



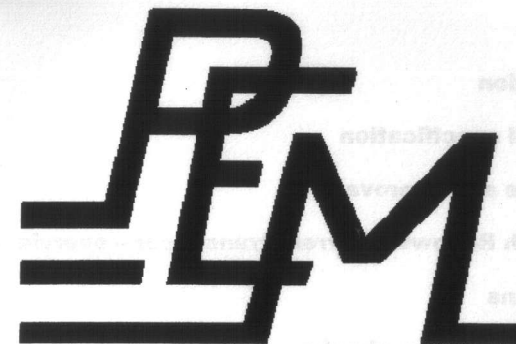
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ROGOWSKI CURRENT TRANSDUCERS

INSTRUCTIONS FOR USE

RCT/- 3ph

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1. INTRODUCTION

The RCT/-3ph is a wide-bandwidth, flexible, clip-around current transducer for measuring ac currents.

PEM's Rogowski Current Waveform Transducers combine high bandwidth, safety, and the minimum disruption to the circuit under test. These instructions should be followed whenever the unit is used. They are intended to help you obtain the best and safest performance from the transducer.

2. TECHNICAL SPECIFICATION

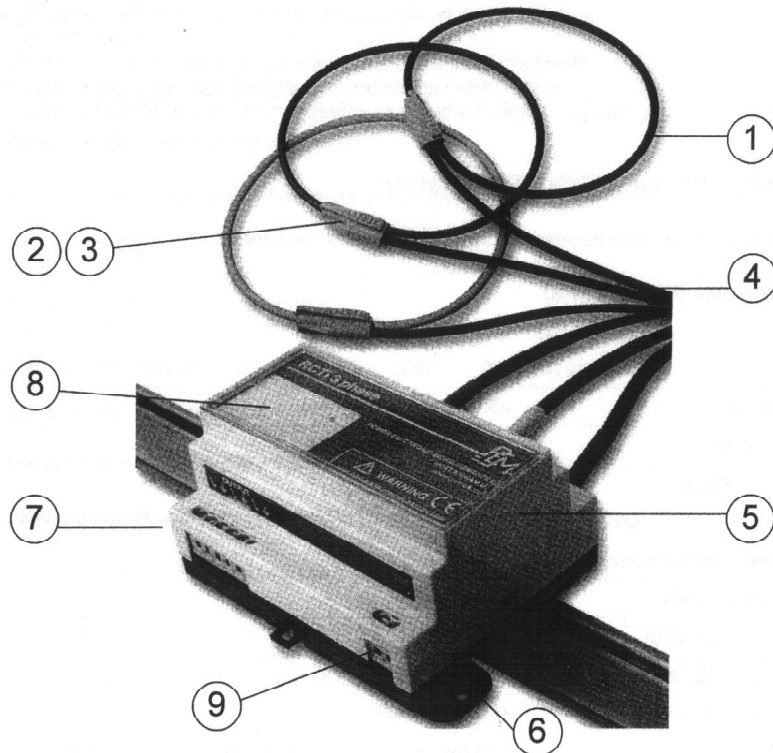
The RCT/-3ph has the following specification (see front page for details of 'Type'):

Current range (Full Scale FS)									
	RCT/-3ph	2	3	4	5	6	7	8	X
	Range (A)	500	1000	2500	5000	10,000	25,000	50,000	
Output FS	±5.0Vrms (±7.07V peak)								
Output limit	150% FS (±10.6V peak)								
Supply voltage	D12 to D24 From - 12Vdc (-10%) at 150.0mA –to- 24Vdc (+20%) at 50.0mA								
Operating temperature range	-5°C to +65°C								
Bandwidth (-3dB)	0.6Hz to 800kHz								
Absolute max di/dt	10kA/μs								
Phase shift @ 50Hz	0.9±0.1 degrees								
Calibrated accuracy	±0.2% of reading with the test current central in the Rogowski loop								
Typical accuracy	±1.0% of reading (5% to 150% FS, 25°C)								
Temperature coefficient	-0.01 (coil) ±0.012 (integrator) %/°C of reading								
Output load	> 10.0kΩ								
Environmental	Indoor use / Altitude up to 2000m Installation Category III, pollution degree 2.								

