

PacT Series VigiPacT

Catalog 2025
Residual-Current Protection Relays



February, 2025

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Life Is On

Schneider
Electric

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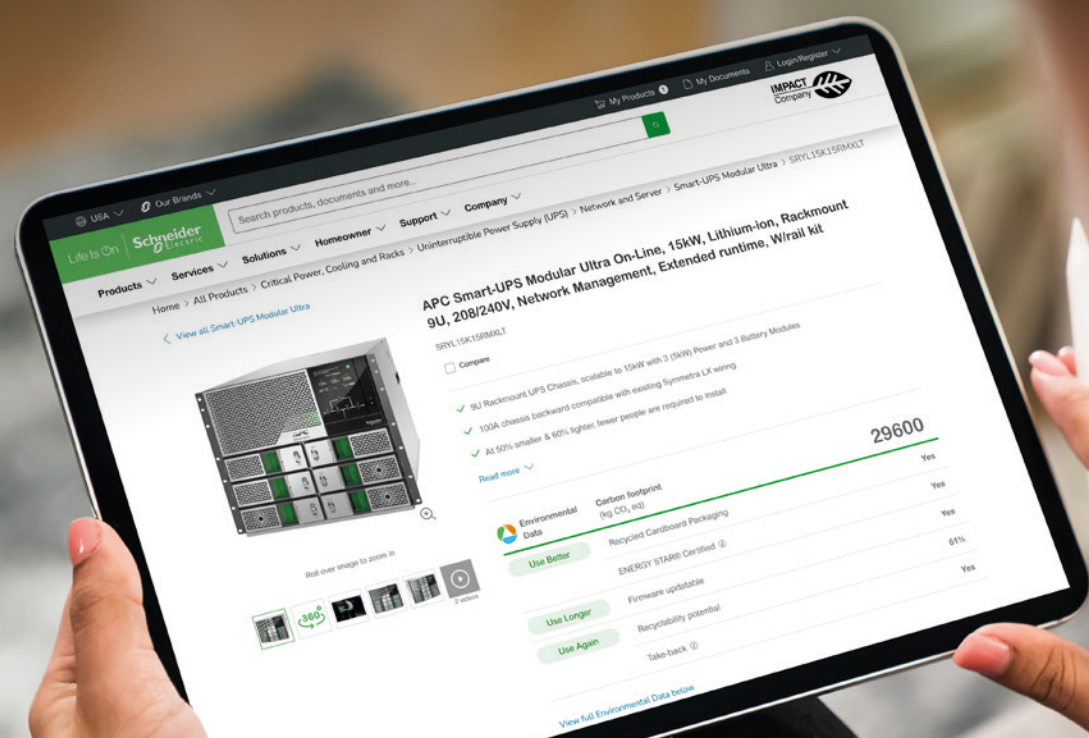
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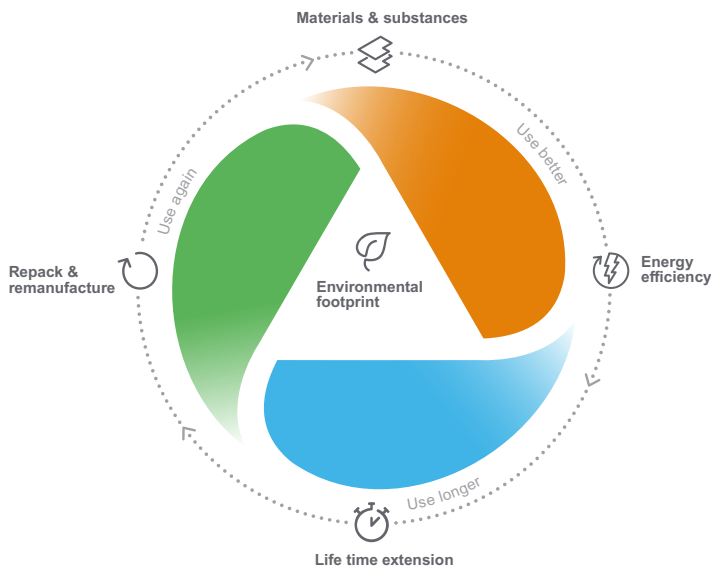


Next-level transparency for better-informed product choices

The Environmental Data Program is a framework for how we measure, categorize, and compare the environmental attributes and footprint of our products.

Using a rigorous, fact-based methodology, the program provides environmental data from across the product lifecycle.

Five data categories across the product lifecycle



Use Better: How sustainable a product is, including environmental footprint, materials and substances, packaging, and energy efficiency.

Use Longer: How a product's life time can be effectively extended in terms of repairability and updatability.

Use Again: How a product can be reused, from dismantling and remanufacturing to recyclability and manufacturer take back.

With this transparent, verified data, customers and partners are empowered to make conscious environmental choices and accurately evaluate and report on sustainability performance.

All our hardware offers have an associated environmental data available on se.com product pages.



Learn more about the
Environmental Data Program

Same Technology, Same Offer, Same Reference, Simpler Names

Vigirex range is becoming Vigi**PacT** to make it easier for you to navigate across the wide range of our world-class digital offerings and select with confidence the offers that are right for you and your needs.

Future-proof your installation with Schneider Electric's low and medium voltage **PacT** Series.

Built on legendary Schneider Electric innovation, the **PacT** Series comprises world-class circuit breakers, switches, residual current devices and fuses, for all standard and specific applications. Experience robust performance with this comprehensive range of EcoStruxure-ready electrical panel, for all applications from 16 to 6300 A in low-voltage and up to 40.5 kV in medium-voltage.

PacT Series

Building on the strengths of the **PacT** Series, Vigirex name will be progressively changed into Vigi**PacT** to become a complete range of protection and monitoring devices. Vigi**PacT** residual current relays, with associated toroids, measure the earth leakage current in the electrical installation to provide earth leakage protection and earth leakage monitoring.

Old names	New names
Compact	Com PacT
Masterpact	Master PacT
Micrologic	MicroLogic
Transferpact	Transfer PacT
Fupact	Fu PacT
Vigirex	Vigi PacT

EcoStruxure Architecture

To enable brand consistency, relevance and impact, we are reinforcing our EcoStruxure™ architecture and digital customer lifecycle tools to ensure a seamless experience from the CAPEX to OPEX phases of each project, bridging our entire ecosystem of partners, services providers and end users.

EcoStruxure is our IoT-enabled open and interoperable system architecture and platform. EcoStruxure delivers enhanced values around safety, reliability, efficiency, sustainability and connectivity for our customers. EcoStruxure leverages advancements in IoT, mobility, sensing, cloud, analytics, and cybersecurity technologies to deliver Innovation At Every Level from Connected Products; Edge Control; and Apps, Analytics & Services: our IoT technology Levels.

Old names	New names
Ecodial	EcoStruxure Power Design
Ecoreal	EcoStruxure Power Build
Ecoreach	EcoStruxure Power Commission
Masterpact MTZ mobile App	EcoStruxure Power Device App

Unleashing digital intelligence

Schneider Electric’s portfolio of LV switchboards and breakers -- from individual units to cloud-connected smart panels and app-based interfaces -- brings **breakthrough innovation** to power distribution with **plug and play modules** with **built-in connectivity** that are both backward compatible and forward thinking to enable the digitization for multiple generations of our switchboard and breaker products.

Connectivity revolutionizes the experience of people who work with these connected products, liberating from on-site checking to receiving remote, real-time updates once the data is integrated into a monitoring system. Connectivity will keep evolving and enhancing the experience for anyone working with our breakers of the future.

For the electrical distribution industry, these breakers and switchboards of the future will set the foundation for an All Digital All Electric world. With Schneider MCCBs in 30-40% of buildings around the globe, and 10 years as the leading breaker with 1.5M units installed per year, ComPacT and its series of modular accessories are already enabling connected capabilities across generations of breakers, changing the game for power distribution while elevating all expectations, experience and capabilities for our breakers now and well into the future.

Life

Schneider Electric simplifies the complexity of electrical installations for channel partners and propose some added value content around 3 mains topics:

- Fire prevention
- Power availability
- Renewability and efficiency/
Green and circularity installations.





All the promises of a leading brand

Certification

The VigiPacT residual current relays comply with all the major standards worldwide, in particular those dealing with:

- Earth leakage protection: IEC 60755 and IEC 60947-2 annex M (sequences MI/MII/MIII/MIV) for the protection of life and property,
- Installation: IEC 60364,
- Electromagnetic compatibility (EMC): IEC 61000,
- Insulation coordination: IEC 60664.

And North American standards:

- Ground fault protection: UL 1053 and CSA 22.2 No. 144 (protection of equipment and property).

Certified quality: ISO 9001: 2000

Our efforts are based on a Quality Management System to enhance the effectiveness of our processes, the goal being to ensure continuous improvement in compliance with standard ISO 9001: 2000.

Our quality objectives are built into our products right from the design phase.

We are committed to implementing the five key points of our quality policy:

- Measurement of customer satisfaction
- Solidly built products
- Control of the manufacturing process
- Management of development projects
- Commitment of all those involved.

CE marking

The CE marking, created by European legislation, is designed to provide assurance that the product is not dangerous, non-polluting and immune to electromagnetic disturbances (EMC directive).

Sustainable products

Schneider Electric is committed to an environmental approach, manufacturing products in line with the requirements of European Directive RoHS (Restriction of Hazardous Substances) in non-polluting ISO 14001-certified manufacturing units.

Achieve Green Building certification

In compliance with ISO 14025 PEP Ecopassport program, Schneider Electric publishes a comprehensive Life Cycle Analysis of our product, providing the environmental data you need to achieve Green Building certifications

Experience the difference today at se.com.

Absolute protection of life and property

The overrun of leakage current thresholds may represent a threat to life and property if it is not immediately located.

Through permanent monitoring of this overrun, the Vigi**PacT** range makes the protection efficient.

VigiPacT

All Schneider Electric's expertise in earth leakage protection

- A very wide range of applications.
- Efficiency of all protection chain components.
- Optimized continuity of supply and protection of people and equipment, unmatched on the market.

Vigi**PacT** residual current devices (RCDs) with appropriate settings provide effective protection of life and property. The characteristics of the relay/toroid combination ensure reliable measurements.

Operation in less than 40 ms

Clearing of faults by Vigi**PacT** relays set to 30 mA and combined with any of its circuit breakers rated up to 630 A.

Overvoltage category IV

The reinforced insulation of Vigi**PacT** relays (overvoltage category IV, i.e. the most severe category) makes direct connection possible at the head of the installation or on the upstream busbars without any additional galvanic isolation.

Continuous self-monitoring

Vigi**PacT** relays continuously monitor the power supply, relay/toroid link and internal electronics. Failure of the detection circuit is signalled and may be used to trip the circuit breaker. The LEDs on the front panel can also be used to check operation at any time.

Settings protected by a lead-sealable cover or password

Access to settings can be protected by a cover with a lead seal. The test and reset buttons remain accessible on the front panel of the relay.

For RHU and RMH relays, settings are protected by a password through the keyboard.

Easy to choose

A three-step process

1

Detection

with associated toroid



A type passive closed toroid



OA type passive split toroid



Rectangular sensor



B type active closed toroid

2

Alarm

with the VigiPacT relay



RH10M/RH10P, RH21M/RH21P, RH68M, RH86M, RH99M/RH99P



RH197M/RH197P



RHUs and RHU



RHB

3

Protection

with the circuit breaker



ComPacT NSX100 to 630



ComPacT NSXm



NG125

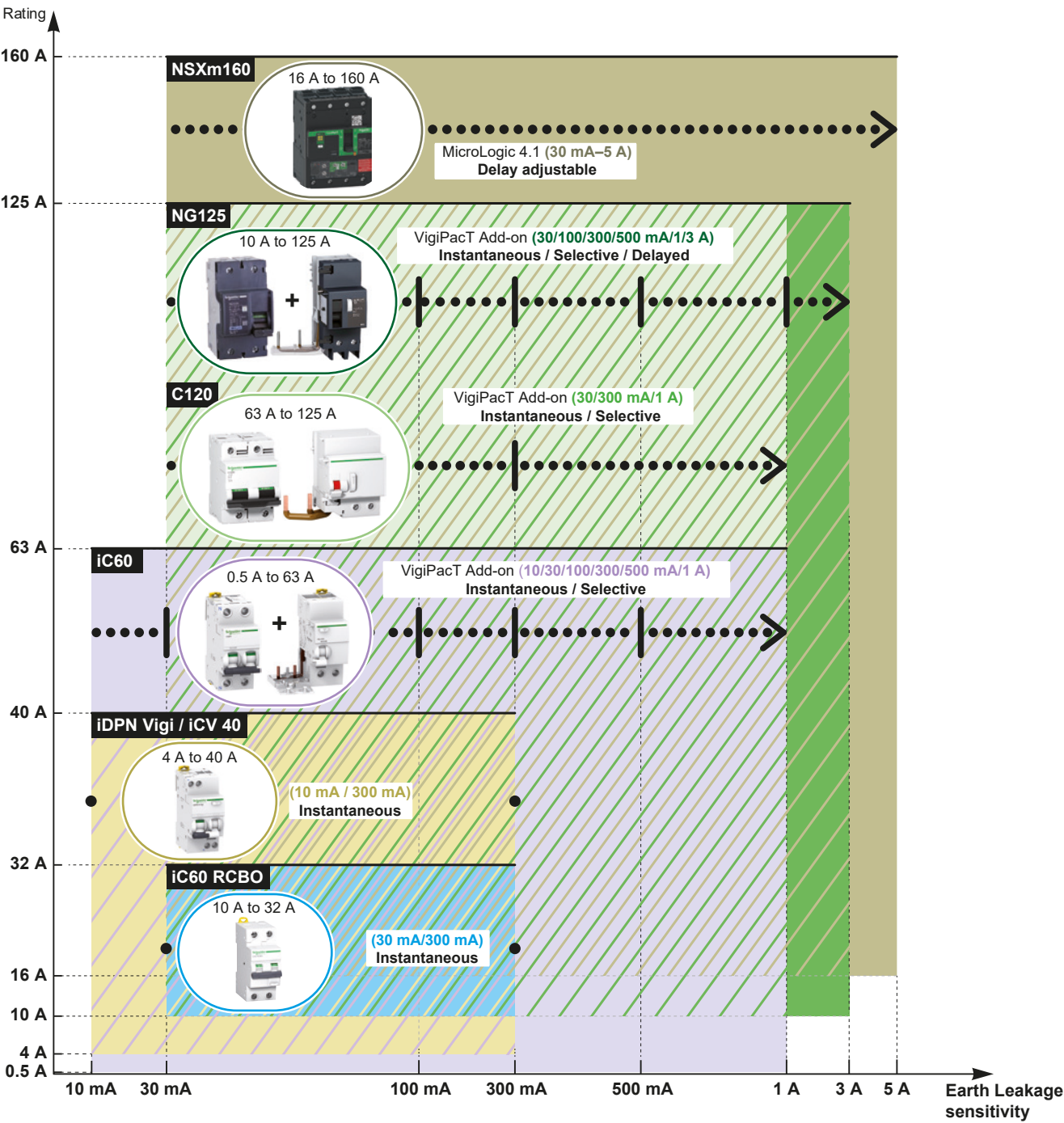


C120

Selecting the Appropriate Residual Current Device

Residual current devices (RCDs) should be coordinated properly to achieve total selectivity, in addition to overcurrent protection. The selection of the appropriate type of RCD, in particular the type (AC, A, B, etc.) follows the same fire prevention as for protection against electric shock. See when to use each type of RCD.

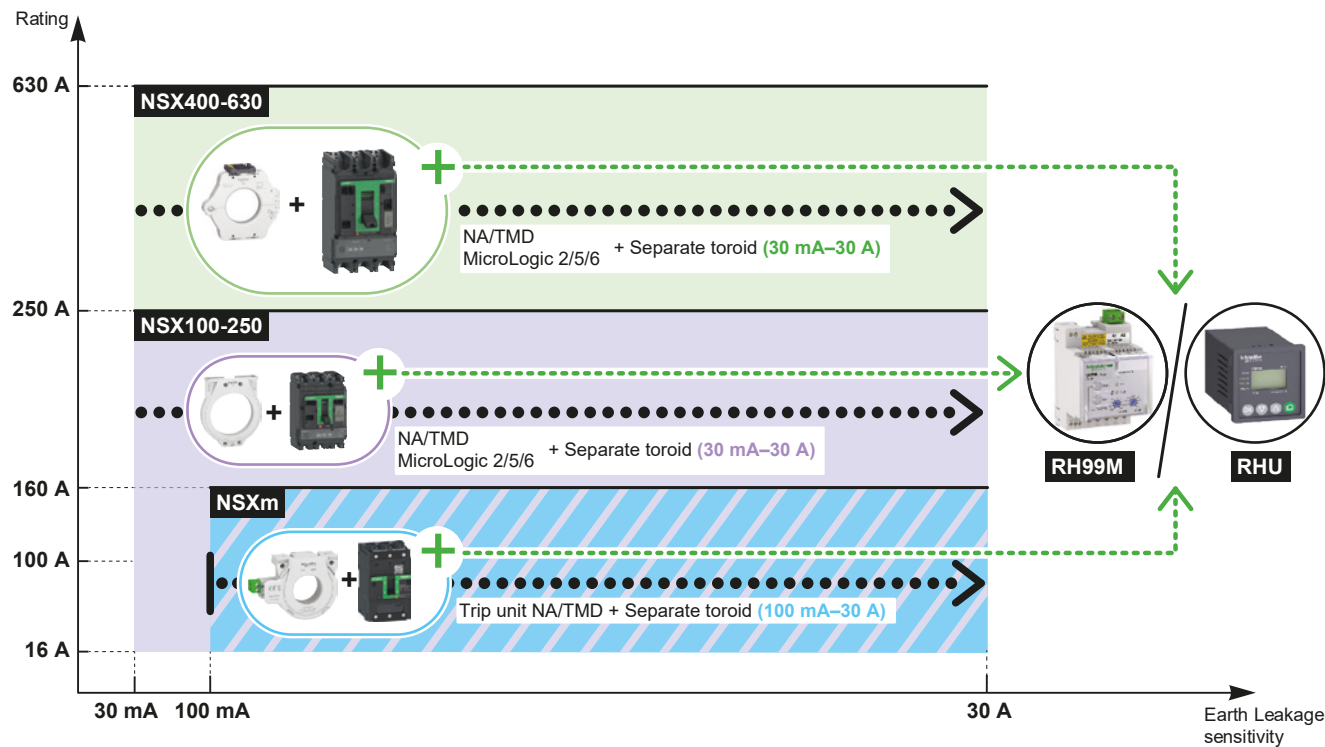
The tables below are an illustration of breakers with appropriate RCD



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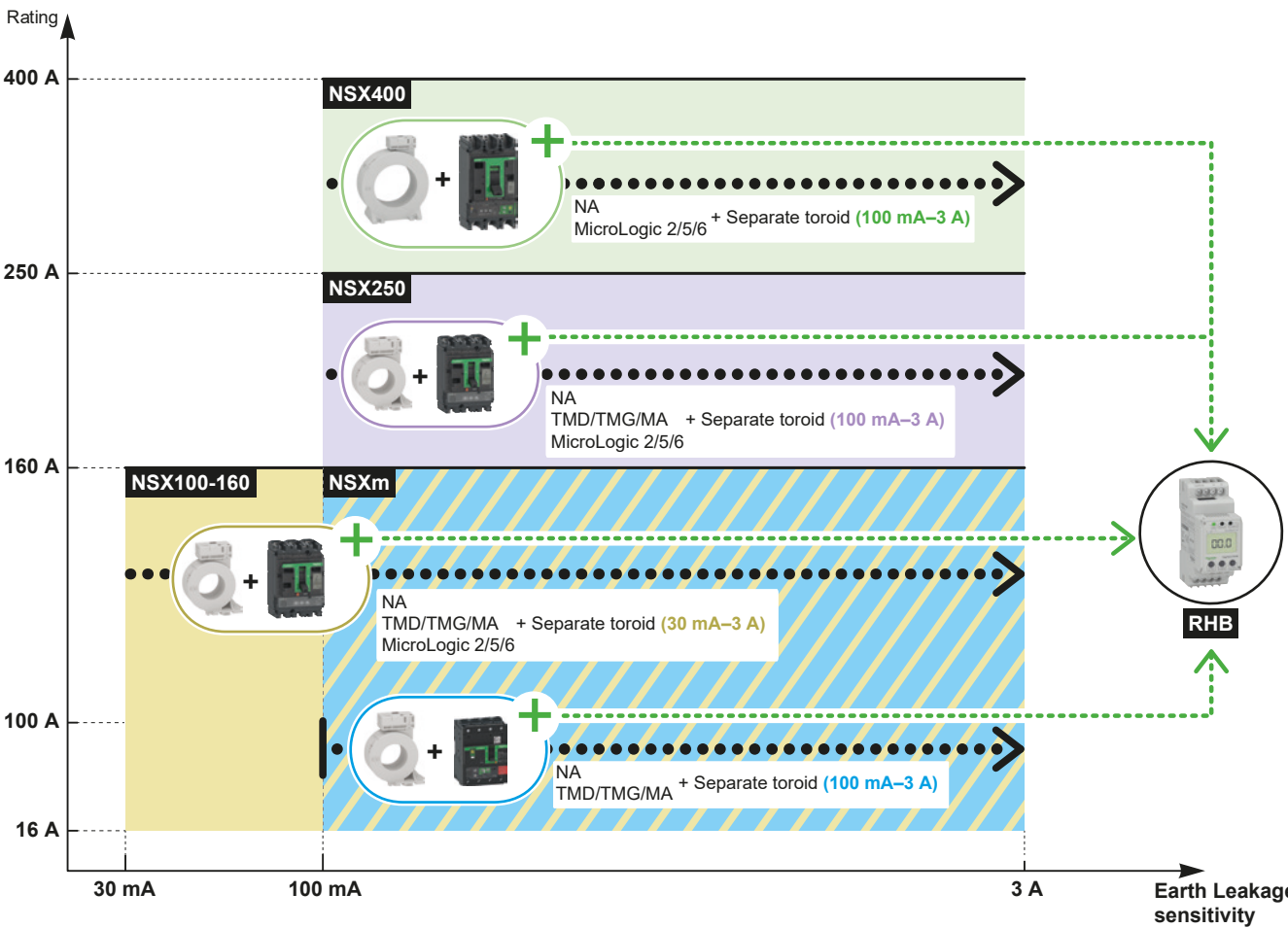
Selecting the Appropriate Residual Current Device

Overview of circuit breakers with separate earth leakage relay type A/AC



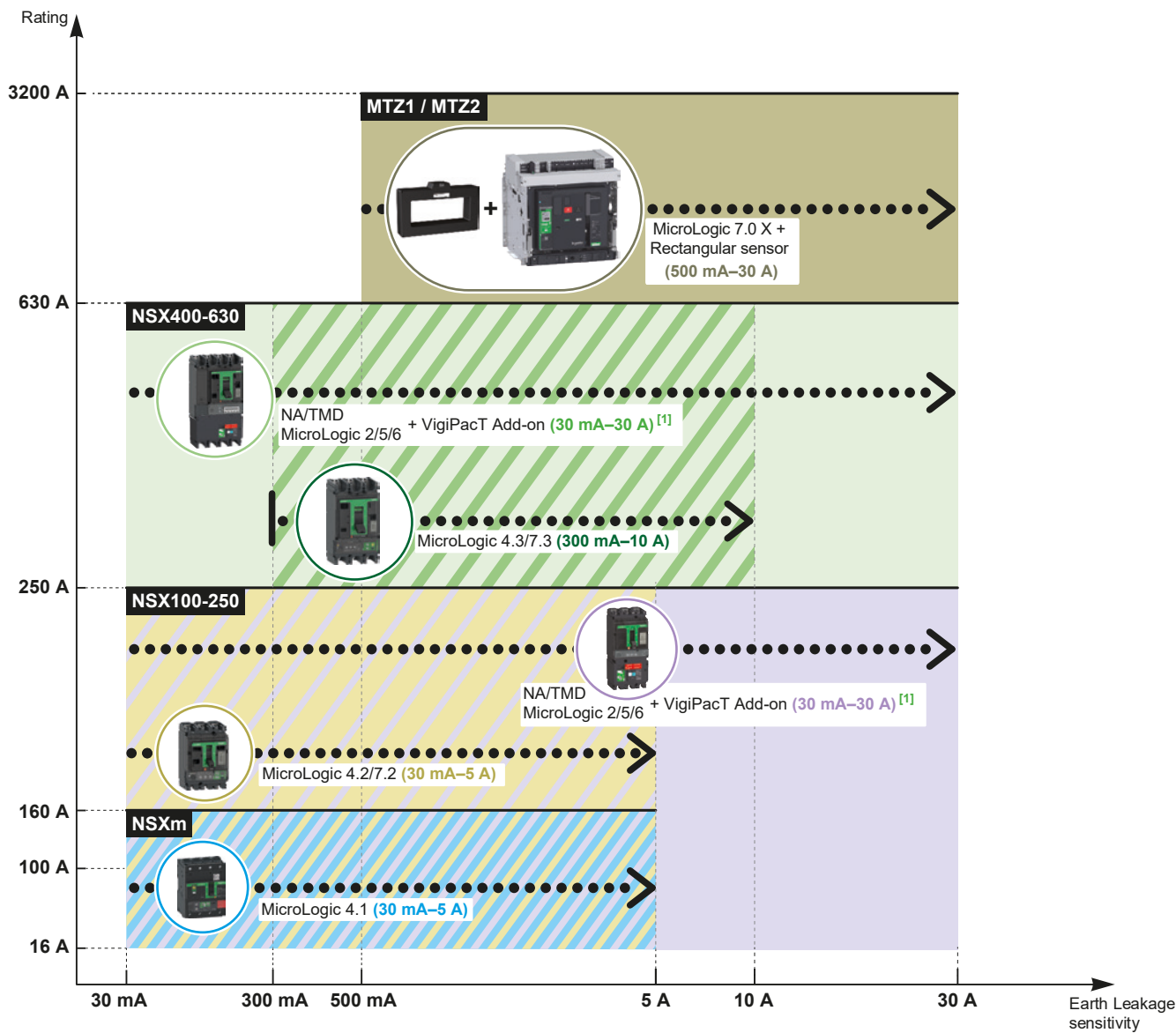
DB439795.ai

Overview of circuit breakers with separate earth leakage relay type B



DB439796.ai

Selecting the Appropriate Residual Current Device



DB439794-01

Easy to install

Formats for all installation systems

Schneider Electric Molded Circuit Breaker format devices in the Vigi**Pact** range can be mounted on a DIN rail (RH10,RH21, RH68, RH86, RH99, RH197 and RHB) or on a universal mounting plate using mounting lugs (RH10, RH21 RH68, RH86 and RH99). The 72 x 72 mm front-panel mount devices (RH10, RH21, RH68, RH86, RH99, RH197, RMH, RHUs and RHU) are mounted on panels, doors or front plates using clips.

Installation system		Suitable format	
		Front-panel mount	DIN rail
Main LV switchboard		■	
Power distribution switchboard	instrument zone	■	
	modular-device zone		■
Motor Control Centre (MCC)			■ with clip-in toroid
Automatic control panel or machine panel			■ with mounting lugs
Final distribution enclosures			■



RHU

- Panel device
- Adjustable tripping threshold from 30 mA to 30 A
- Adjustable pre-alarm of the tripping threshold value
- New HMI with keyboard unit display by LED
- Modbus communication RS485-SL

Front-panel mount device



DIN device

With mounting lugs fixed to a mounting plate



Clip-in toroid and plug-in connectors

Plug-in connectors allow easy disconnection for switchboard acceptance dielectric tests.
DIN-format Vigi**PacT** relays can be equipped with a toroid of 30 to 50 mm in diameter.

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VigiPacT (Residual-Current Protection Relays)

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Installation Recommendations

B

Dimensions and Connections

C

Wiring Diagrams

D

Additional Characteristics

E

Catalog Numbers

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Other Information

> ComPacT

Com**PacT** NSX & NSXM
Catalog
LVPED221001EN



Com**PacT** NS
Catalog
LVPED211021EN



> MasterPacT

Master**PacT** NT & NW
Catalog
LVPED208008EN



Master**PacT** MTZ
Catalog
LVPED216026EN



> PowerPacT

Power**PacT** Multistandard
Catalog
LVPED212023EN



> Selectivity Guide

Selectivity, Cascading
and Coordination Guide
LVPED318033EN



> Relays

RHU User Guide



DOCA0107EN

RMH User Guide



DOCA0108EN

RHB User Guide



DOCA0160EN

RHU Instruction Sheet



NHA34634

RMH Instruction Sheet



NHA34635

RM12T Instruction Sheet



5100512206

> Electrical Distribution Guide

Electrical Distribution Guide
ESXP2G001EN



> RCD Earth Fault Guide

RCD Earth Fault Protection Guide
CA908066E



Functions and Characteristics



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Functions and Characteristics

Selection Guide

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A

Protection^[1] Relays

	RH10	RH21	RH68
	 PB100435.eps  PB100430-10_SE.eps	 PB100433.eps  PB100431-10_SE.eps	 PB108177-22.eps
Failsafe mode or non-failsafe mode	by wiring	by wiring	by wiring
Protection ^[1]	■	■	■
Monitoring	-	-	-
Compliant with IEC 60947-2 Annex M setting = 30 mA ComPact NSX (opening in 60ms)	■	■	■
Compliant with IEC 60947-2 Annex M setting >30 mA all Schneider Electric circuit breakers	■	■	■
Relay type			
A	■	■	■
AC	■	■	■
B	-	-	-
Mounting			
DIN rail	RH10M	RH21M	RH68M
Front-panel mount	RH10P	RH21P	-
Rated operational voltage			
12 to 24 V AC - 12 to 48 V DC	RH10M, RH10P	RH21M	-
48 V AC	-	-	-
110 to 130 V AC	RH10M, RH10P	-	-
220 to 240 V AC	RH10M, RH10P	RH21M & RH21P	RH68M
380 to 415 V AC	RH10M	RH21M & RH21P	-
440 to 525 V AC	-	-	-
100 to 250 V AC/DC	-	-	-
Thresholds			
$I_{\Delta n}$	1 fixed instantaneous threshold choose from 0.03 A to 1 A	2 user-selectable thresholds 0.03 A or 0.3 A	6 user-selectable thresholds from 0.03 A to 3 A
Pre-warning	-	-	-
Time delay			
$I_{\Delta n}$	Instantaneous	1 user-selectable time delay instantaneous or 0.06 s for $I_{\Delta n} = 0.3 A$	Instantaneous for $I_{\Delta n} = 0.03 A$ 8 user-selectable time delay instantaneous to 1 s
Pre-warning	-	-	-
Display and indications			
Voltage presence (LED and/or relay)	■	■	■
Threshold overrun $I_{\Delta n}$ (LED and relay)	■	■	■
pre-warning (LED and relay)	-	-	-
Leakage current (digital)	-	-	-
Settings (digital)	-	-	-
Test with or without actuation of output contacts			
Local	■	■	■
Remote (hard-wired)	■	■	■
Remote (hard-wired for several relays)	■	■	■
Remote (via communication)	-	-	-
Characteristics			
	page A-26	page A-26	page A-29
Sensors^[3]			
Schneider Electric up to 630 A A and TOA toroids	■	■	■
Schneider Electric L up to 3200 A rectangular sensors	■	■	■
Schneider Electric up to 400 A TB toroids	-	-	-

[1] Relay with output contact requiring local, manual reset after fault clearance

[2] Voltage presence relay feature depending of the setting on failsafe or non-failsafe

[3] See characteristics page A-36

	RH86	RH99	RH197	RHUs or RHU	RHB
	 PB108176-22.eps	 PB100434_SE.eps  PB10043219_SE.eps	 PB104914-Reps  PB100715-19_SE.eps	 PB13905-R3.eps	 PB121667_L04.eps
	by wiring	by wiring	by settings	by wiring	non-failsafe mode only
	■	■	■	■	■
	-	■	■	■	-
	■	■	■	■	■
	■	■	■	■	■
	■	■	■	■	■
	-	-	-	-	■
	RH86M	RH99M	RH197M	-	RHB
	-	RH99P	RH197P	RHU & RHUs	-
	-	RH99M, RH99P	RH197M, RH197P	-	-
	-	RH99M	-	-	-
	RH86M	RH99M, RH99P	RH197M, RH197P	RHUs, RHU	-
	-	RH99M, RH99P	RH197M, RH197P	RHUs, RHU	-
	-	RH99M, RH99P	RH197M, RH197P	-	-
	-	RH99M	RH197M, RH197P	-	-
	-	-	-	-	RHB
	8 user-selectable thresholds from 0.03 A to 10 A	9 user-selectable thresholds from 0.03 A to 30 A	19 user-selectable thresholds from 0.03 A to 30 A	1 adjustable threshold from 0.03 A to 30 A	1 adjustable threshold from 0.03 A to 3 A
	-	-	Fixed: 50 % $I_{\Delta n}$ or 100 % $I_{\Delta n}$	1 adjustable threshold from 0.015 A to 30 A	1 adjustable threshold from 0.015 A to 3 A
	Instantaneous for $I_{\Delta n} = 0.03$ A	Instantaneous for $I_{\Delta n} = 0.03$ A	7 user-selectable time delay instantaneous to 4.5 s	1 adjustable time delay instantaneous to 4.5 s	1 adjustable time delay instantaneous to 10 s
	6 user-selectable time delay instantaneous to 0.5 s	9 user-selectable time delay instantaneous to 4.5 s	instantaneous	1 adjustable time delay instantaneous to 4.5 s	1 adjustable time delay instantaneous to 10 s
	-	-	-	-	-
	■	■	■ [2]	■	■ [4]
	■	■	■	■	■
	-	-	■	■	■
	-	-	by bargraph	■	■
	-	-	-	■	■
	■	■	■	■	■ [5]
	■	■	■	■	■
	■	■	-	-	-
	-	-	-	■ except RHUs	-
	page A-29	page A-26	page A-29	page A-29	page A-29
	■	■	■	■	-
	■	■	■	■	-
	-	-	-	-	■

[4] No voltage presence relay

[5] For RHB, with actuation of the contacts only

A

Monitoring Relays

	RH99	RH197	
	 PB100431_SE.eps  PB100432-19_SE.eps	 PB104914-R.eps  PB100715-19_SE.eps	
Failsafe mode or non-failsafe mode	by wiring	by settings	
Protection	■	■	
Monitoring	■	■	
Compliant with IEC 60947-2 Annex M setting = 30 mA ComPacT NSX (opening in 60ms)	■	■	
Compliant with IEC 60947-2 Annex M setting >30 mA all Schneider Electric circuit breakers	■	■	
Relay type			
A	■	■	
AC	■	■	
B	-	-	
Mounting			
DIN rail	RH99M	RH197M	
Front-panel mount	RH99P	RH197P	
Rated operational voltage			
12 to 24 V AC - 12 to 48 V DC	RH99M, RH99P	RH197M, RH197P	
110 to 130 V AC	RH99M, RH99P	RH197M, RH197P	
220 to 240 V AC	RH99M, RH99P	RH197M, RH197P	
380 to 415 V AC	RH99M	RH197M, RH197P	
440 to 525 V AC	RH99M	RH197M, RH197P	
100 to 250 V AC/DC	-	-	
Thresholds			
$I_{\Delta n}$	9 user-selectable thresholds from 0.03 A to 30 A	19 user-selectable thresholds from 0.03 A to 30 A	
Pre-warning	-	Fixed: 50 % $I_{\Delta n}$ or 100 % $I_{\Delta n}$	
Time delay			
$I_{\Delta n}$	Instantaneous for $I_{\Delta n} = 0.03$ A 9 user-selectable time delay instantaneous to 4.5 s	7 user-selectable time delay instantaneous to 4.5 s	
Pre-warning	-	instantaneous	
Display and indications			
Voltage presence (LED and/or relay) ^[1]	■	■ ^[3]	
Threshold overrun $I_{\Delta n}$ (LED and relay)	■	■	
pre-warning (LED and relay)	-	-	
Leakage current (digital)	-	by bargraph	
Settings (digital)	-	-	
Test with or without actuation of output contacts			
Local	■	■	
Remote (hard-wired)	■	■	
Remote (hard-wired for several relays)	■	-	
Remote (via communication)	-	-	
Characteristics	page A-26	page A-29	
Sensors ^[2]			
Schneider Electric A and TOA toroids ^[3] up to 630 A	■	■	
Schneider Electric rectangular sensors up to 3200 A	■	■	
Schneider Electric TB toroids up to 400 A	-	-	

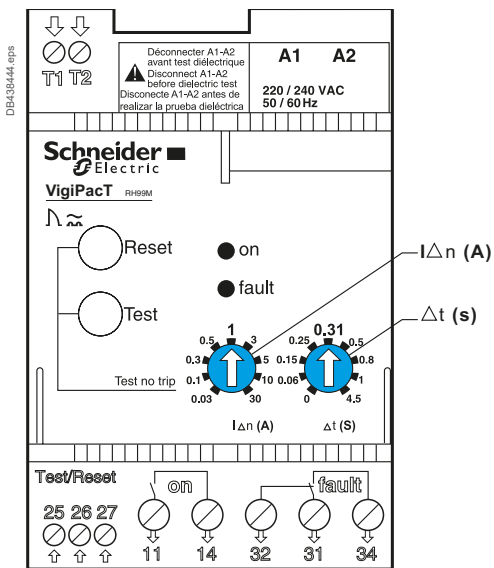
^[1] Voltage presence relay feature depending of the setting on failsafe or non-failsafe

^[2] See characteristics page A-36

^[3] No voltage presence relay

RHUs or RHU		RMH	
		 + 	
by settings		by settings	
■		-	
■		■	
■		No	
■		No	
■		■	
■		■	
-		-	
-		RM12T	
RHU & RHUs		RMH	
-		-	
RHUs, RHU		-	
RHUs, RHU		RMH, RM12T	
-		-	
-		-	
-		-	
1 adjustable threshold from 0.03 A to 30 A		1 adjustable threshold/channel from 0.03 A to 30 A	
1 adjustable threshold from 0.015 A to 30 A		1 adjustable threshold/channel from 0.015 A to 30 A	
1 adjustable time delay instantaneous to 4.5 s		1 adjustable time delay/ channel instantaneous to 4.5 s	
1 adjustable time delay instantaneous to 4.5 s		1 adjustable time delay/channel instantaneous to 4.5 s	
■		■	
■		■	
■		■	
■		■	
■		■	
■		■	
■		■	
■		■	
-		-	
-		-	
■ except RHUs		■	
page A-29		page A-29	
■		■	
■		■	
-		-	

Operation and Use



$I\Delta n$ (A): residual operating-current setting
(the relay operates for a fault current $\geq I\Delta n$)
Schneider Electric guarantees non-operation for all
fault currents $< 0.8 I\Delta n$
 Δt (s): minimum non-operating time

Function

VigiPacT relays measure the earth-leakage current in an electrical installation via their associated sensors. VigiPacT relays may be used for:

- Residual-current protection (RH10, RH21, RH68, RH86 some references of RH99 and RHB)
- Earth-leakage monitoring (RMH and some references of RH99)
- Residual-current protection or earth-leakage monitoring (RH197, RHUs and RHU)

Residual-Current Protection Relay

Protection relays control the power supply interruption to the monitored systems to protect:

- People against indirect contact and direct contact
- Property against fire hazards
- Motors

A relay trips the associated circuit breaker when the set residual operating current $I\Delta n$ is overrun.

