



System for leakage current measurement and analysis

Instruction manual

Leakage current displaying in the Fourier analysis and as RMS value

Leakage current evaluation in relation to the tripping characteristic of all market standard type B / B+ residual current devices

Recording of switch-on /-off current spikes





German Engineering & Design



Thank you for choosing a LEAKWATCH measuring and analysis system from EPA.

If you have any technical questions, please give us a call: Tel.: +49 (0)6181 – 9704 – 0

For the latest information on this product, please visit www.LEAKWATCH.de

Copyright	© 2019 EPA GmbH
Issue number	23/08/2019
Software	Version 3.1
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We would like to thank our academic advisers at the Hochschule Emden/Leer University of Applied Sciences for their support:

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1 Important basic information

1.1 Legal notice

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The contents of this instruction manual are accurate at the date of printing. Because it is under continuous development, the manufacturer reserves the right to change the specification of the product and its performance data as well as the contents of this instruction manual, in both technical and commercial terms, without prior notice. The current version is available at www.leakwatch.de or www.epa.de.

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1.3 General equal treatment

EPA GmbH is aware of the importance of language with respect to the equal rights of women, men, and divers persons and makes every effort to take this into account. To ensure better readability, however, it was necessary to abstain from the consistent use of differentiated formulations.

1.4 Symbols and signal words

Signal words indicate the severity of the danger.

Symbol/signal word	Meaning
	Warning of hazardous electrical voltage.
A IMPORTANT NOTE	Draws your attention to the handling and impact of safety information.
	Draws your attention to a hazardous situation that will result in serious injury or death if not avoided.
	Draws your attention to a hazardous situation that may result in serious injury or death if not avoided.
	Draws your attention to a hazardous situation that may result in minor to moderate injury if not avoided.
NOTE	Draws your attention to possible damage to property and other important information.
	Installation only by a qualified electrician (IEC 60417-6182).

1.5 Marking on the product

Illustration	Designation	
	Nameplate	
EPA GmbH Fliederstr. 8, D-63486 Bruchkbel Tel.: +49 (0) 6181 9704 - 0 www.leakwatch.de Typ: LW-MK3plus Messbereich: 10 Hz bis 150 kHz Umgebungstemp.: -10°C bis +40°C Messkategorie: 1	The nameplate contains all necessary data such as the manufacturer's logo, manufacturer address, type designation, measurement range, environmental temperature, measurement category and serial number.	
	CE mark	
CE	The CE mark is on the device nameplate. The device complies with the relevant essential requirements of all applicable EU directives. The declaration of conformity can be downloaded from <u>www.epa.de</u> .	
	Crossed out trash bin	
	At the end of its service life, this product cannot be disposed of with normal household waste. It must be discarded at a recycling collection point for electrical and electronic equipment.	

2 Safety

2.1 Safety instructions

DANGER

Warning of hazardous electrical voltage!

Take appropriate precautions to prevent electric shocks.

Measurements in hazardous proximity to electrical systems should only be performed under the instruction of a responsible electrician and not carried out alone.

Follow the accident prevention regulations for electrical systems and equipment when carrying out all work.

The user must ensure before each measurement that the test leads and test equipment are in flawless condition.

M IMPORTANT NOTE

Avoid heating of the devices by direct sunlight. This is the only way to ensure their flawless function and long service life.

Strong electromagnetic fields can impair the function of the measuring unit and distort the measured values!

Do not open or modify the hardware.

Measurements of high load currents or motor currents can overload or destroy the sensitive hardware.

The level of the measured leakage currents should not exceed the measuring range indicated in the specification.

2.2 Intended use

The measuring and analysis system **LEAK**WATCH was specially developed for the measurement of leakage currents / differential currents. The measuring unit can be used to analyse leakage currents / differential currents and their effect on residual current devices (RCCB, RCD, RCM).

The software allows you to directly compare the measured signal to the tripping characteristic of well-known AC/DC-sensitive residual current circuit breakers. The rate of utilisation of the selected residual current device is illustrated in percent and a coloured traffic light display.

The frequency analysis and the RMS values of the individual frequency components offer valuable information for leakage current balancing and for selecting potential filtering measures (e.g. low leakage current line filters, leakage current reduction filters, leakage current compensation, etc.). Even for regular leakage current measurements in the context of safety tests, **LEAK**WATCH can offer valuable information about the condition of electrical systems and devices.

The transducer / current clamp should be installed right on the residual current device if the effect on the RCD is to be examined.

A CAUTION

Only qualified personnel are allowed to install the transducer and perform measurements.

The **LEAK**WATCH measuring and analysis system should only be used under the conditions and for the purposes for which it was designed.

Particular attention should be paid to the safety instructions and the technical data setting out the ambient conditions.

Operational safety is not guaranteed in the event of modification or improper use.

LEAKWATCH is used exclusively for the measurement and analysis of leakage currents / differential currents in single-phase and three-phase networks.

2.3 Inadmissible operating conditions

DANGER

Use in potentially explosive atmospheres is not permitted.

A CAUTION

The level of the measured leakage currents should not exceed the value indicated in the specification of the transducer / current clamp. Measurements of high load currents or motor currents can overload or destroy the sensitive hardware.

LEAKWATCH may only be operated with the intended hardware and software. The device may not be used without transducers (LW-SK, LW-CEE, LW-MZ) when measuring.

M IMPORTANT NOTE

External mechanical loads are not allowed!

The device is only intended for measurement category I and may not be used for higher categories.

Strong electromagnetic fields can affect the function and measuring accuracy of the **LEAK**WATCH.

If a transducer is connected to the measuring unit (*LW-SK/LW-CEE* connection), the *LW-MZ* connection must be provided with the appropriate terminating resistor.

2.4 Staff requirements

DANGER

Warning of hazardous electrical voltage!

Only qualified personnel are allowed to install and connect the transducer (LW-SK, LW-MZ)!



A

Qualified personnel as defined by this instruction manual are electricians who are familiar with the installation, assembly, startup and

operation of the device, with the hazards involved, and who, based on their technical training, are also familiar with the relevant standards and provisions.

Repairs may only be carried out by authorised repair centres. Unauthorised tampering can lead to property damage and will void the warranty provided by EPA.

2.5 Follow the operating instructions

MPORTANT NOTE

Please read this manual carefully before using the device. It contains important information on operating the **LEAK**WATCH leakage current analysis system.

The **LEAK**WATCH has been subjected to extensive testing and left the factory in technically and operationally safe condition. To maintain this condition, the user must follow the safety instructions in this manual.

