



- Simulate a low-level voltage source from a Rogowski coil
- MLLA provides filtering of the low-level outputs
- Can be used with any SMRT or FREJA 500 series unit\*
- Three Rogowski output voltage ranges available, 2, 10 and 40 V
- Millivolt output in low voltage range, with high resolution and accuracy

## DESCRIPTION

In Rogowski mode, the current channels will convert from a current source to a millivolt source. This will allow the current channel to simulate a low-level voltage source from a Rogowski coil. The MLLA will provide filtering of the low-level outputs from the latest version of voltage/current generators in the Megger SMRT series and FREJA 500 series test sets. The MLLA provides the interface from the low-level outputs to the device under test using appropriate interface cables.

## APPLICATIONS

There are three ranges for the Rogowski outputs, 2, 10 and 40 Volts, with high resolution and accuracy. When in the low voltage mode, the voltage channel provides 0 to 2 Volt with high resolution and accuracy.

Use the low-level outputs available on the latest versions of SMRT and FREJA relay test sets for testing relays, which use low voltage signals from non-conventional CT's and VT's such as Rogowski coils and CVT's. The current and voltage channels can be configured to simulate low-level outputs using RTMS (Relay Test Management Software) on a SMRT or FREJA Local/Remote on a FREJA 500 Series unit. Low-level outputs are available from the voltage and current channel output terminals through the individual MLLA low-level adapters. For testing relays like the ABB REF615 and REF542 plus, Siemens 7SJ81 and Schneider Easergy P5, the low-level adapters provide the interface between the SMRT/FREJA relay test set converted low-level output terminals and the low-level signal interface cables to the relay under test.

## SOFTWARE

### Relay Test Management Software (RTMS)

Low-level Rogowski and low voltage output capability are included in the latest RTMS or FREJA Local/Remote, which is supplied with all SMRT or FREJA 500 series units provided that the low-level option has been enabled in the SMRT/FREJA unit. RTMS or FREJA Local/Remote is a Microsoft® Windows® XP® Service Pack 3/ Vista™/7/8/10 compatible software program designed to manage all aspects of protective relay testing using the Megger SMRT family or FREJA 500 series units.

### Low-level outputs

In the RTMS System Configuration screen under the System tab is the low-level output button. The low-level output option can be added at the time of order of a new SMRT/FREJA unit by selecting the option "2" in the internal software option section (see SMRT/FREJA data sheets for more information). For the SMRT/FREJA units with hardware revision 3.51 or higher but without the low-level output option, the unit will have to be returned to Megger or an authorized service center to perform the upgrade and calibrate the unit (please contact your local Megger sales representative). Pressing the Low-level output button will take the user to the setting screen as seen in the following figure:

Rogowski:					Low Voltage:				
SCALE: 1.00 A = 150.0 mV					SCALE: 1.00 V = 150.0 mV				
Gen Num	Enabled	Amplitude Correction (multiple)	Phase Correction (degrees)	Max Current (A)	Gen Num	Enabled	Amplitude Correction (multiple)	Phase Correction (degrees)	Max Voltage (V)
1	Normal (0GA)	1.0000	0.00	60.000	1	High (200V)	1.0000	0.00	300.000
2	Normal (0GA)	1.0000	0.00	60.000	2	High (200V)	1.0000	0.00	300.000
3	Normal (0GA)	1.0000	0.00	60.000	3	High (200V)	1.0000	0.00	300.000
					4	High (200V)	1.0000	0.00	300.000

Figure 1: Rogowski and low voltage setting screen

\*Requires VIGENS with hardware version 3.5.1 or higher

# MLLA Rogowski Megger Low-level Adapter



## Low output current generator 0-50 mA/Rogowski

The current generators can provide very low current outputs ranging from 0 to 50 mA full scale or be enabled to provide a voltage output simulating a Rogowski output.