Depending on the relay, you can fix a threshold ($I\Delta n$). The overrun is indicated by a LED and measured current is displayed depending of the relay.

The leakage current is displayed:

- For RH197: on a bargraph made up of 4 LEDs indicating levels corresponding to 20, 30, 40, 50 and 70 % of $I\Delta n$
- For RHUs and RHU: by digital display of the leakage current value

Circuit breaker tripping can be either instantaneous or delayed. Some relays provide a time delay adjustment feature.

The protection relays store the residual-current fault in memory. Once the fault has been cleared and the output contact has been manually reset, the relay can be used again.

Earth-Leakage Monitoring Relays

Earth-leakage monitoring relays can be used to monitor drops in electrical insulation due to ageing cables or extensions in the installation.

Thanks to a continuous measurement of leakage currents, it is possible to plan preventive maintenance on the faulty circuits. An increase in the leakage currents may lead to a complete shutdown of the installation.

The relay sends a control signal when the residual-current operating threshold is overrun.

Depending on the relay, the threshold can be adjustable or user-selectable and the overrun can be signalled via a LED, a bargraph or a digital display of the measured current and an output contact.

The leakage current is displayed:

- For the RH197: on a bargraph made up of 4 LEDs indicating levels corresponding to 20, 30, 40, 50 and 70 % of $I\Delta n$
 - For the RHUs, RHU, RMH and RHB: by digital display of the leakage current value
- The control signal can be either instantaneous or delayed. Some relays provide a time delay adjustment feature.

Earth-leakage monitoring relays do not store the residual-current fault in memory and their output contact is automatically reset when the fault is cleared. When used in conjunction with a PLC controller (Zelio, ...), they protect against earth faults due to insulation failures. Typical applications include telephone relay and radio repeater stations. In the event of a transient fault, this system can be used to automatically restore the supply of electrical power to an unattended station, thereby increasing availability and continuity of service.

Use

VigiPacT relays may be used for protection and maintenance at all levels in the installation. Depending on the relays, they may be used in TT, IT or TNS low-voltage AC installations for voltages up to 1000 V and frequencies from 50/60 Hz up to 400 Hz.

VigiPacT protection relays are suitable for use with all electrical switchgear devices available on the market. They have been tested:

- With ComPacT NSX range: proper functioning and fault clearance time is ensured according to the IEC 60947-2, Annex M, standard, in particular for the 30 mA RCD function.
- With ComPacT NSXm: compatibility with MX or MN coils is ensured, the global clearance time needs to be checked by the designer.
- With third party device: compatibility of output contact and third party coils, and global clearance time shall be checked when selecting the devices.

Compliance with Standards

VigiPacT relays are designed to comply with the following standards:

- IEC/EN 60755: general rules for residual-current protection devices
- IEC/EN 60947-2 annex M: low-voltage switchgear and controlgear, part 2 (circuit breakers)
- IEC/EN 60947-5-1: low-voltage switchgear and controlgear, part 5-1 (electromechanical devices)
- IEC/EN 61000-4-2: electrostatic-discharge immunity test
- IEC/EN 61000-4-3: radiated, radio-frequency, electromagnetic-field immunity test
- IEC/EN 61000-4-4: electrical fast transient/burst immunity test
- IEC/EN 61000-4-5: surge immunity test
- IEC/EN 61000-4-6: immunity to conducted disturbances, induced by radio-frequency fields
- CISPR 11: limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radiofrequency equipment
- Mandatory for CE marking:
 - EN 61000-6-2: immunity to industrial environments
 - EN 50081-1: emissions for commercial and residential environments
- IEC/EN 60664-1: insulation coordination for equipment within low-voltage systems, part 1
- EN 50102: degrees of protection provided by electrical enclosures against external mechanical impact
- IEC 60364 and NF C 15100: installation rules for low-voltage electrical distribution
- UL 1053 and CSA 22.2 No. 144: relays RH10, RH21 and RH99 up to and including 220/240 V comply with these standards

Ground Fault Sensing and Relaying Equipment UL 1053 and CSA 22.2 No. 144 for North American and North American Influenced Markets

The basic standard used to investigate products in this category is UL 1053 "Ground-Fault Sensing and Relaying Equipment".

The Listing Mark of Underwriters Laboratories Inc. on the products is the only method provided by UL to identify products manufactured under its Listing and Follow Up Service.

The listing mark for these products includes the name and/or symbol of Underwriters Laboratories Inc. (as illustrated on the label) together with the word "LISTED", a control number and the following product name "Ground Fault Sensing and Relaying Equipment".

This category covers ground fault current sensing devices, relaying equipment, or combinations of ground fault current sensing devices and relaying equipment which will operate to cause a disconnecting means to function at predetermined values of ground fault current in accordance with the National Electrical Code, ANSI/NFPA70.

The RH99, RH21 and RH10 (M and P) ground fault relays are control powered ground-fault protection devices used to protect an electrical distribution system from ground faults. The relay receives input from sensors, processes the information and if necessary closes output contacts which will cause the associated protection device to trip.

The product is a class 1 combination ground fault current sensor and relay. This equipment is intended to operate devices with shunt trip coils such as molded case circuit breakers, molded case switches and the like, which constitute the disconnecting means, by opening all ungrounded conductors at predetermined values of ground fault current.

This product is designed to protect circuits of not more than 600 V AC, 50/60 Hz only.

The relay should be marked with the following electrical ratings, for the two types M and P:

- Type M: DIN format (Acti 9 type fast mounting or screw mounting)
- Type P: front-panel mount (on panel, door, etc.)
- Ratings:
 - Fixed $I_{\Delta n}$ threshold (a number of choices) and no time delay (instantaneous) or
 - Selectable $I_{\Delta n}$ threshold from 0.03 to 30 A and user-selectable time delay From 0 to 4.5 s (see settings on pages A-26 to A-35)
- Input voltages:
 - AC: 20 to 24 V AC, 48 V AC, 110 to 130 V AC or 220 to 240 V AC, 50/60 Hz, or
 - DC: 12 to 48 V DC
- Maximum consumption: 4 W



DB403571.epa



DB101079.epa

A

PB100430_38_SE.epa



Front-panel mount device

PB100434_SE.epa



DIN device

Environmental Withstand Capacity

VigiPacT relays meet the environmental requirements contained in the following standards:

- IEC/EN 60068-2-30: damp heat, equipment not operating; relative humidity 95 % at 55 °C (hot and humid climate)
- IEC/EN 60068-2-52: salt mist; KB test severity level 2
- IEC/EN 60068-2-56: damp heat, equipment operating; 48 h, environment Category C2

They may consequently be used in all parts of the world.

Degree of Pollution

VigiPacT relays are suitable for operation in the most severe industrial environments. They meet the requirements of degree of pollution 3 (2 for RHB) as per standard

IEC/EN 60664-1 and IEC/EN 60947-1 for low-voltage switchgear and controlgear.

Ambient Temperature

VigiPacT relays are designed for use in ambient temperatures from -35 °C to +70 °C. Relays equipped with a digital display (RHU, RHUs, RMH) or bargraph (RH197) are limited to -25 °C to +55 °C.

Start-up should be carried out within the temperature range indicated above.

The temperature range for device storage, in the original packing, is:

- Between -55 °C and +85 °C for VigiPacT RH10 to RH99
- Between -40 °C and +85 °C for VigiPacT RH197, RHUs, RHU and RMH
- Between -25 °C and +55 °C for VigiPacT RHB

Reinforced Insulation for Direct Connection to Upstream Distribution System

The reinforced insulation of VigiPacT relays (overvoltage category IV, the most severe) makes possible, without any additional galvanic isolation:

- Direct connection of the relay power supply to the upstream circuit (connection upstream of an LV incoming device such as a MasterPact circuit breaker, for example)
- Direct connection to the upstream busbars

Insulation class

All VigiPacT relays, whether DIN or front-panel mount format, have class II insulated fronts as per standards IEC/EN 60664-1 and NF C 15100.

The communication outputs on the RHU and RMH relays are also class II.

Degree of Protection

According to EN 60529 (IP degree of protection) and EN 50102 (IK external mechanical impact protection) standards, the devices are rated IP40 and IK07 for the front face through a door or on a front plate, IP30 for the other faces and IP20 for connections.

VigiPacT relays comply with environmental-protection regulations.

Vibration Withstand Capacity

VigiPacT relays meet the requirements of Veritas and Lloyd's (vibration test from 2 to 13.2 Hz ± 1 mm and from 13.2 to 100 Hz – 0.7 g).

Labels and Markings

- UL, CE and as per IEC 60947-2 annex M, EAC and CCC marking
- VigiPacT relay supply voltage
- Product part number
- The origin (Schneider Electric) and the connection terminals (see pages A-16 to A-22) are indicated on the product.

Recycling

The VigiPacT packaging is made of recyclable cardboard that complies with environmental protection regulations declared in the Product Environmental Profile (PEP).

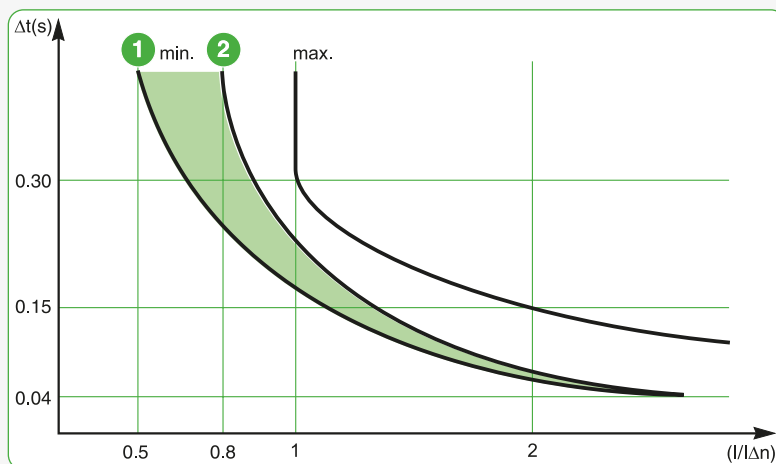
VigiPacT relays are green premium. For more details, please see the product environment profile and the end of life document available on our website.

Safety

VigiPacT Residual current relay used with Schneider Electric ComPacT NSX circuit-breaker with a maximum rating of 630A ensures an overall breaking time of 40ms when set to an operating current of 30mA. It complies with the requirement for 30mA Residual Current Device used as additional protection according to IEC 60364-4-41 for protection against electric shock.

Tolerances on the protection threshold $I_{\Delta n}$ are less than those specified in the residual-current protection standard:

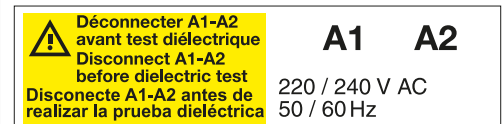
According to standard IEC 60947-2 annex M, instantaneous tripping must take place between 0.5 and 1 x $I_{\Delta n}$. VigiPacT relays trip between 0.8 and 1 x $I_{\Delta n}$, thus increasing immunity to nuisance tripping by 60 %.



Operating tolerances for the protection threshold $I_{\Delta n}$:

- 1 Standards
- 2 VigiPacT

■ Gain in immunity to nuisance tripping with VigiPacT

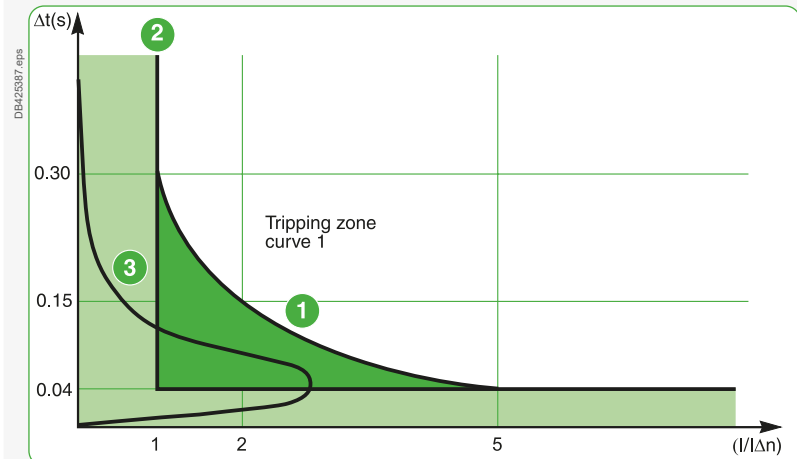


Information on the case

Inverse-time tripping curve:

When circuits are energized, the inverse-time tripping curve avoids nuisance tripping due to short, transient phase-sequence currents, which are caused by:

- The high transient currents caused by certain loads (e.g. motors, LV/LV Transformers, etc.)
- The charging of capacitances between live conductors and earth



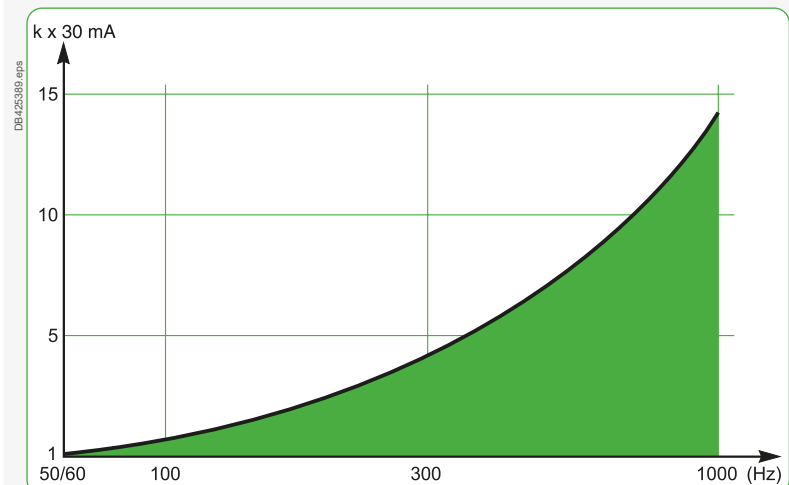
- 1 Curve 1: inverse-time tripping curve as per IEC 60947-2 annex M
- 2 Curve 2: tripping curve with fixed threshold $I = I_{\Delta n}$
- 3 Curve 3: transient zero phase-sequence current upon load energisation
- Zone of optimized continuity of service due to the inverse-time tripping curve
- Non-tripping zone (curve 2)

Frequency filtering:

Frequency converters (e.g. variable-speed drives) implementing IGBTs (Insulated Gate Bipolar Transistor) generate significant levels of high-frequency (HF) leakage currents.

During normal operation (no fault), these capacitive HF leakage currents flowing in the installation conductors do not represent a danger for users. In general, residual-current protection relays are sensitive to these HF natural leakage currents.

If an insulation fault occurs downstream of the frequency converter, the fault current comprises a HF-current component. These HF fault currents do not produce the same physiological effects on the human body as 50/60 Hz currents (see IEC 60479).



Variation in the ventricular-fibrillation threshold depending on the frequency from 50/60 Hz up to 1000 Hz

- Gain in immunity to nuisance tripping with VigiPacT

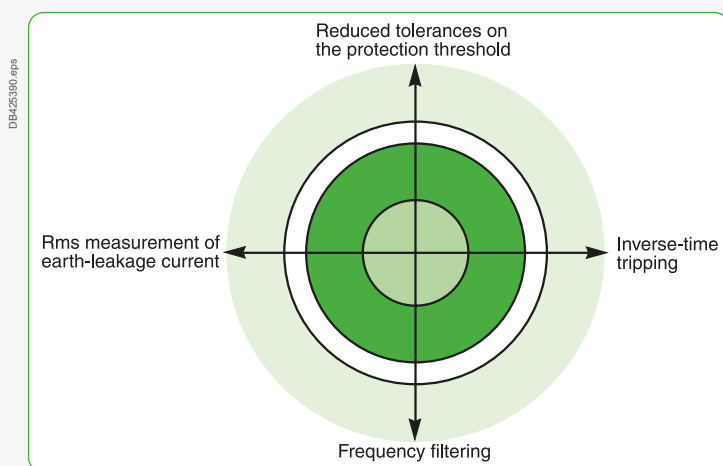
Frequency filtering on the VigiPacT range of residual-current protection relays is designed to provide:

- Maximum protection if an insulation fault occurs.
- Continuity of service that has been specially optimized for this type of load.

Rms measurements of residual current

Rms measurement of fault currents provides the residual-current protection relays with the means to measure all types of signals and to calculate the weighted true rms value depending on the frequency filtering.

Rms measurement of residual current, frequency filtering, the reduced tolerances on the protection threshold and the inverse-time tripping curve built into the VigiPacT relays optimize protection of life and property and enhance the continuity of service.



- Non-tripping zone
- Gain in immunity to nuisance tripping with VigiPacT = optimized continuity of service
- Reduced tolerances zone
- Mandatory protection zone

VigiPacT Relays Continuous Self-Monitoring

VigiPacT relays carry out continuous monitoring of:

- Relay/toroid link (RH10, RH21, RH68, RH86, RH99, RH197, RHU, RMH and RHB)
- Link between the RMH relay and the RM12T multiplexer
- Power supply
- Internal electronics

In the event of problem, the fault or voltage-presence output contact on the protection relays (RH10, RH21, RH68, RH86, RH99, RH197, RHUs, RHU and RHB) is actuated. The cause of the fault must be cleared.

Two Wiring Techniques for Protection Relays

Two different wiring techniques are recommended:

- The first places a premium on safety. The voltage-presence contact on the VigiPacT residual-current protection relay (RH10, RH21, RH68, RH86, RH99 or RHUs and RHU, RHB) is wired in series with the fault contact. This technique allows failsafe operation.
- The second technique places a premium on continuity of service if the supply to the residual-current relay is cut.

For more information, see the wiring diagrams in chapter D.

A

Test and Reset

Test

According to IEC 60364 and NF C 15100 standards, a periodic test is required to check correct operation of the residual-current protection system.

There are two testing modes (trip and no-trip) which actuate the output contact or not:

- Trip mode: the complete protection system with actuation of the output contacts (this trips the circuit breaker).
- No trip-mode: the protection system without actuation of the output contacts (this does not trip the circuit breaker) to maintain the installation up and running.

In both modes, the tests check the correct operation of the displays (RHUs, RHU, RMH, RH197 and the RHB bargraph), the LEDs, and the internal electronics.

Reset

Whatever the test mode is, it clears the memory, resets the LEDs and the relay status condition.

Test and reset modes

Four possible modes		Actuation of output contacts	
		No ^[1]	Yes
Local via button in front			
Remote	1 relay	[1]	[1]
	a number of relays	[2]	[2]
Via communication		RHU/RMH	RHU/RMH

[1] Except for RMH and RHB.

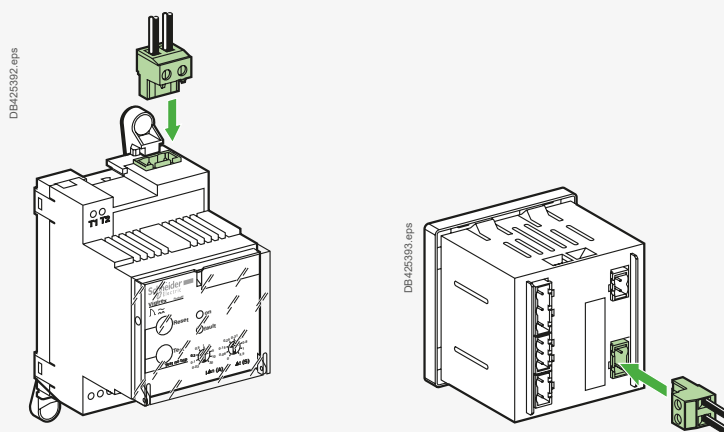
[2] Except for the RHU, RMH, RH197M/P and RHB.

Easy Switchboard Acceptance Tests

During acceptance of a switchboard and prior to dielectric testing, isolation of the residual-current relays by disconnecting the supply is mandatory.

VigiPacT relays except RHB are supplied via a plug-in connector for easy and secure connection and disconnection.

All connections for the front-panel mount relays of the VigiPacT range use plug-in connectors.



Supply connections for the DIN and front-panel mount formats

Formats for All Installation Systems

VigiPacT relays are available in two formats:

- Front-panel mount format 72 x 72 mm (RH10P, RH21P, RH99, RH197P, RHUs, RHU, RMH)

On the DIN-format relays, it is possible to simply clip in:

- The toroids 30 mm and Ø50 mm
- Three mounting lugs for relay installation on mounting plates in control cabinets
- DIN format (RH10M, RH21M, RH68M, RH86M, RH99, RH197M, and RHB).



DIN device with mounting lugs fixed to a mounting plate

Functions and Characteristics

General Characteristics

Formats for All Installation Systems (Cont.)



DIN device



DIN device with clip-in toroid



Front-panel mount device



Lead-sealable cover



Automatic control panel or machine panel



Power distribution switchboard



Main LV switchboard



Motor Control Centre (MCC)

Installation Systems

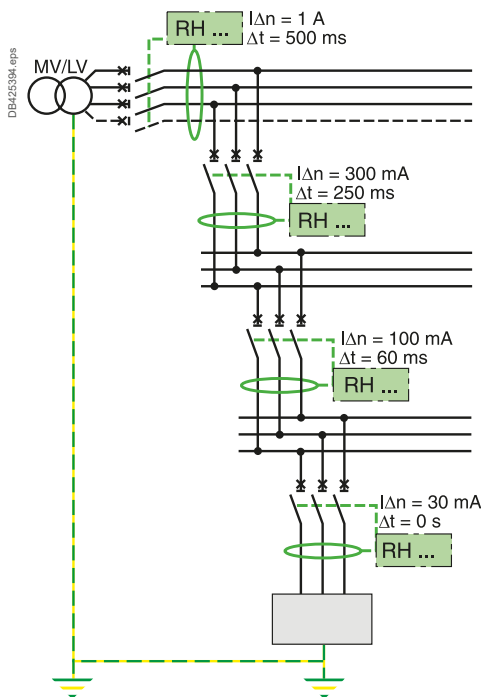
VigiPact relays can be installed in original manufactured low voltage switchboard like OKKEN, BlokSeT MB, BlokSeT, iPMCC. They can also be installed in panel building systems like PrismaSeT G, PrismaSeT P, PrismaSeT iPM, Spacial SF/SFP, and PrismaSeT PH.

Covers

All VigiPact relays, except RHU/RHUs and RMH, are equipped with lead-sealable covers to block access to settings while maintaining access to the device test and reset buttons. VigiPact relays RHU/RHUs and RMH are protected by a password on the display.



Selectivity Between Residual-Current Devices



It is possible to divide the installation into a number of groups of circuits and to protect each group using the suitable residual-current device.

The many fault, alarm and pre-alarm settings and time delays available in the VigiPacT range makes it easy to integrate the residual-current relays at all levels in the electrical installation.

Coordination between the upstream and downstream devices in an installation makes it possible to cut the supply (by the protection relay) exclusively in the part of the installation where the fault occurred.

Implementing Selectivity

Selectivity between upstream and downstream residual-current devices is necessarily of the current and time type.

This is done by correctly adjusting:

- The operating-current settings
- The non-operating and overall breaking times

For correct operation, follow these general selectivity rules:

- **Current:** the upstream device setting must be three times the downstream device setting (in accordance with the standardized rules for the operating/non-operating currents. Better performances can be reached by using the Schneider Electric devices, refer to the Selectivity, Cascading and Coordination Guide for better performances).
- **Time:** the upstream device non-operating time (time delay) must be greater than the total time (the intentional residual-current device delay and the breaking time of the breaking device) for the downstream device.

For more details about how to select a Residual Current Device, please refer to the Schneider Electric Earth Fault Protection Guide.

> Selectivity, Cascading and Coordination Guide



LVPED318033EN

Electromagnetic Disturbances

VigiPacT relays are immune to:

- Overvoltages produced by switching (e.g. lighting circuits)
- Overvoltages produced by atmospheric disturbances
- Radio-frequency waves emitted by devices such as mobile telephones, radio transmitters, walky-talkies, radar, etc.
- Electrostatic discharges produced directly by users.

To guarantee immunity, VigiPacT relays are tested in compliance with the following standards:

- IEC/EN 60947-2: low-voltage switchgear and controlgear, part 2 circuit breakers)
- IEC/EN 61000-4-1: overview of the IEC/EN 61000-4 series
- IEC/EN 61000-4-2: electrostatic-discharge immunity test
- IEC/EN 61000-4-3: radiated, radio-frequency, electromagnetic-field immunity test
- IEC/EN 61000-4-4: electrical fast transient/burst immunity test
- IEC/EN 61000-4-5: surge immunity test
- IEC/EN 61000-4-6: immunity to conducted disturbances, induced by radio-frequency fields
- CISPR 11: limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radiofrequency equipment

The high immunity levels of VigiPacT relays ensure safety without nuisance tripping.

Behavior during micro-outages in the auxiliary supply

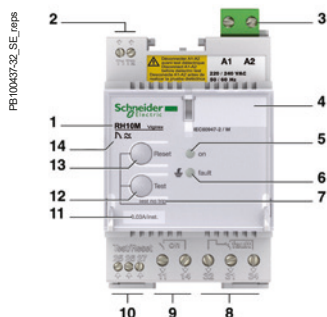
VigiPacT relays are not affected by micro-outages lasting less than 60 ms.

The maximum break time during micro-outages complies with standard IEC/EN 60947-2 annex M.

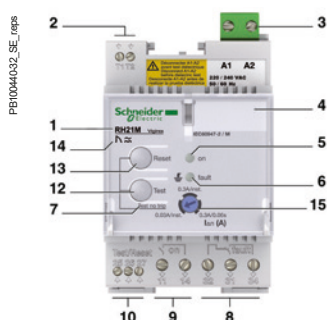
A

Description

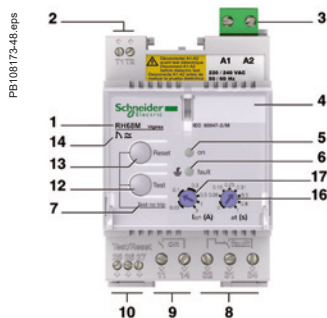
RH10M, RH21M, RH68M, RH86M and RH99M Relays



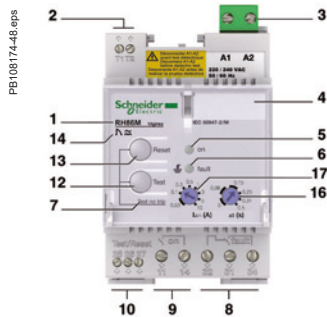
RH10M



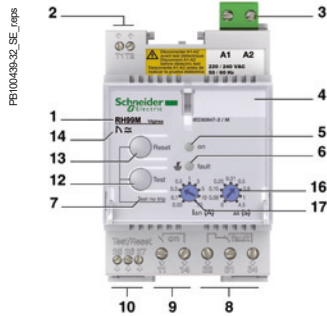
RH21M



RH68M



RH86M



RH99M

Application Type

Functional Description

The earth-fault protection consists of measuring the residual current in an electrical installation and disconnecting the installation when the leaked current becomes dangerous to life and property.

Functions

The main functions of VigiPact RH10M, RH21M, RH68M, RH86M and RH99M relays are to measure the residual current detected by the toroid and trip the installation protection circuit breaker through shunt release MN or MX.

- 1- Protection against residual current
- 2- Local earth-leakage indication on the relay.

If the residual current exceeds the threshold $I_{\Delta n}$ for a time greater than delay Δt , the relay implements one insulation monitoring threshold.

- Earthing system TN-S, IT & TT
- Measurement of r.m.s. value, internal current measurements range 80 – 100%
- Adjustable time delay and current settings depending of version
- Remote and local testing
- Continuous monitoring of electronics, power supply and CT connection.

Relay Marking

- 1 Type of relay
- 4 Customer marking zone (circuit identification)
- 11 Sensitivity (RH10M): $I_{\Delta n}$ (A)/ Δt (s)
- 14 Relay class

Controls

- 7 Press and hold the Reset button, then press the Test button to test the device without actuating the output contacts.
- 12 Test button
- 13 Reset button

Indications

- 5 Green voltage-presence LED (on)
- 6 Red insulation-fault LED (fault)

LED status		Meaning
on	fault	
●	●	Normal operation
●	●	Fault current detected
●	● ● ●	Relay/sensor link fault
●	●	No voltage or device not in service
●	●	Malfunction detected

Key:

- off
- (●) green (or red)
- ● ● flashing

Settings

- 15 Threshold and time-delay selectors (RH21): $I_{\Delta n}$ (A)/ Δt (s)

Three possible settings:

- 0.03 A sensitivity, instantaneous
- 0.3 A sensitivity, instantaneous
- 0.3 A sensitivity, 0.06 s delay
- 16 Time-delay selector: Δt (s)
- RH68M: 8 possible time settings (0.06 s – 1 s)
- RH86M: 6 possible time settings (0.06 s – 0.5 s)
- RH99: 9 possible time settings (instantaneous, 0.06s - 4.5 s)

- 17 Threshold selector (RH99): $I_{\Delta n}$ (A)

- RH68M: 6 possible current settings (0.03 A - 3 A)
- RH86M: 8 possible current settings (0.03 A - 10 A)
- RH99: 9 possible current settings (0.03 A - 30 A)

Connection

- 2 Sensor
- 3 Plug-in supply
- 8 Fault contact
- 9 Voltage-presence contact
- 10 Remote reset/test

Description

RH197M Relays

Functional Description

The earth-fault protection consists of measuring the earth-leakage current in an electrical installation and disconnecting the installation when the leaked current becomes dangerous to life and property.

Functions

The main functions of VigiPact RH197M relays are to measure the earth-leakage current detected by the toroid and trip the installation protection circuit breaker through shunt release MN or MX.

- 1- Protection and monitoring against earth-leakage current
- 2- Local earth-leakage indication on the relay or remote indication by hard wire or via communication
- 3- Display of measurements
- 4- Pre-warning threshold

Relay Marking

- A** Type of relay
- B** Customer marking zone (circuit identification)
- C** Relay class

Controls

- I** Press and hold the Reset button, then press the Test button to test the device without actuating the output contacts.
- J** Test button
- K** Reset button

Indications

- L** Green voltage-presence LED (on)
- M** Yellow alarm LEDs for $I_{\Delta n}$ reaching 50, 40, 30 and 20 % (respectively) of $I_{\Delta n}$ setting. When 70 % of the $I_{\Delta n}$ setting is reached, all the yellow alarm LEDs flash.
- N** Red insulation-fault LED (fault)

LED status		Meaning
on	fault	
●	●	Normal operation
●	●	Fault current detected
●	● ● ●	Faulty sensor/relay link
●	●	No power or device not working

Key:

- off
- green
- ● ● flashing

Settings

- O** Dip switch:
 - Ne/Nd switch used to select the operating mode:
 - failsafe mode: position Ne
 - non-failsafe mode: position Nd
 - "Auto/Manual" switch used to select fault relay reset mode
 - in "Manual" position: latching relay requiring the Reset button to be pressed after fault clearing
 - in "Auto" position: automatic reset of fault relay (after fault clearing)
 - 10 resets are possible according to the following algorithm:

Reset number	1	2	3	4	5	6	7	8	9	10
Reset time after the fault (min.)	0.5	1	2	4	8	16	32	64	128	256

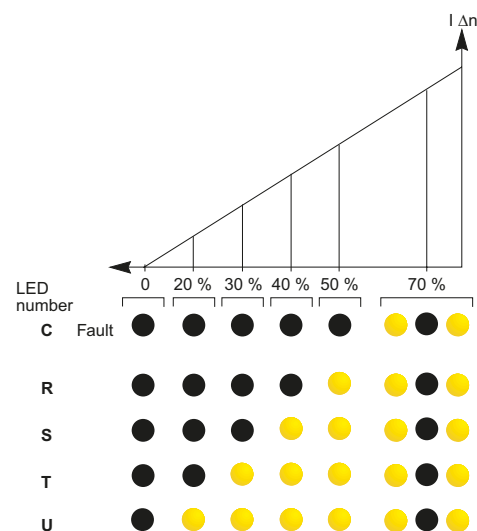
The automatic reset counter is reset 30 minutes after fault relay reset.