We assume no liability for damage caused by failure to follow these instructions.

This manual is an integral part of the product and is valid only for the **LEAK**WATCH measuring and analysis system manufactured by EPA GmbH.

Please pass this manual on to the system operator / end customer / service technician so that it is available when required.

Keep these operating instructions and all other applicable documents in a safe place to ensure that they are available when required.

This is a translation of the original German instruction manual.

3 **Product description**

AC/DC-sensitive residual current circuit breakers (RCCBs) are increasingly used in industrial applications. The modern components used in automation technology (such as frequency inverters, RFI filters, switching power supplies etc.) generate leakage currents when the system is operating. These so-called "operational" leakage currents are interpreted by the protective devices as fault currents and therefore often lead to unreliable operating states in the residual current device and its disconnection. The residual current circuit breaker cannot distinguish between the operational leakage currents and true fault currents.

While the level of the leakage current load can be measured in practice (e.g. with a current clamp), this does not provide information about the individual frequency components of this load and the possibility of making an assessment in relation to the tripping characteristic of the residual current circuit breakers. The tripping thresholds of leakage currents can vary depending the type used and the manufacturer.

The measuring and analysis system **LEAK**WATCH was specially developed for the measurement of leakage currents. It can be used to directly compare the measured signal to the tripping characteristic of well-known residual current circuit breakers. The degree of utilisation of the selected residual current device is immediately identifiable through a percentage display and coloured traffic light displays. The system can be flexibly expanded!

The frequency analysis and the RMS values of the individual frequency components offer valuable information for leakage current balancing and for selecting potential filtering measures (e.g. low leakage current line filters, leakage current compensation, etc.).

This makes LEAKWATCH an indispensable tool for analysing the leakage current balance.

Even for regular leakage current measurements when carrying out safety tests or to identify fault current due to insulation faults, **LEAK**WATCH can offer valuable information about the condition of electrical systems and devices.

The measuring and analysis system consists of three parts:

- Profi measuring unit (type: LW-MK3plus)
- Transducer (type: LW-SK, LW-CEE) or current clamp (type: LW-MZ-50)
- PC software for Windows[™] 7/8/10 (**LW-SOFT**)

The measuring unit is connected to a PC via a USB 2.0 interface with the included USB connection cable. No additional power supply is needed. The software can be downloaded (<u>www.leakwatch.de</u>) or installed from a USB stick. The analysis software runs on Windows[™] 7/8/10. A hard disk with a storage capacity of at least 1 GB is required. The computer must have at least 2 GB of available RAM. The **LEAK**WATCH system ships in a rugged storage case.

Depending on the wire cross-section of the connector of the measured machine or device, five different transducers and three versions for direct connection to a CEE socket (16 A, 32 A and 63 A) are available. The LW-MZ-50 current clamp can be used for fast and easy measuring without disconnecting the current path.

For the measurement, the transducer is placed close to the residual current circuit breaker or mains supply. The three mains phases (L1, L2, L3) and the neutral conductor (N) are routed through the transducer with flexible cables. Power distributors (LW-CEE-16A, LW-CEE-32A and LW-CEE-63A) are available for connection via a CEE socket; this is simply connected between the supply line of a device or a machine. For measurements on earthing contact sockets, the LW-SKO-16A adapter can be connected between the socket and the consumer. Alternatively, the current clamp (LW-MZ-50) can always be used. This means it is not necessary to disconnect the current path.

After a brief menu-guided software installation in Windows[™], the measured leakage current is displayed on the screen. A residual current circuit breaker is selected in a selection field. All commercially available types and manufacturers are available here. Future variants can be integrated by updating the software.

You can choose between displaying the time signal (oscilloscope function), the frequency components (FFT) and an RMS value. Trigger mode is available for fast-switching operations, such as switching on or sporadic switching operations. Short-term and long-term recordings and their analysis are also possible.



4 Technical data

4.1	Rating				
	Frequency measuring range	10 Hz to 150 kHz (depending on the transducer used) LW-MK3plus with LW-SK1400-25:			
		2% 50 Hz to 4 kHz / 3% 30 Hz t			
	Accuracy (100 mA sinus)	LW-MK3plus with L	-W-MZ-50:		
		2% 50 Hz to 4 kHz	z / 3% 30 Hz to 20 kHz		
	Sampling rate	300 kS/s			
	Resolution	0.1 mA			
	Current measuring range	+/- 1 mA to 1400 m	ARMS		
	(dependent upon the transducer)	+/- 10 mA to 10,000	0 mA RMS (HL version)		
	Maximum massuring current	leff +/- 1270 mA	Imax +/- 1800 mA.		
	(pure sinusoidal)	leff +/- 12700 mA	Imax \pm 18000 mA (HL version)		
	Operating temperature	0 °C to 40 °C			
	Transport/storage temperature	ure -20 °C to 85 °C up to 90%, condensation not permitted max. 2000 m above sea level 2 (only permissible for interior)			
	Climate resistance				
	Operating altitude				
	Level of contamination				
		LW-MK3plus:	185 x 130 x 40 mm		
	Dimensions	LW-SK1400-25:	89 x 91 x 59 mm (Ø 25 mm)		
		LW-MZ-50:	216 x 111 x 45 mm (Ø 53 mm)		
		LW-MK3plus:	approx. 400 g		
	Weight	LW- SK1400-25:	approx. 500 g		
		LW-MZ-50:	approx. 550 g		
	Working load	Any			
	Measurement category	I (higher measurem	nent categories are not allowed)		
	Design specification	DIN EN 61010-1 (VDE 0411 Part 1)			
	Power supply	USB 2.0 (PC connection)			
	Operating system	Windows [™] 7 / 8 / 10			
	Disk space requirements	1 GB			
	RAM	4 GB			
	Screen resolution	≥ 1024x768 pixels			

4.2 Dimensions

All dimensions are specified in mm. Tolerance ± 1 mm. Subject to change. Current CAD files can be downloaded at www.epa.de.

LW-MK3plus





LW-SK1400-25







9.02.04 01

LW-MZ-50



4.3 Storage and transport

CAUTION Property damage may occur

Risk of damage to the measuring unit due to improper storage or transport!

NOTE

If the measuring unit was transported at extreme temperatures, it requires an acclimatisation period of at least 2 hours before operation.

Strong vibrations, knocks, shocks and soiling (liquids and solid foreign bodies) must be avoided at all times as they can cause damage to the unit.

Transport/storage temperature	-20 °C to 85°C
Climate resistance	up to 90%, condensation not permitted

4.3.1 Storage

Always store the LEAKWATCH leakage current analysis system properly.