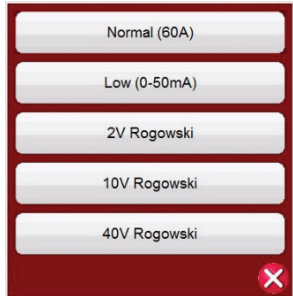


Figure 2: Current generator low output selection list

## Rogowski mode

Rogowski mode will change the current channel from a current source to a voltage source. This will allow the current channel to simulate a low-level voltage source from a Rogowski coil. There are three ranges for the Rogowski outputs, 2, 10 and 40 Volt. Different Rogowski coils have different output levels. In the Rogowski info screen the user sets the scale (or ratio) of the secondary current to millivolt output. This is to adjust the ratio between the Rogowski coil millivolt output to an equivalent secondary current output. Test values must be entered in secondary current values, with the appropriate millivolts applied to the relay under test as well as setting the amplitude and phase correction factors, see the following figure:

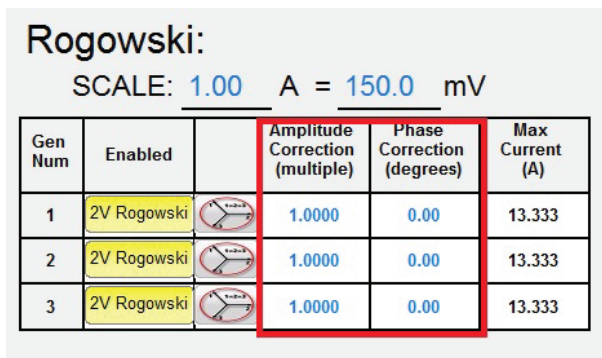


Figure 3: Rogowski amplitude and phase correction factors

Different relays have different Rogowski amplitude and phase correction settings. Check with the appropriate relay manufacturer for which values to apply.

## Low voltage mode

The low voltage mode will change the voltage channel to a millivolt source. This will allow the voltage channel to simulate a low-level voltage source such as a Rogowski or a voltage divider, see the following figure:

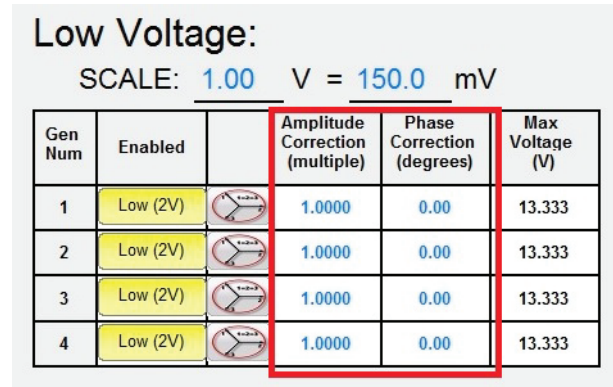


Figure 4: Low voltage amplitude and phase correction factors

After setting low-level outputs and returning to the Home Screen on RTMS, a  $\Theta$  symbol will appear in the setting values window indicating that low-level outputs are enabled, see the following figure:

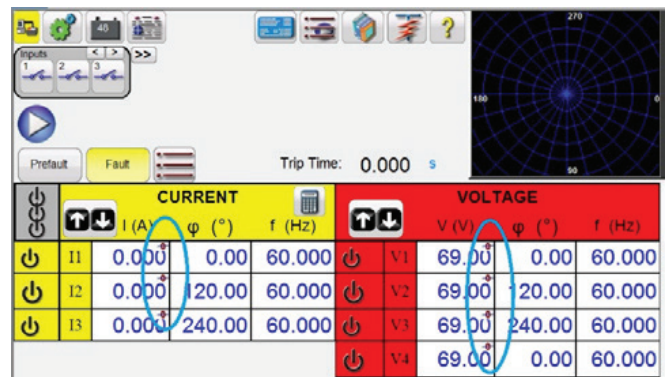


Figure 5: Low-level outputs enabled symbol

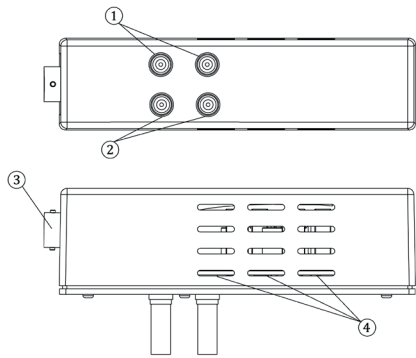
## Ordering information

When purchasing a new SMRT/FREJA with the low-level option, refer to the ordering information in the SMRT/FREJA data sheet to configure the unit to have this option included.

When ordering the low-level hardware upgrade as a field upgrade kit the user will be supplied with a unique 32-digit code number assigned specifically to the serial number of the SMRT/FREJA unit when ordered. This will enable the low-level Rogowski feature to be used with the MLLA to test relays with Rogowski inputs provided the hardware revision in the SMRT/FREJA is 3.51 or higher.\*

\*Requires VIGENS with hardware version 3.5.1 or higher

# MLLA Rogowski Megger Low-level Adapter



1. **Voltage inputs:** For connection to the voltage channel
2. **Current inputs:** For connection to the current channel
3. **Low-level connection terminal:** For connection of relay low-level cables
4. **Ventilation slots:** For cooling purposes

## SPECIFICATIONS

Specifications are subject to change without notice. Accuracies are specified from 10 to 100 % of range, 25 °C ± 5 °C, 50-60 Hz.