- AI 50 % - 100 % (alarm relay setting by Dip switch at 50 % of $I_{\Delta n}$ or 100 % of $I_{\Delta n}$).
- Selector gain for $I_{\Delta n}$.
- P** Threshold $I_{\Delta n}$ (A): 19 possible settings (0.03 A – 0.05 A – 0.075 A – 0.1 A – 0.15 A – 0.2 A – 0.3 A – 0.5 A – 0.75 A – 1 A – 1.5 A – 2 A – 3 A – 5 A – 7.5 A – 10 A – 15 A – 20 A – 30 A)

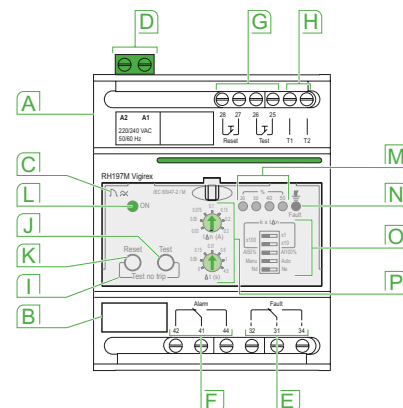
Time-delay selector Δt (s): 7 possible settings (instantaneous – 0.06 s – 0.15 s – 0.31 s – 0.5 s – 1 s – 4.5 s)

Connection

- D** Plug-in supply
- E** Fault contact
- F** Alarm contact
- G** Remote reset/test
- H** Sensor



Status of the indication LEDs according to the measured fault current (% $I_{\Delta n}$)

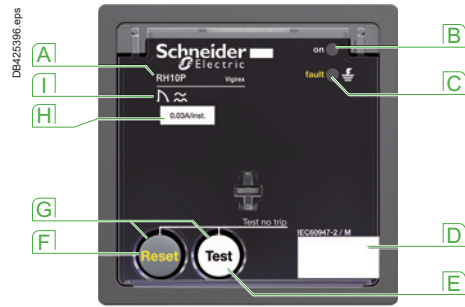


RH197M

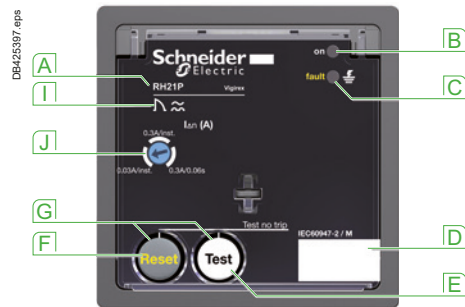
Position of O	Actual trip threshold $I_{\Delta n}$ (A)
	$I_{\Delta n}$ (A)
	10 $I_{\Delta n}$ (A)
	100 $I_{\Delta n}$ (A)
	$I_{\Delta n}$ (A)

Description

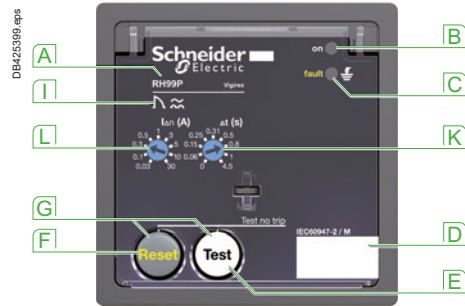
RH10P, RH21P and RH99P Relays



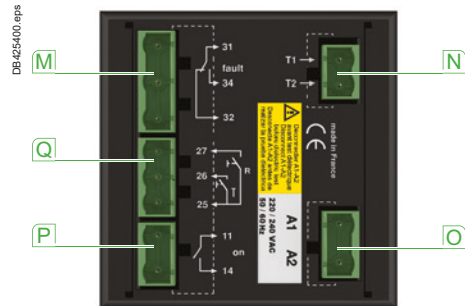
RH10P



RH21P



RH99P



Connections at the back of the relay

Application Type

Functional Description

The earth-fault protection consists of measuring the residual current in an electrical installation and disconnecting the installation when the leaked current becomes dangerous to life and property.

Functions

The main functions of VigiPact RH10P, RH21P and RH99P relays are to measure the residual current detected by the toroid and trip the installation protection circuit breaker through shunt release MN or MX.

- 1- Protection against residual current
- 2- Local earth-leakage indication on the relay.

Relay Marking

- A Type of relay
- D Customer marking zone (circuit identification)
- H Sensitivity (RH10P): $I_{\Delta n}$ (A)/ Δt (s)
- I Relay class

Controls

- E Test button
- F Reset button
- G Press and hold the Reset button, then press the Test button to test the device without actuating the output contacts

Indications

- B Green voltage-presence LED (on)
- C Red insulation-fault LED (fault)

LED status		Meaning
on	fault	
●	●	Normal operation
●	●	Fault current detected
●	● ●	Relay/sensor link fault
●	●	No voltage or device not in service
●	●	Malfunction detected

Key:
● off
● (●) green (or red)
● ● flashing

Settings

J Threshold and time-delay selectors (RH21): $I_{\Delta n}$ (A)/ Δt (s)

Three possible settings:

- 0.03 A sensitivity, instantaneous
- 0.3 A sensitivity, instantaneous
- 0.3 A sensitivity, 0.06 s delay

K Time-delay selector: Δt (s)

RH99: 9 possible time settings (instantaneous – 0.06 s – 0.15 s – 0.25 s – 0.31 s – 0.5 s – 0.8 s – 1 s – 4.5 s)

L Threshold selector: $I_{\Delta n}$ (A)

RH99: 9 possible current settings (0.03 A – 0.1 A – 0.3 A – 0.5 A – 1 A – 3 A – 5 A – 10 A – 30 A)

Connection

All connections for front-panel mount relays are of the plug-in type

- M Fault contact
- N Sensor
- O Plug-in supply
- P Voltage-presence contact
- Q Remote reset/test

Description

RH197P Relays

Functional Description

The earth-fault protection consists of measuring the earth-leakage current in an electrical installation and disconnecting the installation when the leaked current becomes dangerous to life and property.

Functions

The main functions of VigiPact RH197P relays is to measures the earth-leakage current detected by the toroid and trips the installation protection circuit breaker through shunt release MN or MX

- 1- Protection and monitoring against earth-leakage current
- 2- Local earth-leakage indication on the relay or remote indication by hard wire or via communication
- 3- Display of measurements
- 4- Pre-warning threshold

Relay Marking

- A** Type of relay
- D** Customer marking zone (circuit identification)
- I** Relay class

Controls

- E** Test button
- F** Reset button

Indications

- B** Green voltage-presence LED (on)
- C** Red insulation-fault LED (fault)
- R** Yellow alarm LEDs for $I_{\Delta n}$ reaching 50, 40, 30 and 20 % (respectively) of $I_{\Delta n}$ setting. When 70 % of the $I_{\Delta n}$ setting is reached, all the yellow alarm LEDs (**R**) and the red insulation-fault LED flash.

LED status		Meaning
on	fault	
●	●	Normal operation
●	●	Fault current detected
●	●	Relay/sensor link fault
●	●	No voltage or device not in service

Key:

- off
- (●) green (or red)
- ● flashing

Settings

- K** Time-delay selector:
7 possible settings (instantaneous – 0.06 s – 0.15 s – 0.31 s – 0.5 s – 1 s – 4.5 s)
- L** Threshold selector:
19 possible settings (0.03 A – 0.05 A – 0.075 A – 0.1 A – 0.15 A – 0.2 A – 0.3 A – 0.5 A – 0.75 A – 1 A – 1.5 A – 2 A – 3 A – 5 A – 7.5 A – 10 A – 15 A – 20 A – 30 A)
- U** Ne/Nd switch used to select the operating mode:
 - Failsafe mode: position Ne
 - Non-failsafe mode: position Nd
- V** "Auto/Manual" switch used to select fault relay reset mode
 - In "Manual" position: latching relay requiring the Reset button to be pressed after fault clearing
 - In "Auto" position: automatic reset of fault relay (after fault clearing)
 - 10 resets are possible according to the following algorithm:

Reset number	1	2	3	4	5	6	7	8	9	10
Reset time after the fault (min.)	0.5	1	2	4	8	16	32	64	128	256

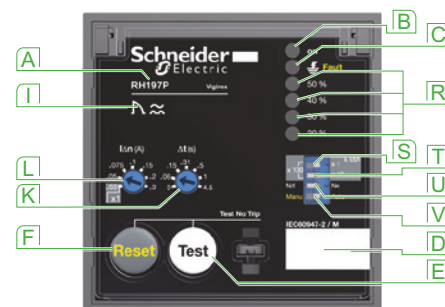
The automatic reset counter is reset 30 minutes after fault relay reset.

Connection

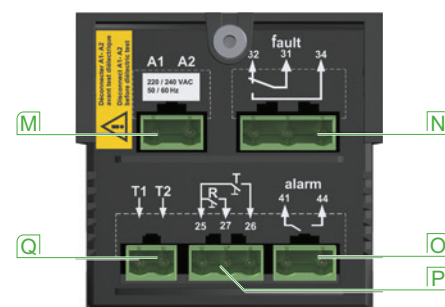
All connections for front-panel mount relays are of the plug-in type.

- M** Plug-in supply
- N** Fault contact
- O** Alarm contact
- P** Remote reset/test
- Q** Sensor
- S** - **T** Gain selector for threshold selector 12 ($I_{\Delta n}$):

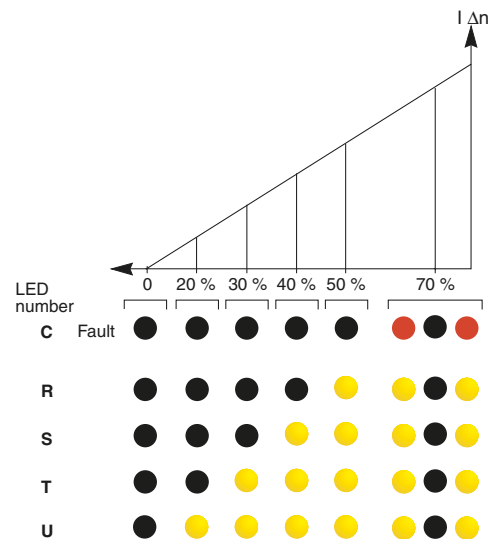
The $I_{\Delta n} = 0.030$ A setting is not modified by the gain selector



RH197P



Connections on the back of the relay

Status of the indication LEDs according to the measured fault current (% $I_{\Delta n}$)

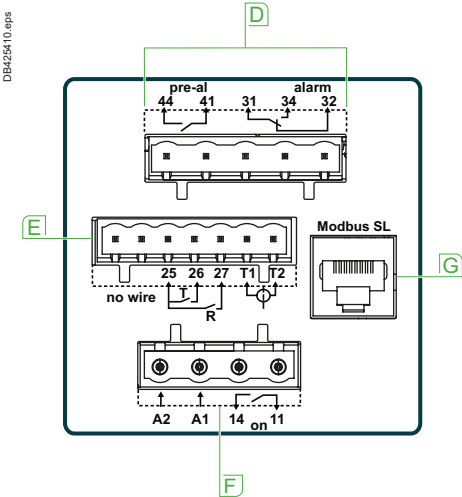
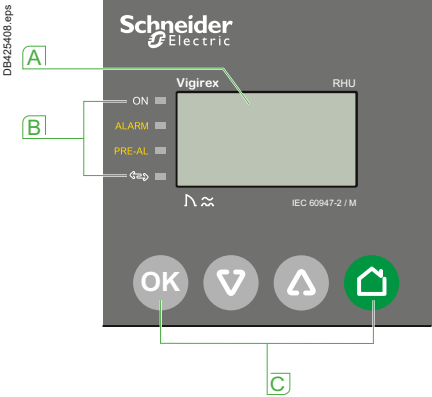
Position of S and T	Actual trip threshold $I_{\Delta n}$ (A)
	$I_{\Delta n}$ (A)
	10 $I_{\Delta n}$ (A)
	100 $I_{\Delta n}$ (A)
	$I_{\Delta n}$ (A)

Functions and Characteristics

Description

RHUs and RHU Relays

A



Functions

The VigiPacT RHU is used together with a toroid (open or closed) or a rectangular sensor.

VigiPacT RHU:

- Measures the residual current detected by the toroid.
- Displays the residual current.
- Trips the installation protection circuit breaker through an MN or MX release if the residual current exceeds the threshold $I\Delta N$ for a time greater than the delay Δt .
- Activates a pre-alarm when the residual current on a circuit exceeds pre-alarm threshold.
- Activates an alarm when the residual current on a circuit exceeds alarm threshold.
- Integrates perfectly in the Smart Panel architecture system by communicating with the Modbus communication (except RHUs which is without communication).

HMI Description and Navigation Principles

Overview

Legend	Display	Description
A	LCD screen	Displays the parameter settings and the measurement values.
B	Status LEDs	Indicates power on, status of alarm, pre-alarm, and communication.
C		Allows to navigate.

Status LED

Status LED	Color	Description
ON	Green	Is switched on when the VigiPacT relay is powered.
Alarm	Red	Is switched on when an alarm is active.
Pre-alarm	Orange	Is switched on when a pre-alarm is active.
COM	Green	Blinks when the VigiPacT relay detects or sends a Modbus frame.

Navigation Buttons

Button	Icon	Description
Validation	OK	Allows to: ■ Modify parameter. ■ Select an item. ■ Validate current setting. ■ Start test mode. ■ Exit test mode at the end of the test.
Down	Down arrow	Allows to move to: ■ The next screen. ■ The next menu item. Allows to decrease the numerical value while setting the parameters.
Up	Up arrow	Allows to move to: ■ The previous screen. ■ The previous menu item. Allows to increase the numerical value while setting the parameters.
Home	Home icon	■ Allows to access the home menu.

Connection

- D Terminal block to connect the pre-alarm contact and the alarm contact
- E Terminal block to connect the toroid and the Test/Reset contacts
- F Terminal block to connect the power supply and voltage presence contact
- G Modbus SL port



User guide RHU
DOCA0107EN



Instruction sheet
RHU NHA34634

Description

RMH Relay and RM12T Multiplexer

Functions

The VigiPacT RMH is used together with a VigiPacT RM12T and toroid (open or closed) or a rectangular sensor.

VigiPacT RMH:

- Measures the residual current detected by the toroids (12 maximum).
- Displays the residual current.
- Activates a pre-alarm when the residual current on a circuit exceeds its pre-alarm threshold.
- Activates an alarm when the residual current on a circuit exceeds its alarm threshold.
- Integrates perfectly in the Smart Panel architecture system by communicating with the Modbus communication.

Alarm Detection

An alarm is active when the measured residual current is greater than the set alarm threshold (I alarm) on at least one toroid for a period of time greater than the set alarm delay (t alarm in milliseconds or seconds) for that particular toroid.

When an alarm is active:

- The **ALARM** and **PRE-AL** LED are switched on.
- When only one alarm is detected, the **Metering** screen of the corresponding toroid is displayed, and the residual current value blinks.
- When more than one alarm are detected, the **Alarm** screen is displayed.

Pre-Alarm Detection

A pre-alarm is active when the measured residual current is greater than the set pre-alarm threshold on at least one channel for a period of time greater than the set pre-alarm trip delay (t pre-alarm in milliseconds or seconds) for that particular toroid.

When a pre-alarm is active:

- The **PRE-AL** LED is switched on and the displayed value blinks.
- When only one pre-alarm is detected, the **Metering** screen of the corresponding toroid is displayed, and the residual current value blinks.
- When more than one alarm are detected, the Pre-alarm screen is displayed.

HMI Description and Navigation Principles

Overview

Legend	Display	Description
A	LCD screen	Displays the parameter settings and the measurement values.
B	Status LEDs	Indicates power on, status of alarm, pre-alarm, and communication
C	Navigation buttons	Allows to navigate

Status LED

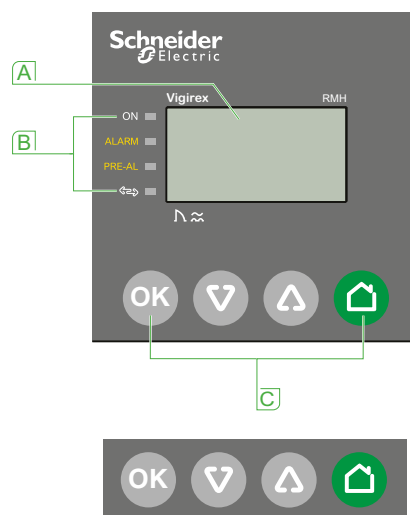
Status LED	Color	Description
ON	Green	Is switched on when the VigiPacT relay is powered.
Alarm	Red	Is switched on when an alarm is active.
Pre-alarm	Orange	Is switched on when a pre-alarm is active.
COM	Green	Blinks when the VigiPacT relay detects or sends a Modbus frame.

Navigation Buttons

Button	Icon	Description
Validation		Allows to: ■ select an item. ■ modify parameter. ■ validate current setting. ■ start test mode. ■ exit test mode at the end of the test.
Down		Allows to move to: ■ next screen. ■ next menu item. Allows you to decrease the numerical value.
Up		Allows to move to: ■ previous screen. ■ previous menu item. Allows to increase the numerical value.
Home		Allows to access the home menu.



PB114667 eps



DB425409 eps

DB419277 eps



User guide RMH
DOCA0108EN

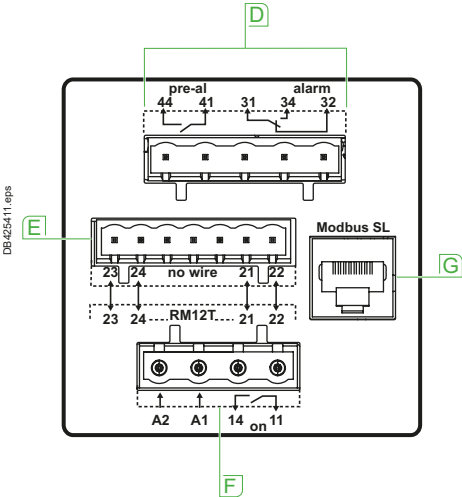


Instruction sheet RMH
NHA34635

Description

RMH Relay and RM12T Multiplexer

A



Connections on the back side of the RMH



Front of RM12T multiplexer

Connection

- D** Terminal block to connect the pre-alarm contact and the alarm contact
- E** Terminal block to connect the RM12T multiplexer
- F** Terminal block to connect the power supply and voltage presence contact
- G** Modbus SL port

RM12T Multiplexer Connection

- T** Sensors (12 measurement channels)
- U** RMH relay
- V** Supply

Description

RHB Relay

Functions

The VigiPacT RHB:

- Measures the residual current detected by the toroid.
 - Displays the residual current.
 - Trips the installation protection circuit breaker through an MN or MX release if the residual current exceeds the threshold $I_{\Delta N}$ for a time greater than the delay Δt .
- The relay implements two insulations monitoring thresholds, one corresponding to a pre-alarm and another to an alarm.

Alarm Detection

The alarm threshold I_{alarm} corresponds to a residual current that is dangerous for the installation.

An alarm is active when the measured residual current is greater than the set alarm threshold (I_{alarm}) on toroid for a period of time greater than the set alarm delay (t_{alarm} in milliseconds or seconds).

- When an alarm is active, AL1 and AL2 LEDs are switched on.
- When an alarm is detected, the residual current value in the LCD display blinks.

Pre-Alarm Detection

The pre-alarm threshold $I_{\text{pre-alarm}}$ corresponds to an earth leakage level that must be eliminated before being dangerous for the installation.

A pre-alarm is active when the measured residual current is greater than the set pre-alarm threshold for a period of time greater than the set pre-alarm trip delay ($t_{\text{pre-alarm}}$ in milliseconds or seconds).

- When a pre-alarm is active, AL1 LED is switched on.
- When a pre-alarm is detected, the residual current value in the LC display blinks.

Time Delays

Ton1 and Ton2 delay the alarm output through LEDs and relays.

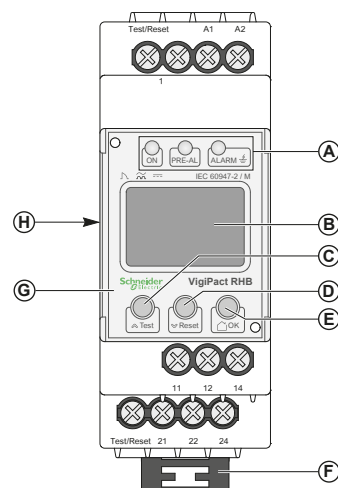
- Ton1 time delay is related to pre-alarm
- Ton2 time delay is related to alarm.

RHB Installation

- On a DIN rail (flush mounted or in cubicle)
- Screwed on a plate (with optional kit LV..., sold separately)
- Install the connectors delivered with the RHB.



VigiPacT RHB



- A Status LEDs: On, Pre-alarm, Alarm
- B Multifunctional LCD display
- C Test/UP button
- D Reset/DOWN button
- E MENU/OK button
- F DIN clip
- G Lead-seal cover
- H QR code to access device information
- I Socket for toroid connection with the wiring kit

PB121667-eps

A

DB43877-aii

Description

Sensors

A

055470-20_SE.eps



A type passive closed toroid

PB115812.eps



PB115819_L116.eps



OA type passive split toroid

059476-40_SE.eps



Rectangular sensor

LV481012_Image.eps



B type active closed toroid

Compatibility with Toroids

VigiPacT RH10, RH21, RH68, RH86, RH99, RH197, RHUs, RHU and RMH relays may be used with the following sensors:

- Closed toroids (A type)
- Split toroids (OA type)
- Rectangular sensors (L type).

VigiPacT RHB relays may only be used with closed toroid (B type).

Adaptation to Installations

- Closed toroids are suitable for new installations up to 630 A. Certain toroids may be mounted on DIN rails, plates or brackets, clipped onto the VigiPacT relay or tied to the cables (see page B-6).
- Split toroids (from 80 to 120 mm) facilitate installation in existing systems up to 250 A. Thank to a trigger, it's very useful to open the toroid, put the cables and re-close the toroid. These toroids could be installed directly on plates or as a modular product through a specific part.
- Rectangular sensors are for busbars in installations with currents ≤ 3200 A.

Compatibility with Rectangular Sensors

The RH10, RH21, RH68, RH86, RH99, RH197, RHUs, RHU and RMH relays may be used with rectangular sensors (L type) 280 x 115 mm and 470 x 160 mm. The VigiPacT sensitivity must be set to ≥ 500 mA.

Withstand Capacity for High Residual-Current Faults

Tests guarantee accurate measurements after a high phase-sequence current flowing through the toroid during a short-circuit between a phase and the PE conductor.

Temperature Ranges

- The temperature range for toroid operation is:
 - A/OA type toroids: $-35^{\circ}\text{C}/+70^{\circ}\text{C}$
 - Rectangular sensors: $-35^{\circ}\text{C}/+80^{\circ}\text{C}$
 - B type toroids: $-25^{\circ}\text{C}/+70^{\circ}\text{C}$
- The temperature range for toroid storage is:
 - A/OA type toroids: $-55^{\circ}\text{C}/+85^{\circ}\text{C}$
 - L type rectangular sensors: $-55^{\circ}\text{C}/+100^{\circ}\text{C}$.
 - B type toroids: $-25^{\circ}\text{C}/+70^{\circ}\text{C}$.

A

Characteristics

Protection Relays with Output Contact Requiring Local Manual Reset After a Fault

VigiPacT Protection Relays		RH10	RH21
General characteristics			
Monitored distribution system: LV AC/System voltage		50/60/400 Hz ≤ 1000 V	50/60/400 Hz ≤ 1000 V
System earthing arrangement		TT, TNS, IT	TT, TNS, IT
Type class as per IEC 60947-2 appendix M ^[1]		A	A
Operating-temperature range		-35 °C/+70 °C	-35 °C/+70 °C
Storage-temperature range		-55 °C/+85 °C	-55 °C/+85 °C
Electrical characteristics			
Power supply: rated operational voltage U _e	12 to 24 V AC - 12 to 48 V DC	50/60 Hz/DC	RH21M only
	48 V AC - 24 to 130 V DC	50/60 Hz/DC	-
	48 V AC	50/60 Hz	-
	110 to 130 V AC	50/60 Hz	-
	220 to 240 V AC	50/60 Hz	-
	380 to 415 V AC	50/60 Hz	-
	440 to 525 V AC	50/60 Hz	-
Operational voltage tolerances	U _e : 12 to 24 V AC - 12 to 48 V DC	55 % to 120 % U _e ^[2]	55 % to 120 % U _e ^[2]
	U _e : 48 V AC - 24 to 130 V DC	-	-
	U _e : 48 to 415 V	55 % to 110 % U _e	55 % to 110 % U _e
	U _e : 110 to 415 V	-	-
	U _e : 220 to 240 V	-	-
Overvoltage category	U _e > 415 V	70 % to 110 % U _e	70 % to 110 % U _e
		4	4
Rated impulse withstand voltage up to U _e = 525 V AC		8	8
Maximum consumption	AC	4 VA	4 VA
	DC	4 W	4 W
Insensitive to micro-outages ≤ 60 ms relay can operate even if there is a power outage for less than 60ms		■	■
Toroid loss detection		■	■
Leakage-current measurements	Measurement range	from 15 mA to 60 A	from 15 mA to 60 A
	Measurement accuracy	±7 %	±7 %
I _{Δn} current detection	Display refresh time	-	-
	Threshold I _{Δn}	1 fixed threshold 0.03 A - 0.05 A - 0.1 A - 0.25 A 0.3 A - 0.5 A - 1 A	2 user-selectable thresholds 0.03 A or 0.3 A
	I _{Δn} -current detection range	80 % I _{Δn} to 100 % I _{Δn}	80 % I _{Δn} to 100 % I _{Δn}
	Time delay Δt	instantaneous	instantaneous for I _{Δn} = 0.03 A 1 user-selectable time delay instantaneous or 0.06 s for I _{Δn} = 0.3 A
	Δt settings (s)	0	0 0.06
	Maximum non-operating time at 2 I _{Δn} (s)	-	- 0.06
	Maximum operating time at 5 I _{Δn} (s) (residual-current relay alone)	0.015	0.015 0.13
	Maximum total time at 5 I _{Δn} ^[3] (s)	0.04	0.04 0.15
	Setting	none	selector
	Output contact	changeover with latching	changeover with latching
Pre-warning current detection	I pre-warning threshold	-	-
	Pre-warning-current detection range	-	-
	Time delay Δt pre-warning	-	-
	Δt pre-warning settings	-	-
	Maximum non-detection time at 2 I pre-warning	-	-
	Maximum detection time at 5 I pre-warning	-	-
	Setting	-	-
	Output contact	-	-
Test with or without actuation of the output contacts and output-contact reset following a fault	Hysteresis	-	-
	Local	■	■
	Remote (hard-wired) (10 m maximum)	■	■
	Remote (hard-wired for several relays) (10 m maximum)	■	■
Self-monitoring	Remote (via communication)	-	-
	Relay/sensor link	continuous	continuous
	Power supply	continuous	continuous
	Electronics	continuous	continuous

^[1] Type A relays up to 5 A and type AC above 5 A.

^[2] 80 % to 120 % U_e if U_e < 20 V.

^[3] Maximum time to clear the fault current when combined with a Schneider Electric circuit breaker or switch rated ≤ 630 A.

Characteristics

Protection Relays with Output Contact Requiring Local Manual Reset After a Fault

RH68	RH86	RH99
50/60/400 Hz ≤ 1000 V	50/60/400 Hz ≤ 1000 V	50/60/400 Hz ≤ 1000 V
TT, TNS, IT	TT, TNS, IT	TT, TNS, IT
A	A	A
-35 °C/+70 °C	-35 °C/+70 °C	-35 °C/+70 °C
-55 °C/+85 °C	-55 °C/+85 °C	-55 °C/+85 °C
-	-	■
-	-	-
-	-	RH99M only
-	-	■
■	■	■
-	-	■
-	-	RH99M only
-	-	55 % to 120 % U _e ^[2]
-	-	-
55 % to 110 % U _e	55 % to 110 % U _e	55 % to 110 % U _e
-	-	-
55 % to 110 % U _e	55 % to 110 % U _e	-
-	-	70 % to 110 % U _e
4	4	4
8	8	8
4 VA	4 VA	4 VA
4 W	4 W	4 W
■	■	■
■	■	■
from 15 mA to 60 A	from 15 mA to 60 A	from 15 mA to 60 A
±7 %	±7 %	±7 %
-	-	-
6 user-selectable thresholds 0.03 A - 0.1 A - 0.3 A - 0.5 A - 1 A - 3 A	8 user-selectable thresholds 0.03 A - 0.1 A - 0.3 A - 0.5 A - 1 A - 3 A - 5 A - 10 A	9 user-selectable thresholds 0.03 A - 0.1 A - 0.3 A - 0.5 A - 1 A - 3 A - 5 A - 10 A - 30 A
80 % I _{Δn} to 100 % I _{Δn} instantaneous for I _{Δn} = 0.03 A 8 user-selectable time delays instantaneous to 1 s	80 % I _{Δn} to 100 % I _{Δn} instantaneous for I _{Δn} = 0.03 A 6 user-selectable time delays instantaneous to 0.5 s	80 % I _{Δn} to 100 % I _{Δn} instantaneous for I _{Δn} = 0.03 A 9 user-selectable time delays instantaneous to 4.5 s
0 0.06 0.15 0.25 0.31 0.5 0.8 1	0 0.06 0.15 0.25 0.31 0.5	0 0.06 0.15 0.25 0.31 0.5 0.8 1 4.5
- 0.06 0.15 0.25 0.31 0.5 0.8 1	- 0.06 0.15 0.25 0.31 0.5	- 0.06 0.15 0.25 0.31 0.5 0.8 1 4.5
0.015 0.13 0.23 0.32 0.39 0.58 0.91 1.2	0.015 0.13 0.23 0.32 0.39 0.58	0.015 0.13 0.23 0.32 0.39 0.58 0.91 1.2 4.8
0.04 0.15 0.25 0.34 0.41 0.6 0.93 1.22	0.04 0.15 0.25 0.34 0.41 0.6	0.04 0.15 0.25 0.34 0.41 0.6 0.93 1.22 4.82
selector	selector	selector
changeover with latching	changeover with latching	changeover with latching
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
■	■	■
■	■	■
■	■	■
-	-	-
continuous	continuous	continuous
continuous	continuous	continuous
continuous	continuous	continuous

A

Characteristics

Protection Relays with Output Contact Requiring Local Manual Reset After a Fault

A

VigiPacT Protection Relays

General characteristics

Monitored distribution system: LV AC/System voltage

System earthing arrangement

Type class as per IEC 60947-2 appendix M ^[1]

Operating-temperature range

Storage-temperature range

Electrical characteristics

Power supply:	12 to 24 V AC - 12 to 48 V DC	50/60 Hz/DC
rated operational voltage U _e	48 V AC - 24 to 130 V DC	50/60 Hz/DC
	110 to 130 V AC	50/60 Hz
	220 to 240 V AC	50/60 Hz
	380 to 415 V AC	50/60 Hz
	440 to 525 V AC	50/60 Hz
	100 to 250 V AC/DC	50/400 Hz/DC

Operational voltage tolerances	U _e : 12 to 24 V AC - 12 to 48 V DC
	U _e : 48 V AC - 24 to 130 V DC
	U _e : 48 to 415 V
	U _e : 110 to 415 V
	U _e > 415 V

Overvoltage category	
Rated impulse withstand voltage up to U _e = 525 V AC	U _{imp} (kV)
Maximum consumption	AC
	DC

Insensitive to micro-outages ≤ 60 ms

Maximum break time on toroid failure (as per standard IEC 60947-2)

Leakage-current measurements	Measurement range
	Measurement accuracy
	Display measurement
	Display refresh time

Fault current detection (Alarm for RHU) (Alarm 2 for RHB)	Threshold I _{Δn}

Alarm (Pre-Alarm for RHU) Alarm 1 for RHB	I alarm threshold
---	-------------------

Alarm-current detection range
Time delay Δt alarm

Δt alarm settings
Maximum non-detection time at 2 I alarm
Maximum detection time at 5 I alarm
Setting
Output contact
Hysteresis

Test with or without actuation of the output contacts and output-contact reset following a fault	Local
	Remote (hard-wired) (10 m maximum)
	Remote (hard-wired for several relays) (10 m maximum)
	Remote (via communication)
Self-monitoring	Relay/sensor link
	Power supply
	Electronics

[1] Type A relays up to 5 A.

[2] Maximum time to clear the fault current when combined with a Schneider Electric circuit breaker or switch rated ≤ 630 A.

[3] 110 V AC, 230 V AC and 400 V AC only.

[4] 85 % during energisation.

[5] < 20 % of I_{Δn}: display = 0 and > 200 % of I_{Δn}: display = SAT.

[6] Not available for DC version.

[7] For RHB, without actuation of the contacts only.

Characteristics

Protection Relays with Output Contact Requiring Local Manual Reset After a Fault

RH197M	RH197P	RHUs and RHU	RHB
50/60/400 Hz ≤ 1000 V	50/60/400 Hz ≤ 1000 V	50/60/400 Hz ≤ 1000 V	0 to 2000 Hz < 800 V
TT, TNS, IT	TT, TNS, IT	TT, TNS, IT	TT, TNS
A	A	A	B
-25 °C/+55 °C	-25 °C/+55 °C	-25 °C/+55 °C	-25 °C/+55 °C
-40 °C/+85 °C	-40 °C/+85 °C	-40 °C/+85 °C	-40 °C/+85 °C
-	-	-	-
■	■	■	-
■ [3]	■	■	-
■ [3]	■	-	-
■ [3]	-	-	-
-	-	-	-
-	-	-	■
-	-	-	-
80 % to 110 % Ue	70 % to 110 % Ue	-	-
-	-	70 % to 110 % Ue [4]	70 % to 120 % Ue
85 % to 110 % Ue	70 % to 110 % Ue	-	-
-	-	-	-
4	4	4	3
8	8	8	4
4 VA	4 VA	8 VA	6.5 VA
4 W	4 W	-	6.5 W
■	■	■	< 200 ms at 70 % Ue
■	■	■	■
-	-	from 15 mA to 60 A	from 0 mA to 6 A
±7 %	±7 %	±7 %	±17.5 % or ± 2 digits
4 DEL 20, 30, 40 and 50 % of IΔn	4 DEL 20, 30, 40 and 50 % of IΔn	from ±20 % [5] to 200 % of IΔn	from 0 % to 200 % of IΔn
0.5 s	0.5 s	2 s	0.5 s
19 user-selectable thresholds 0.03 A - 0.05 A - 0.075 A - 0.1 A - 0.15 A - 0.2 A 0.3 A - 0.5 A - 0.75 A - 1 A - 1.5 A - 2 A - 3 A - 5 A 7.5 A - 10 A - 15 A - 20 A - 30 A	19 user-selectable thresholds 0.03 A - 0.05 A - 0.075 A - 0.1 A - 0.15 A - 0.2 A 0.3 A - 0.5 A - 0.75 A - 1 A - 1.5 A - 2 A - 3 A - 5 A 7.5 A - 10 A - 15 A - 20 A - 30 A	1 adjustable threshold from 0.03 A to 1 A in 0.001 A steps from 1 A to 30 A in 0.1 A steps	1 adjustable threshold from 0.03 A to 100 mA in 0.001 A steps
80 % IΔn to 100 % IΔn	80 % IΔn to 100 % IΔn	80 % IΔn to 100 % IΔn	50 % IΔn to 100 % IΔn
instantaneous for IΔn = 0.03 A 7 user-selectable time delays instantaneous to 4.5 s	instantaneous for IΔn = 0.03 A 7 user-selectable time delays instantaneous to 4.5 s	instantaneous for IΔn = 0.03 A 1 adjustable time delay to 4.5 s in 10 ms steps	instantaneous for IΔn = 0.03 A 1 adjustable time delay to 10s in: 0-1s: 10ms steps & 1s-10s: 100ms steps
0 0.06 0.15 0.31 0.5 1 4.5	0 0.06 0.15 0.31 0.5 1 4.5	0 0.06 ≤ Δt	0...10 s
- 0.06 0.15 0.31 0.5 1 4.5	- 0.06 0.15 0.31 0.5 1 4.5	- same as for RH99	Δt + 30 ms
0.020 0.13 0.32 0.39 0.58 1.2 4.8	0.020 0.13 0.32 0.39 0.58 1.2 4.8	0.015 same as for RH99	Δt + 23 ms
0.04 0.20 0.34 0.41 0.6 1.22 4.82	0.04 0.20 0.34 0.41 0.6 1.22 4.82	0.04 same as for RH99	Δt + 40 ms
selector changeover with latching in manual position; 10 automatic resets in auto position (see algorithm) setting by Dip switch at 50 % of IΔn or 100 % of IΔn	selector changeover with latching in manual position; 10 automatic resets in auto position (see algorithm) fixed at 50 % of IΔn or 100 % of IΔn [6]	keypad changeover with latching	keypad changeover with latching
80 % I alarm to 100 % I alarm	80 % I alarm to 100 % I alarm	1 adj. threshold from 20 to 100 % IΔn 0.015 A to 1 A in 0.001 A steps 1 A to 30 A in 0.1 A steps 0.015 A < I < 30 A	1 adj. threshold from 20 to 100 % IΔn 0.015 A to 1 A in 0.001 A steps 1 A to 30 A in 0.1 A steps 0.015 A < I < 30 A
instantaneous	instantaneous	80 % I alarm to 100 % I alarm	50 % I alarm 1 to 100 % I alarm 1
-	-	1 adjustable time delay instantaneous to 4.5 s in 10 ms steps	1 adjustable time delay instantaneous to 10 s in 10 ms & 100 ms steps
-	-	0 s 0.06 s ≤ Δt	Δt + 30 ms
-	-	- same as for IΔn	Δt + 23 ms
-	-	0.015 s same as for IΔn	Δt + 40 ms
-	-	keypad	keypad
NO without latching	NO without latching	YES	YES
0, -10 % IΔn	0, -10 % IΔn	alarm deactivated at 70 % of I alarm threshold	requires manual reset
■	■	■	■ [7]
■ [6]	■	■	■ [7]
-	■	■	■ [7]
-	-	■ RHU only	-
continuous	continuous	continuous	continuous
continuous	continuous	continuous	continuous
watch-dog in microprocessor	watch-dog in microprocessor	continuous	continuous

A

Characteristics

Protection Relays with Output Contact Requiring Local Manual Reset After a Fault

VigiPacT Protection Relays			RH10 - RH21 - RH68 - RH86 - RH99						
Electrical characteristics as per IEC 60755 and EN 60755, IEC 60947-2 and EN 60947-2, UL 1053 and CSA C22.2 N° 144 for RH10 to 99 with Ue ≤ 220 V (cont.)									
Characteristics of output contacts as per standard IEC 60947-5-1	Rated thermal current (A)	8							
	Minimum load	10 mA at 12 V							
	Utilization category	AC12	AC13	AC14	AC 15	DC12	DC13		
	24 V	6	6	5	5	6	2		
	48 V	6	6	5	5	2	-		
	110-130 V	6	6	4	4	0.6	-		
	220-240 V	6	6	4	4	-	-		
	250 V	-	-	-	-	0.4	-		
	380-415 V	5	-	-	-	-	-		
Rated operational current (A)	440 V	-	-	-	-	-	-		
	660-690 V	-	-	-	-	-	-		
	Voltage presence (LED and/or relay) ^[1]	■							
	Threshold overrun	fault (LED)	■						
		alarm (LED and relay)	-						
	Leakage current and settings (digital)	-							
	Setting protection	sealable cover							
	Communication								
	Suitable for supervision (internal bus)	-							
Mechanical characteristics		DIN			Front-panel mount				
Dimensions	6 modules x 9 mm			72 x 72 mm					
Weight	0.3 kg			0.3 kg					
Insulation class (IEC 60664-1)	Front face	2			2				
	Communication output	-			-				
Degree of protection IP (IEC 60529)	Front face	IP40			IP40				
	Other faces	IP30			IP30				
	Connections	IP20			IP20				
Mechanical impact on front face IK (EN 50102)	IK07 (2 joules)			IK07 (2 joules)					
Sinusoidal vibrations (Lloyd's and Veritas)	2 to 13.2 Hz ±1 mm and 13.2 to 100 Hz - 0.7 g			2 to 13.2 Hz ±1 mm and 13.2 to 100 Hz - 0.7 g					
Fire (IEC 60695-2-10)	■			■					
Environment									
Damp heat, equipment not in service (IEC 60068-2-30)	28 cycles +25 °C/+55 °C/RH 95 %								
Damp heat, equipment in service (IEC 60068-2-56)	48 hours, Environment category C2								
Salt mist (IEC 60068-2-52)	KB test, severity 2								
Degree of pollution (IEC 60664-1)	3								
Electromagnetic compatibility ^[2]	Electrostatic discharges (IEC 61000-4-2)	Level 4							
	Radiated susceptibility (IEC 61000-4-3)	Level 3							
	Low-energy conducted susceptibility (IEC 61000-4-4)	Level 4							
	High-energy conducted susceptibility (IEC 61000-4-5)	Level 4							
	Radiofrequency interference (IEC 61000-4-6)	Level 3							
	Conducted and radiated emissions (CISPR11)	Class B							
Sensors and accessories									
Sensors	A, TOA type toroids	■							
	L type rectangular sensors for IΔn ≥ 500 mA	■							
Cables	TB Type toroids	-							
	Relay/sensor link via standard twisted pair not supplied	■							
	Relay/sensor link via connection kit, 1m, 2.5m	-							

[1] Depending on the type of wiring (optimum continuity of service or optimum protection).