The measuring unit must be stored in a dry, enclosed space.

4.3.2 Transport

Always transport the LEAKWATCH leakage current analysis system in its original packaging.

The supplied storage case must be used for transport.

5 Scope of delivery and optional accessories

5.1 Delivery contents

The measuring and analysis system is offered as a complete set. You can also purchase various accessories that are appropriate for your application.

The LEAKWATCH leakage current analysis system is delivered in a storage case (see scope of delivery).

The hardware has been subjected to extensive testing and left the factory in technically and operationally safe condition.

- A Please keep the original packaging for later shipment, e.g. for calibration.
- A Transport damage due to defective packaging will void the warranty.



Scope of delivery and optional accessories

Delivery scope LW-SET-MZ*



Delivery scope LW-SET-MZ-SK*



5.2 Optional accessories

Unit of measurement



Frequency measuring range: 10 Hz to 150 kHz Leakage current measuring range: depends on the transducer used

The LW-MK3plus is connected to a transducer type LW-SK1400, LW-SK10000 or LW-CEE via connecting cable LW-DAT2M and additionally has a connection for current clamp LW-MZ-50. The connection to the PC is made via the USB interface.

Type: LW-MK3plus

Article no.: 50275628



Current clamp

Frequency measurement range: from 10 Hz to 50 kHz Leakage current measuring range: 1 A / 10 A RMS (switchable) The three mains phases (L1, L2, L3) and the neutral conductor (N) are enclosed with the current clamp. The maximum diameter is 53 mm. This means it is not necessary to disconnect the current path. For evaluation, a measuring unit LW-MK3plus is required. The connection is made via the 2 m connection cable of the clamp with a BNC connector.

Type: LW-MZ-50

Article no.: 50275624



Transducer for DIN rail mounting

Frequency measuring range: 10 Hz to 150 kHz Leakage current measuring range: max. 1400 mA RMS / 10000 mA RMS

The three mains phases (L1, L2, L3) and the neutral conductor (N) are fed through the transducer (maximum diameter 25 mm). For evaluation, a measuring unit LW-MK3plus is required. The LW-SK1400-25 is intended for permanent installation in the control cabinet or a sub-distribution board. It is simply snapped onto a DIN rail. It can be used for control measurements of the leakage current at periodic intervals.

Type: LW-SK1400-25 Type: LW-SK1400-25-HL Article no.: 50275398 (1400 mA) Article no.: 50275494 (10000 mA)



Connecting cable

Cable for connecting the transducer to the measuring unit. Length 2 m.

Type: LW-DAT2M

Article no.: 50275417



Transducer for screw mounting

Frequency measurement range: from 10 Hz to 150 kHz Leakage current measuring range: max. 1400 mA RMS / 10000 mA RMS The three mains phases (L1, L2, L3) and the neutral conductor (N) are routed through the transducer. The maximum diameter is 70 mm (LW-SK10000-70) to 210 mm (LW-SK10000-210). For evaluation, a measuring unit LW-MK3plus is required. The connection is made via the LW-DAT2M connecting cable.

Type: LW-SK10000-70
Type: LW-SK10000-105
Type: LW-SK10000-140
Type: LW-SK10000-210
Type: LW-SK10000-70-HL
Type: LW-SK10000-105-HL
Type: LW-SK10000-140-HL
Type: LW-SK10000-210-HL

Article no.: 50275490 (1400 mA) Article no.: 50275491 (1400 mA) Article no.: 50275492 (1400 mA) Article no.: 50275493 (1400 mA) Article no.: 50275447 (10000 mA) Article no.: 50275444 (10000 mA) Article no.: 50275445 (10000 mA) Article no.: 50275446 (10000 mA)



Power distributor with integrated transducer (CEE adapter) Frequency measurement range: from 10 Hz to 150 kHz Leakage current measuring range: max. 1400 mA RMS / 10000 mA RMS The LW-CEE-16A and the LW-CEE-32A are power distributors with integrated transducers for operation on the LW-MK3plus measuring card. The connection is made via the LW-DAT2M connecting cable. The power distributor has a 2-m connection cable with a CEE plug for 16 A or 32 A. Four 1-phase SCHUKO sockets and two CEE sockets for 16 A are installed (LW-CEE-32A: 1x 16 A, 1x 32 A). The LW-CEE are suitable for quick and easy measurements in the power supply of machines and devices.

Type: LW-CEE-16A Type: LW-CEE-32A Type: LW-CEE-16A-HL Type: LW-CEE-32A-HL Article no.: 50275404 (1400 mA) Article no.: 50275408 (1400 mA) Article no.: 50275507 (10000 mA) Article no.: 50275509 (10000 mA)



Extension cable with integrated transducer (CEE adapter) Frequency measurement range: from 10 Hz to 150 kHz Leakage current measuring range: max. 1400 mA RMS / 10000 mA RMS The LW-CEE-63A is a CEE plug-coupling combination with integrated transducer for operation on the LW-MK3plus measuring card. This is a 1.5-m long rubber hose H07RN-F 5G16. The connection is made via the LW-DAT2M connection cable. The connecting cable has a CEE plug and a coupling for 63 A. The LW-CEE-63A is suitable for quick and easy measurements in the power supply of machines and devices.

Type: LW-CEE-63A Type: LW-CEE-63A-HL Article no.: 50275409 (1400 mA) Article no.: 50275508 (10000 mA)



Earthing contact socket adapter with integrated transducer

Frequency measuring range: 10 Hz to 150 kHz Leakage current measuring range: max. 1400 mA RMS The LW-SKO is an adapter for earthing contact sockets (CEE 7/3) with integrated measuring transducer for operation on the LW-MK3plus measuring unit. The connection is made via the LM-DAT2M connecting cable. The adapter has a built-in Schuko plug and a Schuko socket. It is suitable for quick and easy measurements in the power supplies of single-phase devices.

Type: LW-SKO-16A

Article no.: 50275627 (1400 mA)



USB cable

Cable for connecting the LW-MK3plus measuring unit to the PC.

Type: LW-USB-2.0

Article no.: 50275297



Mounting tabs

LW-FIX mounting tabs (4 pieces) for preparation of the permanent assembly of a LW-MK3plus measuring unit in the control cabinet.

Type: LW-FIX

Article no.: 50275414



Storage box

Storage case for the measuring and analysis system with foam padding, without equipment.

Type: LW-BOX-MZ

Article no.: 90001060

6 Hardware

6.1 Installation of the hardware



Warning of hazardous electrical voltage!

Take appropriate precautions to prevent electric shocks.