3. STANDARDS AND APPROVALS

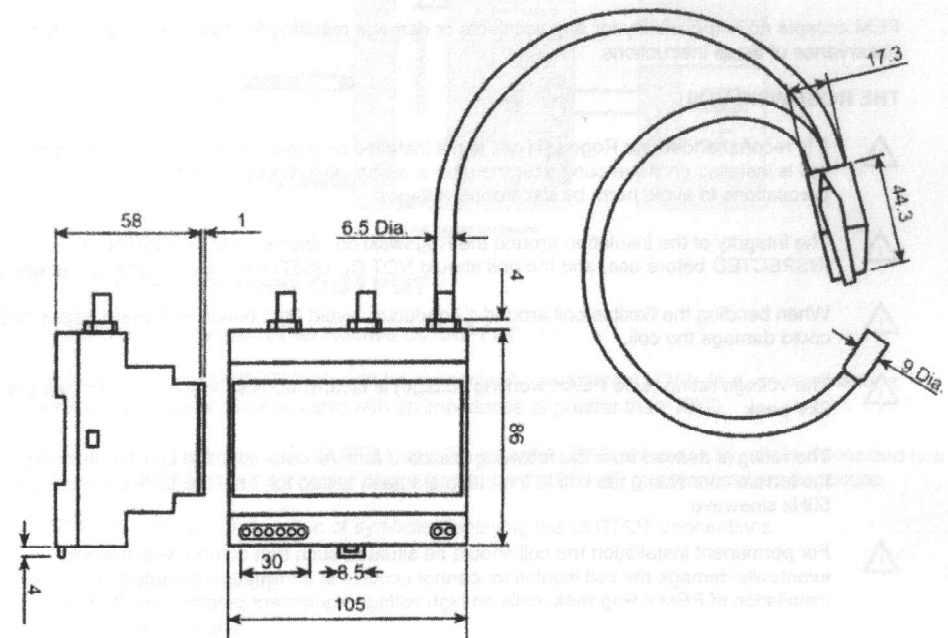
EMC approvals	EN61236
Safety approvals	EN61010:2001 Safety requirements for electrical equipment for measurement, control and laboratory use

4. OVERVIEW: RCT/3ph – ROGOWSKI CURRENT TRANSDUCER



1. Rogowski coil (loop).
2. 'Free-end' of the Rogowski coil
3. Ferrule (the connecting mechanism for closing the Rogowski coil).
4. Cable connecting the Rogowski coil to the integrator - doubly screened low noise co-axial cable.
☐ *The Rogowski coil and connecting cable have double or re-enforced insulation.*
5. Plastic DIN rail mount electronic enclosure housing the electronic integrator.
 For mounting on DIN RAIL according to DIN EN 50 022
6. Position for removable tabs to enable panel mounting of the enclosure.
 Mounting screw size is M4 (not supplied)
7. Rising clamp screw terminal connector plug for fitting 3 x Output cable
 Max/ Min wire size: 2.5 sq.mm / 0.5 sq. mm
 Rated torque / screw size: 0.5Nm / M3
8. Identification label providing details of I.D. Number / current rating / output rating and supply voltage
9. Rising clamp screw terminal connector plug for fitting DC supply cable
 Max/ Min wire size: 2.5 sq.mm / 0.5 sq. mm
 Rated torque / screw size: 0.5Nm / M3

5. DIMENSIONS



All dimensions are in mm





6. SAFETY AND PRE-USE CHECKS



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



PEM accepts no responsibility for any accidents or damage resulting from careless use, or non-observance of these instructions.