[2] Compatibility for both relay and sensor.

[3] No voltage presence relay.

[4] By bargraph.

Characteristics

Protection Relays with Output Contact Requiring Local Manual Reset After a Fault

	RH197						RHUs and RHU						RHB					
	8						8						5					
	10 mA at 12 V						10 mA at 12 V						1 mA at 10 V					
	AC12	AC13	AC14	AC 15	DC12	DC13	AC12	AC13	AC14	AC15	DC12	DC13	AC12	AC13	AC14	AC15	DC12	DC13
	6	6	5	5	6	2	6	6	5	5	6	2	-	-	-	-	1	-
	6	6	5	5	2	-	6	6	5	5	2	-	-	-	-	-	-	-
	6	6	4	4	0.6	-	6	6	4	4	0.6	-	-	-	-	-	0.2	-
	6	6	4	4	-	-	6	6	4	4	-	-	-	5	3	-	0.1	-
	-	-	-	-	0.4	-	-	-	-	-	0.4	-	-	-	-	-	-	-
	5	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	■ [3]						■						■					
	■						■						■					
	■						■						■					
	■ [4]						■						■					
	sealable cover						by password on the display						sealable cover and password protected					
	-						■ (RHU only)						-					
	DIN			Front-panel mount			Front-panel mount											
	8 modules x 9 mm - H 89 mm			72 x 72 mm			72 x 72 mm						4 modules x 9 mm - H 90 mm					
	0.3 kg			0.3 kg			0.3 kg						0.15 kg					
	2			2			2						2					
	-			-			2						-					
	IP40			IP40			IP40						IP40					
	IP30			IP30			IP30						IP30					
	IP20			IP20			IP20						IP20					
	IK07 (2 joules)			IK07 (2 joules)			IK07 (2 joules)						IK07 (2 joules)					
	2 to 13.2 Hz ±1 mm and 13.2 to 100 Hz - 0.7 g			2 to 13.2 Hz ±1 mm and 13.2 to 100 Hz - 0.7 g			2 to 13.2 Hz ±1 mm and 13.2 to 100 Hz - 0.7 g						2 to 13.2 Hz ±1 mm and 13.2 to 100Hz - 0.7 g					
	■			■			■						-					
	28 cycles +25 °C/+55 °C/ RH 95 %			28 cycles +25 °C/+55 °C/ RH 95 %			28 cycles +25 °C/+55 °C/ RH 95 %						28 cycles +25°C/+55°C/ RH 95%					
	48 hours, Environment category C2			48 hours, Environment category C2			48 hours, Environment category C2						48 hours, Environnement category C2					
	KB test, severity 2			KB test, severity 2			KB test, severity 2						KB test, severity 2					
	3			3			3						2					
	Level 4			Level 4			Level 4						Level 3					
	Level 3			Level 3			Level 3						Level 3					
	Level 4			Level 4			Level 4						Level 4					
	Level 4			Level 4			Level 4						Level 4					
	Level 3			Level 3			Level 3						Level 3					
	Class B			Class B			Class B						Class A					
	■						■						-					
	■						■						-					
	-						-						■					
	■						RHU only											
	-						-						■					

A

Characteristics

Monitoring Relays with Output Contact That Automatically Resets After Fault Clearance

PB100434_SE.epa



RH99M

PB10043230_SE.epa



RH99P

PB113809-R4.epa



RMH

+

059485-51_SE.epa



RM12T

VigiPacT Monitoring Relays

General characteristics

Monitored distribution system: LV AC/System voltage

System earthing arrangement

Type class as per IEC 60947-2 appendix M^[1]

Operating-temperature range

Storage-temperature range

Electrical characteristics

Power supply:	12 to 24 V AC - 12 to 48 V DC	50/60 Hz/DC
rated operational voltage U _e	110 to 130 V AC	50/60 Hz
	220 to 240 V AC	50/60 Hz
	380 to 415 V AC	50/60 Hz
	440 to 525 V AC	50/60 Hz

Operational voltage tolerances	U _e : 12 to 24 V AC -12 to 48 V DC
	48 V ≤ U _e ≤ 415 V
	U _e > 415 V

Overvoltage category

Rated impulse withstand voltage up to U_e = 525 V ACU_{imp} (kV)

Maximum consumption

AC

DC

Insensitive to micro-outages ≤ 60 ms

Maximum break time on toroid failure (as per standard IEC 60947-2)

Leakage-current measurements

Measurement range

Measurement accuracy

Measurement time for 1 channel

Measurement time for 12 channels

Display measurement

Display refresh time

Alarm

IΔn

threshold

Alarm-current detection range

Time delay Δt alarm

Δt alarm settings (s)

Maximum non-detection time at 2 IΔn (2 I alarm for RMH) (s)

Maximum detection time at 5 IΔn (5 I alarm for RMH) (s)

Setting

Output contact

Hysteresis

Pre-alarm

I pre-alarm threshold

Pre-alarm current detection range

Time delay Δt pre-alarm

Accuracy

Setting

Output contact

Hysteresis

Test with or without activation of output contacts

Local

Remote (hard-wired) (10 m maximum)

Remote (hard-wired for several relays) (10 m maximum)

Remote (via communication)

Self-monitoring

Relay/sensor link

Sensor/multiplexer RM12T and RM12T/RMH link

Power supply

Electronics

[1] Type A relays up to 5A and type AC up to 30 A.

[2] 80 % to 120 % U_e if U_e < 20 V.

[3] -15 % during energisation.

[4] < 20 % of IΔn: display = 0 and > 200 % of IΔn: display = SAT.

Characteristics

Monitoring Relays with Output Contact That Automatically Resets After Fault Clearance

RH99	RHUs and RHU	RMH and RM12T associated
50/60/400 Hz ≤ 1000 V	50/60/400 Hz ≤ 1000 V	50/60/400 Hz ≤ 1000 V
TT, TNS	TT, TNS, IT	TT, TNS
A	A	A
-35 °C/+70 °C	-25 °C/+55 °C	-25 °C/+55 °C
-55 °C/+85 °C	-40 °C/+85 °C	-40 °C/+85 °C
■	-	-
■	■	-
■	■	■
RH99M only	-	-
RH99M only	-	-
55 % to 120 % Ue ^[2]	-	-
55 % to 110 % Ue	70 % to 110 % Ue	70 % to 110 % Ue ^[3]
70 % to 110 % Ue	-	-
4	4	4
8	8	8
4 VA	8 VA	8 VA
4 W	-	-
■	■	■
■	■	■
from 15 mA to 60 A	from 15 mA to 60 A	from 15 mA to 60 A on 12 measurement channels
±7 %	±7 %	±10 %
-	< 200 ms	< 200 ms
-	-	< 2.4 s (< n x 200 ms if n toroids)
-	from 20 % ^[3] to 200 % of I _{Δn}	from 20 % ^[4] to 200 % of I _{Δn}
-	2 s	2 s
9 user-selectable thresholds 0.03 A - 0.1 A - 0.3 A - 0.5 A - 1 A - 3 A - 5 A - 10 A - 30 A	1 adjustable threshold from 0.03 A to 1 A in 0.001 A steps from 1 A to 30 A in 0.1 A steps	1 adjustable threshold/channel from 0.03 A to 1 A in 0.001 A steps from 1 A to 30 A in 0.1 A steps
80 % I _{Δn} to 100 % I _{Δn}	80 % I _{Δn} à 100 % I _{Δn}	80 % I _{Δn} à 100 % I _{Δn}
instantaneous for I _{Δn} = 0.03 A	instantaneous for I _{Δn} = 0.03 A	instantaneous for I _{Δn} = 0.03 A
9 user-selectable time delays: instantaneous to 4.5 s	1 adjustable time delay to 4.5 s in 10 ms steps	1 adjustable delay/channel instantaneous to 4.5 s in 10 ms steps
0 0.06 0.15 0.25 0.31 0.5 0.8 1 4.5		0 s other time delays
- 0.06 0.15 0.25 0.31 0.5 0.8 1 4.5		0.2 s 0.2 s + Δt alarm
0.015 0.13 0.23 0.32 0.39 0.58 0.91 1.2 4.8		2.4 s 2.4 s + (1.2 x Δt alarm)
selector	keypad	keypad
changeover	changeover	changeover
none	alarm contact deactivated at 80 % of I alarm threshold	alarm contact deactivated at 80 % of I alarm threshold
-	1 adj. threshold from 20 to 100 % I _{Δn} 0.015 A to 1 A in 0.001 A steps 1 A to 30 A in 0.1 A steps	1 adj. threshold/channel from 20 to 100 % I _{Δn} 0.015 A to 1 A in 0.001 A steps 1 A to 30 A in 0.1 A steps 0.015 A ≤ I pre-alarm ≤ I alarm ≤ 30 A
-	80 % I pre-alarm to 100 % I pre-alarm	80 % I pre-alarm to 100 % I pre-alarm
-	1 adjustable delay instantaneous to 4.5 s in 10 ms steps	1 adjustable delay/channel instantaneous to 4.5 s in 10 ms steps
-	0/-20 % for all settings not including polling time	0/-20 % for all settings not including polling time
-	keypad	keypad
-	YES	YES
-	pre-alarm contact deactivated at 70 % of I pre-alarm threshold	pre-alarm contact deactivated at 70 % of I pre-alarm threshold
■	■	■
■	■	-
■	-	-
-	■ (RHU only)	■
continuous	continuous	continuous
-	-	continuous
continuous	continuous	continuous
continuous	continuous	continuous

A

Characteristics

Monitoring Relays with Output Contact That Automatically Resets After Fault Clearance (Cont.)

A

PB100434_SE.aps



RH99M

PB100432_30_SE.aps



RH99P

PB113005-R4.aps



+

050485-51_SE.aps



RM12T

VigiPacT Monitoring Relays

Electrical characteristics (cont.)

Characteristics of output contacts as per standard IEC 60947-5-1	Rated thermal current (A)
Rated operational current (A)	Minimum load
	Utilization category
	24 V
	110-130 V
	220-240 V
	250 V
	380-415 V
	440 V
	660-690 V
Display and indications	Voltage presence (LED and/or relay)
	Threshold overrun alarm (LED and relay)
	pre-alarm (LED and relay)
	Leakage current and settings (digital)

Setting protection

Communication

Suitable for supervision (internal bus)

Mechanical characteristics

Dimensions

Weight

Insulation class (IEC 60664-1)	Front face
	Communication output
Degree of protection IP (IEC 60529)	Front face
	Other faces
	Connections

Mechanical impact on front face IK (EN 50102)

Sinusoidal vibrations (Lloyd's and Veritas)

Fire (IEC 60695-2-1)

Environment

Damp heat, equipment not in service (IEC 60068-2-30)

Damp heat, equipment in service (IEC 60068-2-56)

Salt mist (IEC 60068-2-52)

Degree of pollution (IEC 60664-1)

Electromagnetic compatibility ^[1]

Electrostatic discharges (IEC 61000-4-2)
Radiated susceptibility (IEC 61000-4-3)
Low-energy conducted susceptibility (IEC 61000-4-4)
High-energy conducted susceptibility (IEC 61000-4-5)
Radiofrequency interference (IEC 61000-4-6)
Conducted and radiated emissions (CISPR11)

Sensors and accessories

Sensors	A, TOA type toroids
	L type rectangular sensor for $I_{\Delta n} \geq 500$ mA
	TB type toroids
Cables	Relay/sensor link via standard twisted pair not supplied
	Relay/sensor link via connection kit, 1m, 2.5m, 5m or 10m

[1] Compatibility for both relay and sensor.

Characteristics

Monitoring Relays with Output Contact That Automatically Resets After Fault Clearance (Cont.)

	RH99						RHUs and RHU						RMH and RM12T Associated					
													RMH			RM12T		
	8 10 mA at 12 V						8 10 mA at 12 V						8 10 mA at 12 V					
	AC12	AC13	AC14	AC15	DC12	DC13	AC12	AC13	AC14	AC15	DC12	DC13	AC12	AC13	AC14	AC15	DC12	DC13
	6	6	5	5	6	2	6	6	5	5	6	2	6	6	5	5	6	2
	6	6	4	4	0.6	-	6	6	4	4	0.6	-	6	6	4	4	0.6	-
	6	6	4	4	-	-	6	6	4	4	-	-	6	6	4	4	-	-
	-	-	-	-	0.4	-	-	-	-	-	0.4	-	-	-	-	-	0.4	-
	5	-	-	-	-	-	5	-	-	-	-	-	5	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	■						■						■			■ LED		
	■ (fault indication)						■						■			-		
	-						■						■			-		
	-						■						■			-		
	sealable cover						by password on the display						by password on the display			-		
	-						■ (RHU only)						■					
	DIN		Front-panel mount		Front-panel mount		Front-panel mount		Front-panel mount		Front-panel mount		DIN		DIN		DIN	
	6 modules x 9 mm		72 x 72 mm		72 x 72 mm		72 x 72 mm		72 x 72 mm		72 x 72 mm		72 x 72 mm		12 modules x 9 mm		12 modules x 9 mm	
	0.3 kg		0.3 kg		0.3 kg		0.3 kg		0.3 kg		0.3 kg		0.3 kg		0.42 kg		0.42 kg	
	2		2		2		2		2		2		2		-		-	
	-		-		-		-		-		-		-		-		-	
	IP40		IP40		IP40		IP40		IP40		IP40		IP40		IP40		IP40	
	IP30		IP30		IP30		IP30		IP30		IP30		IP30		IP30		IP30	
	IP20		IP20		IP20		IP20		IP20		IP20		IP20		IP20		IP20	
	IK07 (2 joules)		IK07 (2 joules)		IK07 (2 joules)		IK07 (2 joules)		IK07 (2 joules)		IK07 (2 joules)		IK07 (2 joules)		IK07 (2 joules)		IK07 (2 joules)	
	2 to 13.2 Hz ±1 mm and 13.2 to 100 Hz – 0.7 g		2 to 13.2 Hz ±1 mm and 13.2 to 100 Hz – 0.7 g		2 to 13.2 Hz ±1 mm and 13.2 to 100 Hz – 0.7 g		2 to 13.2 Hz ±1 mm and 13.2 to 100 Hz - 0.7 g		2 to 13.2 Hz ±1 mm and 13.2 to 100 Hz - 0.7 g		2 to 13.2 Hz ±1 mm and 13.2 to 100 Hz - 0.7 g		2 to 13.2 Hz ±1 mm and 13.2 to 100 Hz - 0.7 g		2 to 13.2 Hz ±1 mm and 13.2 to 100 Hz - 0.7 g		2 to 13.2 Hz ±1 mm and 13.2 to 100 Hz - 0.7 g	
	■		■		■		■		■		■		■		■		■	
	28 cycles +25 °C/+55 °C/RH 95 % 48 hours, Environment category C2 KB test, severity 2 3 Level 4						28 cycles +25 °C/+55 °C/RH 95 % 48 hours, Environment category C2 KB test, severity 2 3 Level 4						28 cycles +25 °C/+55 °C/RH 95 % 48 hours, Environment category C2 KB test, severity 2 3 Level 4					
	Level 3						Level 3						Level 3					
	Level 4						Level 4						Level 4					
	Level 4						Level 4						Level 4					
	Level 3						Level 3						Level 3					
	Class B						Class B						Class B					
	■						■						■					
	■						■						■					
	-						-						-					
	■						■						■					
	-						-						-					

Functions and Characteristics

Characteristics

Sensors

A



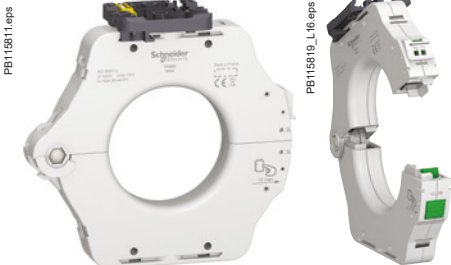
A type closed toroid: PA30 and PA50



A type closed toroid: MA120



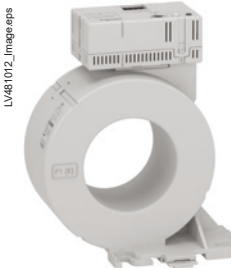
A type passive closed toroid: IA80



OA type passive split toroid: TOA80



Type L rectangular sensor



B type active closed toroid: TB60 & TB60P

Sensors

Associated relays

- Monitoring relays
- Protection relays

General characteristics

- Monitored distribution system
- Insulation level Ui
- Closed sensor
- Split sensor
- Operating-temperature range
- Storage-temperature range
- Degree of protection

Electrical characteristics

- Transformation ratio
- Overvoltage category
- Rated impulse withstand voltage Uimp (kV)

Sensor characteristics

Rated operational current Ie (A)	
Rated short-time withstand current	Icw kA/0.5 s
Residual short-circuit withstand current (IEC 60947-2)	IΔw kA/0.5 s

Mechanical characteristics

Type of sensor

- TA30 toroid
- PA50 toroid
- IA80 toroid
- MA120 toroid
- SA200 toroid
- GA300 toroid
- TOA80 toroid
- TOA120 toroid
- L1 rectangular sensor
- L2 rectangular sensor
- TB35 toroid
- TB60 toroid
- TB120 toroid
- TB210 toroid
- TB35P toroid
- TB60P toroid

Wiring

Wire size (mm²) for resistance R = 3 Ω

- 0.22
- 0.75
- 1
- 1.5

Mounting

- Clip-on mounting on rear of VigiPacT relay
- Symmetrical DIN rail (horizontal or vertical mounting)
- Plain, slotted or profiled plate
- On cable
- On busbars
- Opening/closing (number of operation)

Environment

- Damp heat, equipment not in service (IEC 60068-2-30)
- Damp heat, equipment in service (IEC 60068-2-56)

- Salt mist (IEC 60068-2-52)
- Degree of pollution (IEC 60664-1)

[1] With RH10, RH21, RH99, RH197, RHUs and RHU, IΔn must be ≥ 300 mA
[2] From 0.5 to 2.5 mm².

Characteristics

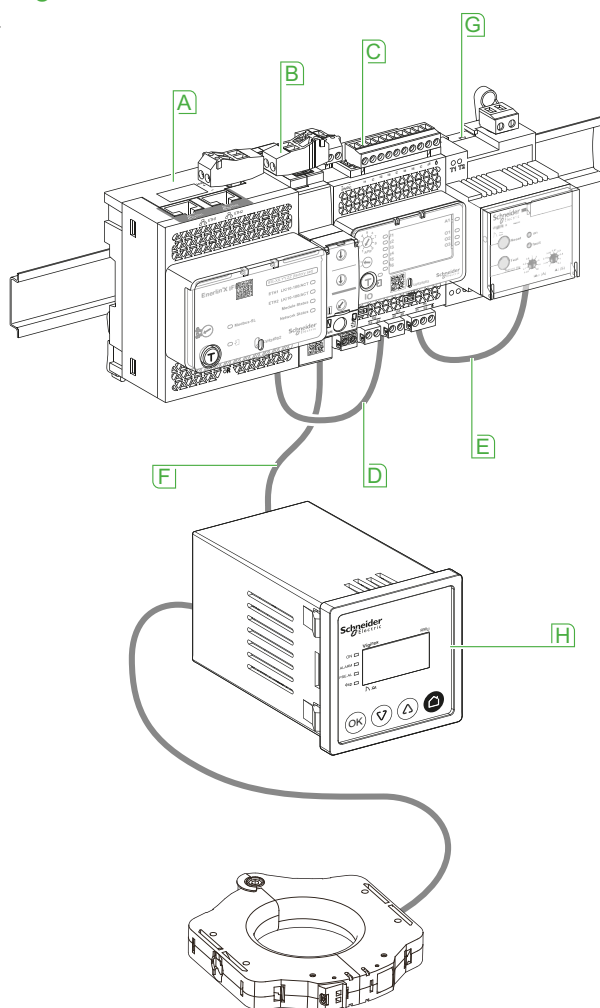
Sensors

	A Type Closed Toroid						TOA Type Split Toroid		L Type Rectangular Sensor ^[1]		B Type Closed Toroid			
	RH99, RMH, RHUs and RHU RH10, RH21, RH68, RH86, RH99, RH197, RHUs and RHU						RH99, RMH, RHUs and RHU RH10, RH21, RH68, RH86, RH99, RH197, RHUs and RHU		RH99, RMH, RHUs and RHU RH10, RH21, RH68, RH86, RH99, RH197, RHUs and RHU		- RHB			
	BT 50/60/400 Hz 1000 V ■ - -35 °C/+70 °C -55 °C/+85 °C IP30 (connections IP20)						BT 50/60/400 Hz 1000 V - ■ -35 °C/+70 °C -55 °C/+85 °C IP40 (connections IP20)		BT 50/60/400 Hz 1000 V ■ - -35 °C/+80 °C -55 °C/+100 °C IP30 (connections IP20)		BT 50/60/2000 Hz 800 V ■ - -25 °C/+70 °C -25 °C/+70 °C IP40 (connections IP20)			
	1/1000 4 12						1/1000 4 12		1/1000 4 12		1/600 3 8			
	TA30	PA50	IA80	MA120	SA200	GA300	TOA80	TOA120	L1 = 280 x 115	L2 = 470 x 160	TB35 TB35P	TB60 TB60P	TB120	TB210
	65	85	160	250	400	630	160	250	1600	3200	63	160	250	400
	85	85	85	85	85	85	50	85	100	100	25	25	25	25
	85	85	85	85	85	85	50	85	85	85	36	36	36	36
	Dimensions Ø (mm)		Weight (kg)		Dimensions Ø (mm)		Weight (kg)	Inside dimensions (mm)		Weight (kg)	Dimensions (mm)		Weight (kg)	
	30		0.120		-		-	-		-	-		-	
	50		0.200		-		-	-		-	-		-	
	80		0.420		-		-	-		-	-		-	
	120		0.450		-		-	-		-	-		-	
	200		1.320		-		-	-		-	-		-	
	300		2.280		-		-	-		-	-		-	
	-		-		80		0.9	-		-	-		-	
	-		-		120		1.5	-		-	-		-	
	-		-		-		-	280 x 115		11	-		-	
	-		-		-		-	470 x 160		20	-		-	
	-		-		-		-	-		-	35		0.310	
	-		-		-		-	-		-	60		0.530	
	-		-		-		-	-		-	120		1.460	
	-		-		-		-	-		-	210		4.290	
	-		-		-		-	-		-	35		0.390	
	-		-		-		-	-		-	60		0.690	
	Max. link length (m)						Max. link length (m)		Max. link length (m)		Max. link length (m)			
	18						18		-		-			
	60						60		10 ^[2]		10			
	80						80		10 ^[2]		10			
	100						100		10 ^[2]		10			
	TA30, PA50						-		-		-			
	TA30, PA50, IA80, MA120						■		-		■			
	TA30, PA50, IA80, MA120, SA200, GA300						■		-		■			
	IA80, MA120, SA200, GA300						■		■		■			
	-						-		■		-			
	-						10 maximum		-		-			
	28 cycles +25 °C/+55 °C/RH 95 %						28 cycles +25 °C/+55 °C/RH 95 %		28 cycles +25 °C/+55 °C/RH 95 %		28 cycles +25 °C/+55 °C/RH 95 %			
	48 hours, environment category C2						48 hours, environment category C2		48 hours, Environment category C2		48 hours, environment category C			
	KB test, severity 2						KB test, severity 2		KB test, severity 2		KB test, severity 2			
	3						3		4		3			

A

RH99, RHU and RMH

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- A** IFE gateway (LV34001)
- B** IFM (LV434000)
- C** IO Module (LV434063)
- D** ULP cable
- E** Dedicated wiring
- F** Cable for Modbus SL - 1 x RJ45 and 1 x Free wires
- G** VigiPacT relay without communication RH99M
- H** VigiPacT relay with communication RHU

I/O
I/O application module

RHU and RMH are equipped for Modbus communication serial in line.

Overview of Functions

Communication provides a means to identify the device, indicate status conditions, control the device, set the protection and alarms and analyse the instantaneous and maximum residual currents to assist operation and maintenance. It involves the transmission of data (bits or words) in real time, periodically or on request.

Note: a complete description of the communication system and the protocol are provided in the RHU or RMH user guide.

Remote Control		RHU	RMH
Device identification			
Address set		☒	☒
Type of device		RHU	RMH
Status indications			
Pre-alarm		☒	☒
Alarm		☒	☒
Controls			
Test with actuation of the output contacts		☒	☒
Test without actuation of the output contacts		☒	☒
Output-contact reset following a fault		☒	☐
Alarm-display memory reset		☐	☒
Protection settings			
I pre-alarm threshold		☒	☒
Pre-alarm time delay		☒	☒
Alarm threshold		☒	☒
Alarm time delay		☒	☒
Alarm reset		☒	☐
Toroid selection		☐	☒
Operating and maintenance aids			
Measurements	Alarm threshold value	☒	☒
	Mesured earth leakage as percentage of alarm threshold value	☒	☒
	Maximum leakage current	☒	☒
Fault readings	Malfunction detected	☒	☒
	RMH/RM12T link fault	☐	☒
	Saturation of fault-current measurements	☒	☒
	Sensor link fault	☒	☒



Installation Recommendations

Relays and Associated Toroids..... B-2

Toroid Compatibility with ComPacT NSX B-4

Possible Installation Positions

RH10-21-68-86-99M/P, RH197M/P, RHUs, RHU, RMH and RHB.... B-5

A and OA Type Toroids and Rectangular Sensors B-6

B Type Toroids and Rectangular Sensors B-7

Connection

Relays and Sensors B-8

Toroids and Rectangular Sensors B-10

Selection and Installation Instructions for Toroids
and Rectangular Sensors..... B-11

Other Chapters

Functions and Characteristics A-1

Dimensions and Connection C-1

Wiring Diagrams D-1

Additional Characteristics..... E-1

Catalog Numbers F-1

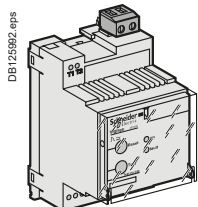
Installation Recommendations

Relays and Associated Toroids

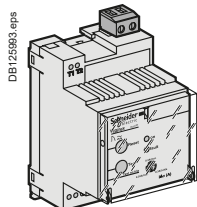
www.se.com

Residual-current protection relay

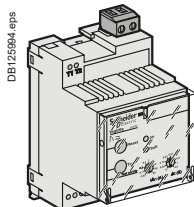
Modular format (DIN rail mount)



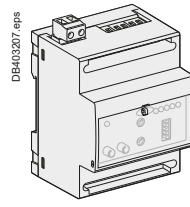
RH10M



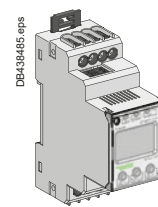
RH21M



RH68M, RH86M, RH99M

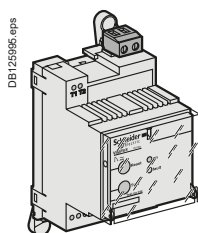


RH197M

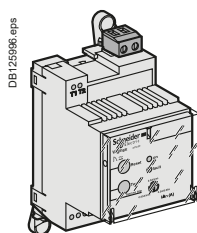


RHB

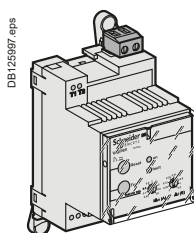
Modular format (with mounting accessories ^[1])



RH10M



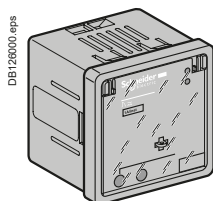
RH21M



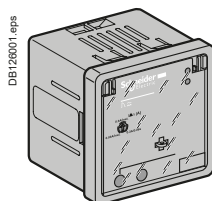
RH99M

^[1] Supplied as option, to be clipped into relay for installation on a mounting plate.

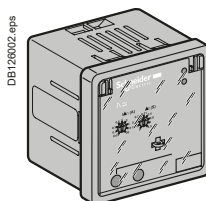
Front-panel mount format



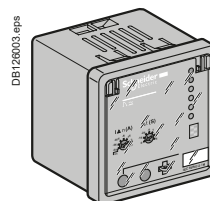
RH10P



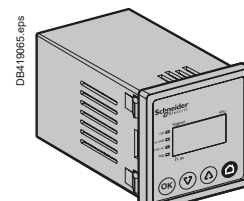
RH21P



RH99P



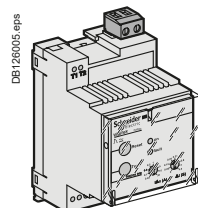
RH197P



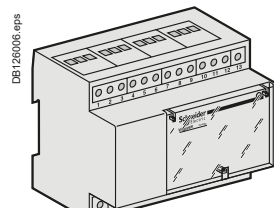
RHUs and RHU

Residual Current Monitoring Relays

Modular format

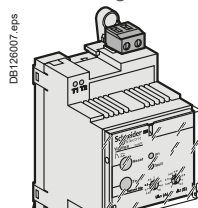


RH68M, RH86M, RH99M



RM12T

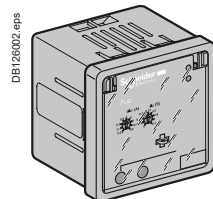
Mounting accessories ^[1]



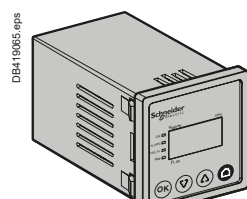
RH99M

^[1] Supply as an option.

Front-panel mount format



RH99P

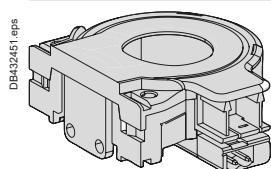


RMH

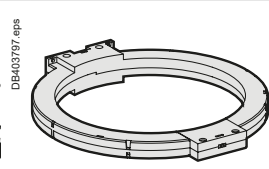
The VigiPacT RMH always requires a RM12T multiplexer.

Toroids

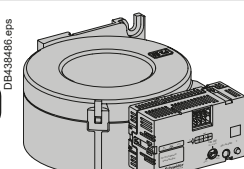
Closed from 30 to 300 mm



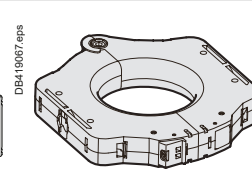
A toroid



GA300 toroid

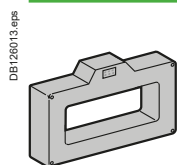


TB60-TB60P

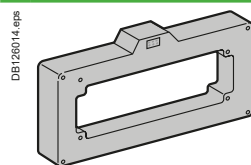


TOA toroid

Rectangular sensors



L1 = 280 x 115 mm



L2 = 470 x 160 mm

Selection and compatibility of toroids and rectangular sensors

Type of sensor			Type of VigiPacT relay	
Closed toroid	Split toroid	Rectangular sensor ^[1]	RH10-21-68-86-99, RH197, RHUs, RHU and RMH	RHB
TA30	-	-	■	-
PA50	TOA80	-	■	-
IA80	-	-	■	-
MA120	TOA120	-	■	-
SA200	-	-	■	-
GA300	-	-	■	-
-	-	L1	■	-
-	-	L2	■	-
TB35/TB35P	-	-	-	■
TB60/TB60P	-	-	-	■
TB120	-	-	-	■
TB210	-	-	-	■

[1] See restrictions in table below.

Sensor restrictions table

Sensors	Relays RH10, RH21, RH68, RH86, RH99, RH197, RHUs, RHU and RMH	RHB
A type closed toroid	no restrictions	-
OA type split toroid	no restrictions	-
L type rectangular sensors	$I_{\Delta n} \geq 0.5 \text{ A}$	-
B type closed toroid	-	see page B-4

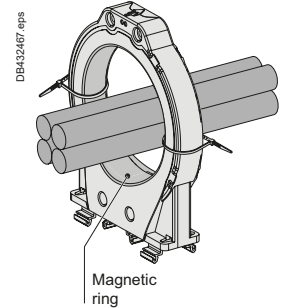
Toroid Compatibility with ComPacT NSX

Toroid selection table to be fully compliant with IEC 60947-2 annex M standard

DB430278.ai

		I Δ n						
		30 mA	100 mA	300 mA	500 mA	1A	3A	30A
Type A	NT							
	NW							
	MTZ							
	NS630b							
	NSX C2							
	NSX C1							
	NSXm [1]							
	40 A	TA30 [2]						
	63 A	PA50 [2]						
	80 A							
	125 A		IA80 [2]					
	160 A		MA120 [2]					
	250 A			SA200				
	320 A			GA300				
	400 A							
	630 A							
	1600 A							
	3200 A							

For circuits with high transient currents (6 In)



DB432467.eps

		I Δ n						
		30 mA	100 mA	300 mA	500 mA	1A	3A	30A
Type OA	NT							
	NW							
	MTZ							
	NS630b							
	NSX C2							
	NSX C1							
	NSXm [1]							
	40 A							
	63 A							
	80 A							
	125 A		TOA80					
	160 A					TOA120		
	250 A							
	320 A							
	400 A							
	630 A							
	1600 A							
	3200 A							

		I Δ n						
		30 mA	100 mA	300 mA	500 mA	1A	3A	30A
Type L	NT							
	NW							
	MTZ							
	NS630b							
	NSX C2							
	NSX C1							
	NSXm [1]							
	40 A							
	63 A							
	80 A							
	125 A							
	160 A							
	250 A							
	320 A							
	400 A							
	630 A				L1			
	1600 A				L2			
	3200 A							

		I Δ n						
		30 mA	100 mA	300 mA	500 mA	1A	3A	30A
Type B	NT							
	NW							
	MTZ							
	NS630b							
	NSX C2							
	NSX C1							
	NSXm [1]							
	40 A	TB35						
	63 A	TB35P						
	80 A	TB60						
	125 A	TB60P						
	160 A		TB120					
	250 A		TB210					
	320 A							
	400 A							
	630 A							
	1600 A							
	3200 A							

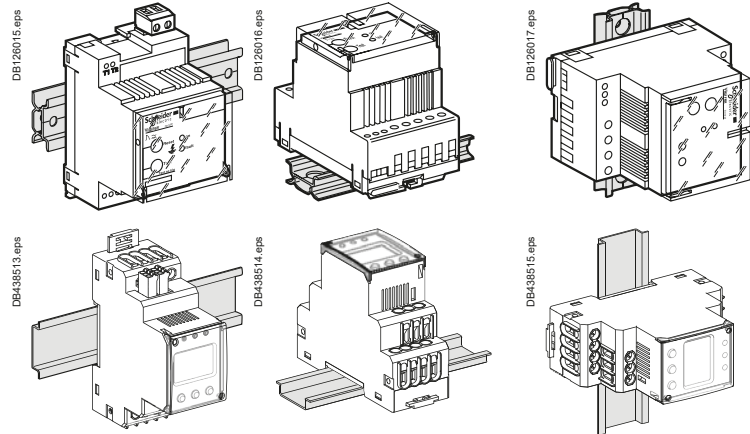
- [1] NSXm not compliant with 30 mA setting.
- [2] The addition of a shielding ring allows immunisation with respect to false zero-sequence currents (tested at 6 In as per IEC 60947-2 annex M) to help prevent nuisance tripping for the settings indicated in table below. (Dotted line to show toroid range covers. I.e: TA30 can be used from I Δ n=30 mA to 30A).

