

Tektronix®

**TRCP0300, TRCP0600, and TRCP3000
Current Probes
User Manual**



077-1213-00



TRCP0300, TRCP0600, and TRCP3000 Current Probes User Manual

Warning

The servicing instructions are for use by qualified personnel only. To avoid personal injury, do not perform any servicing unless you are qualified to do so. Refer to all safety summaries prior to performing service.

Copyright © Tektronix. All rights reserved. Licensed software products are owned by Tektronix or its subsidiaries or suppliers, and are protected by national copyright laws and international treaty provisions. Tektronix products are covered by U.S. and foreign patents, issued and pending. Information in this publication supersedes that in all previously published material. Specifications and price change privileges reserved.

TEKTRONIX and TEK are registered trademarks of Tektronix, Inc.

Table of Contents

Important safety information	iii
General safety summary	iii
Service safety summary	vi
Terms in the manual	vi
Terms on the product	vii
Symbols on the product	vii
Compliance Information	ix
Safety compliance	ix
Environmental compliance	xi

Specifications

Tektronix Rogowski Current Probe

Handling instructions	6
Safety and pre-use checks	7
The Rogowski coil	8
The integrator	9
Power options	9
External supply	9
Standard alkaline batteries	9

Using your Rogowski Probe

Replacing the battery	11
Switching on	11
Obtaining the best measurement	12
Sensitivity to external currents and voltages	12
Output cables	13
Cleaning and decontamination	13
Returning your probe for recalibration or repair	13

Important safety information

This manual contains information and warnings that must be followed by the user for safe operation and to keep the product in a safe condition.

To safely perform service on this product, see the *Service safety summary* that follows the *General safety summary*.

General safety summary

Use the product only as specified. Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. Carefully read all instructions. Retain these instructions for future reference.

This product shall be used in accordance with local and national codes.

For correct and safe operation of the product, it is essential that you follow generally accepted safety procedures in addition to the safety precautions specified in this manual.

The product is designed to be used by trained personnel only.

Only qualified personnel who are aware of the hazards involved should remove the cover for repair, maintenance, or adjustment.

Before use, always check the product with a known source to be sure it is operating correctly.

This product is not intended for detection of hazardous voltages.

Use personal protective equipment to prevent shock and arc blast injury where hazardous live conductors are exposed.

While using this product, you may need to access other parts of a larger system. Read the safety sections of the other component manuals for warnings and cautions related to operating the system.

When incorporating this equipment into a system, the safety of that system is the responsibility of the assembler of the system.

The intended use of this product is for the measurement of AC current.

To avoid fire or personal injury

Use proper power cord. Use only the power cord specified for this product and certified for the country of use.

Use proper power cord. Use only the power cord specified for this product and certified for the country of use. Do not use the provided power cord for other products.

Ground the product.

Power disconnect.

Use proper AC adapter. Use only the AC adapter specified for this product.

Connect and disconnect properly.

Observe all terminal ratings.

Observe all terminal ratings. To avoid fire or shock hazard, observe all rating and markings on the product. Consult the product manual for further ratings information before making connections to the product.

Do not apply a potential to any terminal, including the common terminal, that exceeds the maximum rating of that terminal.

Do not operate without covers. Do not operate this product with covers or panels removed, or with the case open. Hazardous voltage exposure is possible.

Avoid exposed circuitry. Do not touch exposed connections and components when power is present.

Do not operate with suspected failures. If you suspect that there is damage to this product, have it inspected by qualified service personnel.

Disable the product if it is damaged. Do not use the product if it is damaged or operates incorrectly. If in doubt about safety of the product, turn it off and disconnect the power cord. Clearly mark the product to prevent its further operation.

Before use, inspect probes, test leads, and accessories for mechanical damage and replace when damaged. Do not use probes or test leads if they are damaged, if there is exposed metal, or if a wear indicator shows.

Examine the exterior of the product before you use it. Look for cracks or missing pieces.

Use only specified replacement parts.

Replace batteries properly. Replace batteries only with the specified type and rating.