### Environment

<b>Application field:</b>	For use in high-voltage substations and industrial environments
<b>Temperature operating:</b>	0 °C to 50 °C (32 °F to + 122 °F)
<b>Storage and transport:</b>	- 25 °C to + 70 °C (- 13 °F to + 158 °F)
<b>Humidity:</b>	5 % – 90 % RH, non-condensing
<b>Altitude (operational):</b>	3000 m. Full duty cycle: 2000 m.

### CE-marking

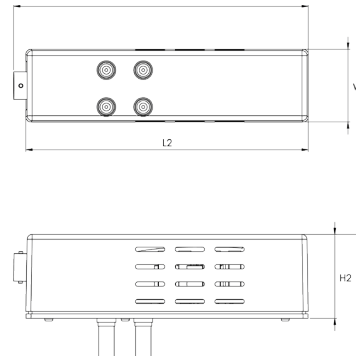
LVD: EN/IEC 61010-1:2001 (2nd Edition)

### Conformance Standards

<b>Safety:</b>	EN 61010-1, UL 61010-1, CSA- C22.2 #61010-1
<b>Shock:</b>	EN/IEC 60068-2-27
<b>Vibration:</b>	EN/IEC 68-2-6
<b>Transit drop:</b>	ISTA 1A
<b>Free fall:</b>	EN/IEC 60068-2-32
<b>Drop/topple:</b>	EN/IEC 60068-2-31
<b>EMC emissions:</b>	EN 61326-2-1, EN 61000-3-2/3 FCC Subpart B of Part15 Class A
<b>Immunity:</b>	EN 61000-4-2/3/4/5/6/8/11

## GENERAL

### Dimensions



L1 = 5.83in. (14.80 cm)  
L2 = 5.57in. (14.14 cm)  
W = 1.37in. (3.47cm)  
H1 = 2.60in. (6.60cm)  
H2 = 1.64in. (4.16cm)

### Weight

1 lb. (0.45 kg) each

### Enclosure

The MLLA unit comes housed in a rugged, lightweight UL94 V0 rated plastic enclosure. IEC Enclosure Rating IP20

### AC Low-level Rogowski output (converted current channels)


<b>Range:</b>	2 V
<b>Accuracy:</b>	0 – 1 V: 0.5 mV typical and 1 mV guaranteed 1 – 2 V: 0.5 mV typical and 2 mV guaranteed
<b>Resolution:</b>	0.001
<b>Measurements:</b>	AC RMS
<b>Ranges:</b>	10 and 40 V
<b>Accuracy:</b>	± 0.05 % of reading + 0.02 % of range typical ± 0.15 % of reading + 0.05 % of range guaranteed
<b>Resolution:</b>	0.001
<b>Measurements:</b>	AC RMS

### AC Low-level voltage output

<b>Range:</b>	2 V
<b>Accuracy:</b>	0 – 1 V: 0.5 mV typical and 1 mV guaranteed 1 – 2 V: 0.5 mV typical and 2 mV guaranteed
<b>Resolution:</b>	0.001
<b>Measurements:</b>	AC RMS

\*Requires VIGENS with hardware version 3.5.1 or higher




**ORDERING INFORMATION**

Description	Part Number
 <p>Megger Low Level Adapter (Set of three filters)</p>	<b>MLLA</b>
<p>Low-level option hardware upgrade kit</p> <p>The low-level hardware upgrade kit, with a unique 32-digit code number assigned specifically to the SMRT/FREJA unit when ordered (requires the customer to provide the unit serial number when ordering the kit). This will enable the low-level Rogowski feature to be used with the MLLA to test relays with Rogowski inputs provided the hardware revision in the SMRT/FREJA is 3.51 or higher.</p> <p><i>NOTE: For the upgrade of SMRT/FREJA units with hardware revision older than 3.51, please contact your local Megger sales representative as the unit will have to be returned to Megger or an ASC for the upgrade and calibration.</i></p>	<b>87416</b>







**Low-level relay and cable accessory list**

	2013-473	2013-474	1014-415	2015-125	2015-303
ABB REF 615	■				
ABB REF 542 plus				■	
ABB REX 521				■	
ABB REC 523				■	
ABB REF 541/3/5				■	
ABB REM 543/5	■				
ABB REF 601	■				
ABB REF 542 SCU					■
Siemens 7SJ81		■			
Schneider Easergy P5			■		