A DANGER

Measurements in hazardous proximity to electrical systems should only be performed under the instruction of a responsible electrician and not carried out alone.

Follow the accident prevention regulations for electrical systems and equipment when carrying out all work.

The user must ensure before each measurement that the test leads and test equipment are in flawless condition.

The transducer must only be installed by an authorised and qualified specialist who is familiar with the relevant safety provisions.

Installation should only be carried out while the power supply is disconnected and no parts in the system are live!

The transducer must be firmly installed in the distribution board for measuring.

NOTE

The LW-MK3plus measuring unit may only be connected to the PC after the software installation has been completed.

Measurements of high load currents or motor currents can overload or destroy the sensitive hardware.

The level of the leakage currents to be measured should not exceed the measuring range indicated in the specification.

All conductors required to operate the system (except the protective earth conductor and cable shields) are run isolated through the cable duct on the transducer. Pay attention to the direction of flow of the power.



Metallic cable sheathing (e.g. individual shielding) in the duct area must be removed. Continued on next page

All LW-SK transducers, LW-CEE measuring adapters and LW-MZ current clamps work in any location and do not require special ventilation and cooling.

The LW-SK1400-25 transducer is designed for mounting on a rail in accordance with DIN 50022.



To analyse leakage and differential currents flowing through the residual current circuit breaker, install the transducer directly behind the residual current circuit breaker (see wiring diagram page 26).

The transducer must be inserted in the circuit where the residual current circuit breaker is located or will be located in the future.

The leakage currents (differential currents) can be measured both in three-phase and single-phase networks.

6.2 Measurement setup

The following hardware is required:

- Measuring unit (LW-MK3plus)
- Transducer / measuring adapter (LW-SK / LW-CEE) with connecting cable (LW-DAT2M) or current clamp (LW-MZ)
- USB connection cable (LW-USB-2.0)
- PC, laptop or tablet running Windows[™] 7 / 8 / 10 with LEAKWATCH –PC-software (LW-SOFT)

The measuring unit is connected to a PC via a USB 2.0 interface with the included USB connection cable. No additional power supply is needed.

A transducer or a current clamp can be connected to the measuring unit. Transducers or measuring adapters are connected to the measuring unit via a connecting cable (LW-DAT2M). The *LW-SK/LW-CEE* connection is used for this purpose.

Depending on the wire cross section of the connector of the measured machine or device, various transducers and measuring adapters for connection with a CEE or Schuko plug can be selected from.

The current clamp is connected to the *LW-MZ* connection. The measuring range of the clamps can be set to 1 A or 10 A (the measuring range must also be adjusted accordingly in the software).

M IMPORTANT NOTE

If a transducer or measuring adapter is connected to the measuring unit (*LW-SK/LW-CEE* connection), the *LW-MZ* connection must be provided with the appropriate terminating resistor (LW-BNC-75R).



For the measurement, the transducer / current clamp is placed close to the residual current circuit breaker or mains supply. The three mains phases (L1, L2, L3) and the neutral conductor (N) are routed through the transducer (LW-SK) or the current clamp (LW-MZ).



CEE adapter connection units (LW-CEE-16A, LW-CEE-32A and LW-CEE-63A) are available for connection via a CEE socket; these are simply connected to the supply line of a device or a machine.





6.3 Connection example (circuit diagram)

LEAKWATCH

NOTE

The LW-MK3plus measuring unit may only be connected to the PC after the software installation has been completed.

7.1 System requirements

- PC or laptop computer
- Operating system Windows [™] 7/8/10
- Free hard disk space 1.2 GB (or more)
- Recommended RAM 4 GB (or more)
- Minimum screen resolution 1024x768 pixels

The latest version of the LW-Soft software on a USB stick or via download from <u>www.epa.de</u> is required for installation.

7.2 Installing software

During installation, important configurations are made on your PC in order to operate the **LEAK**WATCH LW-Soft software.

IMPORTANT NOTE

Only connect the LW-MK3plus measuring unit to the PC via the USB connection after the software has been completely installed.

NOTE

Installation is only possible with full administrator rights.

It is recommended to disable or configure security programs during installation, so as to prevent interference with the installation.

Windows 8/10 does not allow the installation of unsigned drivers. In order to be able to install unsigned drivers, the signature check must be bypassed (for more information, see *Installation Software*).

All unnecessary applications should be closed before starting the installation.

After installation, the PC must be restarted before the program can be started.

The following pages provide a detailed description of the installation procedure.

Installer / setup.exe

The data carrier contains an automatic installer as well as the measuring and analysis program LW-Soft itself. We recommend running the installer (*setup.exe*).

If the current drivers and runtime engine from National Instrument have already been installed, the folder with the LW-Soft software can simply be copied to the PC without further installation.



The data carrier contains an automatic installer. To run the installer, click on the file *setup.exe*.



Confirm with "execute".



The installer starts automatically. Click on "*Next*" to confirm.

🗐 EPA L	W-Soft	- • ×
EPA®	Destination Directory Select the installation directories.	
	All software will be installed in the following locations. To install software into a different location, click the Browse button and select another directory.	
	Directory for EPA LW/Soft C\Program Files (x86)\EPA Leakwatch\	Browse
	Directory for National Instruments products C-\Program Files (x86)\National Instruments\	Browse
	< C Back Nex	t>> Cancel

Change the target directory if necessary (not recommended). Click on "*Next*" to confirm.

A License Agreement You must accept the lice	enses displayed below to proceed.		AKWATCH
Lizenzvereinbarung	für Software		-
Zur Überlassung von	Software als Teil von L	ieferungen.	
1 Gegenstand			
Der Lizenznehmer er nicht weiter übertr Nutzungsrecht für d Programm genannt. EPA GmbH, Fliederst EPA genannt, weist Stand der Technik F	wirbt mit dieser Lizenzw agbare und nicht ausschl is Software LeakWatch, i r. 8, D-63486 Bruchköbel ausdrücklich darauf hin, ehler im Programm nicht	ereinbarung ießliche m folgenden , im folgen dass nach ausgeschlos	das den dem sen •
	 I accept the Lice I do not accept t 	ense Agreement. he License Agreemer	nt.

Please read and accept the EPA License Agreement. Then click on "*Next*" to confirm.

Continued



Click on "*Next*" to confirm.

LEAKWATCH*
append a

This may take a few minutes.

EPA	Leakwatch CS		_	• *
EPA %	* Installation Complete			KWATCH*
	The installer has finished updating your system.			
		<< Back	Next>>	Finish

Click on "Finish" to confirm.



Click on "Restart" to restart the PC.