Do not operate in wet/damp conditions. Be aware that condensation may occur if a unit is moved from a cold to a warm environment.

Do not operate in an explosive atmosphere.

Keep product surfaces clean and dry. Remove the input signals before you clean the product.

Provide proper ventilation. Refer to the installation instructions in the manual for details on installing the product so it has proper ventilation.

Slots and openings are provided for ventilation and should never be covered or otherwise obstructed. Do not push objects into any of the openings.

Provide a safe working environment. Always place the product in a location convenient for viewing the display and indicators.

Be sure your work area meets applicable ergonomic standards. Consult with an ergonomics professional to avoid stress injuries.

Probes, coil, and test leads

Remove all coils and BNC cables that are not in use

Use only correct Measurement Category (CAT), voltage, temperature, altitude, and amperage rated coils and BNC cables for any measurement.

Beware of high voltages.

Connect and disconnect properly.

Connect and disconnect properly. De-energize the circuit under test before connecting or disconnecting the current probe.

Inspect the coil and accessories.

Service safety summary

The *Service safety summary* section contains additional information required to safely perform service on the product. Only qualified personnel should perform service procedures. Read this *Service safety summary* and the *General safety summary* before performing any service procedures.

To avoid electric shock. Do not touch exposed connections.

Do not service alone. Do not perform internal service or adjustments of this product unless another person capable of rendering first aid and resuscitation is present.

Disconnect power. To avoid electric shock, switch off the product power and disconnect the power cord from the mains power before removing any covers or panels, or opening the case for servicing.

Use care when servicing with power on. Dangerous voltages or currents may exist in this product. Disconnect power, remove battery (if applicable), and disconnect test leads before removing protective panels, soldering, or replacing components.

Verify safety after repair. Always recheck ground continuity and mains dielectric strength after performing a repair.

Terms in the manual

These terms may appear in this manual:



WARNING. *Warning statements identify conditions or practices that could result in injury or loss of life.*



CAUTION. *Caution statements identify conditions or practices that could result in damage to this product or other property.*

Terms on the product

These terms may appear on the product:

- DANGER indicates an injury hazard immediately accessible as you read the marking.
- WARNING indicates an injury hazard not immediately accessible as you read the marking.
- CAUTION indicates a hazard to property including the product.

Symbols on the product



When this symbol is marked on the product, be sure to consult the manual to find out the nature of the potential hazards and any actions which have to be taken to avoid them. (This symbol may also be used to refer the user to ratings in the manual.)

The following symbols may appear on the product:



CAUTION
Refer to Manual



WARNING
High Voltage



Protective Ground
(Earth) Terminal



Earth Terminal



Do not connect to or
remove from an
uninsulated conductor that
is HAZARDOUS LIVE.

Compliance Information

This section lists the EMC (electromagnetic compliance), safety, and environmental standards with which the instrument complies.

Safety compliance

This section lists the safety standards with which the product complies and other safety compliance information.

EU declaration of conformity – low voltage

Compliance was demonstrated to the following specification as listed in the Official Journal of the European Union:

Low Voltage Directive 2014/35/EU.

- EN 61010-1. Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements.
- EN 61010-2-032. Particular requirements for handheld current clamps for electrical measurement and test equipment.

Additional compliances

- IEC 61010-1. Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements.
- IEC 61010-2-032. Particular requirements for handheld current clamps for electrical measurement and test equipment.

Equipment type

Test and measuring equipment.

Pollution degree description

A measure of the contaminants that could occur in the environment around and within a product. Typically the internal environment inside a product is considered to be the same as the external. Products should be used only in the environment for which they are rated.

- Pollution Degree 1. No pollution or only dry, nonconductive pollution occurs. Products in this category are generally encapsulated, hermetically sealed, or located in clean rooms.
- Pollution Degree 2. Normally only dry, nonconductive pollution occurs. Occasionally a temporary conductivity that is caused by condensation must be expected. This location is a typical office/home environment. Temporary condensation occurs only when the product is out of service.
- Pollution Degree 3. Conductive pollution, or dry, nonconductive pollution that becomes conductive due to condensation. These are sheltered locations where neither temperature nor humidity is controlled. The area is protected from direct sunshine, rain, or direct wind.
- Pollution Degree 4. Pollution that generates persistent conductivity through conductive dust, rain, or snow. Typical outdoor locations.