Possible Installation Positions

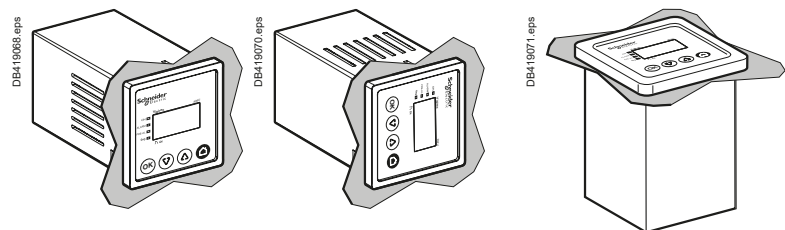
RH10-21-68-86-99M/P, RH197M/P, RHUs, RHU, RMH and RHB

Possible installation positions

Modular format



Front-panel mount format



Relay mounting possibilities

Mounting of modular format relays RH10M-21M-68M-86M-99M-RH197M RHB

The relay can be mounted in three ways:

- On a DIN rail (only this mounting for RH197M)
- On a mounting plate using 3 M4 screws (not supplied) and 3 removable mounting accessories (supplied).

Mounting of front-panel mount relays RH10P-21P-86P-99P, RHUs, RHU and RMH

No special tools are required to mount the relay. Simply insert the device through the cutout. The size of the cutout complies with standard DIN 43700.

Front panel thickness: 1 mm minimum/2.5 mm maximum.

The relay clips onto the panel.

Mounting of relay RH197P

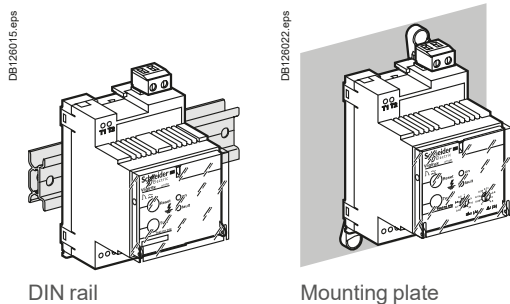
No tools are required to mount the relay in position. Simply insert the device through the cutout and tighten the clamp by turning the knurled nut.

The size of the cutout complies with standard DIN 43700.

Front panel thickness: 1 mm minimum/4 mm maximum.

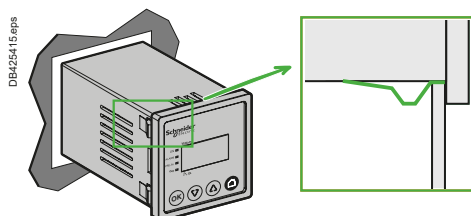
Mounting of RM12T multiplexer

The multiplexer must always be mounted on a DIN rail.



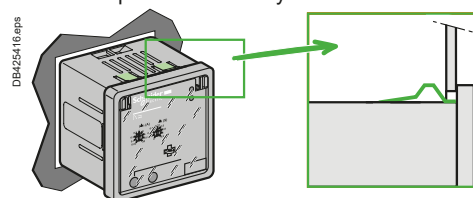
DIN rail

Mounting plate

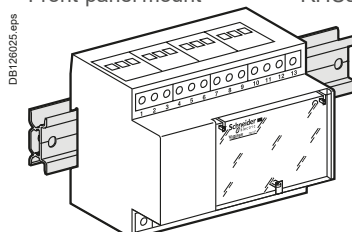


Front-panel mount

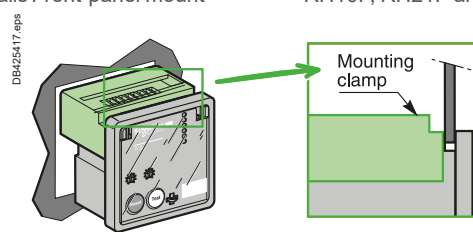
RHUs, RHU and RMH details Front-panel mount



RH10P, RH21P and RH99P detail



RM12T: DIN rail only



Front-panel mount

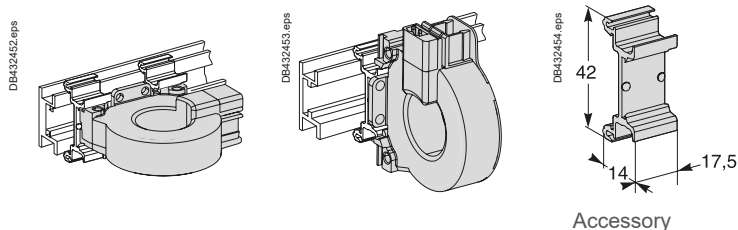
RH197P detail

Possible Installation Positions

A and OA Type Toroids and Rectangular Sensors

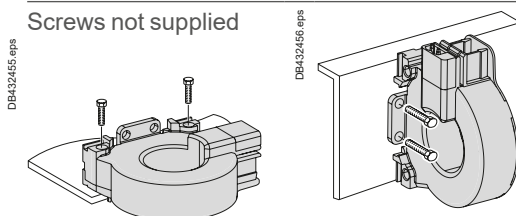
Toroid mounting possibilities

On DIN rail (TA30, PA50, IA80 and MA120)
using supplied accessories



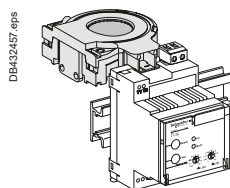
On a plate (TA30, PA50, IA80, MA120, SA200, GA300, TOA80 and TOA120) or bracket

Screws not supplied



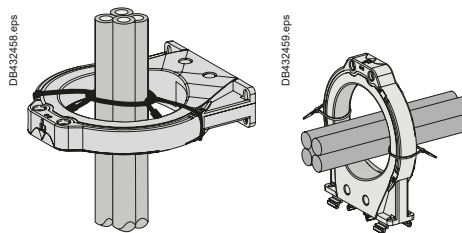
Screw Ø4	Screw Ø5
TA30	IA80
PA50	MA120
	SA200
	GA300
	TOA80
	TOA120

Clipped on the back of the relay (TA30 and PA50)

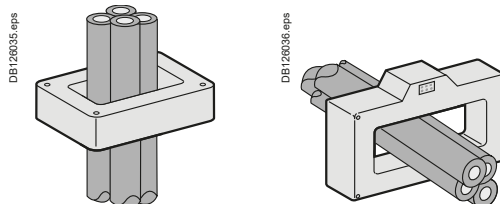


Tied to cables (IA80, MA120, SA200 and GA300),
cable-ties not supplied

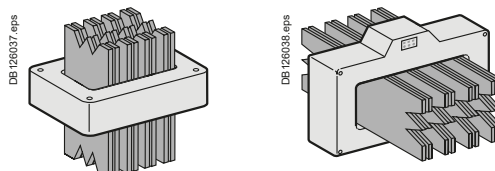
Cable-ties with 9 mm maximum width and 1.5 mm maximum thickness



Tied to cables (rectangular sensors)



On bars with chocks (rectangular sensors)

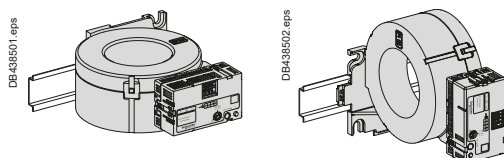


Possible Installation Positions

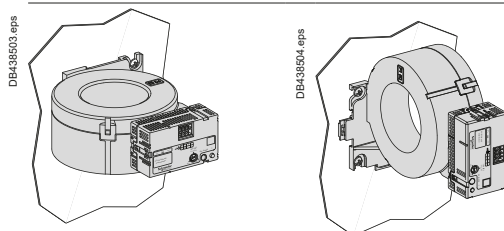
B Type Toroids and Rectangular Sensors

Toroid mounting possibilities

On DIN rail (TB35 and TB35P)
using supplied accessories

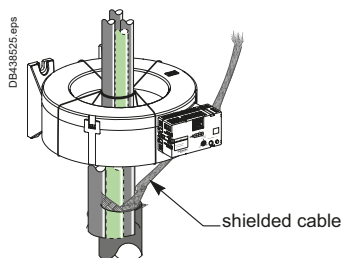


On a plate (TB35, TB35P, TB60, TB60P, TB120 and TB210)



Screw Ø5	Screw Ø6
TB35	TB60
TB35P	TB60P
	TB120
	TB210

Tied to cables
cable-ties not supplied



B

Connection

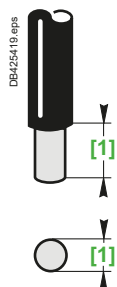
Relays and Sensors

Product, terminal or screw		Cable type	Terminal capacity (mm²)						Conduct. size	Stripping		Tightening torque	
			Rigid min.	max.	Flexible min.	max.	Flexible with ferrule min.	max.	AWG	Rigid/flexible (mm) (inch)		(N.m)	(In-lbs)
RH10M, RH21M, RH68M, RH86M and RH99M													
11, 14			0.2	4	0.2	2.5	0.25	2.5	24-12	8	.31	0.6	5.2
31, 32, 34			0.2	4	0.2	2.5	0.25	2.5	24-12	8	.31	0.6	5.2
A1, A2			0.2	2.5	0.2	2.5	0.25	2.5	24-12	7	.27	0.6	5.2
T1, T2		twisted pair	0.14	1.5	0.14	1	0.25	0.5	26-16	5	.19	0.25	2.2
25, 26, 27		3 twisted wires L<10 m	0.14	1.5	0.14	1	0.25	0.5	26-16	5	.19	0.25	2.2
RH197M													
A1, A2			0.2	2.5	0.2	2.5	0.25	2.5	24-12	7	.27	0.6	5.2
31, 32, 34			0.2	2.5	0.2	2.5	0.25	2.5	24-12	7	.27	0.6	5.2
25-26, 27-28			0.2	2.5	0.2	2.5	0.25	2.5	24-12	7	.27	0.6	5.2
T1, T2			0.2	2.5	0.2	2.5	0.25	2.5	24-12	7	.27	0.6	5.2
41, 42, 44			0.2	2.5	0.2	2.5	0.25	2.5	24-12	7	.27	0.6	5.2
RH10P, RH21P, RH99P													
11, 14 or 41, 44			0.2	2.5	0.2	2.5	0.25	2.5	24-12	7	.27	0.6	5.2
31, 32, 34			0.2	2.5	0.2	2.5	0.25	2.5	24-12	7	.27	0.6	5.2
A1, A2			0.2	2.5	0.2	2.5	0.25	2.5	24-12	7	.27	0.6	5.2
T1, T2		twisted pair	0.2	2.5	0.2	2.5	0.25	2.5	24-12	7	.27	0.6	5.2
25, 26, 27		3 twisted wires L<10 m	0.2	2.5	0.2	2.5	0.25	2.5	24-12	7	.27	0.6	5.2
RH197P													
11, 14			0.2	2.5	0.2	2.5	0.25	2.5	24-12	7	.27	0.6	5.2
31, 32, 34			0.2	2.5	0.2	2.5	0.25	2.5	24-12	7	.27	0.6	5.2
A1, A2			0.2	2.5	0.2	2.5	0.25	2.5	24-12	7	.27	0.6	5.2
T1, T2		twisted pair	0.2	2.5	0.2	2.5	0.25	2.5	24-12	7	.27	0.6	5.2
25, 26, 27		3 twisted wires L>10 m	0.2	2.5	0.2	2.5	0.25	2.5	24-12	7	.27	0.6	5.2
RHUs and RHU													
A1, A2			0.2	2.5	0.2	2.5	0.25	2.5	22-12	6	.23	0.5	4.4
11, 14			0.2	2.5	0.2	2.5	0.25	2.5	22-12	6	.23	0.5	4.4
31, 32, 34			0.2	2.5	0.2	2.5	0.25	2.5	22-12	6	.23	0.5	4.4
41, 44			0.2	2.5	0.2	2.5	0.25	2.5	22-12	6	.23	0.5	4.4
T1, T2		twisted pair	0.2	2.5	0.2	2.5	0.25	2.5	22-12	6	.23	0.5	4.4
25, 26, 27		3 twisted wires L<10 m	0.2	2.5	0.2	2.5	0.25	2.5	22-12	6	.23	0.5	4.4
Bus ^[1] 24 V, 0 V -, +		twisted pair	0.2	2.5	0.2	2.5	0.25	2.5	22-12	6	.23	0.5	4.4
		twisted pair	0.2	2.5	0.2	2.5	0.25	2.5	22-12	6	.23	0.5	4.4
RMH													
A1, A2			0.2	2.5	0.2	2.5	0.25	2.5	22-12	6	.23	0.5	4.4
11, 14			0.2	2.5	0.2	2.5	0.25	2.5	22-12	6	.23	0.5	4.4
31, 32, 34			0.2	2.5	0.2	2.5	0.25	2.5	22-12	6	.23	0.5	4.4
41, 44			0.2	2.5	0.2	2.5	0.25	2.5	22-12	6	.23	0.5	4.4
21, 22		twisted pair L<10 m	0.2	2.5	0.2	2.5	0.25	2.5	22-12	6	.23	0.5	4.4
23, 24		twisted pair L<10 m	0.2	2.5	0.2	2.5	0.25	2.5	22-12	6	.23	0.5	4.4
Bus 24 V, 0 V -, +		twisted pair	0.2	2.5	0.2	2.5	0.25	2.5	22-12	6	.23	0.5	4.4
		twisted pair	0.2	2.5	0.2	2.5	0.25	2.5	22-12	6	.23	0.5	4.4
RM12T													
12 toroid connections 1 to 12 and 15 to 20		1 twisted pair/toroid L < 10 m	0.2	2.5	0.2	2.5	0.25	2.5	22-12	6	.23	0.5	4.4
21, 22		twisted pair L<10 m	0.2	2.5	0.2	2.5	0.25	2.5	22-12	6	.23	0.5	4.4
23, 24		twisted pair L<10 m	0.2	2.5	0.2	2.5	0.25	2.5	22-12	6	.23	0.5	4.4
25, 26			0.2	2.5	0.2	2.5	0.25	2.5	22-12	6	.23	0.5	4.4
RHB													
A1, A2, T/R, 11, 12, 14, 21, 22, 24			0.2	2.5	0.2	2.5	0.25	2.5	24-12	6	.23	0.5	4.4
Toroid and sensors													
TA30 and PA50 Ø30 to 50 mm connectors supplied		twisted Cu/Al	0.2	2.5	0.2	2.5	0.2	1.5	24-14	6	.23	0.5	4.4
IA80 to GA300 Ø80 to 300 mm		twisted Cu/Al	0.2	2.5	0.2	2.5	0.2	1.5	24-1	6	.23	0.5	4.4
TOA80 - TOA120 Ø5 mm round lugs note supplied:			0.2	2.5	0.2	2.5	0.2	1.5	24-14	6	.23	0.6	5.2
S1, S2		twisted Cu/Al	-	-	-	-	-	-	-	-	-	3	26.4
Mounting on a mounting plate and DIN Rail clip			-	-	-	-	-	-	-	-	-	3.5	31
L1, L2		twisted pair L<10 m	0.5	2.5	0.5	2.5	0.5	2.5	20-14	8 to 9	.33	-	-

[1] RHU only.

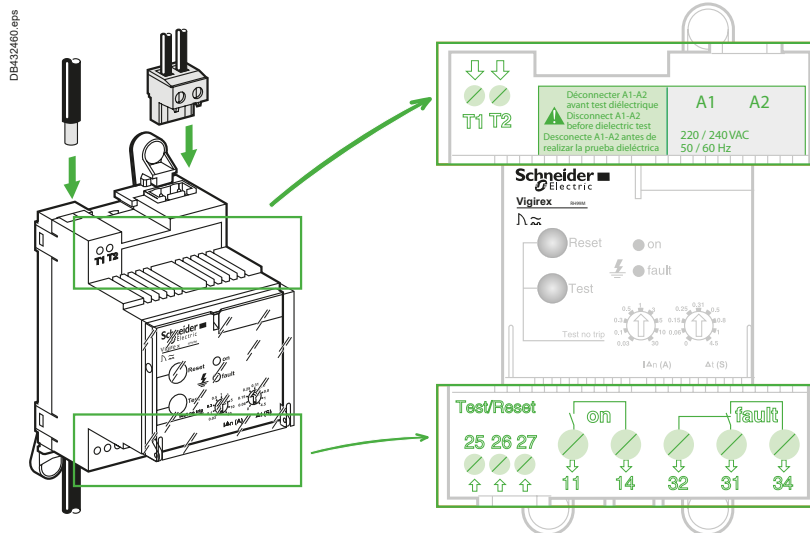
Connection Relays and Sensors

Connection of relays



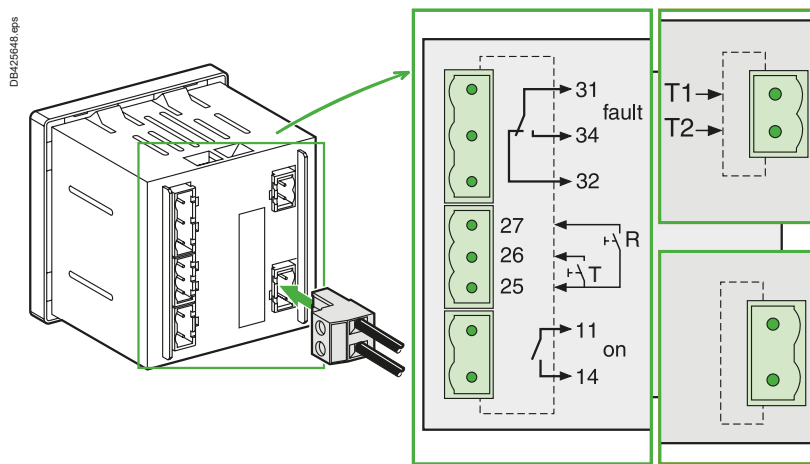
[1] See table page B-8.

Modular format



B

Front-panel mount format

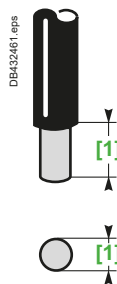


MFR39443

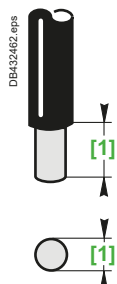
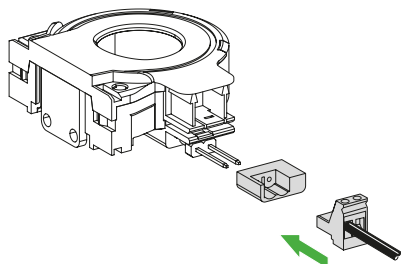
Connection of toroids

TA30 and PA50 closed toroids
(connectors supplied)

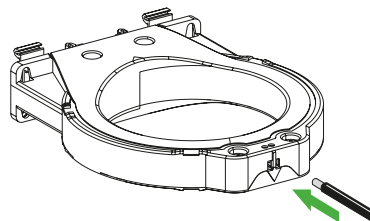
IA80, MA120, SA200 and GA300 closed toroids



[1] See table page B-8.



[1] See table page B-8.

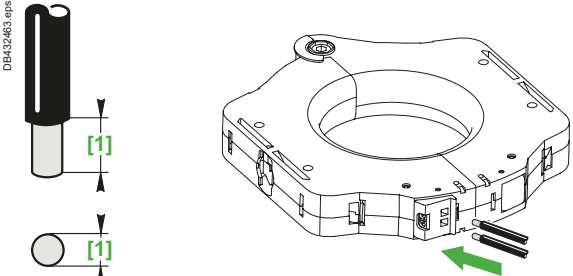


Connection

Toroids and Rectangular Sensors

Connection of toroids (cont.)

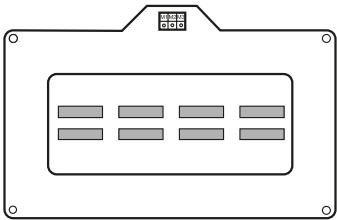
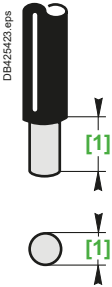
TOA80 and TOA120 split toroids (Ø5 mm round lugs not supplied)



[1] See table page B-8.

Connection of rectangular sensors and conductor layout

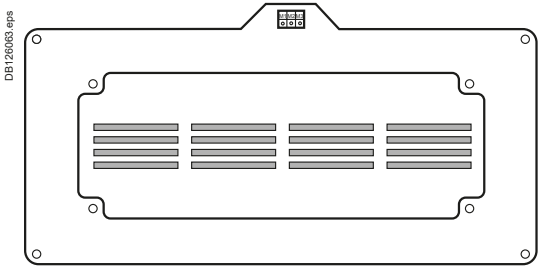
L1: frame 280 x 115 mm
Busbars with 70 mm spacing



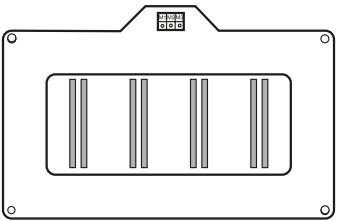
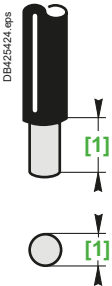
2 bars 50 x 10 mm (1600 A)
The neutral can be located on the right or the left.

[1] See table page B-8.

L2: frame 470 x 160 mm
Busbars with 115 mm spacing

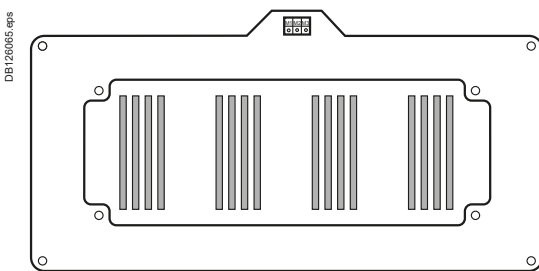


4 bars 100 x 5 mm (3200 A)
The neutral can be located on the right or the left.

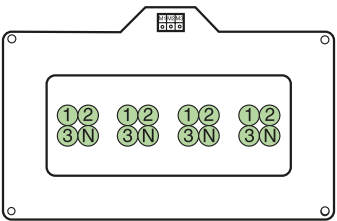
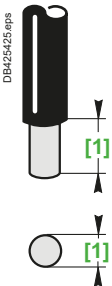


2 bars 100 x 5 mm (1600 A)
The neutral can be located on the right or the left.

[1] See table page B-8.



4 bars 125 x 5 mm (3200 A)
The neutral can be located on the right or the left.



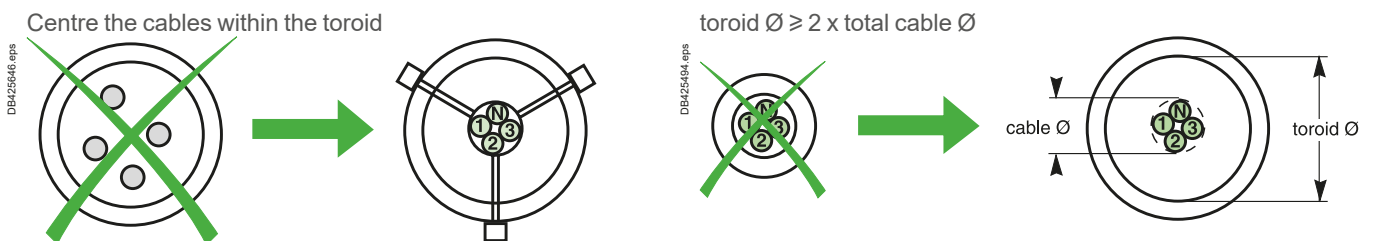
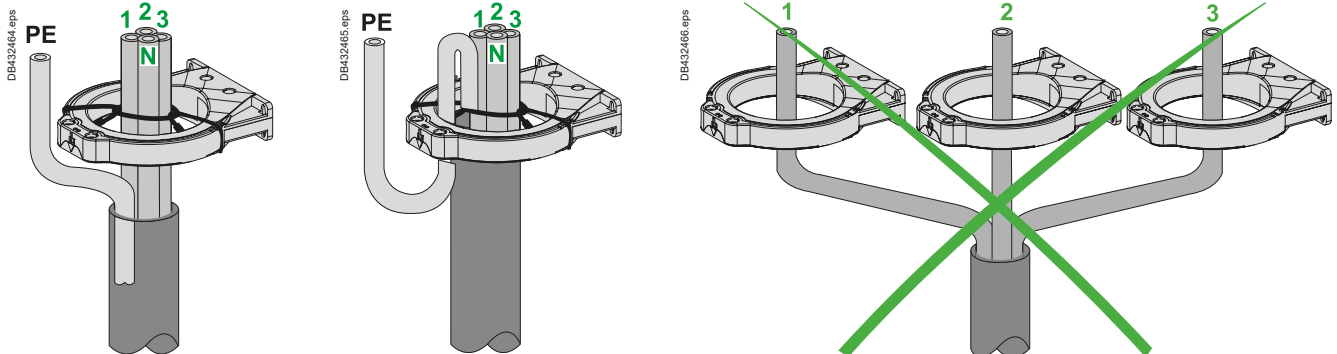
4 cables 240 mm² (1600 A)

[1] See table page B-8.

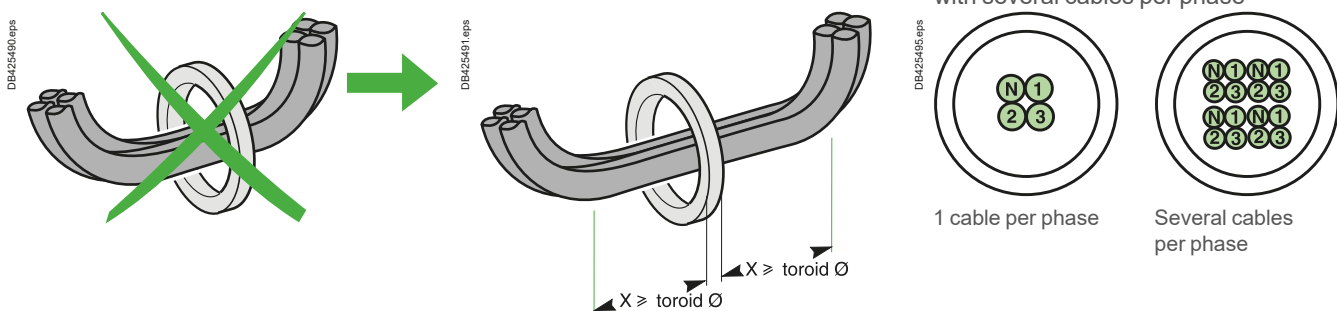
Note: connect M1 and M2 with VigiPacT.

Selection and Installation Instructions for Toroids and Rectangular Sensors

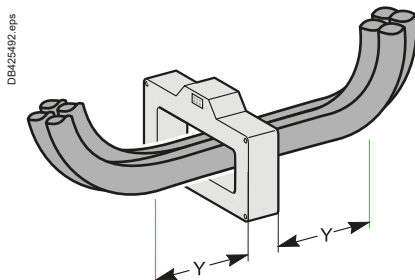
Cable layout



Do not bend cables near the toroids



Do not bend cables near the sensors



Note: $Y \geq 25$ cm for 280 x 115 mm sensor.

Note: $Y \geq 30$ cm for 470 x 160 mm sensor.

Selection of rectangular sensors according to circuit power

3P + N copper bars

Rated operational current (I_e)	Max. cross-section/phase	Sensors
1600 A	2 bars 50 x 10 mm ²	L1
	2 bars 100 x 5 mm ²	
3200 A	4 bars 100 x 5 mm ²	L2
	4 bars 125 x 5 mm ²	

Installation Recommendations

Selection and Installation Instructions for Toroids and Rectangular Sensors

Connection between VigiPacT relays and sensors

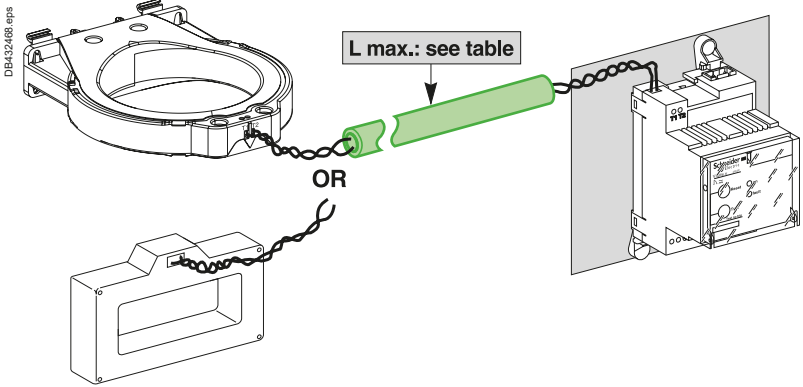
VigiPacT relays must be connected to the sensors as indicated:

Cross-section (Cu)	Maximum length
Toroids	
0.22 mm ² [1]	18 m
0.75 mm ² [1]	60 m
1 mm ² [1]	80 m
1.5 mm ² [1]	100 m
Rectangular sensors	
0.5 mm ² min./2.5 mm ² max.	10 m

[1] Wire size for resistance R maximum = 3 W.

Cable type

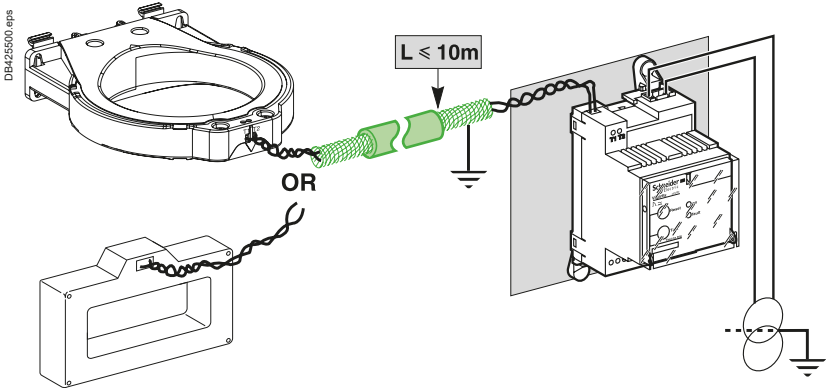
Standard twisted pair (not to be run alongside power cables).
A wiring kit is mandatory for RHB.



In highly disturbed environments:

Wiring

Shielded twisted pair (not to be run alongside power cables).
The shielding must be earthed at both ends by connection to the equipotential bonding circuit.
The cable between the toroid and the relay should be as short as possible.
If this is not sufficient, use a transformer with high frequency (HF) shielding.
A wiring kit is mandatory for RHB.



Auxiliary power supply via external transformer

Dimensions and Connection

Dimensions

RH10M, RH21M, RH68M, RH86M, RH99M and RH197M Relays .	C-2
RH10P, RH21P, RH99P, RH197P, RHUs, RHU, RMH and RM12T Relays.....	C-3
RHB.....	C-4
A Type Closed Toroids.....	C-5
OA Type Split Toroids and Rectangular Sensors	C-6
B Type Active Closed Toroids.....	C-7

C

Other Chapters

Functions and Characteristics.....	A-1
Installation Recommendations.....	B-1
Wiring Diagrams	D-1
Additional Characteristics.....	E-1
Catalog Numbers	F-1

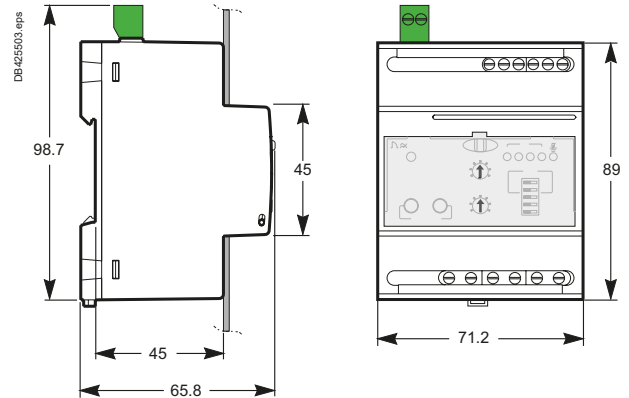
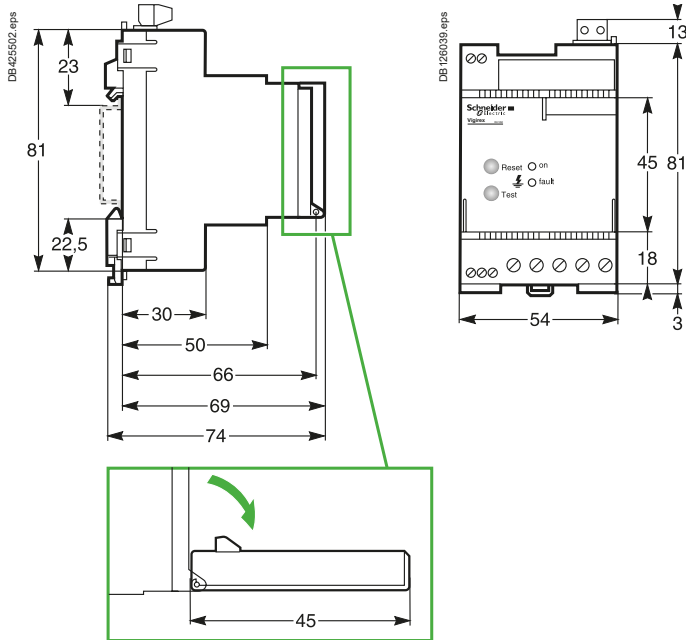
Dimensions

RH10M, RH21M, RH68M, RH86M, RH99M and RH197M Relays

Mounting on a DIN rail

RH10M, RH21M, RH68M, RH86M and RH99M

RH197M



Mounting on a mounting plate

RH10M, RH21M, RH68M, RH86M and RH99M

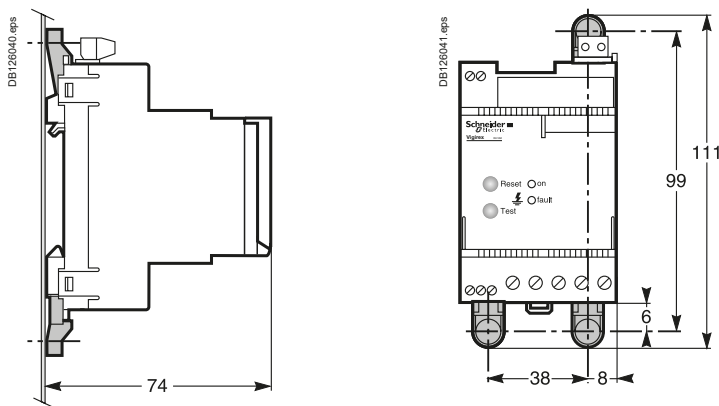
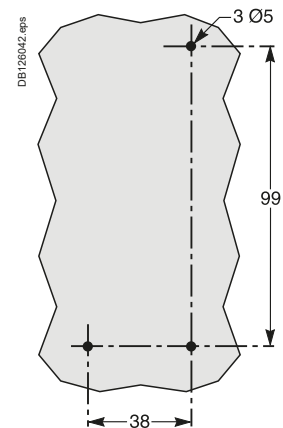


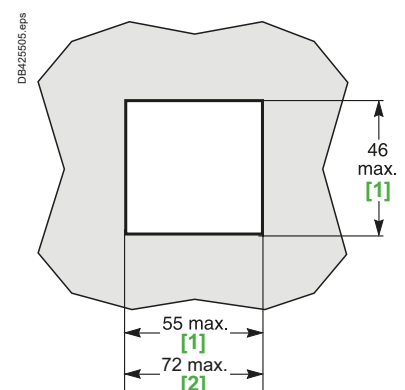
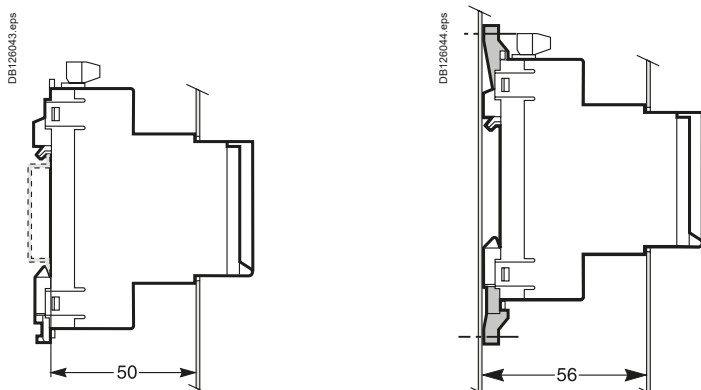
Plate drilling layout



Door cutout

Mounting on a DIN rail

Mounting on a mounting plate



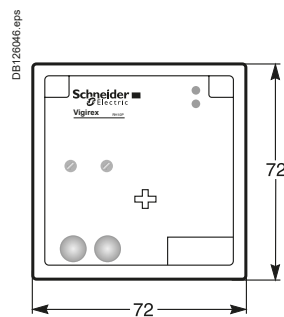
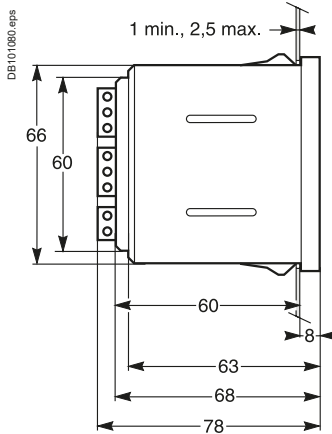
[1] For IP4 requirements.
[2] For RH197M.