7.3 Device driver installation

In order to be able to also install <u>unsigned</u> drivers for the 64-bit version of Windows 8/10, the signature check must be temporarily disabled.

Driver installation for LW-MK3plus LEAKWATCH measuring unit on WINDOWS[™] 10:

```
Skip steps 1-6 for WINDOWS<sup>™</sup> 7 and WINDOWS<sup>™</sup> 8!
```

1.) Press and hold [Shift] and click on "Restart" in the On/Off menu.



Continued

2.) Select "Troubleshooting".



3.) Select "Advanced Options".



Continued

4.) Select "Start Settings".

wiederherstellen	$\langle 0 \rangle$	Starthilfe Probleme behebe Windows verhinde	n, die das Laden am	von		
Zur vorherigen Version zurückkehren		Eingabeau Eingabeaufforderu Problembehandlu	ifforderun ing für die erweit ng verwenden	9 erte		
Systemimage- Wiederherstellung Windows mit einer bestimmten Systemisionadate wiederheitellen	-	UEF Firn (C) Einste PCs &	Erwe	iterte Optic	onen	
			-	System wiederherstellen ^{Windows anhand eines auf dem PC}	C:\	Eingabeaufforderung Eingabeaufforderung für die erweit Problembehandlung verwenden
Weitere Wiederherstellungsoptionen	anzeigen			aufgezeichneten Wiederherstellungs-		
Weitere Wiederherstellungsoptionen	anzeigen		+	aufgezeichneten Winderhersteilungs- punkts wiederhersteilen Systemimage- Wiederhersteilung Windows mit einer bestimmten Systemimagedatei wiederhersteilen	₽	Starteinstellungen Windows-Startverhalten ändern

5.) Select "Restart".

¢	Starteinstellungen	
	 Neustarten, um Windows-Optionen zu ändern, z. B.: Videomodus mit niedriger Auflösung aktivieren Oebugmodus aktivieren Startprotokollierung aktivieren Abgesicherten Modus aktivieren Erzwingen der Treibersignatur deaktivieren Schutz des Antlischadsoftware-Fruhstarts deaktivieren Automatischen Neustart bei Systemfehler deaktivieren 	Nu starten

Continued

6.) Press [7] (Windows restarts without forcing driver signatures).

rücken Sie eine Nur	mmerntaste, um eine der Optionen unten auszuwählen:
erwenden Sie die Nummer	rntasten oder die Funktionstasten F1-F9.
) Debugmodus akti	vieren
2) Startprotokollieru	ng aktivieren
3) Video mit niedrige	er Auflösung aktivieren
4) Abgesicherten Mo	odus aktivieren
5) Abgesicherten Mo	odus mit Netzwerktreibern aktivieren
6) Abgesicherten Mr	odus mit Eingebeaufforderung aktivieren
	eibersignatur deaktivieren
8) Schutz des Antisci	nadsoftware-Fruhstarts deaktivieren

7.) After restarting, open the Device Manager in the Control Panel. The Windows search function can be used for this purpose.

Systemsteuerung (1)	
🚔 Geräte-Manager	
🔎 Weitere Ergebnisse anzeigen	
Geräte-Manager × Herunterfahren >	

- 8.) Connect the USB connection of the LEAKWATCH measuring unit LW-MK3plus to the PC.

9.) After connecting the USB port of the LW-MK3plus measuring unit to the PC, a new "Serial USB device" is detected in the Device Manager.



10.) Right-click on "Serial USB Device" and then "Update Driver Software".



11.) Click on "Search for driver software on the computer".



12.) Click "Select from a list of device drivers on the computer".

		>
-	Treibersoftware aktualisieren - Serielles USB-Gerät (COM4)	
	Auf dem Computer nach Treibersoftware suchen	
	na dem compater nach neberoennare bachen	
	An diesem Ort nach Treibersoftware suchen:	
	✓ Durchsuchen	
	☑ Unterordner einbeziehen	
	→ Aus einer Liste von Gerätetreibern auf dem Computer auswählen	
	aus derselben Kategorie stammen.	

Continued on next page

13.) Click on "*Drive*" and then on "*Browse*".Then select the appropriate folder in which the drivers are located.

Treiber aktualisieren – Serielles USB-Gerät (COM7)
Wählen Sie den für diese Hardware zu installierenden Gerätetreiber.
Wählen Sie den Hersteller und das Modell der Hardwarekomponente, und klicken Sie auf "Weiter". Klicken Sie auf "Datenträger", wenn Sie über einen Datenträger verfügen, der den erforderlichen Treiber enthält.
🗹 Kompatible Hardware anzeigen
Modell Image: Serielles USB-Gerät Image: Serielles USB-Gerät
Der Treiber hat eine digitale Signatur. Datenträger Warum ist Treibersignierung wichtig?
 Treiber aktualisieren – Serielles USB-Gerät (COM7) Wählen Sie den für diese Hardware zu installierenden Gerätetreiber.
Wähle "Weite Installation von Datenträger X In
erford Legen Sie den Installationsdatenträger des Herstellers ein und stellen Sie sicher, dass das richtige Laufwerk Abbrechen
Modell Serielles USE Serielles USE
Dateien des Herstellers kopieren von:
Der Treiber hat eine digitale Signatur.
Warum ist Treibersignierung wichtig?

🔒 Datei suchen \times DRIVER Suchen in: \sim 🎯 🤌 📂 🛄 - Name Änderungsdatum Тур * 01.06.2015 15:05 📓 STM32F103 Setup-Info Schnellzugriff 🐻 STM32F103_win10 01.06.2015 15:05 Setup-Info STM32F103_win78 01.06.2015 15:05 Setup-Info stm32h103_vista 15.12.2014 14:25 . Setup-Info Desktop Bibliotheken Dieser PC < Netzwerk Dateiname: STM32F103 Öffnen Dateityp: Setup-Informationen (*.inf) Abbrechen

14.) Select the driver, and then click "Open".

15.) Select the latest driver "STM32 Virtual COM Port" and click "Next".

Treil	ber aktualisieren – Serielles USB-Gerät (COM7)	
Wähle	en Sie den für diese Hardware zu installierenden G	erätetreiber.
•	Wählen Sie den Hersteller und das Modell der Hardwarekompor "Weiter". Klicken Sie auf "Datenträger", wenn Sie über einen Dat erforderlichen Treiber enthält.	nente, und klicken Sie auf ienträger verfügen, der den
Kom	npatible Hardware anzeigen	
Mode		
STI	M32 Virtual COM Port Version: 1.0.0.0 [17.05.2011]	
STI	M32 Virtual COM Port Version: 1.0.0.0 [27.03.2014]	
ST	M32 Virtual COM Port Version: 1.0.0.0 [27.03.2014]	
STI	M32 Virtual COM Port Version: 1.0.0.0 [27.03.2014]	
A De	er Treiber hat keine digitale Signatur.	Datenträger
A	anum ist Traibersionienung wichtig?	
<u></u>	ardin ist nebersignierung wichtig:	
		Weiter Abbrechen

16.) The driver will now be updated.