Pollution degree

Pollution Degree 2 (as defined in IEC 61010-1). Note: Rated for indoor, dry location use only.

IP rating

IP20 (as defined in IEC 60529).

Measurement and overvoltage category descriptions

Measurement terminals on this product may be rated for measuring mains voltages from one or more of the following categories (see specific ratings marked on the product and in the manual).

- Measurement Category II. For measurements performed on circuits directly connected to the low-voltage installation.
- Measurement Category III. For measurements performed in the building installation.
- Measurement Category IV. For measurements performed at the source of low-voltage installation.

Environmental compliance

This section provides information about the environmental impact of the product.

Product end-of-life handling

Observe the following guidelines when recycling an instrument or component:

Equipment recycling. Production of this equipment required the extraction and use of natural resources. The equipment may contain substances that could be harmful to the environment or human health if improperly handled at the product's end of life. To avoid release of such substances into the environment and to reduce the use of natural resources, we encourage you to recycle this product in an appropriate system that will ensure that most of the materials are reused or recycled appropriately.



This symbol indicates that this product complies with the applicable European Union requirements according to Directives 2012/19/EU and 2006/66/EC on waste electrical and electronic equipment (WEEE) and batteries. For information about recycling options, check the Tektronix Web site (www.tek.com/productrecycling).

Specifications

The Tektronix Rogowski Current Probes, the TRCP0300, TRCP0600, and TRCP3000, combines high bandwidth performance with minimal disruption to the circuit under test. Refer to these instructions when using your probe. They will help you obtain the best and safest performance from your product.

The Specifications in this section were valid at the time the product was shipping. Go to www.tek.com for updated specifications for this product.

	TRCP0300	TRCP0600	TRCP3000
Frequency range	9 Hz to 30 MHz	12 Hz to 30 MHz	1 Hz to 16 MHz
Peak current	300 A	600 A	3000 A
Minimum current	250 mA	500 mA	500 mA
Sensitivity	20 mV/A	10 mV/A	2 mV/A
External probe attenuation setting on scope	50X	100X	500X
Accuracy (typical)	+/- 2% of reading	+/- 2% of reading	+/- 2% of reading
Coil diameter	1.7 mm	4.5 mm	8.5 mm
Termination	1 M Ω BNC	1 M Ω BNC	1 M Ω BNC

Peak output voltage ± 6 V (corresponding to \pm Peak current)

Output cable 0.5 m, BNC to BNC, 50 Ω

Absolute di/dt ratings

TRCP0300 70 kA/ μ s (peak) | 1.0k A/ μ s (rms)

TRCP0600 100 kA/ μ s (peak) | 1.2 kA/ μ s (rms)

TRCP3000 100 kA/ μ s (peak) | 1.2 kA/ μ s (rms)

Operating temperature range

Integrator electronics	0 °C to +40 °C
Coil and cable (TRCP0300 and TRCP0600)	-40 °C to +125 °C
Coil and cable (TRCP3000)	-20 °C to +100 °C

Accuracy, typical	5% to 100% peak current
Calibration	Nominally $\pm 0.2\%$ with the conductor central in the Rogowski loop See the calibration certificate for further details.
Positional accuracy	$\pm 2\%$ variation of accuracy with conductor position in the loop See Obtaining the best measurement on page 12
Linearity	$\pm 0.05\%$ of reading

Coil insulation	TRCP0300: 1.2 kV TRCP0600: 5 kV TRCP3000: 10 kV
------------------------	---

Operation with external adaptor

DC supply voltage	12 VDC ($\pm 10\%$)
DC socket type	3.5 mm OD and 1.3 mm ID jack socket, center positive
Only use the external adaptor supplied with product.	
Adaptor mains input voltage	100 VAC to 240 VAC
Adaptor mains input frequency	50 Hz to 60 Hz
Adaptor supply voltage/current	12V DC/450mA Max @ 100VAC input
Mains input voltage fluctuation	Up to 10%