Dimensions

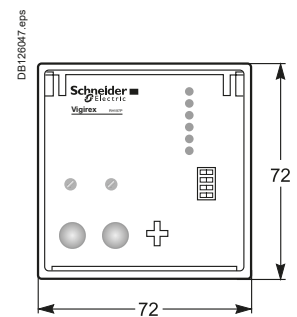
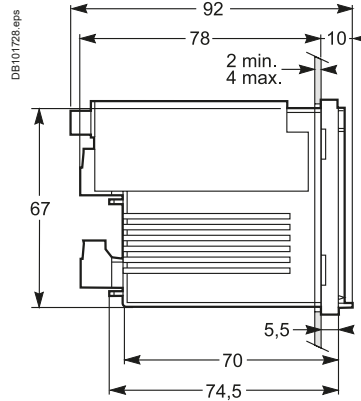
RH10P, RH21P, RH99P, RH197P, RHUs, RHU, RMH and RM12T Relays

Front-panel mount relays (cutout complying with standard DIN 43700)

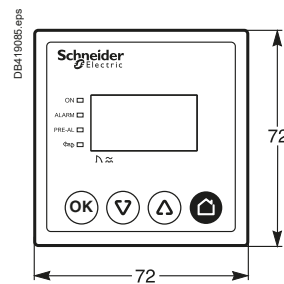
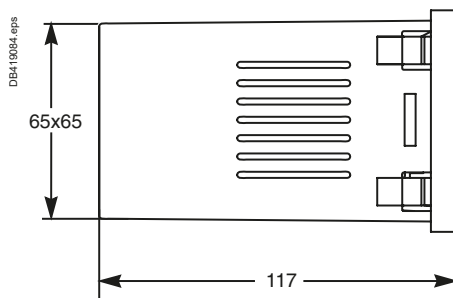
RH10P, RH21P and RH99P



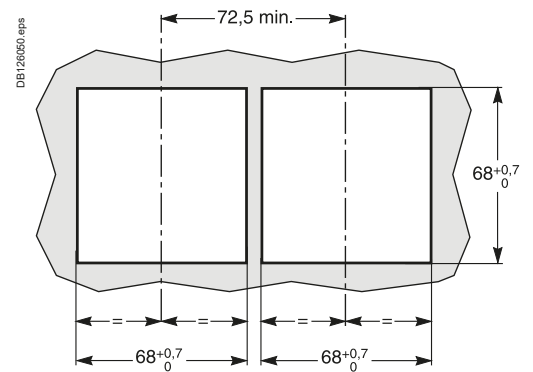
RH197P



RHUs, RHU and RMH

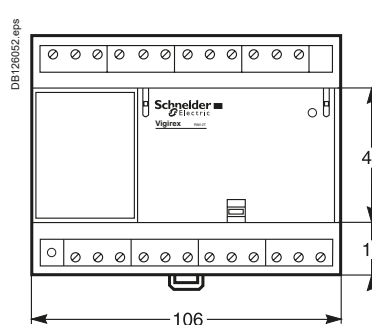
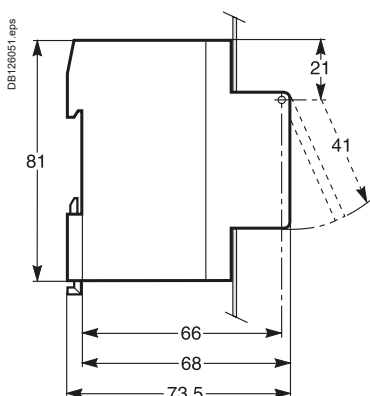


Door Cutout

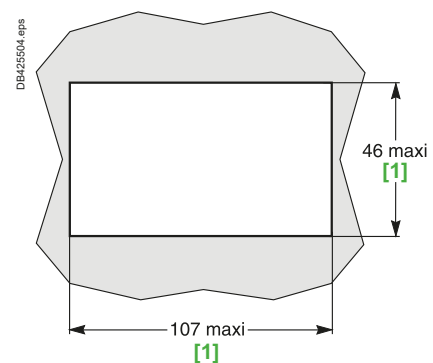


DIN rail mounting only

RM12T



Door cutout

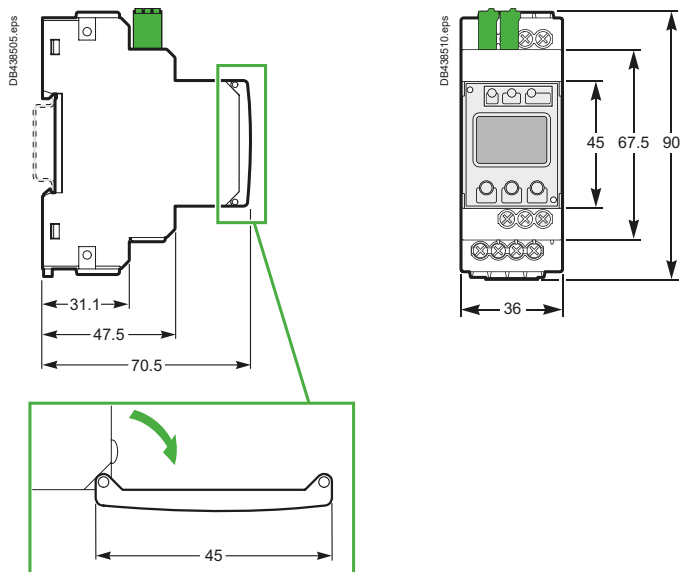


[1] For IP4 requirements.

Dimensions

RHB

Mounting on a DIN rail



Mounting on a mounting plate

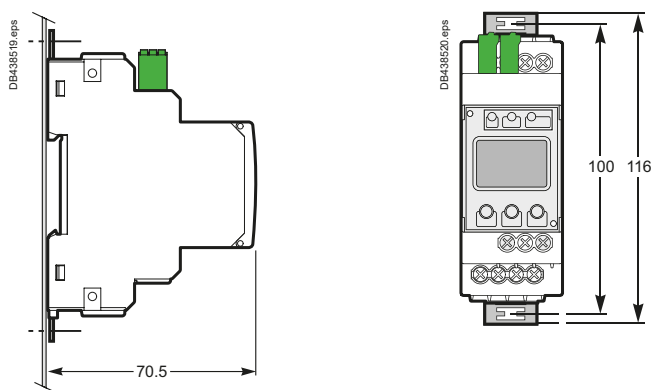
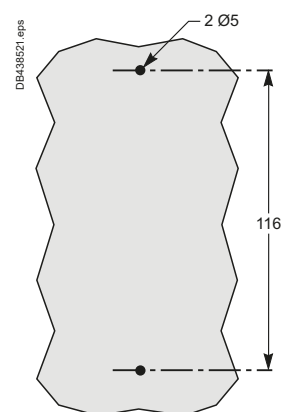
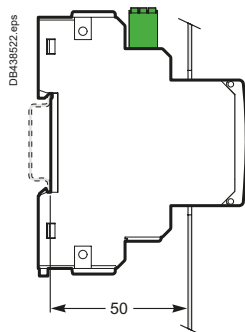


Plate drilling layout

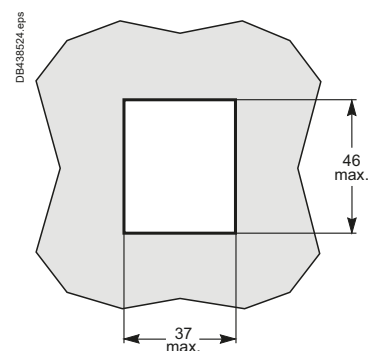
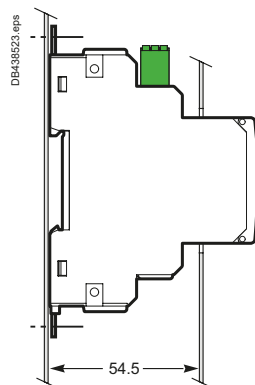


Door cutout

Mounting on a DIN rail



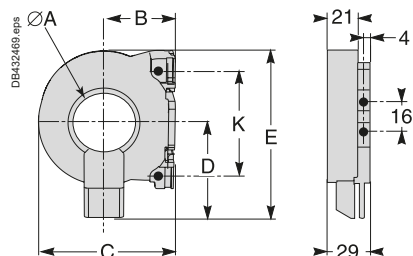
Mounting on a mounting plate



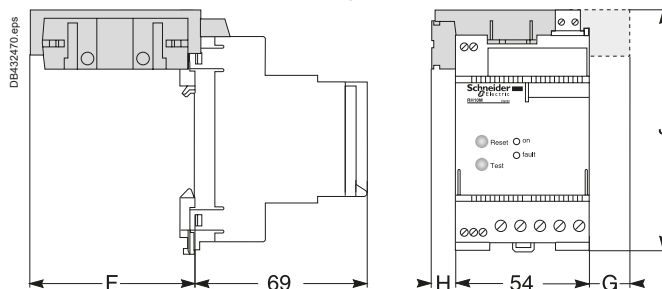
Dimensions

A Type Closed Toroids

TA30 and PA50 toroids

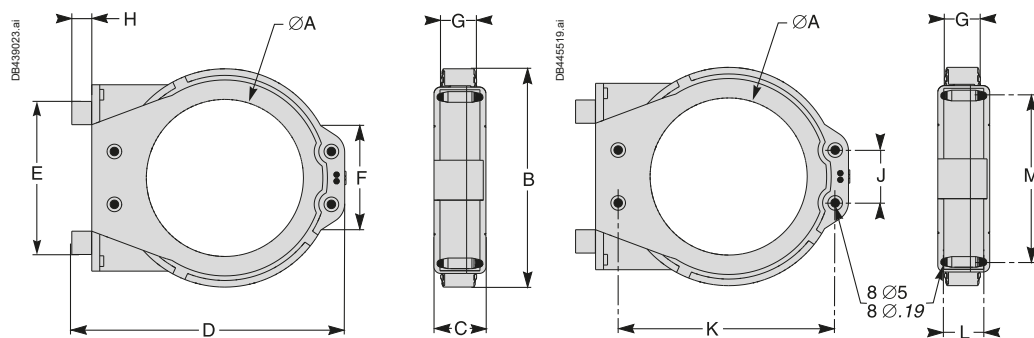


Secured to the back of the relay



Type	$\varnothing A$	B	C	D	E	F	G	H	J	K
TA30	20.4	32.5	63	44	74.5	60	-	9	98	50
PA50	50.4	45	88	57	100	86	11	22	96	60

IA80, MA120, SA200 and GA300 toroids

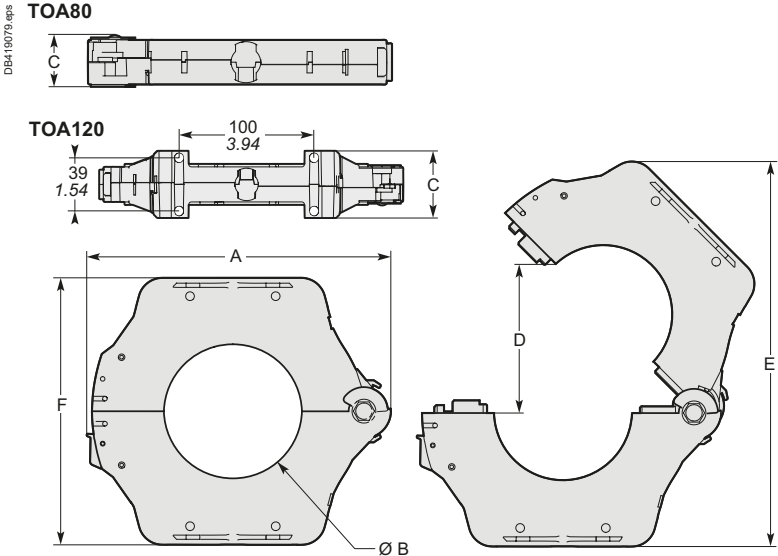


Type	$\varnothing A$	B	C	D	E	F	G	H	J	K	L	M
IA80	80	122	44	150	80	55	26.5	8	40	126	35	65
MA120	118	164	39	190	140	-	25	6	40	163	30	125
SA200	196	256	46	274	120	90	29	10.5	60	254	37	104
GA300	291	360	46	390	120	90	28	10.5	60	369	37	104

Dimensions

OA Type Split Toroids and Rectangular Sensors

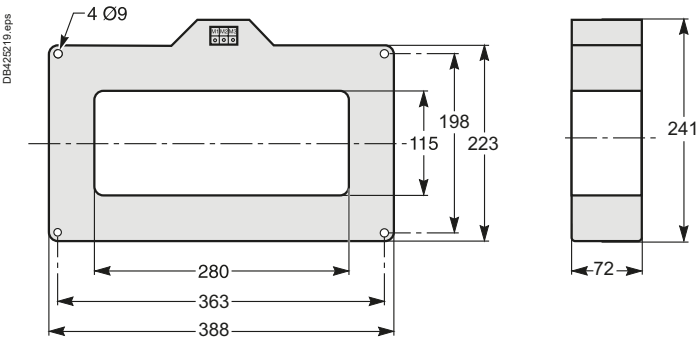
TOA80 and TOA120 toroids



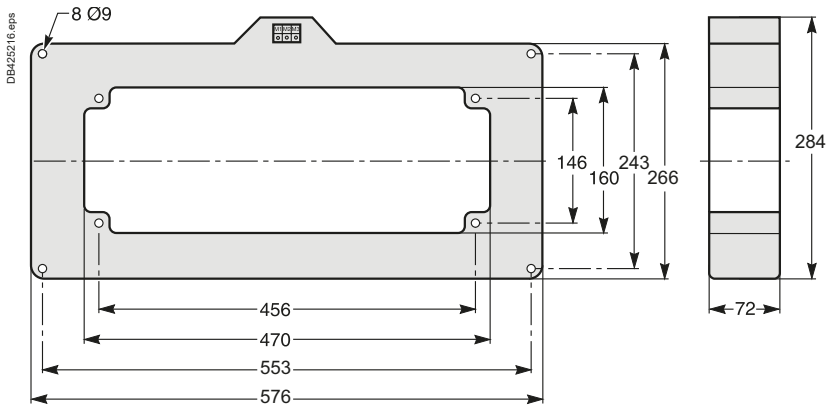
Type	Dimensions (mm)					
	A	ØB	C	D	E	F
TOA80	177	80	28	108	235	156
TOA120	225	120	50	150	303	205

Rectangular sensors

L1: frame 280 x 115 mm



L2: frame 470 x 160 mm

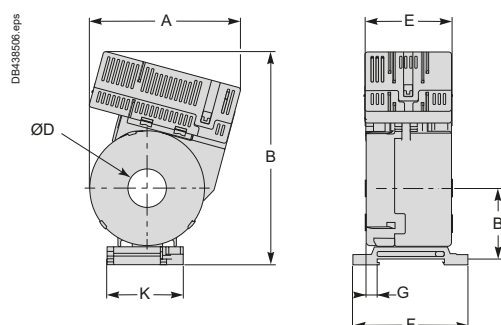


Dimensions and Connection

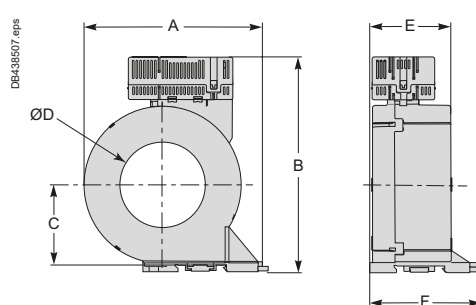
Dimensions

B Type Active Closed Toroids

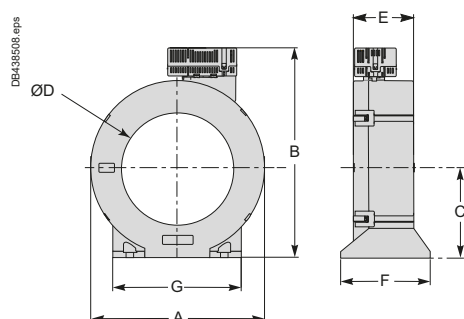
TB35/TB35P toroids



TB60/TB60P toroids

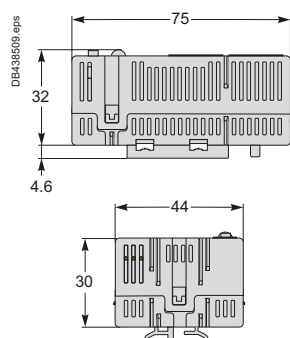


TB120/TB210 toroids



Type	A	B	C	ØD	E	F	G
TB35/ TB35P	97	130	47	35	46	61	-
TB60/ TB60P	126	151	57	60	56	78	-
TB120	188	225	96	120	65	96	139
TB210	339	339	153	210	67	113	277

Electronic Module for TB35/TB60/TB120/ TB210/TB35P/TB60P





Wiring Diagrams

Wiring Diagrams

RH10, RH21, RH68M, RH86M, RH99M, RH10, RH21, RH86
and RH99P D-2

RH86, RH99 Monitor D-4

RH197M with MX Shunt Release D-5

RH197M with MN Undervoltage Release D-6

RH197P with MX Shunt Release D-7

RH197P with MN Undervoltage Release D-8

RHUs and RHU D-9

RMH D-10

Communication Bus, Test and Remote Reset Functions,
Power Supply D-11

RHB D-12



Other Chapters

Functions and Characteristics A-1

Installation Recommendations B-1

Dimensions and Connection C-1

Additional Characteristics E-1

Catalog Numbers F-1

Wiring Diagrams

RH10, RH21, RH68, RH86, RH99M, RH10, RH21, RH86 and RH99P

Wiring for optimum continuity of service

RH10M, RH21M, RH68M, RH86M and RH99M Wiring with MX Shunt Release

All diagrams are shown with circuits de-energized, all devices open and relays in released position.

L1: lamp

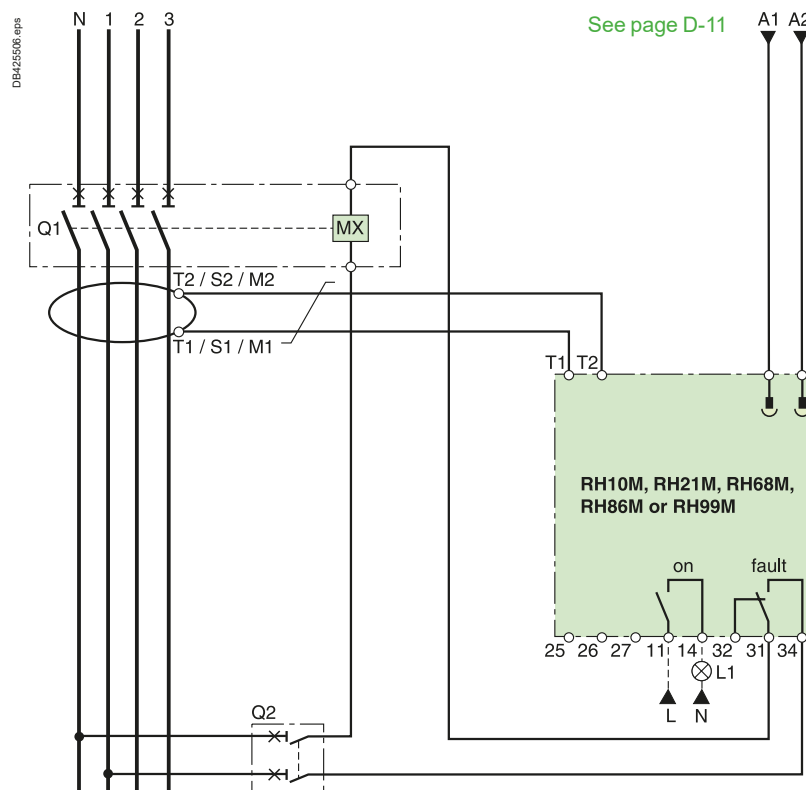
MX: shunt release

Q₁: circuit breaker protecting the main circuit

Q₂: DPN circuit breaker

RH10M, RH21M, RH68M, RH86M and RH99M:

- A₁-A₂: auxiliary power supply
- T₁-T₂: A or TOA type toroid or rectangular sensor (if I_{Δn} ≥ 500 mA)
- 11-14: "voltage-presence" contact
- 26-25: relay test
- 27-25: "fault" reset
- 31-32-34: "fault" contact.



Note: for the RH99 earth leakage monitor use the "fault" contact 31, 32, 34.

RH10P, RH21P and RH99P Wiring with MX Shunt Release

L1: lamp

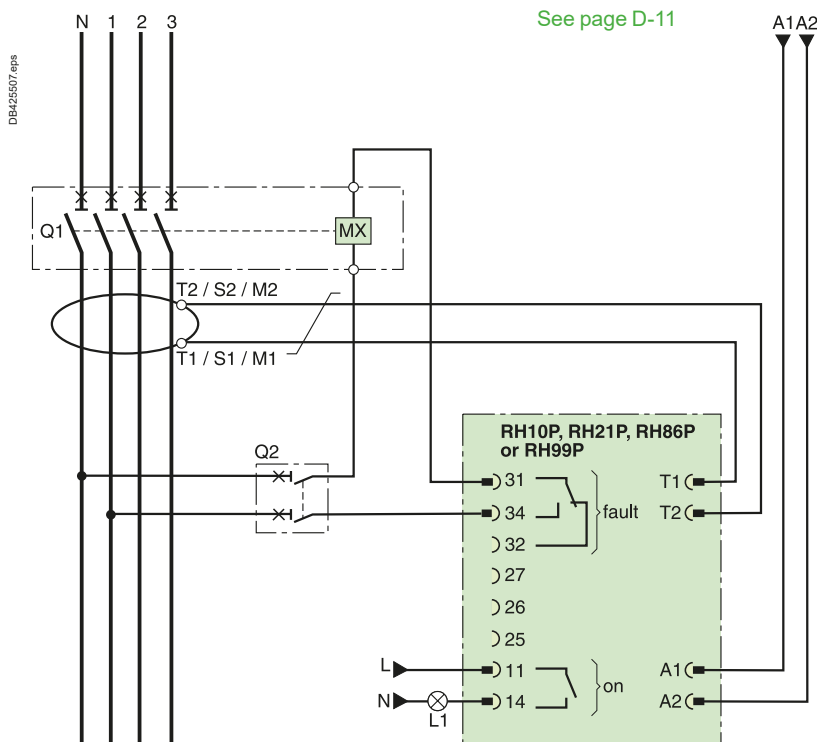
MX: shunt release

Q₁: circuit breaker protecting the main circuit

Q₂: DPN circuit breaker

RH10P, RH21P and RH99P:

- A₁-A₂: auxiliary power supply
- T₁-T₂: A or TOA type toroid or rectangular sensor (if I_{Δn} ≥ 500 mA)
- 11-14: "voltage-presence" contact
- 26-25: relay test
- 27-25: "fault" reset
- 31-32-34: "fault" contact.



Note: for the RH99 earth leakage monitor use the "fault" contact 31, 32, 34.

Wiring Diagrams

RH10, RH21, RH68, RH86, RH99M, RH10, RH21, RH86 and RH99P

Wiring for optimum protection

RH10M, RH21M, RH68M, RH86M and RH99M Wiring with MN Undervoltage Release

All diagrams are shown with circuits de-energized, all devices open and relays in released position.

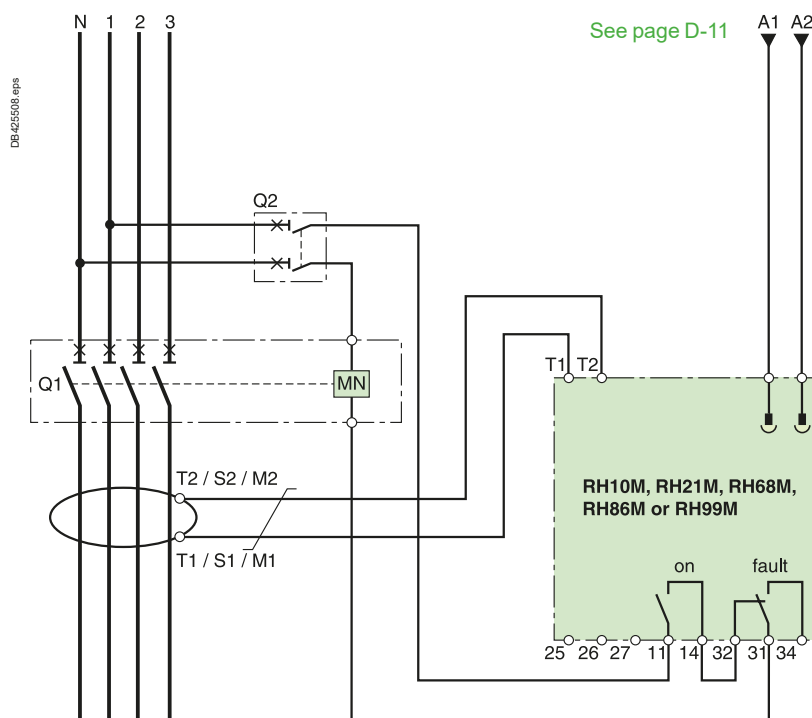
MN: undervoltage release

Q₁: circuit breaker protecting the main circuit

Q₂: DPN circuit breaker

RH10M, RH21M, RH68M, RH86M and RH99M:

- **A₁-A₂:** auxiliary power supply
- **T₁-T₂:** A or TOA type toroid or rectangular sensor (if $I_{\Delta n} \geq 500$ mA)
- **11-14:** "voltage-presence" contact
- **26-25:** relay test
- **27-25:** "fault" reset
- **31-32-34:** "fault" contact.



Note: for the RH99 earth leakage monitor use the "fault" contact 31, 32, 34.

RH10P, RH21P and RH99P Wiring with MN Undervoltage Release

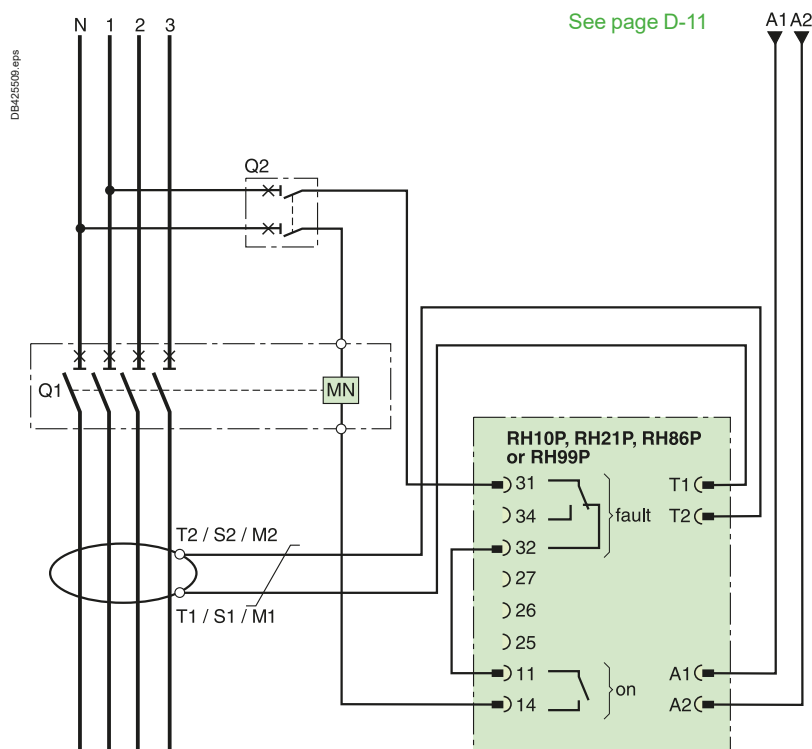
MN: undervoltage release

Q₁: circuit breaker protecting the main circuit

Q₂: DPN circuit breaker

RH10MP, RH21P and RH99P:

- **A₁-A₂:** auxiliary power supply
- **T₁-T₂:** A or TOA type toroid or rectangular sensor (if $I_{\Delta n} \geq 500$ mA)
- **11-14:** "voltage-presence" contact
- **26-25:** relay test
- **27-25:** "fault" reset
- **31-32-34:** "fault" contact.



Note: for the RH99 earth leakage monitor use the "fault" contact 31, 32, 34.

Wiring Diagrams

RH86, RH99 Monitor

Auto-reclosing application for unattended stations

RH86M, RH99M Monitor Wiring with ATm Auto-Reclosing Controller

All diagrams are shown with circuits de-energized, all devices open and relays in released position.

Zelio Logic: Programmable logic controller

H: red light

MT: motor mechanism module

MX: shunt release

Q₁: circuit breaker protecting the main circuit

Q₄ to Q₆: DPN circuit breakers

RH86M, RH99M monitor:

■ **A₁-A₂:** auxiliary power supply

■ **T₁-T₂:** A or TOA type toroid or rectangular sensor (if $I\Delta n \geq 500$ mA)

■ **11-14:** "voltage-presence" contact

■ **26-25:** relay test

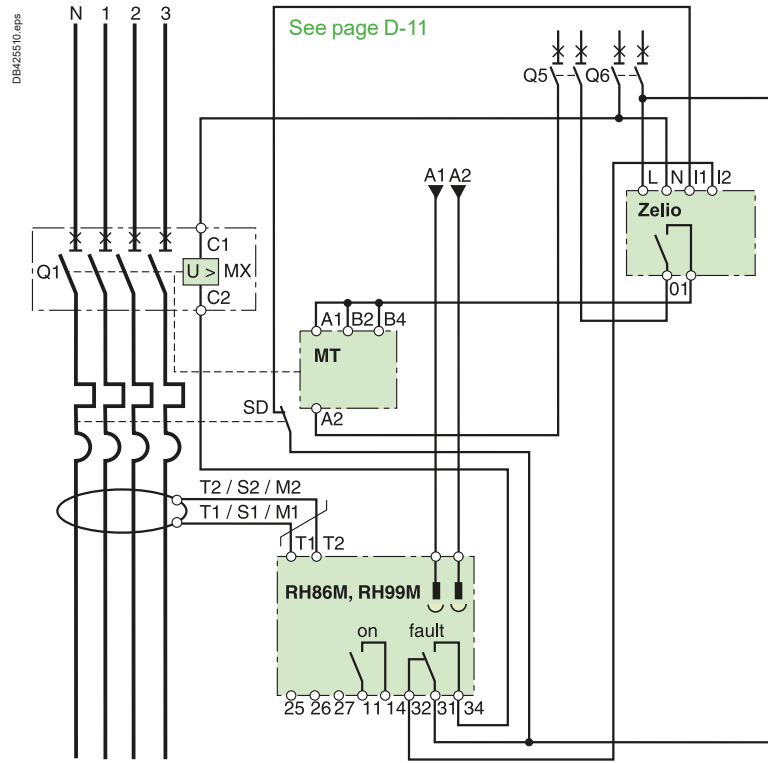
■ **27-25:** "fault" reset

■ **31-32-34:** "fault" contact

S₁ et S₂: single-pole switch

SD: auxiliary fault indication contact

T: sensor



RH99P Monitor Wiring with ATm Auto-Reclosing Controller

Zelio Logic: Programmable logic controller

H: red light

MT: motor mechanism module

MX: shunt release

Q₁: circuit breaker protecting the main circuit

Q₄ to Q₆: DPN circuit breakers

RH99P monitor:

■ **A₁-A₂:** auxiliary power supply

■ **T₁-T₂:** A or TOA type toroid or rectangular sensor (if $I\Delta n \geq 500$ mA)

■ **11-14:** "voltage-presence" contact

■ **26-25:** relay test

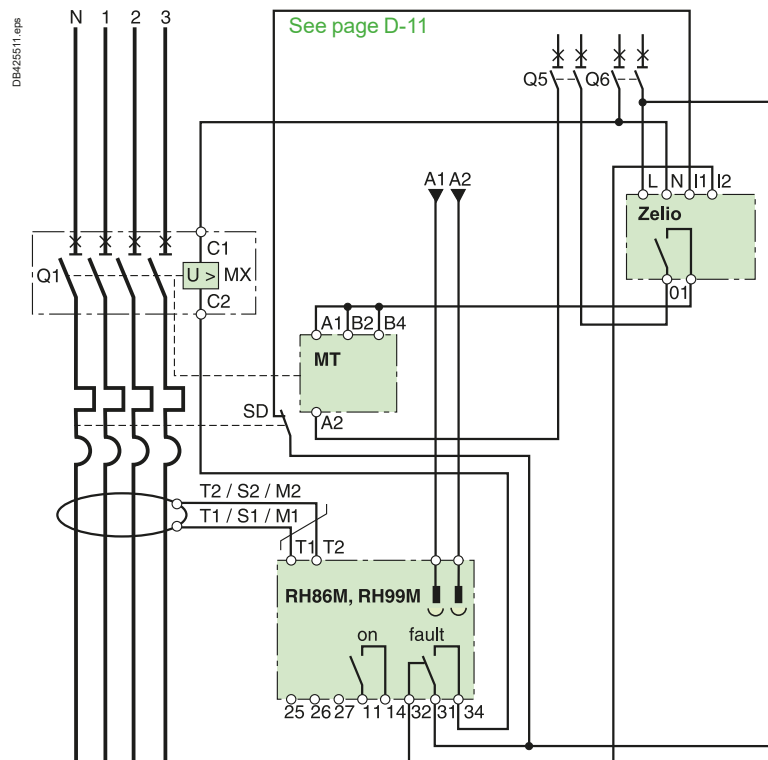
■ **27-25:** "fault" reset

■ **31-32-34:** "fault" contact

S₁ et S₂: single-pole switch

SD: auxiliary fault indication contact

T: sensor



Additional Information

- The SD auxiliary contact is mandatory
- Manual operation of the MT motorized operating mechanism always overrides the ATm3 auto-reclosing controller
- Use a single power supply (L/N) for all inputs (I), the ATm3 and the MX auxiliary.

Wiring Diagrams

RH197M with MX Shunt Release

RH197M Wiring for Optimum Continuity of Service

All diagrams are shown with circuits de-energized, all devices open and relays in released position.