17.) Select "Install this driver software anyway" (WINDOWS™ 10 only).



18.)

Geräte-Manage	if and the second s	_
Datei Aktion A	Ansicht ?	
(+ +) 📰 🖾	🛛 📅 💯 💺 🗙 💿	
V 🗄 DESKTO		×
> 🗃 Akk		
∽ 🔮 And ←	Treibersoftware aktualisieren - STM32 Virtual COM Port	
_ 🔤		
V 🖶 Ans	Die Treibersoftware wurde erfolgreich aktualisiert	
× ≕ Aur	ble helberbortware warde enorgreich aktaansiert.	
Au		
> Cor	Die Installation der Treibersoftware für dieses Gerät ist abgeschlossen:	
> 🚍 Dru		
> 🔐 DVI	STM32 Virtual COM Port	
> 🗛 Eing		
> 属 Gra		
> 📷 IDE		
> Lau		
> 💭 Net		
> 🗖 Pro		
> 📕 Sof		
> 🍇 Spe		
> 🏣 Sys		
> 🔜 Tas		

19.) The LW-MK3plus measuring unit is now recognised as "NI-VISA USB Device".



The driver installation is now complete and the LW-MK3plus measuring unit can now be used with the LEAKWATCH software.

NOTE

To check whether the Windows hardware driver has been installed correctly, please connect the LW-MK3plus measuring unit via USB to your PC and follow the further steps.

After installing Windows updates, it may be necessary to reinstall the software.

7.4 Functional description of the software

The **LEAK**WATCH measuring and analysis system allows you to measure and immediately analyse leakage currents (differential currents). The individual functions are explained below.

7.4.1 Launch program

Run the LW-Soft.exe file by double-clicking on the **LEAK**WATCH icon.



The program is loaded.

EPA ®	®	
	Starting Data Storage Module	3.1.10.1 © EPA GmoH

7.4.2 Hardware settings

Located in the *Settings* menu is the *HW Settings* button. Please select the used measuring card and the transducer first.

- Leakwatch		_	(Internal	CLEARING MEAN ADMINIST AND ADMINIST	
EPA %		LEAKAG	GE CURRENT MEA	SUREMENT AND ANALYSIS	LEAKWATCH*
Measurement	Analysis	Record	Settings		
SW Settings Software	W Settings HW Settings Hardware	Leakwatch Settings	Editor	Settings	
Software Sof	0,02 0,03	Settings	Category	LW-MK3plus	7
					🖌 ок

If you are analysing a 60 Hz network, the *mains frequency* can be changed from 50 Hz to 60 Hz.

Leakwatch Settings Editor	
	Settings
Settings Category LW-MK Type Selection Transducer Selection LEAKCOMP Selection Mains Frequency	Frequency 50Hz 💌

The LEAKCOMP Selection currently has no effect on the program.

Leakwatch Settings Editor	
	Settings
Settings Category	
LW-MK Type Selection Transducer Selection LEAKCOMP Selection Mains Frequency	LEAKCOMP-50Hz
	Abelistromkompensation Leskage current compensation DEAKCOMP Www.leskacomp.de Sono Sono Sono Sono Batter
J	√ ок

7.4.3 Software settings

Press the SW Settings button to open the settings menu for Language, Simulation and Software Reset.

Select the desired language. English (recommended) is selected by default.

Leakwatch Settings Editor	
	Software Settings
Settings category Language Simulation Software Reset	Language
	English

Simulation mode can be used to operate the software without hardware, e.g. to test functions. For example, a sine or a square wave signal with a specific frequency and amplitude can be simulated.

Leakwatch Settings Editor	×
	Software Settings
Settings category	
Language Simulation Software Reset	Simulation
	ON/OFF
	Signal type Square Wave
	Offset 0
	Noise
	Amplitude 300
	Measure Rate [Hz] 300000
	<u>м</u> ок

The factory default software or hardware settings can be restored by means of the reset buttons.

Continued

- Leakwatch Settings Editor		×
	Software Settings	
Settings category Language Simulation Schware Reat	Restore Default Settings	
	Restore Software Settings Restore Hardware Settings	ОК

7.4.4 Information field

General hardware and software information is provided in the lower right area. Changes can be made via the *Settings* menu.

-500 - -600 -											C1 Y 0 C2 Y 0 C1 X 0 C2 X 0		
-700 - -800 - -900 -											dt X 0	RCD EPA/RCCB1-0,03	-
-1000-,, 0 + 💌 🖤	0,0	1	0,02 0	,03 0,1	04 0,0 Time [s	05 0,06]	0,07	0,08	0,09	0,1	Area max. 0 Area min. 0	Transducer LW-MKSplus Transducer LW-MZ-50_1A Mains Freq. 50Hz SW Version 3.1.10.1	
												L 🖉 🚫 Do, 15.Aug.2019 1	15:31:13

7.4.5 Hardware detection

First check whether the hardware (LW-MK3plus) has been properly recognised by WindowsTM. To do so, press the *ON/OFF* button.

The hardware should then be detected automatically. This is indicated by the icons (change from red to green).

NOTE

If the hardware is not recognised, the driver configuration must be checked in the Windows Control Panel (see also driver installation).

7.4.6 Menu selection

Here you will find the menu selections *Measurement*, *Analysis*, *Record* and *Settings*. The individual menus are explained below.

	- Leakwatch	0	in March		Sha da			when we have	and a	and and 1	n		×
	LEAKAGE CURRENT MEASUREMENT AND ANALYSIS											LEAKWATCH"	
	Measurement Analysis Record Settings		tings										
	U ON/OFF Pa	use Signal	FFT	RMS	Compare	Trigger	Screenshot	Save Graph	Screenshot 3x	Excel Export		EPA/RCCB1-0,03	
			Measurement					Ex	port			RCD-Selection	

7.4.7 RCD selection

The desired tripping characteristic can be selected from a variety of common AC/DCsensitive RCD types via an *RCD selection* drop-down menu. The calculation of the RCD utilisation depends on the selected RCD.