Operation with battery

Battery supply, B version	4 x 1.5 V AA alkali batteries
Battery life, B version	25 hours, typical

Safety	EN61010-1:2010 EN61010-2-032:2012
---------------	--------------------------------------

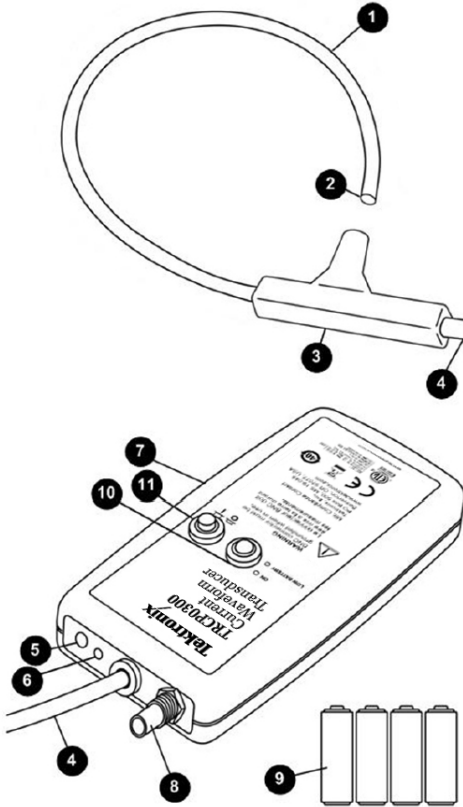
Voltage rating (TRCP0300)	300 V CAT II
----------------------------------	--------------

Voltage rating (TRCP0600)	600 V CAT III
----------------------------------	---------------

Voltage rating (TRCP3000)	1000 V CAT III
----------------------------------	----------------

Environmental	Rated for indoor use
Altitude	Up to 2,000 m (6,562 ft)
Installation Category	II
Pollution Degree	2
Maximum relative humidity	80% up to 31 °C Decreasing linearly to 50% at 40 °C

Tektronix Rogowski Current Probe



Index number	Description
1	Rogowski coil (probe)
2	Probe free end
3	Ferrule
4	Connecting cable
5	DC power socket
6	DC power status LED
7	Enclosure

Index number	Description
8	BNC output socket
9	4 x AA batteries
10	Status indicator LED GREEN = ON RED = Batter LOW
11	Power button

Handling instructions

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

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

The free end of the coil is unclipped in the direction shown. While the illustration below is specifically related to the TRCP0300, Similar handling instructions apply for the TRCP0600 and TRCP3000.



When clipping or unclipping the coil, hold the ferrule as shown in this image.



WARNING. Never force the free end of the coil into the ferrule. This could damage the coil insulation.



WARNING. Do not apply force to the cable attached to the coil. This could damage the coil.

NOTE. When not in use, return the probe coil to the protective case it was shipped in.

Safety and pre-use checks



WARNING. The transducer does not protect you from electric shock while applying or removing the probe from hazardous live conductors. Additional protective means are necessary to avoid electric shock from hazardous live conductors which cannot be de-energized.

If hazardous live voltages are present and accessible in the installation, appropriate protective equipment must be used.



WARNING. The Rogowski coil must not be used if the coil outer layer is damaged or in any way compromised.



WARNING. *The probe must only be used in conjunction with properly grounded test equipment.*

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

The Rogowski coil



WARNING. *The integrity of the insulation around the Rogowski coil itself must be visually inspected before use, and the probe must not be used if there are signs of damage.*



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



WARNING. *The voltage rating (safe PEAK working voltage) is clearly labeled on the cable adjacent to the coil. For the TRCP0300, TRCP0600, and TRCP3000, see the coil insulation and voltage rating in Specifications. Never use at voltages greater than this value.*



WARNING. *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 coil has a friction fit, the coil is fully inserted when you feel that you can ease the free end of the coil into the ferrule no further.*



WARNING. *The voltage ratings are appropriate for intermittent use of the probe as a test instrument and not for continuous use in a permanent installation.*

For permanent installation the coil should be situated such that corona, which will eventually damage the coil insulation, cannot occur. For information regarding permanent installation of TRCP models on high voltage equipment, please consult Tektronix.