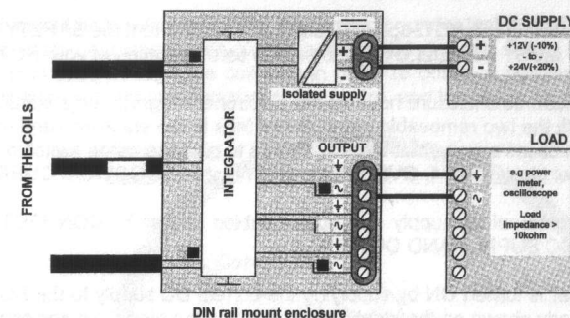
THE ROGOWSKI COIL

-  It is recommended the Rogowski coil is not installed on a live conductor. If the Rogowski coil is installed on a live conductor the user is responsible for taking sufficient safety precautions to avoid harm by hazardous voltages.
-  The integrity of the insulation around the Rogowski coil itself should be VISUALLY INSPECTED before use, and the unit should NOT BE USED if there are signs of damage.
-  When bending the flexible coil around a conductor, avoid tight bends and sharp edges that could damage the coil.
-  The voltage rating (safe PEAK working voltage) is clearly labelled on the coil. The rating is 2kV peak.

The rating is derived from the following standard test: All coils supplied by PEM including the ferrule connecting the coil to the cable are flash tested for 1 minute at 4kVrms using a 50Hz sinewave.
-  For permanent installation the coil should be situated such that corona, which would eventually damage the coil insulation, cannot occur. For information regarding permanent installation of PEM's Rogowski coils on high voltage equipment please consult PEM.
-  Voltage ratings are only valid if the 'free-end' of the coil is fully inserted into the socket, and remains fully inserted during use.

The 'free-end' will be fully inserted when the user feels the free-end of the coil engage with the jaw mechanism of the ferrule. Visual indication that the free-end is fully inserted is observed by ensuring the ferrule jaws overlap the plastic cap on the free-end.

7. CONNECTIONS





8. DC SUPPLY AND OUTPUT

The RCTi-3ph is powered by an external DC SUPPLY.

The OUTPUT from the RCTi-3ph must be connected to an external LOAD (e.g. an oscilloscope, power meter, data acquisition card) with an impedance of greater than 10kΩ.

Connections to the external DC SUPPLY and the external LOAD are made by cables connected to a removable screw terminal connector plug mounted on the DIN rail mount electronic enclosure.



OUTPUT CABLES - Explanation of symbols identifying the OUTPUT connections

-  Voltage signal out.
-  Signal ground.

For best operation a short length <3m of 50 ohm co-axial cable or twisted pair cable should be used to connect the RCTi-3ph output to the load. Although at present this has not been included in the immunity tests and may decrease RF noise immunity, PEM does not consider the use of long cables (> 10m) to be problematic from the noise viewpoint. PEM has conducted tests using a 25m extension and no discernible attenuation of measured current signal has occurred although, as is to be expected, there is an increased measurement delay of 5ns/m.

In some electrically noisy environments it is best practice to use a shielded twisted pair or doubly shielded 50 ohm coaxial cable. In such cases the outer shield should be connected to the ground of the load measuring device and left open circuit at the end connected to the RCTi-3ph.

DC SUPPLY - Explanation of symbols identifying the DC SUPPLY connections

-  Direct current
-  Positive / Negative terminal

The user must power the RCTi-3ph with a suitable external DC power supply which should have the CE mark if the customer requires this certification. Ideally the cable connecting the RCTi to the load should be twin-core power cable of sufficient rating.

In some electrically noisy environments it is best practice to use a shielded twin core power cable. In such cases the shield should be connected to the ground of the external dc power supply and left open circuit at the end connected to the RCTi-3ph.

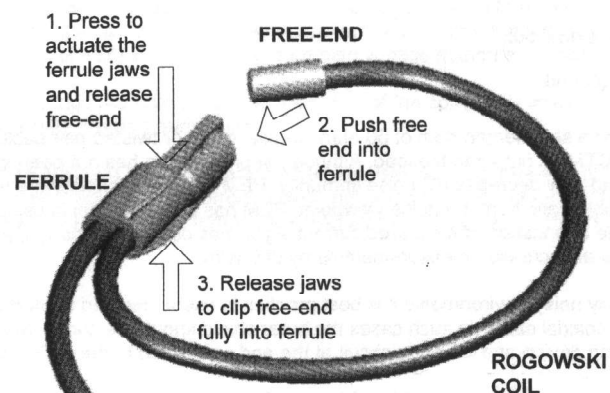
9. INSTALLATION AND TURN-ON

⚠ Before installing the RCTi-3ph and taking a measurement the SAFETY AND PRE-USE CHECKS MUST BE FOLLOWED to ensure safe operation of your RCTi-3ph

1. Mount the electronic enclosure housing the electronic integrator on a suitable DIN rail. Alternatively fit the two removable panel mount tabs to the enclosure and mount to a suitable panel. In both cases ensure that there is access to both the range switch and the removable PCB mount terminal block (see '4. OVERVIEW: RCTi-3ph – ROGOWSKI CURRENT TRANSDUCER')
2. Connect the external dc supply and output cables as per '6. CONNECTIONS' and the cabling advice in '7. DC SUPPLY AND OUTPUT'.

