coil free end into the end-cap no further.

The voltage ratings of the Rogowski coil are appropriate for intermittent use of the CWT as a test instrument and not for continuous use in a permanent installation.

The ratings are derived from the following standard test:
3kVrms / 60s / 50Hz Sinewave

For information regarding permanent installation of PEM’s Rogowski coils on high voltage equipment please consult PEM.

The user must ensure that the absolute maximum rated di/dt is not exceeded

THE INTEGRATOR

Although not relied upon for safety, PEM recommend that the unit is properly grounded to the connected monitoring equipment via the BNC output lead.

POWER OPTIONS

The CWT can be powered by an external DC source or by one of two battery options. The battery option is displayed along with the model type on the CWT serial number label and will state either standard non-rechargeable batteries **[B]** or rechargeable option **[R]**

External Supply

The CWT can be powered by an external DC supply. The DC voltage must be 12V(±10%) using a centre positive connector. When the DC supply is present a RED indicating LED adjacent to the socket is illuminated.

Standard Alkaline Batteries

Four fully charged AA alkaline batteries provide approx. 25 hours operation. Healthy batteries are indicated by the GREEN LED. If the LED is RED the batteries are depleted and must be replaced.

When the DC voltage is present the batteries are inoperative.

Rechargeable Batteries

Four fully charged rechargeable AA cells provide approx. 10 hours operation. Healthy batteries are indicated by the GREEN LED. If the LED is RED, the batteries are depleted and must be replaced or recharged.

When the DC supply is present the batteries are inoperative, and the external DC voltage powers the transducer. In addition, when the DC supply is present (regardless of whether the transducer is ON or OFF) the rechargeable batteries are trickle charged.

REPLACING THE BATTERIES

The circuit under test must be **de-energised** or the probe removed from the test circuit before replacing the batteries.

Low battery is indicated by a red LED located near the power switch. To replace the batteries, switch-off the CWT, remove the battery cover and replace with appropriate batteries for your CWT type.

Alkaline batteries that are deeply discharged are more prone to leaking. PEM strongly advise that for long-term storage, the batteries are removed from the instrument.

SWITCHING ON

Before installing the CWT and taking a measurement refer to SAFETY AND PRE-USE CHECKS and HANDLING INSTRUCTIONS to ensure safe operation of your CWT.

The probe must only be applied to or removed from **de-energised** circuits.

1. Connect the BNC output lead of the transducer to the appropriate oscilloscope or other monitoring equipment.

   Although not relied upon for safety, PEM recommend that the unit is properly grounded to the connected monitoring equipment via the BNC output lead.

2. Having carried out the VISUAL INSPECTION of the Rogowski coil, carefully position the coil around the **de-energised** conductor under test.

3. Insert the ‘free ends’ of the coil fully inside the end-cap.

4. Re-energise the conductor.

5. Use the push button to switch ON by pressing and releasing the button, and to turn OFF by depressing the button fully; the LED indicates that the transducer is ON when the LED is GREEN.

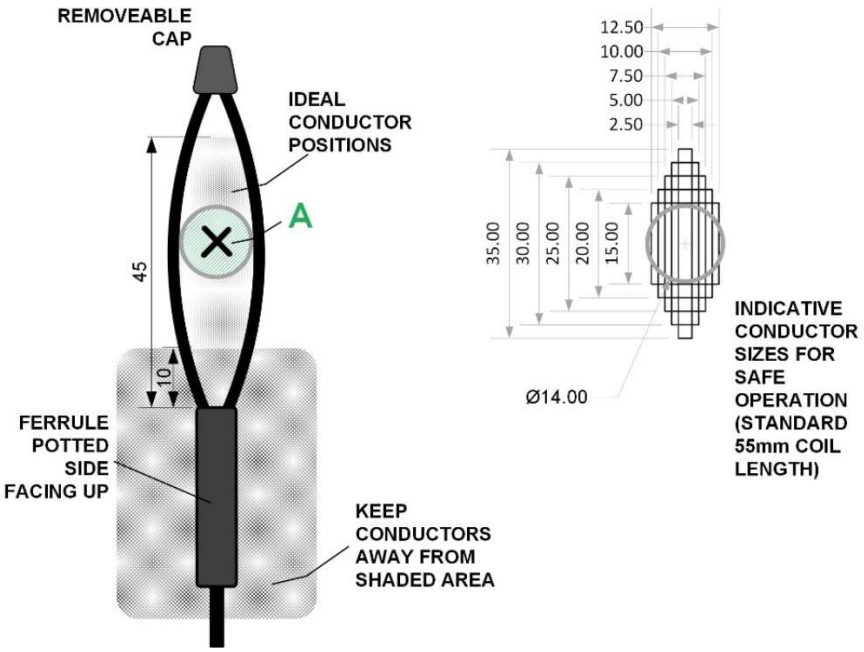
6. After switch-on the CWT may require a settling period of up to 2 minutes before providing correct current measurement. The settling period is dependent on warm-up time and the low frequency bandwidth.