WARNING. *You must ensure that the absolute maximum rated di/dt is not exceeded.*

The integrator



WARNING. *The probe must only be used with oscilloscopes or monitoring equipment that have their BNC inputs properly grounded.*

Power options

The probe can be powered by an external DC source or by a battery option.

External supply

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

Standard alkaline batteries

Healthy batteries are indicated by the Green Status Indicator LED. If the LED is Red, the batteries are delivering less than 2V and must be replaced.

When the DC voltage is present the batteries are inoperative.

Using your Rogowski Probe

Replacing the battery

Low battery is indicated by a red LED located near the power switch. To replace the battery, remove the probe from the test circuit, switch-off the transducer, remove the battery cover, and replace the used batteries with appropriate batteries for your transducer type (standard or rechargeable).

Make sure the probe is removed from the test circuit before replacing the batteries.

Switching on



CAUTION. Make sure you've read the following sections before switching on the transducer: [Safety and pre-use checks](#) on page 7 and [Handling instructions](#) on page 6.



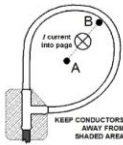
WARNING. The probe may be used only with oscilloscopes or monitoring equipment with properly grounded BNC inputs.

1. Connect the BNC output of the transducer to your grounded oscilloscope or current monitoring equipment.
2. Visually inspect the Rogowski coil ensuring that the insulation is intact. If you see an abrasion or tear, use a different probe.
3. If the coil passes the inspection in the previous step, un-clip the coil and wrap it around the de-energized conductor under test.
4. Insert the free-end of the coil fully inside the ferrule.
5. Re-energize the conductor.
6. Use the Power button to switch the transducer On by pressing and releasing the button. Turn the transducer Off by pressing and releasing the button when the transducer is on. The transducer is on when the Status Indicator LED is Green.

After using this procedure, the transducer may require a settling period of up to 2 minutes before providing a correct current measurement. The settling period is dependent on warm-up time and the low frequency bandwidth.

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 shows the direction a positive current should pass through the coil loop in order to obtain a positive output voltage. The Rogowski Current probe has been calibrated with the conductor near the center (position **A**), and this is the ideal position for accuracy.



For the best high frequency performance the center of the current should lie on the line shown **A** to **B**, where **B** is half way around the circumference of the coil.

Sensitivity to external currents and voltages

The sensitivity of the TRCP to currents that are outside the closed loop of the Rogowski coil is very small, provided that the external currents are less than the current rating of the probe 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.

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. $1\text{ kV}/\mu\text{s}$) or high frequency oscillations in the MHz range, then measurement error can arise due to capacitive coupling to the coil.

To check for any unwanted response to adjacent fields, it is recommended to quantify the output of the probe 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.

Output cables

Your probe includes a 500 mm BNC to BNC output. It is possible to use longer cables; these should be 50 ohm, single screened co-axial cable.

Extension cables can be used if necessary. Consideration should be given to routing very long extension cables.

Cleaning and decontamination

To prevent surface contamination the Rogowski coil and cable should be inspected 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. The probe must be disconnected from any external circuit and turned off prior to cleaning.

Returning your probe for recalibration or repair

To return your product for repair or recalibration, please contact Tektronix in advance for shipping instructions (refer to [Contacting Tektronix](#) for contact details).



洛克儀器股份有限公司 Lock Instrument Co. Ltd
(台北公司) 235 新北市中和區中正路 764 號 6 樓 TEL : 886-2-32346000
(新竹公司) 300 新竹市北區光華二街 72 巷 79 號 TEL : 886-3-5324199
官方網站: www.lockinc.com.tw 網路商店: www.pcstore.com.tw/lock