EPA/RCCB1-0,03	-
	_

RCD-Selection

NOTE

The RCDs can only be supplemented or changed by EPA. If an RCD is missing, please contact EPA.

7.4.8 RCD usage

The *RCD* % display shows the percentage utilisation for the selected RCD. The traffic light colours additionally indicate whether the RCD can be safely operated.

RCD % 6,85

7.4.9 Value table

In the value table, certain values such as the total RMS value (*RMS* [*mA*]), the RCD utilisation ([*RCD* %]), the maximum current (*Max.Amplitude* [*mA*]) and the minimum current (*Min.Amplitude* [*mA*]) and the base frequency (*Base Frequency* [*Hz*]) are displayed.

Description	Value	
RMS [mA]	6,38	
RCD [%]	6,85	
Max. Amplitude [mA]	11,31	
Min. Amplitude [mA]	-11,51	
Base Frequency [Hz]	2444,78	

7.4.10 Starting and stopping measurements

The ON/OFF button must always be pressed at the beginning of the measurement. To stop the measurement, the *Hold* button can be pressed.

ĺ	- Leakwatch	-	Marchanara a	unilla dann aut	Instants of and south and								
	EPAS	LEAKAGE CURRENT MEASUREMENT AND ANALYSIS											
		Ber Charles											
	Measurement	Analysis	Record	Settings									
	U			: 🟥 🔛	n 🖄 n 🗹	EPA/RCCB1-0,03							
	ON/OFF Pause	Signal	FFT RMS Measurement	Compare Trigger	Screenshot Save Graph Screenshot 3x Excel Export Export	RCD-Selection							

7.4.11 Documenting measuring results

The measurements can be documented via the export functions.



A screenshot of the currently visible window is created when the *Screenshot* button is pressed.

When the *Screenshot 3x* button is pressed, simultaneous screenshots of the signal, FFT and RMS are created

After the storage location has been selected, a comment field appears. The comment field can be used to enter individual text for each screenshot.

	×
Comment for Screenshot	!
Messung an Anlage 1. Frequenzumrichter 1 AN, Frequenzumrichter 2 AUS	
	💉 ок

The text will then be displayed on the screenshots in the lower blue bar.



The *Save Graph* function only saves the graph of the respective measurement. This function is limited to *Signal, FFT* and *Trigger*.

The *Excel Export* function exports the measurement data to an XLSX file. This function is limited to *Signal* (time and amplitude), *FFT* (frequency, amplitude and RCD utilisation) and *Trigger*.

7.4.12 Measurement time range

Selecting the *Signal* button displays the leakage current in the time domain, similar to an oscilloscope.



7.4.13 Scaling

Scaling can be used to set or automatically scale the time range (X axis) and the current range (Y axis).



7.4.14 Graph options

Graph Options allows you to display a horizontal and a vertical grid (with signal).



The X and Y axes can also be switched between linear and logarithmic display (in FFT).

```
Graph Options

X Axis Grid V Axis Grid

X log. V log.

Keep Peaks
```



If the checkmark is set to *Keep Peaks*, the maximum amplitudes (positive and negative) are displayed.

7.4.15 Cursor

When the cursor is enabled, two green vertical lines appear. The area between the two cursor lines is measured automatically and the minimum and maximum values (area min. / area max.) are displayed. In addition, the X and Y position and the difference (dt X) are displayed.





The image section and the cursor can be changed via the control below the graph.

+ 🔎 🕪

If the element with the cross is selected, the position of the cursor on the X-axis can be changed.

+

If the element with the magnifying glass is selected, the measuring signal can be displayed differently in the X and Y direction.

•,⊕

The symbols have the following functions: Zoom in on the image area, enlarge the X area, enlarge the Y area, display full screen, enlarge image areas and reduce image areas.



The signal can be displayed in its original form again by clicking on the full-screen icon.



If the element with the hand is selected, the measuring signal can be shifted arbitrarily in the X and Y direction.

7.4.16 Measurement frequency range

Since residual current devices of type B / B + have a different triggering threshold depending on the frequency (see red line), it makes sense to look at the magnitude of the leakage currents over a defined frequency spectrum. The logarithmic display clearly shows the complete spectrum from 10 Hz up to 150 kHz. The effect on the leakage current at a certain frequency when using different components (inverters, filters, etc.) can be made visible with the help of the FFT (Fast Fourier Transformation).



7.4.17 RMS bar display

Showing critical frequencies and frequency ranges can be very helpful to find errors and for leakage current balancing. In addition to the current value in mA, all current values are also displayed in green, yellow or red depending on the selected RCD. Ideally, all values should be in the green range.

There are five fixed frequencies and three fixed frequency ranges. In addition, there is a variable frequency display (custom RMS) that can be freely changed.



7.4.18 **RCD comparison**

mA

To compare different residual current circuit breakers, the program offers a separate overview. The selection boxes allow you to freely select different types of FI circuit breakers. These can then be compared with each other based on their degree of utilisation. The traffic lights can be very handy in this instance as well.



7.4.19 Trigger mode

The program offers the possibility of detecting on/off currents or short-term current peaks with trigger mode. In trigger mode, fast pulses can be recorded with defined trigger thresholds. The key to triggering the RCD is not only the amplitude of the differential current, but also the duration.



The frequency spectrum of the current image section can be displayed via the FFT tab.



The signal can be analysed over the first 300 ms via the *Power up verification* tab. Residual current devices evaluate the differential current (which may be leakage or fault current) in relation to the rated residual current (e.g. 30 mA, 300 mA, 500 mA). The product standard prescribes the maximum value at which the RCD must trigger for defined periods of time. The analysis also includes the short-term delay.



7.4.20 Short-term recording

Short-term recording can be used to record leakage currents over a defined period of several seconds or minutes, e.g. when starting a machine or when connecting other system parts.

Simply click on the *Record* button. The recording can be paused and resumed via the *Pause* button.



If the *Record* button is pressed, a window opens in which you can specify the storage location and the file name.

7.4.21 Evaluation of short-term recording

To evaluate the recording, press the *Open Record* button. After switching to the File Viewer, the file can be selected and the measurement analysed. To do this, open the record again (Open record).



7.4.22 Play short-term recording

With the *Load Record* button the recorded measurement can be played back. Press the *Play* button to do so.



The recording can be paused and resumed with the *Play* button. With the *Continue* button the recording can be played consecutively in an endless loop.

7.4.23 Long-term recording

If several days are to be recorded, a long-term recording can be made.

The desired start and end time (also the date) can be set under *Time Definition*.