Switch setting:



L1: lamp and audio alarm

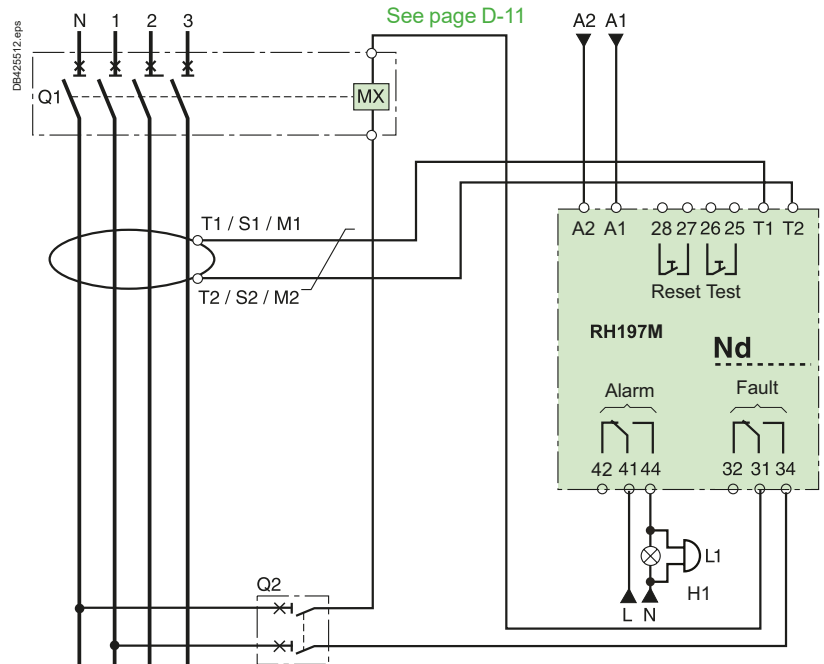
MX: shunt release

Q₁: circuit breaker protecting the main circuit

Q₂: DPN circuit breaker

RH197M:

- **A₁-A₂:** auxiliary power supply
- **T₁-T₂:** A or TOA type toroid or rectangular sensor (if $I_{\Delta n} \geq 500$ mA)
- **41-44:** "alarm contact"
- **26-25:** relay test
- **27-25:** "fault" reset
- **31-32-34:** "fault" contact



RH197M Wiring for Optimum Protection

All diagrams are shown with circuits de-energized, all devices open and relays in released position.

Switch setting:



Warning

The supply for A1-A2 must be different from that of the MX shunt release.

L1: lamp and audio alarm

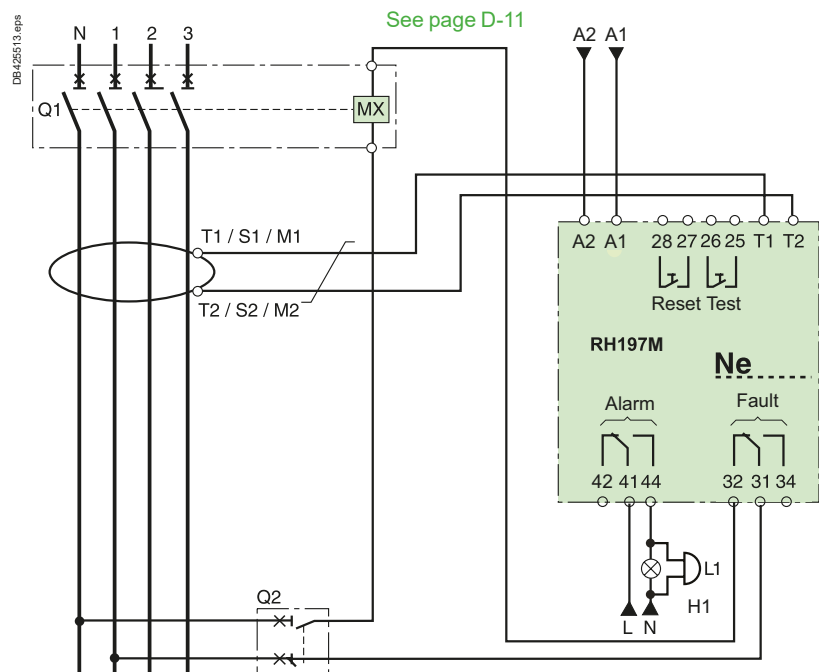
MX: shunt release

Q₁: circuit breaker protecting the main circuit

Q₂: DPN circuit breaker

RH197M:

- **A₁-A₂:** auxiliary power supply
- **T₁-T₂:** A or TOA type toroid or rectangular sensor (if $I_{\Delta n} \geq 500$ mA)
- **41-44:** "alarm contact"
- **26-25:** relay test
- **27-25:** "fault" reset
- **31-32-34:** "fault" contact



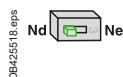
Wiring Diagrams

RH197M with MN Undervoltage Release

RH197M Wiring for Optimum Continuity of Service

All diagrams are shown with circuits de-energized, all devices open and relays in released position.

Switch setting:



L1: lamp and audio alarm

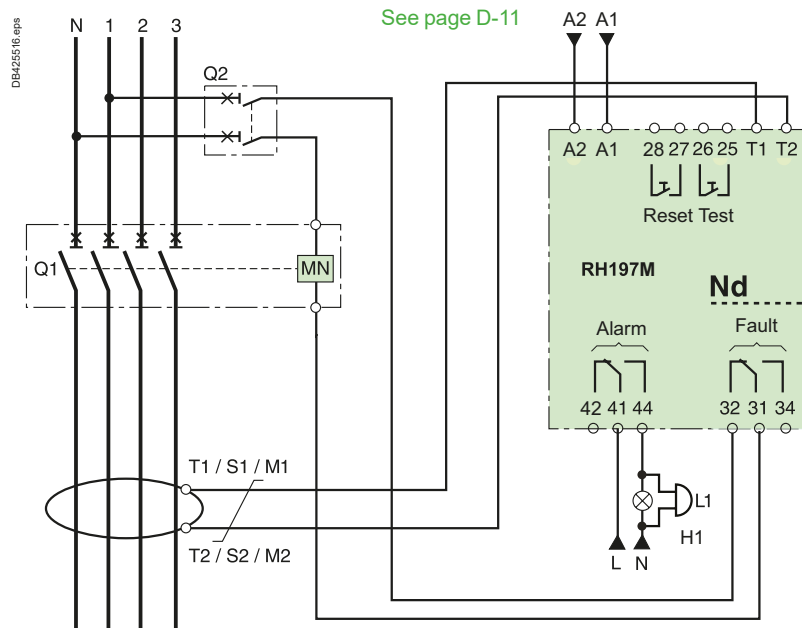
MN: undervoltage release

Q₁: circuit breaker protecting the main circuit

Q₂: DPN circuit breaker

RH197M:

- **A₁-A₂:** auxiliary power supply
- **T₁-T₂:** A or TOA type toroid or rectangular sensor (if $I\Delta n < 500$ mA)
- **41-44:** "alarm contact"
- **26-25:** relay test
- **27-25:** "fault" reset
- **31-32-34:** "fault" contact

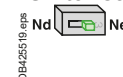


See page D-11

RH197M Wiring for Optimum Protection

All diagrams are shown with circuits de-energized, all devices open and relays in released position.

Switch setting:



L1: lamp and audio alarm

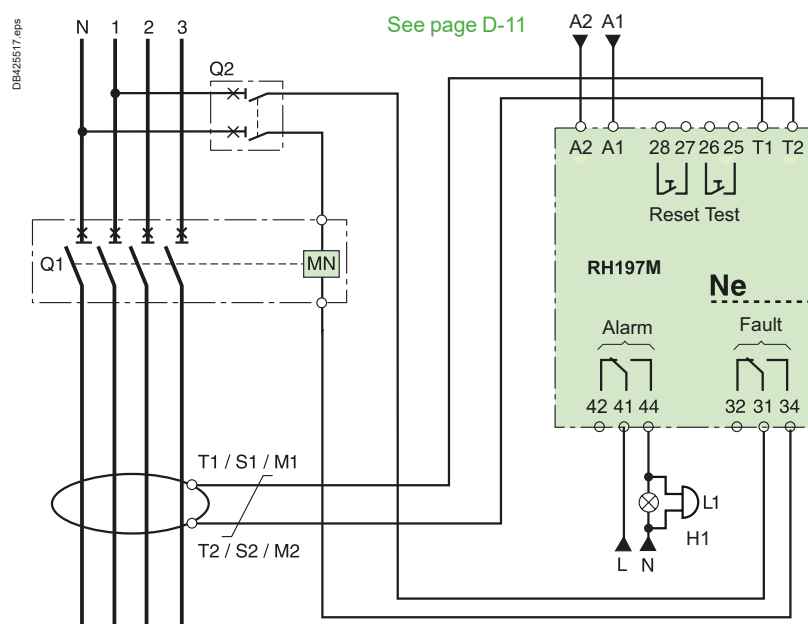
MN: undervoltage release

Q₁: circuit breaker protecting the main circuit

Q₂: DPN circuit breaker

RH197M:

- **A₁-A₂:** auxiliary power supply
- **T₁-T₂:** A or TOA type toroid or rectangular sensor (if $I\Delta n \leq 500$ mA)
- **41-44:** "alarm contact"
- **26-25:** relay test
- **27-25:** "fault" reset
- **31-32-34:** "fault" contact



See page D-11

Wiring Diagrams

RH197P with MX Shunt Release

RH197P Wiring for Optimum Continuity of Service

All diagrams are shown with circuits de-energized, all devices open and relays in released position.

Switch setting:



L1: lamp and audio alarm

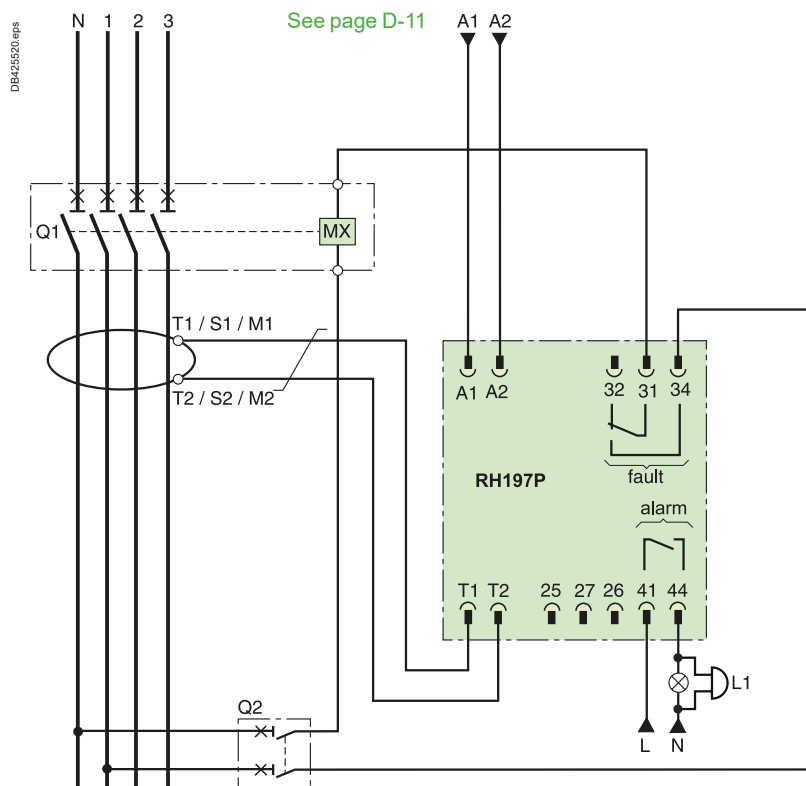
MX: shunt release

Q₁: circuit breaker protecting the main circuit

Q₂: DPN circuit breaker

RH197P:

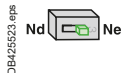
- **A₁-A₂:** auxiliary power supply
- **T₁-T₂:** A or TOA type toroid or rectangular sensor (if $I_{\Delta n} \leq 500$ mA)
- **41-44:** "alarm contact"
- **26-25:** relay test
- **27-25:** "fault" reset
- **31-32-34:** "fault" contact



RH197P Wiring for Optimum Protection

All diagrams are shown with circuits de-energized, all devices open and relays in released position.

Switch setting:



Warning

The supply for A1-A2 must be different from that of the MX shunt release.

L1: lamp and audio alarm

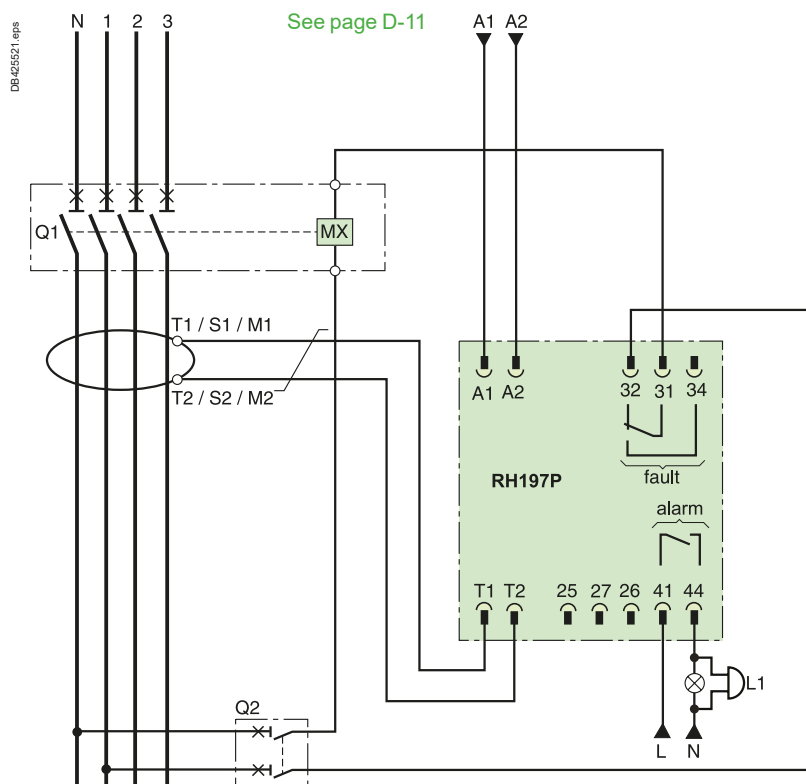
MX: shunt release

Q₁: circuit breaker protecting the main circuit

Q₂: DPN circuit breaker

RH197P:

- **A₁-A₂:** auxiliary power supply
- **T₁-T₂:** A or TOA type toroid or rectangular sensor (if $I_{\Delta n} \leq 500$ mA)
- **41-44:** "alarm contact"
- **26-25:** relay test
- **27-25:** "fault" reset
- **31-32-34:** "fault" contact



Wiring Diagrams

RH197P with MN Undervoltage Release

RH197P Wiring for Optimum Continuity of Service

All diagrams are shown with circuits de-energized, all devices open and relays in released position.

Switch setting:



L1: lamp and audio alarm

MN: undervoltage release

Q₁: circuit breaker protecting the main circuit

Q₂: DPN circuit breaker

RH197P:

■ **A₁-A₂:** auxiliary power supply

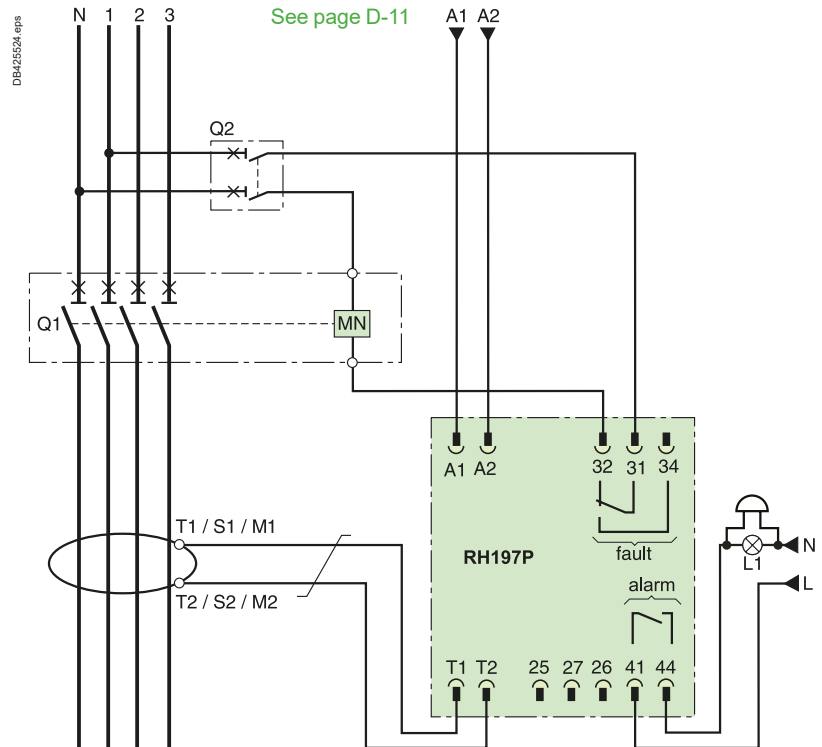
■ **T₁-T₂:** A or TOA type toroid or rectangular sensor (if $I\Delta n < 500$ mA)

■ **41-44:** "alarm contact"

■ **26-25:** relay test

■ **27-25:** "fault" reset

■ **31-32-34:** "fault" contact



RH197P Wiring for Optimum Protection

All diagrams are shown with circuits de-energized, all devices open and relays in released position.

Switch setting:



L1: lamp and audio alarm

MN: undervoltage release

Q₁: circuit breaker protecting the main circuit

Q₂: DPN circuit breaker

RH197P:

■ **A₁-A₂:** auxiliary power supply

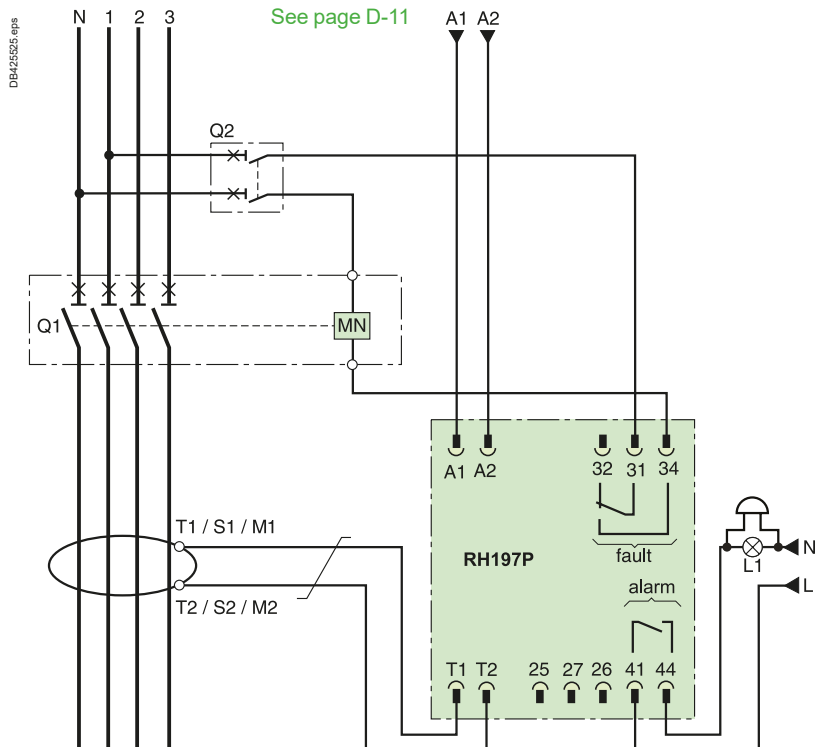
■ **T₁-T₂:** A or TOA type toroid or rectangular sensor (if $I\Delta n \leq 500$ mA)

■ **41-44:** "alarm contact"

■ **26-25:** relay test

■ **27-25:** "fault" reset

■ **31-32-34:** "fault" contact



RHUs and RHU Wiring with MX Shunt Release: Optimum Continuity of Service

All diagrams are shown with circuits de-energized, all devices open and relays in released position.

See page D-11

L1: lamp and audio alarm

L2: lamp

MX: shunt release

Q₁: circuit breaker protecting the main circuit

Q₂: DPN circuit breaker

RHUs and RHU:

■ **A₁-A₂:** auxiliary power supply

■ **T₁-T₂:** A or TOA type toroid or rectangular sensor (if $I\Delta n \geq 0.5$ A)

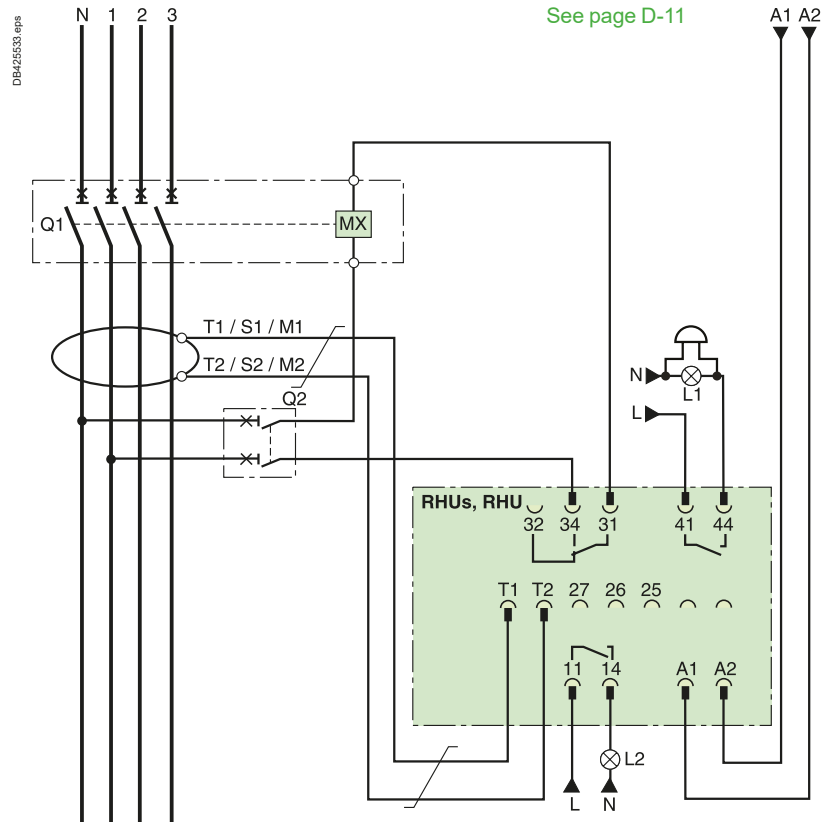
■ **11-14:** "voltage-presence" contact

■ **26-25:** relay test

■ **27-25:** "fault" reset

■ **31-32-34:** "fault" contact

■ **41-44:** "alarm contact".



[1] RHU only.

RHUs and RHU Wiring with MN Undervoltage Release: Optimum Protection

L1: lamp and audio alarm

MN: undervoltage release

Q₁: circuit breaker protecting the main circuit

Q₂: DPN circuit breaker

RHUs and RHU:

■ **A₁-A₂:** auxiliary power supply

■ **T₁-T₂:** A or TOA type toroid or rectangular sensor (if $I\Delta n \geq 0.5$ A)

■ **11-14:** "voltage-presence" contact

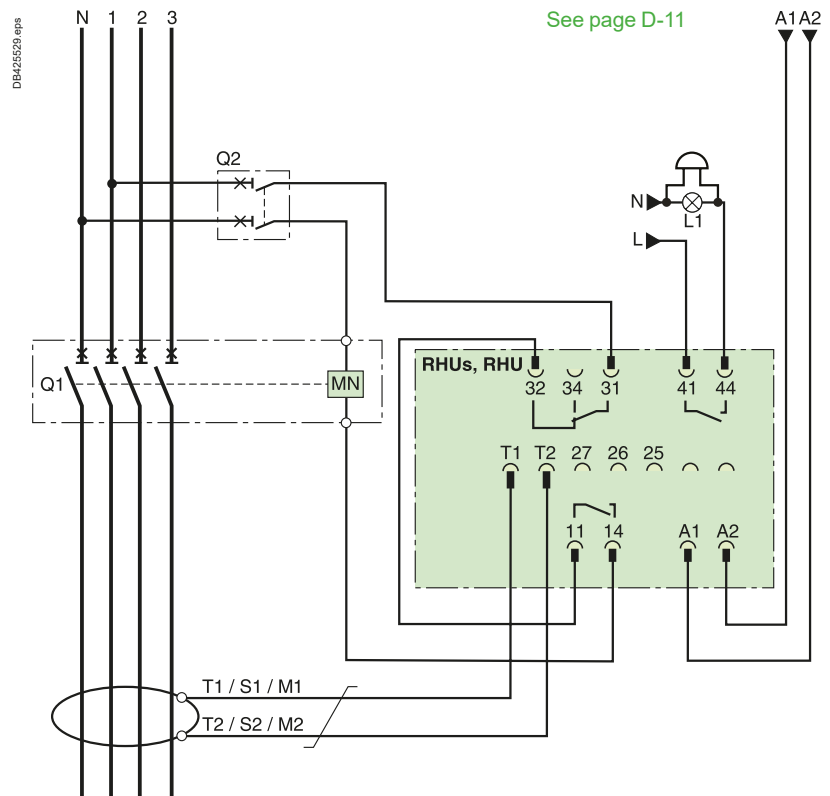
■ **26-25:** relay test

■ **27-25:** "fault" reset

■ **31-32-34:** "fault" contact

■ **41-44:** "alarm contact".

See page D-11



[1] RHU only.

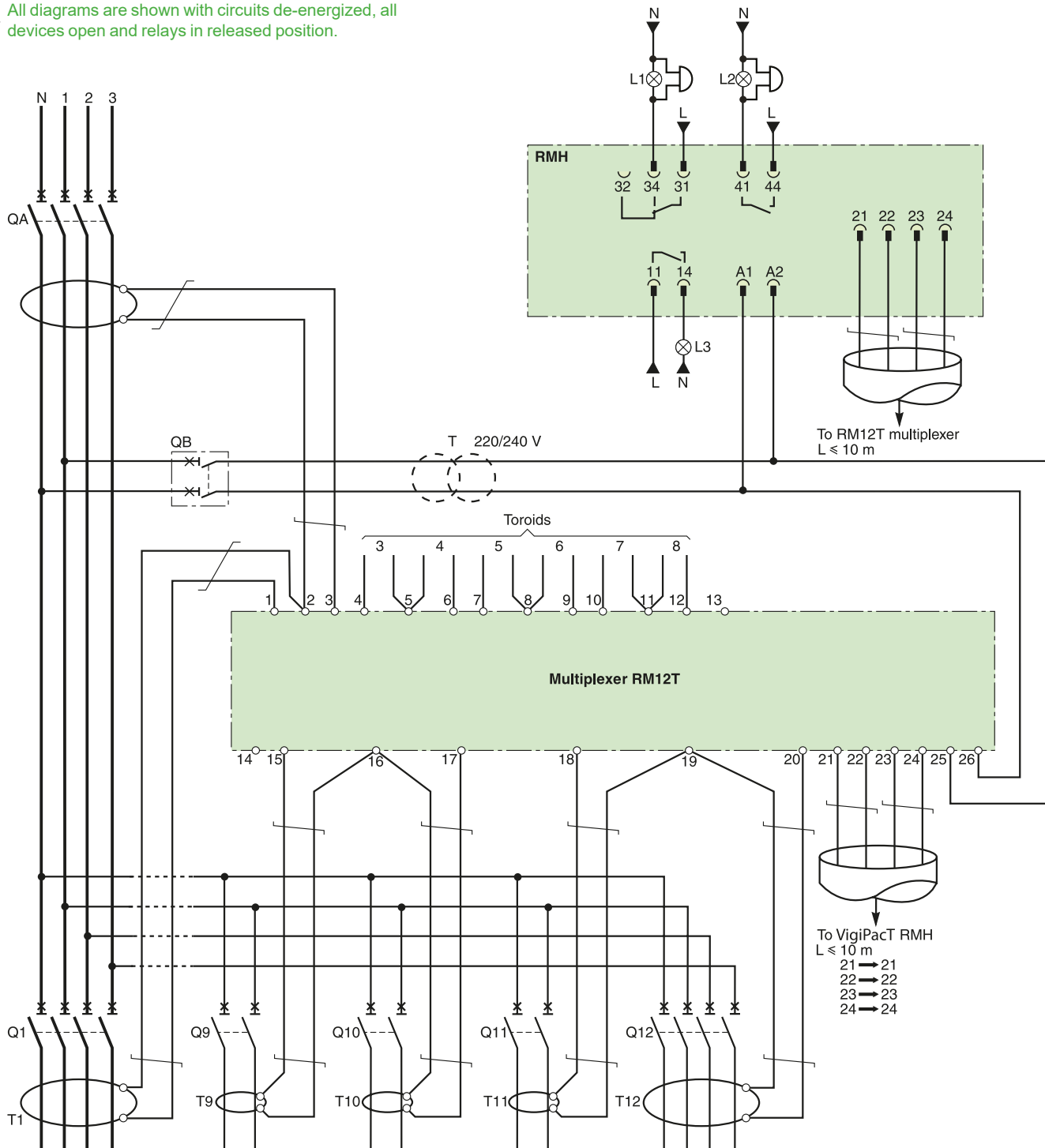
Wiring Diagrams

RMH

RMH Wiring with RM12T Multiplexer

All diagrams are shown with circuits de-energized, all devices open and relays in released position.

D9439279.eps



L1, L2: lamp and audio alarm

L3: lamp

QA: switchboard incoming circuit breaker for the main circuit

QB: circuit breaker protecting the RMH and RM12T power supply circuit

QA1 to QA12: circuit breakers on main outgoing circuits 1 to 12

T: transformer with 220/240 V secondary (if required), rating ≥ 4 VA

T1 to T12: residual current measurement toroids for circuits 1 to 12 (or rectangular sensor if $I\Delta n \geq 0.5$ A)

RM12T multiplexer

■ Terminals 1 to 12 and 15 to 20: connection of toroids

■ Terminals 21 to 24: connection of RMH earth leakage monitor

■ Terminals 25 to 26: auxiliary power supply.

RMH earth leakage monitor

■ A1-A2: auxiliary power supply

■ 11-14: "voltage-presence" contact

■ 21 to 24: connection of RM12T multiplexer

■ 31-32-34: "alarm" contact

■ 41-44: "pre-alarm" contact.

Wiring Diagrams

Communication Bus, Test and Remote Reset Functions,
Power Supply

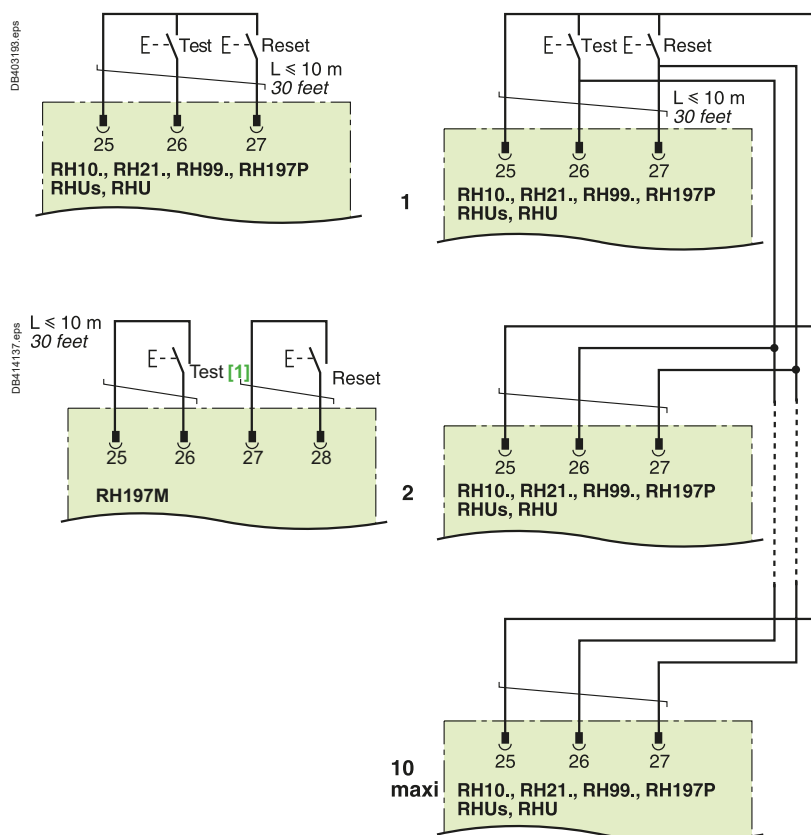
Connection of Test and Remote Reset Functions

Cable

The cable must not exceed 10 m in length.
Use a cable with 3 twisted wires.

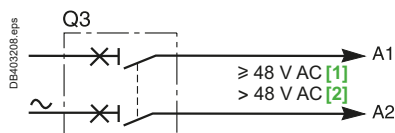
Contacts

Use pushbuttons with low-level contacts suitable
for the minimum load of 1 mA at 4 V.

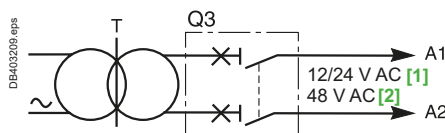


[1] Not available on DC version/Hold on for a time equivalent to the time delay setting for others versions.

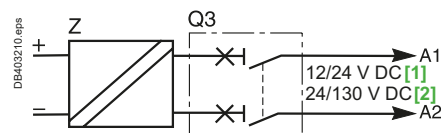
Connection of RH10, RH21, RH99, RH197, RHUs and RHU Power Supply



[1] RH10, RH21 and RH99.
[2] RH197.



T: class 2 isolation transformer mandatory:
■ for $V_{A1,A2} \leq 24 \text{ V AC}$ for RH10, RH21 and RH99
■ for $V_{A1,A2} = 48 \text{ V AC}$ for RH197P

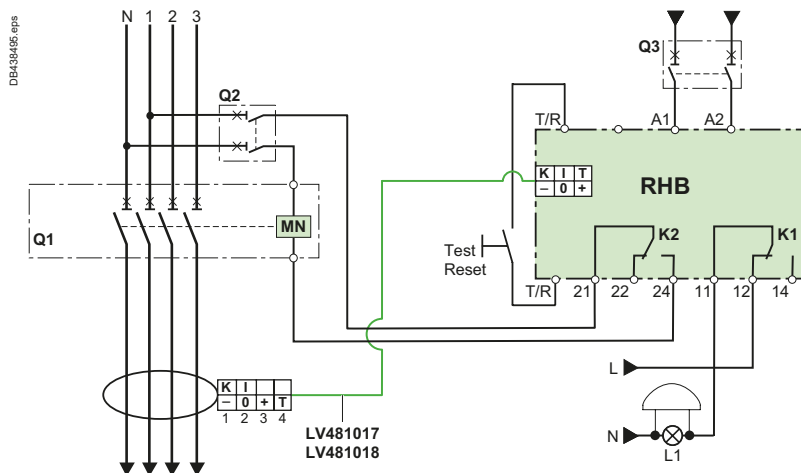


The DC power supply must be galvanically isolated from the AC power system.

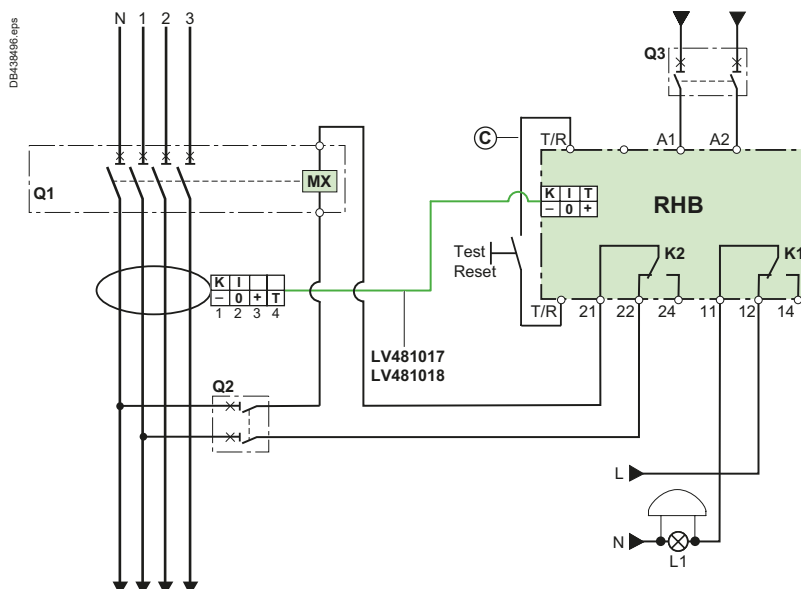
RHB

All diagrams are shown with circuits de-energized, all devices open and relays in released position.

- **21-22-24:** Output relay K2



- **21-22-24:** Output relay K2



Additional Characteristics

VigiPacT Devices

RCD Operating Principle	E-2
Residual-Current Measurements	E-4
Applications	E-10
Questions and Answers.....	E-16

Leakage-Current Monitoring Using RCDs.....E-17

Tripping Curves and Frequency Filtering

RH10, RH21, RH68, RH86 and RH99	E-23
RH197M	E-24
RH197P	E-25
RHUs and RHU.....	E-26
RHB.....	E-27

Other Chapters

Functions and Characteristics.....	A-1
Installation Recommendations.....	B-1
Dimensions and Connection	C-1
Wiring Diagrams	D-1
Catalog Numbers	F-1

VigiPacT Devices

RCD Operating Principle

VigiPacT devices are primarily intended to protect life and property on industrial, commercial or similar sites.

VigiPacT RCDs implement:

- An electronic relay supplied by an auxiliary source
- Measurements using a separate toroid.