**Table of optional accesories**



Description	Part Number
 <p>Single adapter (filter)</p>	<b>V1013-611</b>
 <p>Set of three (Qty. 1 each, red, yellow, and blue) CAT5E Ethernet cables for interconnection between the MLLA and the ABB REF 615 relay under test, each 210 cm (7 ft.) long, LEMO connector to RJ45.</p>	<b>2013-473</b>
 <p>Set of three (Qty. 1 each, red, yellow, and blue) CAT5E Ethernet cables for interconnection between the MLLA and the Siemens 7SJ81 relay under test, each 210 cm (7 ft.) long, LEMO connector to RJ45.</p>	<b>2013-474</b>

\*Requires VIGENS with hardware version 3.5.1 or higher

Description	Part Number
 <p>Set of three (Qty. 1 each, red, yellow, and blue) generic CAT5E Ethernet cables for interconnection between the MLLA and the relay under test, each 210 cm (7 ft.) long, LEMO connector to 8 mm banana.</p>	<p><b>2013-475</b></p>
 <p>CAT5E Ethernet cables for interconnection between the MLLA and the Schneider Easergy P5 relay under test. The cable is 210 cm (7 ft.) long, with 4 x CAT5E Ethernet cables on the relay end and 3 x LEMO connectors on the MLLA end.</p>	<p><b>1014-415</b></p>
 <p>CAT5E Ethernet cables for interconnection between the MLLA and the ABB REF 542 plus relay under test. The cable is 210 cm (7 ft.) long, with 3 x twin BNC connectors on the relay end and 3 x LEMO connectors on the MLLA end.</p>	<p><b>2015-125</b></p>
 <p>Qty. 1 each, CAT5E Ethernet cable for interconnection between the MLLA and the ABB REF 615 relay under test, each 210 cm (7 ft.) long, LEMO connector to RJ45.</p>	<p><b>Red: 2013-473A</b></p>
	<p><b>Yellow: 2013-473B</b></p>
	<p><b>Blue: 2013-473C</b></p>
 <p>Qty. 1 each, CAT5E Ethernet cables for interconnection between the MLLA and the Siemens 7SJ81 relay under test, each 210 cm (7 ft.) long, LEMO connector to RJ45.</p>	<p><b>Red: 2013-474A</b></p>
	<p><b>Yellow: 2013-474B</b></p>
	<p><b>Blue: 2013-474C</b></p>
 <p>Qty. 1 each, CAT5E Ethernet cable for interconnection between the MLLA and the ABB REF 542 plus relay under test, each 210 cm (7 ft.) long, LEMO connector to twin BNC.</p>	<p><b>Red: 2015-125A</b></p>
	<p><b>Yellow: 2015-125B</b></p>
	<p><b>Blue: 2015-125C</b></p>
 <p>Qty. 1 each, generic CAT5E Ethernet cables for interconnection between the MLLA and the relay under test, each 210 cm (7 ft.) long, LEMO connector to 8 mm banana.</p>	<p><b>Red: 2013-475A</b></p>
	<p><b>Yellow: 2013-475B</b></p>
	<p><b>Blue: 2013-475C</b></p>

\*Requires VIGENS with hardware version 3.5.1 or higher

# MLLA Rogowski Megger Low-level Adapter

Description		Part Number
	<p>CAT5E Ethernet cables for interconnection between the MLLA and the ABB REF542 SCU relay under test. The cable is 210 cm (7 ft.) long, with 3 x twin BNC connectors on the relay end and 3 x LEMO Connectors on the MLLA end.</p>	<p><b>2015-303</b></p>
	<p>Qty. 1 each, CAT5E Ethernet cable for interconnection between the MLLA and the ABB REF542 SCU relay under test, each 210 cm (7 ft.) long, LEMO Connector to RJ45.</p>	<p><b>Red: 2015-303A</b></p> <p><b>Yellow: 2015-303B</b></p> <p><b>Blue: 2015-303C</b></p>

**United States**

4545 West Davis Street  
 Dallas, Texas 75211-3422 USA  
 T 800.723.2861 (USA only)  
 T +1 214.333.3201  
 F +1 214.331.7399  
 E [usasales@megger.com](mailto:usasales@megger.com)

**MLLA\_DS\_US\_v4e**

[us.megger.com](http://us.megger.com)  
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