The transducer is turned ON by supplying the correct DC supply to the RCTi-3ph. The DC supply voltage is clearly shown on the identification label on the electronic enclosure and is fully specified in '2. SPECIFICATION' on page 3. of this manual.

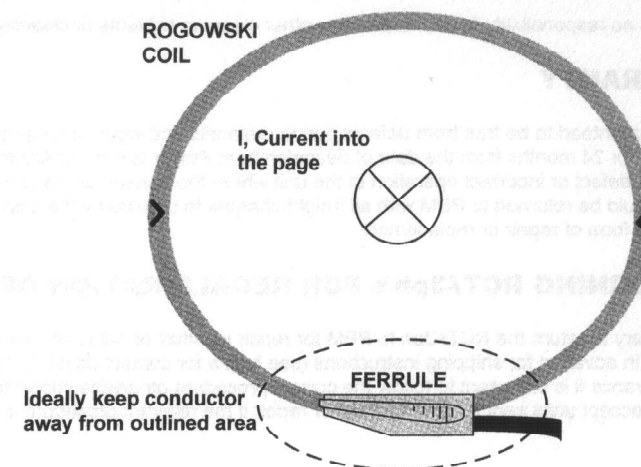
3. After switch-on the RCTi-3ph requires a settling down time to attain its quiescent state before providing correct current measurement. The time, which depends on warm-up and low frequency bandwidth, can be as long as 2 minutes.
4. Having carried out the visual inspection of the Rogowski coil, un-clip the coil as shown below
5. Wrap the Rogowski coil around the de-energised conductor under test and fully insert the free-end of the Rogowski coil into the ferrule, see below:



6. The user is now ready to re-energise the conductor under test and take measurements.

10. OBTAINING THE BEST MEASUREMENT

The Rogowski coil should be positioned so that the conductor under test is encircled by the coil but is not adjacent to the cable attachment (see picture below). The diagram below shows the direction a positive current should pass through the coil loop in order to obtain a positive output voltage. The RCTi has been calibrated with the conductor near the centre, and this is the ideal position.



The sensitivity of the RCTi-3ph to currents that do not pass through the coil is very small, provided that such currents are no greater than the RCTi-3ph's rating or such currents are relatively distant from the coil. In the vicinity of a multi-turn inductor the 'H' field is far stronger than from a single conductor carrying the same current, and such positions should be avoided.

Similarly 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. several 100 V/μs) or high frequency oscillations in the MHz range, then measurement error can arise due to capacitive coupling to the coil.

As a check on any unwanted response to adjacent fields, it is wise to display the output of the RCTi-3ph when close to (but not encircling) the conductor whose current is to be measured. This will reveal the magnitude of any unwanted response to currents close to but outside the coil.

11. CLEANING AND DECONTAMINATION

To prevent surface contamination of the Rogowski coil and cable inspect regularly. To clean the coil and cable use a mild detergent and water to remove any contamination, wipe with clean water to remove the detergent and dry thoroughly with a clean cloth. Obviously the RCTi-3ph must be disconnected from any external circuit prior to cleaning.

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

12. 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 or incorrect operation of the unit where the transducer has not been misused the RCTi-3ph 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.

13. RETURNING RCTi-3ph's FOR RECALIBRATION OR REPAIR

If it is necessary to return the RCTi-3ph to PEM for repair whether or not under warranty please contact PEM in advance for shipping instructions (see below for contact details). To facilitate customs clearance it is important to follow the correct procedure otherwise import tax will be charged. PEM will not accept units sent for recalibration or repair if the relevant procedure is not followed.

For technical updates or enquiries and the latest product releases please consult

www.pemuk.com

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