Value Definition can be used to select the values to be stored and the intervals at which values are to be stored. By default, all fields are checked and the save rate is set to 1 second.

The data is stored as a .tdms file. The storage location can be set under *File Path*.

The long-term recording can be carried out at the same time as the regular measurement. During recording, the RCD and the custom frequency range in the RMS menu should not be changed, as this could lead to incorrect results.



7.4.24 Analysing long-term recordings in the File Viewer

The data stored in the long-term recording is stored as a .tdms file.

To evaluate the recording directly, press the *Open Record* button. After switching to the File Viewer, the file can be selected and the measurement analysed. To do this, open the record again (Open record).





The lower section shows the entire time range. The area within the two red cursors is displayed in the upper area and the measured values are displayed in the value table on the right. The individual curves can be faded in and out with the checkmarks in the graph.

Screenshots can be created here as well, or the values can be exported to Excel.

7.4.25 Evaluate long-term recording in Excel

The tdms file format can also be opened in Excel via the import function (use the TDM Excel add-on for Microsoft[™] Excel).

	А	В	С	D	E	F	G	Н	1	J	К	L	М
1	RMS [mA]	RCD [%]	Max. Amplitude [mA]	Min. Amplitude [mA]	50 Hz	150 Hz	450 Hz	750 Hz	1050 Hz	20 Hz - 2 kHz	2 - 50 kHz	50 - 300 kHz	Custom RMS
2	1,29	0	3,39	-3,63	0,03	0	0	0	0	0,07	0,31	0,8	0,1
3	1,38	0	3,38	-3,64	0,03	0	0	0	0	0,08	0,31	0,81	0,1
4	1,49	0	3,38	-3,64	0,03	0	0	0	0	0,07	0,31	0,8	0,1
5	1,17	0	3,37	-3,65	0,03	0	0	0	0	0,07	0,31	0,8	0,09
6	1,57	0	3,36	-3,66	0,03	0	0	0	0	0,07	0,31	0,8	0,1
7	1,22	0	3,35	-3,67	0,03	0	0	0	0	0,07	0,31	0,81	0,09
8	1,2	0	3,34	-3,68	0,03	0	0	0	0	0,07	0,31	0,8	0,09
9	1,21	0	3,37	-3,65	0,03	0	0	0	0	0,08	0,31	0,8	0,1
10	53,09	0	66,41	-162,7	0,03	0	0	0	0	0,08	0,31	0,8	0,1
11	33,37	11,82	69,61	-70,85	0,07	0,02	0,01	0,01	0,01	0,47	6,61	12,96	0,34
12	33,28	12,19	69,56	-70,01	0,04	0,01	0,01	0,01	0,03	28,33	1,65	16,89	28,33
13	33,26	12,52	87,19	-76,09	0,03	0,01	0,02	0,02	0,02	28,33	3,24	18,25	28,33
14	1,38	0	3,4	-3,62	0,03	0	0	0	0	0,08	0,31	0,8	0,1
15	1,45	0	3,42	-3,6	0,03	0	0	0	0	0,08	0,31	0,81	0,1

8 Background information on leakage current

8.1 Leakage currents and RCDs

Leakage currents are not fault currents, but they occur for operational reasons. The leakage currents – which are generally capacitive – are currents that flow via (interference suppression) capacitors or so-called parasitic capacitances (e.g. motor cable shield) to the ground potential without an insulation fault being present.

An RCD cannot distinguish between a true fault current and an operational leakage current. RCDs detect leakage currents as differential current. If this is too high, unintentional triggering and thus standstills of the machines and systems occur.

For AC/DC-sensitive residual current circuit breakers (type B, B +), the specification of the rated residual current $I_{\Delta n}$ "30 mA" is based only on the mains frequency (50 Hz), but these RCDs have a frequency-dependent tripping characteristic (normative from 0 Hz to 1 kHz or 20 kHz or also higher - depending on the type).

Leakage currents differ in their frequency. Measuring with a normal current clamp is thus not very informative.

Even a 15 mA leakage current at 50 Hz can lead to RCD tripping, but not at high frequencies. This is why **LEAK**WATCH was developed.

8.2 Static leakage currents

A distinction is made between static and dynamic leakage currents, which can lead to a shutdown of the residual current circuit breaker when exceeding the RCD tripping threshold.

Even without insulation faults, static leakage currents flow via the protective conductor or other conductive parts to the safety ground during operation of a consumer. These are often caused by EMC measures (suppression capacitors, shielding, line capacitance, filter circuits, etc.). The clock frequencies (e.g. with servo or frequency converters) and whether the devices are single-phase or three-phase significantly impacts the frequency and amplitude of the operational leakage currents.

8.3 Dynamic leakage currents

Dynamic leakage currents occur only briefly. Especially during switching operations (switching on/off) of devices with filter circuits, current peaks of a few mA to A may occur for a short time. During the switching process, uneven contact results in asymmetrical conditions (star point shift of the capacitances), which usually last only a few ms. But this is often enough to cause RCCBs to trip.

Background information on leakage current

8.4 Typical causes of leakage currents in automation technology

- o EMC filter in mains or motor cables
- Internal EMC filters of frequency converters
- Parasitic capacities of shielded motor cables
- High clock frequency of frequency converters
- o Unbalanced network behaviour when switching on and off

8.5 Possible measures for leakage current reduction



Please contact us if you have any questions about measurements, how to analyse them or how to reduce leakage currents!

Phone: +49 (0)6181 - 97 04 0 or e-mail: info@epa.de

9 Maintenance

9.1 Inspection and maintenance

Maintenance and inspection of the starting current measuring and analysis system may only be carried out by qualified electricians. Unless explicitly described in these instructions, modifications to the hardware and software may only be carried out by EPA or persons authorised by EPA.

The measuring and analysis system is maintenance-free when used as intended.

9.2 Calibration

Regular calibration (e.g. yearly) is recommended. This can be carried out by EPA on request.

9.3 Repairs

CAUTION Property damage may occur

The measuring and analysis system can be damaged or destroyed if the instructions are not followed.

Repairs on the measuring unit and transducers may only be performed by the EPA service department.

9.4 Disposal

For compliance with ElektroG (German Electrical and Electronic Equipment Act on the disposal of electrical and electronic waste), you may return the equipment to us.

The equipment is then either recycled by us or disposed of by a recycling company according to legal requirements.

LEAKWATCH is designed for commercial use. These devices may not be disposed of at municipal collection points for electrical appliances or with household waste.



IMPORTANT NOTE

The devices contain electronic components and must be disposed of properly.

If you have any questions, please contact us.

Presented by:



EPA GmbH

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