7. PEM recommend that the integrator is kept well away from any strong sources of electromagnetic interference when taking measurements.

OBTAINING THE BEST MEASUREMENT

The CWTUM-F and CWTUMHF-F are calibrated with a conductor at position **A** in the diagram below, with the conductor central in the Rogowski coil, this is the best conductor position for accuracy and high frequency performance. The diagram also shows the direction a positive current should pass through the Rogowski coil in order to obtain a positive output voltage.

The sensitivity of the CWT to currents that are outside the closed loop of the Rogowski coil is small, provided that the external currents are less than the current rating of the CWT or that such currents are relatively distant from the coil. In the vicinity of a multi-turn conductor the effects are far stronger than from a single conductor carrying the same current, and such positions should be avoided. The diagram indicates particular positions where external conductors should be kept away, as these areas are the most susceptible to pick up from external magnetic fields. To check for any unwanted response to adjacent fields, it is recommended to quantify the output of the CWT when close to (but not encircling) the conductor under test. This will reveal the magnitude of any unwanted responses to currents close to, but outside, the coil. The drawing includes indicative maximum conductor sizes for safe operation assuming the Rogowski coil has the standard 55mm coil length.



If there is a surface with a high voltage very close to the coil and the voltage is subject to high rates of change (e.g. 1kV/µs) or high frequency oscillations in the MHz range, then measurement error can arise due to capacitive coupling to the coil. For the CWTUMHF-F interference from external voltages are significantly attenuated due to the electrostatic screen that covers the Rogowski coil.

OUTPUT CABLES

Your CWT has been supplied with a 500mm, 50ohm BNC to BNC output cable. It is possible to use longer cables and these should be of a 50ohm single screened co-axial cable type.

PEM does not consider the use of extension cables to be problematic from the noise viewpoint but consideration should be given to the routing of very long cables.

CLEANING AND DECONTAMINATION

To prevent surface contamination the Rogowski coil and cable should be inspected regularly.

The CWT must be disconnected from any external circuit and turned OFF prior to cleaning.

To clean the coil and cable use a mild detergent and a damp cloth to remove any contamination, wipe dry with clean cloth to remove the detergent and dry thoroughly before placing back into service.

PEM accepts no responsibility for the use of any other cleaning solvents or cleaning methods.

WARRANTY

The coil is guaranteed to be free from defects due to materials and workmanship for 12 months and the integrator for 24 months from the date of despatch from Power Electronic Measurements Ltd.

In the event of a defect where the transducer has not been misused the CWT should be returned to PEM with all freight charges to be paid by the customer. Correction shall be in the form of repair or replacement.

Power Electronic Measurements Ltd shall not be liable for any consequential damages, losses, costs or expenses arising from the use or misuse of this product however caused.

RETURNING YOUR CWT FOR RECALIBRATION OR REPAIR

To return the CWT for repair or recalibration please contact PEM in advance for shipping instructions by emailing service@pemuk.com or visit our website, www.pemuk.com for contact details and our returns procedure.

END OF LIFE DISPOSAL

Once your probe reaches end of life it must be disposed of responsibly and recycled. The device must not be disposed of with household waste.

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