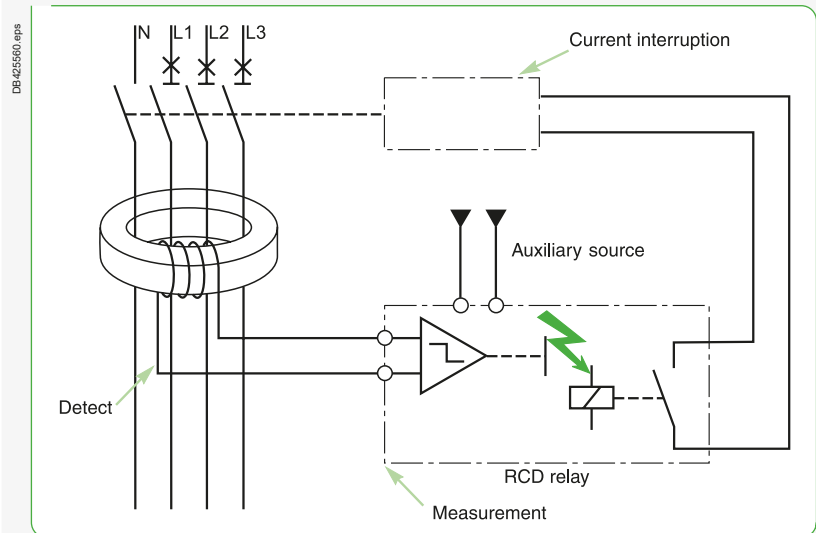
When there is no insulation fault, the vector sum of the currents flowing in the live conductors is equal to zero.

If an insulation fault occurs, the sum is no longer equal to zero and the fault current creates in the toroid a magnetic field which generates a current on the secondary winding.

This current is monitored by a measurement circuit and, if it overruns the set threshold for a time greater than the set intentional time delay, the relay orders the current-breaking device to open.

VigiPacT devices comply with standard IEC 60755 (the general standard governing RCDs) and with standard IEC 60947-2 annex M.

These standards define the various device characteristics and the necessary tests for the products.



RCD operating principle.

RCD Sensitivity Levels

Electronic relays offer wide setting ranges for the sensitivity and the time delay. The installation standards characterise the required RCD sensitivity depending on the need for protection.

Sensitivity depending on the different needs

High sensitivity	Medium sensitivity	Low sensitivity
30 mA	100 mA to 3 A	> 10 A

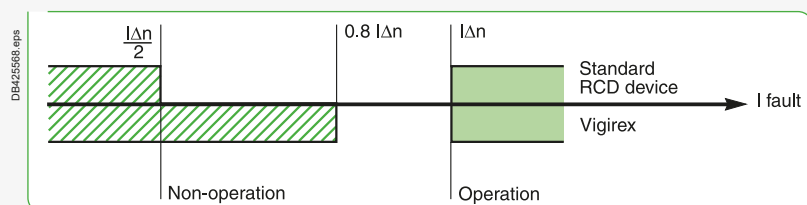
RCD Operating/Non-Operating Current

The standards indicate the preferred values for the residual operating current settings. Operating current $I_{\Delta n}$ in A:

0.006 – 0.01 – 0.03 – 0.1 – 0.3 – 0.5 – 1 – 3 – 10 – 30.

To take into account the tolerances (temperature, dispersion of components, etc.), the standards indicate that an RCD device set to an $I_{\Delta n}$ value must:

- **Not operate** for all fault currents $\leq I_{\Delta n}/2$
- **Operate** for all fault currents $\geq I_{\Delta n}$.



VigiPacT devices are designed for non-operation up to $0.8 I_{\Delta n}$.

Standard IEC 60947-2 annex M allows manufacturers to indicate the level of non-operation if it differs from the general rule.

VigiPacT Devices

Residual-Current Measurements

Toroid Characteristics

The toroids used for VigiPacT devices enable the electronic relay to measure the different zero-sequence currents flowing in the monitored circuit.

They are designed to:

- Measure currents
- Withstand overvoltages
- Withstand short-circuit currents.

Measurement of Zero-Sequence Currents

■ Measurement dynamics

The necessary measurement dynamics require a special magnetic circuit to measure very low currents and correct adaptation of the impedance (to avoid saturation) when measuring higher currents.

To that end, the correct compromise is required between:

- A material with high magnetic permeability μ_r and the saturation phenomena
- Toroid size (cross-sectional area) and acceptable dimensions
- A high number (n) of turns and:
 - sufficiently low resistance
 - sufficient signal amplitude (gain $1/n$).

■ Measurement limits

When a three-phase current flows through the measurement toroid and there is no insulation fault (the sum of the currents is equal to zero), a secondary current equivalent to a false zero-sequence fault current is created. This is due to leakage flows caused by manufacturing tolerances. It is necessary to qualify this phenomenon by indicating the rated operational current for a given zero-sequence leakage current.

Table indicating the limits for $I_{\Delta n}$ /rated current

See page B-11.

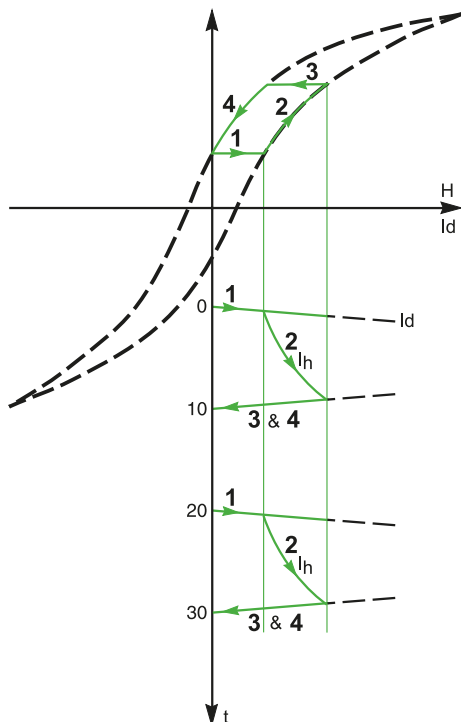
Note: strict compliance with the installation rules for the cables passing through the toroid is indispensable.

The addition of a "regulator sleeve" for the magnetic field considerably increases the rated operational current.

Measurement of Disturbed Currents

Toroids can capture the waveforms of currents comprising low-frequency harmonics. The main challenge is to measure current with a DC component, which can saturate the magnetic circuit and reduce the sensitivity of measurements. In this case, there is a risk that a fault current might not be detected. To help avoid this problem and ensure that the toroid provides an accurate output signal, it is necessary to use a magnetic material that does not have a horizontal saturation curve, with low residual induction B_r . This is type A measurements.

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Toroid hysteresis cycle for type A measurements.

I_d : primary current

$I_m = I_d - I_h$

Additional Characteristics

VigiPacT Devices

Residual-Current Measurements

Short-Circuit Withstand Capacity

The RCD must be sized for the short-circuit currents corresponding to the controlled protection device, at the point in the installation where it is placed.

Standard IEC 60947-2 annex M requests that the various short-circuit currents that the RCD supports must be declared to ensure correct operation without damage to the interconnected devices.

■ I_{sc} : rated short-circuit current

■ I_{cw} : rated short-time withstand current

■ $I_{\Delta w}$: rated conditional residual short-circuit withstand current.

Note: the requested characteristics are required for an RCD-circuit breaker combination. For an RCD-switch combination, more in-depth study is required if the fault current that must be interrupted is greater than $6 I_n$ (where I_n is the switch rating).

The VigiPacT range is consistent with the characteristics of the monitored circuits and the protection circuit breakers.

	VigiPacT with TA 30, PA 50, IA 80, MA120 toroids combined with a Schneider Electric brand circuit breaker, rated ≤ 630 A	VigiPacT with SA 200 and GA 300 toroids combined with a ComPacT NS630b to 3200 A or a MasterPact MTZ circuit breaker up to 6300 A
I_{cw}	100 kA/0.5 s	100 kA/0.5 s
I_{sc}	150 kA	100 kA
$I_{\Delta w}$	85 kA/0.5 s	85 kA/0.5 s

Considering the above, the combination of a VigiPacT device with a ComPacT NS, NSX or NSXm or MasterPact circuit breaker ensures optimal operation regardless of the system earthing arrangement (particularly for TN-S).

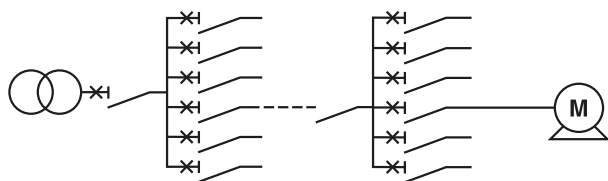
Overvoltage Withstand Capacity

The overvoltage withstand capacity of VigiPacT devices is tested to comply with the requirements in standard IEC 60947-1 appendix H (which reuses those in standard IEC 60664-1 on insulation coordination).

■ Impulse withstand voltage

The distribution-system voltage and the position of the device in the system determine the overvoltage levels to which the electrical devices may be subjected (see table H1 in standard IEC 60947-1).

A VigiPacT device (relay + toroid) may be installed at the head of an installation. The overvoltage withstand capacity of VigiPacT type A device (relays + toroid) is suitable to be installed at the head of a low voltage distribution system up.

Rated installation voltage	Position			
DB126072.eps				
	Head of the LV installation	On the distribution circuits	Near the loads	
	230/400 V	6 kV	4 kV	2.5 kV
	400/690 V	8 kV	6 kV	4 kV
	.../1000 V	12 kV	8 kV	6 kV
Category	4	3	2	

■ VigiPacT implementation

The characteristics listed below are specified.

For Type A	Sensors	Supply (for $U_s > 48$ V)	Relay output contacts
Reference voltage	1000 V	525 V	400 V
Category	4	4	4
U_{imp}	12 kV	8 kV	6 kV
For Type B (RHB)	Sensors	Supply (for $U_s > 48$ V)	Relay output contacts
Reference voltage	800 V	240 V	240 V
Category	3	3	3
U_{imp}	8 kV	4 kV	4 kV

VigiPacT Devices

Residual-Current Measurements

Characteristics of Measurement Relays: Immunity to Natural Leakage Currents

VigiPacT relays implement four techniques:

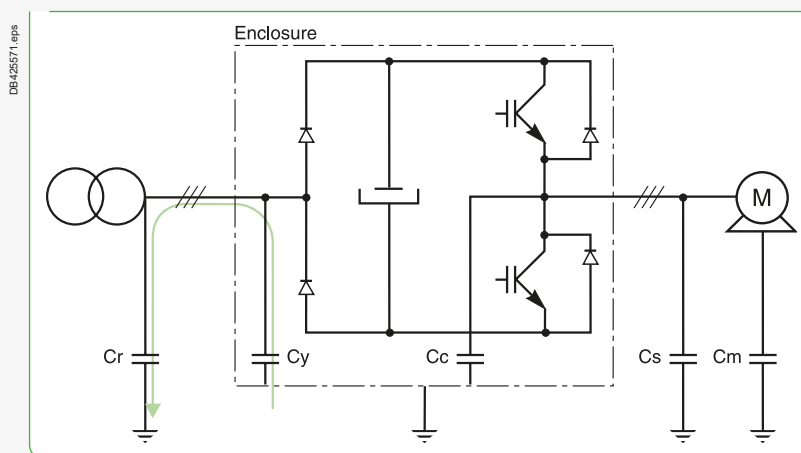
- To manage the leakage-current measurements without causing nuisance tripping
- And to trip when a line to earth fault occurs.

Nuisance Tripping

Nuisance trippings are due to non dangerous leakage currents existing in the installation.

They can come from:

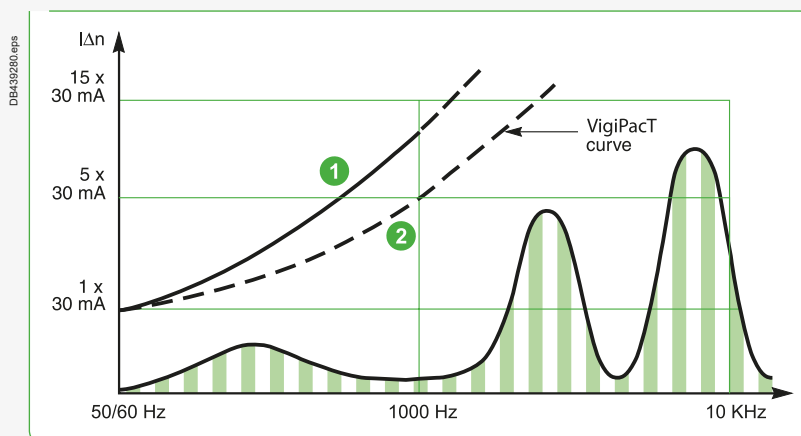
- Transient or permanent high-frequency currents (high-frequency harmonics)
- Low-frequency leakage currents.



Flow of leakage currents in a frequency converter.

These currents may reach levels of several tens or hundreds of milliamperes (rms value).

Standard IEC 60479 provides information on the human body sensitivity depending on the frequency. The figure below shows the result of the filters on VigiPacT in reducing the effects of the harmonic currents and malfunctions due to transient currents.



- 1 Frequency factor for the fibrillation threshold (IEC 60749-2).
- 2 Limiting values of the natural leakage currents downstream of a rectifier.

Additional Characteristics

VigiPacT Devices

Residual-Current Measurements

Rms Measurements

VigiPacT devices carry out rms measurements of the residual current. This is the means to:

- Accurately measure the harmonic currents and avoid nuisance tripping due to non-dangerous currents with high crest factors
- Correctly calibrate the energies of the fault currents because, for both fire hazards and the protection of property, it is the energy of the fault current that must be taken into account.

Curve $I\Delta n$ /Non-Delayed Relay Times

Protection for people requires the use of non-delay type relays. These relays must comply with standards. Standards IEC 60947-2 annex M and IEC 60755 indicate the preferred values for the operating-current setting. They stipulate the maximum break time depending on the residual fault current. See table B in B.4.2.4.1 in standard IEC 60947-2 annex M.

If =	$I\Delta n$	2 $I\Delta n$	5 $I\Delta n$	10 $I\Delta n$
Time Tps	0.3 s	0.15 s	0.04 s	0.04 s

Key:

Time Tps: total time required to break the current (including the time for the associated protection device to open)

If: leakage current

$I\Delta n$: residual operating current setting

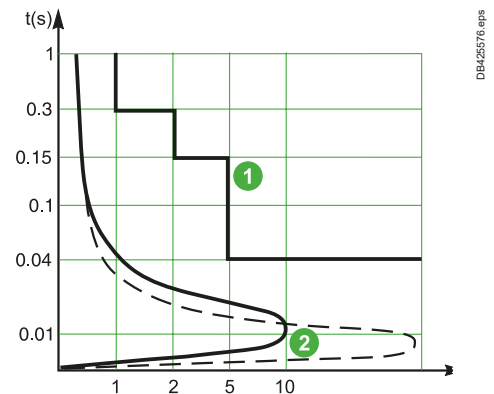
For devices set to 30 mA, 5 $I\Delta n$ can be replaced by 0.25 A, in which case 10 $I\Delta n$ is replaced by 0.5 A.

VigiPacT uses this type of response curve to manage the false fault currents caused by switching in of loads (transformers, motors).

Schneider Electric VigiPacT protection relays are in accordance with IEC 60947-2/M standard. The only restriction is for 30 mA setting which require association with ComPacT NSX circuit breaker up to 630 A.

Non-Operation up to 0.8 $I\Delta n$

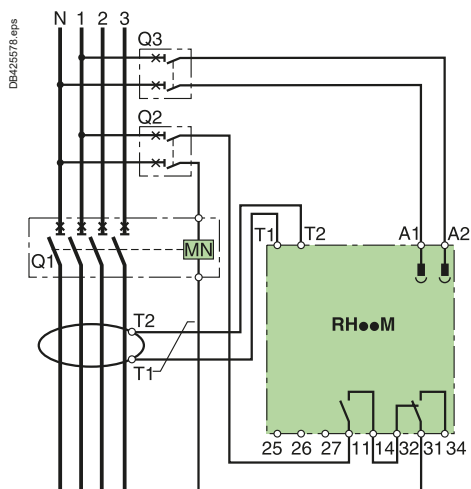
This function equipping VigiPacT relays significantly increases (from 0.5 $I\Delta n$ to 0.8 $I\Delta n$) the immunity of relays to continuous leakage currents, both natural and intentional.



- 1 Standardized RCD response curve as per the table.
- 2 Leakage-current curve for switching in of a load with leakage capacitance.

VigiPacT Devices

Residual-Current Measurements



VigiPacT wired for optimum protection

Characteristics of the Relay/Toroid Combination: Measurement Integrity

The integrity of measurements depends on the capacity of the RCD to handle the various disturbances on the distribution system. The generic standard for EMC is IEC 61000-6-2 which defines the minimum immunity level.

The test standards in the IEC 61000 series define the various requirement levels. Standard IEC 60947-2 annex M determines the required level for RCDs with separate toroids.

Schneider has established for the VigiPacT RCDs its own requirements that are similar or more demanding than those in the standard.

The table below lists the required tests.

Description of phenomena for A Type	Test standard		Standardized tests as per IEC 60947-2 annex M	VigiPacT tests
	Title	Code		
Discharges, due to the accumulation of static electricity, can lead to malfunctions and destruction.	Electrostatic-discharge immunity test	IEC 61000-4-2	8 kV contact 8 kV in air	8 kV contact 15 kV in air
Radiated EM fields (radio-telephones, transmitters) can disturb operation of devices.	Radiated (radio-frequency) EM field immunity test	IEC 61000-4-3	10 V /m 80 to 1000 MHz modulated at 1 kHz	12 V /m 80 to 1000 MHz modulated at 1 kHz
Switching of LV devices (contactors, contact bouncing, breaking of inductive loads, etc.) may cause malfunctions and destruction.	Electrical fast transients/bursts immunity test	IEC 61000-4-4	4 kV on supply 2 kV on I/O 5 kHz fast burst/transient lasting 15 ms every 300 ms	4 kV on supply 2 kV on I/O 5 kHz fast burst/transient lasting 15 ms every 300 ms
Atmospheric overvoltages, switching of MV devices may cause malfunctions and destruction.	Surge immunity test	IEC 61000-4-5	- On supply > 100 V AC 4 kV between line and earth 4 kV between lines - On supply < 100 V AC 2 kV between line and earth 1 kV between lines - On DC supply 0.5 kV between line and earth 0.5 kV between lines - On input/output (I/O) 2 kV between line and earth 1 kV between lines 1.2/50 µs wave, open circuit 8/20 µs short-circuit	- On supply > 100 V AC 4 kV between line and earth 4 kV between lines - On supply < 100 V AC^[1] 4 kV between line and earth 4 kV between lines - On DC supply 2 kV between line and earth 1 kV between lines - On input/output (I/O) 2 kV between line and earth 1 kV between lines 1.2/50 µs wave, open circuit 8/20 µs short-circuit
EM fields (radio-telephones, transmitters) can cause HF currents resulting in device malfunctions.	Immunity test for conducted disturbances induced by radio-frequency fields	IEC 61000-4-6	10 V 150 kHz to 80 MHz modulated at 1 kHz	10 V 150 kHz to 80 MHz modulated at 1 kHz
Faults on the distribution system may cause malfunctions.	Voltage-dip immunity test	IEC 61000-4-11	Specific RCD-device tests	-

Additional Characteristics

VigiPacT Devices

Residual-Current Measurements

Voltage-Dip Withstand Capacity

Standard IEC 60947-2 annex M defines precise criteria for the voltage-dip withstand capacity of RCDs that depend on the supply voltage. Even if the auxiliary source fails, the RCD must operate correctly to 70 % of the rated auxiliary-source voltage. VigiPacT devices comply with the standard.

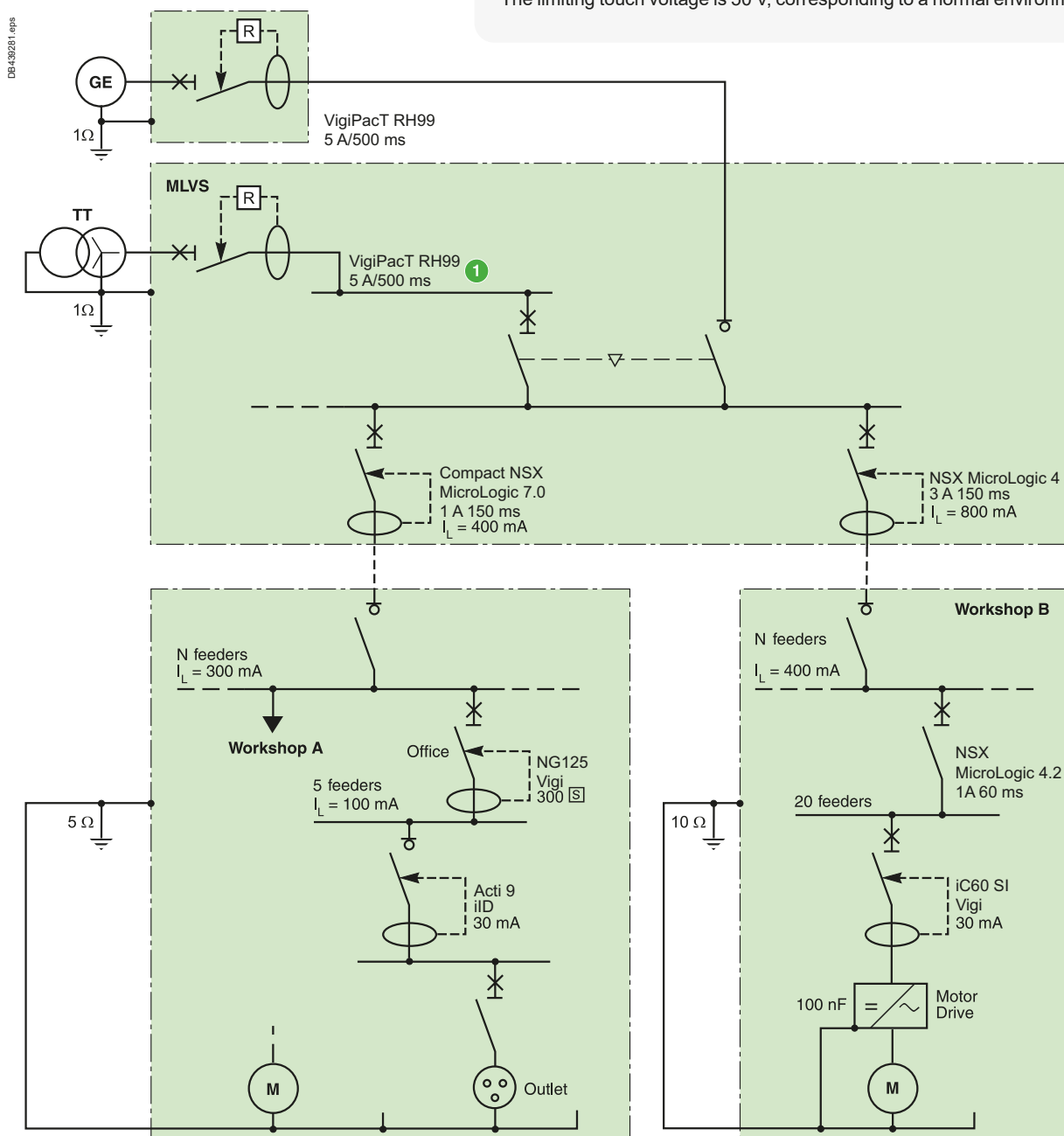
- Operation under downgraded voltage conditions (see the characteristics on Pages A-28 to A-37). Additional standard functions are built in to make the protection as dependable as possible:
 - Failsafe operation is possible, see relay wiring
 - A voltage LED provides a local indication that voltage is not present.

VigiPacT Devices

Applications

Example of Protection Using RCDs

The diagram below shows a low-voltage distribution system (TT system) in a one-story building containing a number of workshops. The measured resistance of the earth electrodes is $1\ \Omega$ for the transformer, $1\ \Omega$ for the engine-generator set, $5\ \Omega$ for workshop A and $10\ \Omega$ for workshop B. Workshop B has machines with high intentional leakage currents (filters, etc.). The limiting touch voltage is 50 V , corresponding to a normal environment.



Distribution diagram with selectivity.

The RCD settings as shown in the diagram:

- Provide for the safety of life and property
- Ensure total selectivity in the event of an insulation fault in the installation
- Eliminate problems concerning malfunctions due to natural leakage current.

Requirements of Standards

Protection against electric shock, protection in case of fault (indirect contact)

An RCD (indicated ① in the diagram on page E-10) must be installed at the origin of the installation (see page E-24).

The authorized settings are:

■ Operating current threshold

the maximum setting is $I_{\Delta n} = 50 \text{ V}/10 \Omega = 5 \text{ A}$

Note: even though the earthing resistance of the main LV switchboard is 1Ω , the RCD at the head of the installation shall protect against faults occurring downstream whatever their position and the greatest earth resistance must therefore be considered, i.e. 10Ω . (see page E-24)

■ Non-operating time (time delay)

the non-operating time must not exceed $\Delta t = 1 \text{ s}$. (according to IEC 60364-4-41 see EIG/RCD guide).

Additional protection

Additional protection must mainly be provided on final circuits in the workshops, in particular for the socket-outlets. It is provided by instantaneous high-sensitivity 30 mA RCDs.

Protection Implementation

Taking leakage currents into account

The leakage currents must be measured or estimated. Tables provide estimates for various loads (see page E-10) and for computer hardware (see page E-19).

The minimum setting for an RCD is:

$I_{\Delta n} > 2 I_L$ (where I_L is the total leakage current downstream of the RCD).

■ On the circuits supply power outlets, the leakage current must therefore be limited to $I_L < 30 \text{ mA}/2 = 15 \text{ mA}$

e.g. downstream of the 30 mA iID 63 A, no more than 4 PCs can be installed (from the table on page E-19, the estimated leakage current for a PC is 3.5 mA, giving 4×3.5 for 4 PCs = $14 \text{ mA} < 15 \text{ mA}$)

■ In Workshop B, there are 20 frequency converters equipped with 100 nF filters (see page E-10), corresponding to a leakage current of approximately 21 mA per converter. The sum of the leakage currents is therefore 420 mA. The RCD upstream must therefore be set to at least $2 \times I_L$, i.e. 1 A.

Taking selectivity into account (see page A-14)

■ Current-based selectivity

The following two conditions must be satisfied:

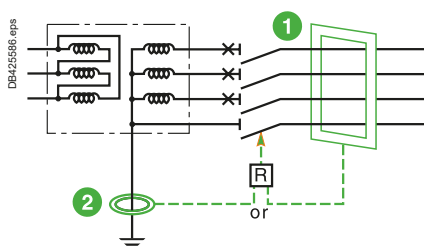
- $I_{\Delta n}$ of upstream RCD $> 2 I_{\Delta n}$ of downstream RCD (selectivity requirement)
- $I_{\Delta n}$ of upstream RCD $> 2 I_L$ (leakage current requirement).

■ Time-based selectivity

The following condition must be satisfied:

upstream non-operating time $>$ downstream total operating time (relay + breaking device).

VigiPacT Devices Applications



Installation of the VigiPacT measurement toroid at the head of an installation.

Single-Source Diagram RCD at the Head of an Installation

The fault current on the transformer incomer can be calculated two ways:

- By measuring the sum of the currents in the live conductors (3 Ph + N)
- By measuring the fault current directly on the earthing conductor.

The latter method is useful because at the head of sizeable installations, the cables or busbars are large and it is difficult to install the measurement toroid.

	Advantages	Disadvantages	Comments
1 Rectangular sensor	Standard solution Tests in factory	Difficult to install	Good solution for new installations
2 Measurement toroid on earthing conductor	Size of toroid Easy installation at any time	"Custom" solution Special toroid mounting and wiring outside the switchboard On-site tests	Good solution for existing installations Possible only with RCDs with separate toroid

Note: the rectangular sensors in the VigiPacT range are specifically designed for this type of installation.

Multi-Source Diagram with TT System

At this level in the installation and in the event of an insulation fault, continuity of service is obtained by:

- Selectivity between the RCDs for faults on the output circuits
- Source redundancy for faults on the main busbars.

The sources must not be disconnected simultaneously.

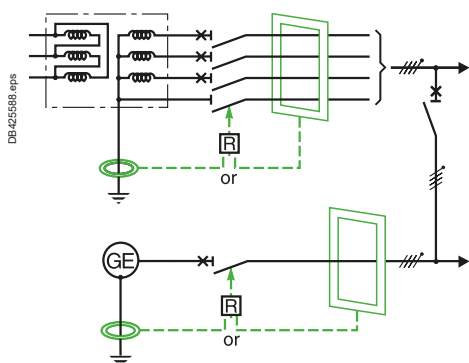
Each Source Has a Separate Earth Electrode

The measurement toroid for the header RCD is positioned in the same manner as for a single source.

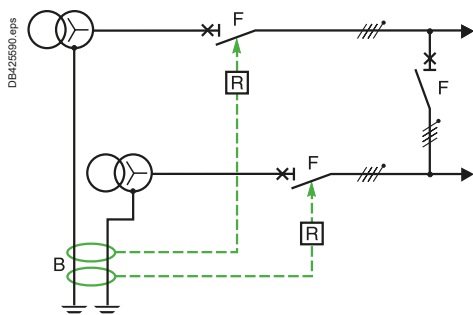
- **The two sources are never coupled**

This is the typical situation for a normal source with an engine generator set as a backup source.

Each RCD monitors the fault current in the part of the installation in which it is installed.



The two sources are never coupled.



The two sources may be coupled.

- **The two sources may be coupled**

It is not possible to use the system presented above because if a fault occurs, each of the measurement toroids for the RCDs detects only a part of the fault current, i.e. the protection of persons is not ensured.

To correctly set up protection using an RCD, the two earth electrodes must both be run through the measurement toroids for the two header RCDs.

This diagram is in fact identical to that for a single-source system with two parallel-connected transformers (as concerns insulation faults).

Note: in the event of a fault, even when the sources are not coupled, the two protection devices trip. There is no selectivity in clearing the faulty source.

This system downgrades the continuity of service.

The Sources Are Connected to the Same Earth Electrode

Caution is required in setting up the RCDs.

■ The two sources are never coupled

Installation of the toroids at points A allows for correct monitoring of the insulation fault and selectivity in clearing the faulty part of the installation.

■ The two sources may be coupled

The same conditions (each source has an earthing conductor, two sources with a closed coupling) means the measurement toroids must be installed at point B, on the common earth electrode.

This system has the same disadvantages, i.e. no selectivity in clearing the sources.

IMPORTANT

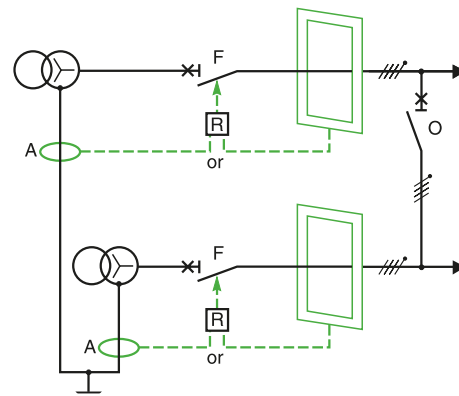
Coupling may be carried out by a source coupling device (the most frequent case), particularly when there is a DC bus downstream.

Example. DC bus shared by a number of rectifiers.

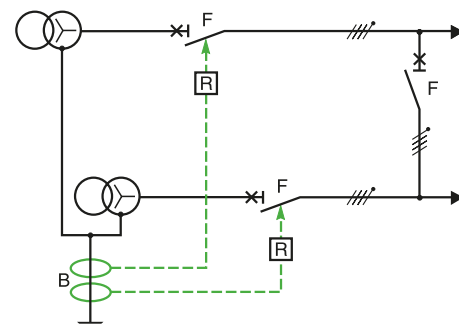
Multi-Source Diagram with TN System

Use of RCDs at the head of an installation with the TN system for the protection of persons is uncommon. The reason for their use can be the long length of cables and/or the low I_{sc} value.

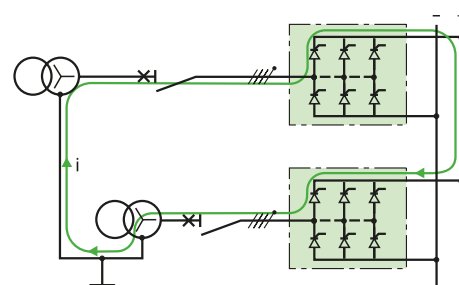
It is possible to use them for the protection of property when the fault impedance is not controlled. The functional diagram is identical to that for a multi-source TT system with a single earth electrode. The limiting conditions mentioned above are identical (except for the fact that the sensitivity of the settings is very low and thus not comparable with the natural leakage currents or the coupling currents). The main limiting factor is the possible flow of neutral current in the earthing circuits. For selectivity and in order to avoid malfunctions, each situation must be carefully studied.



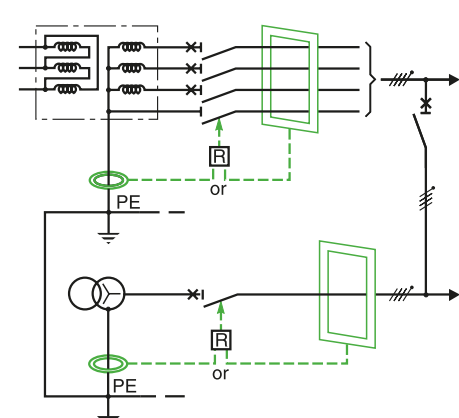
The two sources are never coupled.



The two sources may be coupled.



Coupling via the load and DC bus.



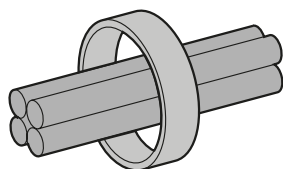
Multi-source diagram with TN system.

VigiPacT Devices

Applications

E

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Magnetic ring for conductors.

Recommendations for Toroid Installation

For measurements of residual currents using RCDs with separate toroids, a number of simple rules must be observed to avoid nuisance tripping, i.e.:

- Install the conductors in the measurement toroids
- Take into account the operational current of the toroids
- Install the toroid on a straight section of the conductors
- Use a magnetic ring if:
 - Transient currents are high ($\approx 6 I_n$ where I_n is the maximum permissible continuous current for the toroid)
 - The application requires high sensitivity (eg. $I_{\Delta n} = 30 \text{ mA}$)
 - The nominal current for the application is in the neighbourhood of the maximum permissible current of the toroid.

Further information is provided on these rules in the section on device installation.

Rated Operational Current of the Sensors

Particular precautions may be required for toroid installation. This is because high currents “but not an insulation fault” can locally saturate the magnetic circuit of the toroid, creating abnormal flows that are interpreted on the secondary winding as zero-sequence currents.

The rated operational current for the toroids used with VigiPacT devices:

- Is indicated for the minimum setting value at 30 mA
- Takes into account inrush currents (up to $6 I_n$).

Selection of toroids and rectangular sensors depending on the power circuit
See [page B-11](#).

Example 1. A motor feeder (30 kW/57 A at 400 V) must be monitored by a VigiPacT device with a toroid having a minimum diameter of 30 mm (TA30).

This means that the device may be set to 30 mA instantaneous without risk of nuisance tripping.

The rated operational current must be taken into account to avoid nuisance tripping, however, higher currents will not damage the toroid.

Example 2. On the motor feeder mentioned in example 1, the inrush current is, in fact, significantly higher than $6 I_n$.

To avoid possible tripping, it may be necessary to:

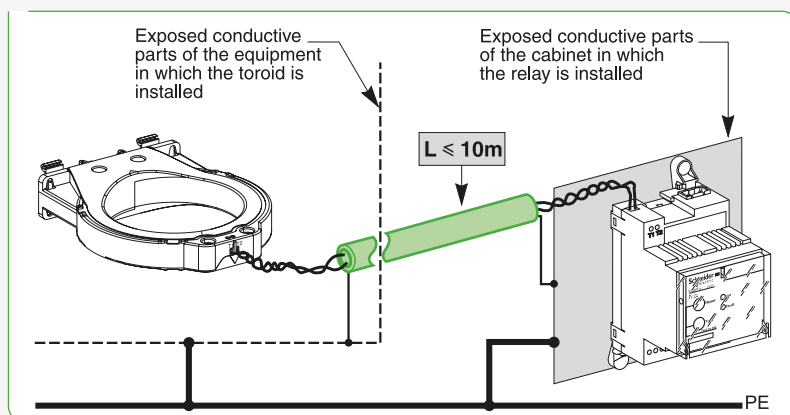
- Use a toroid having a larger diameter
- Set up a time delay complying with the safety rules ($< 1 \text{ s}$) and selectivity requirements for the upstream RCDs.

These two measures may be implemented simultaneously.

Disturbed Environments

Measurements in disturbed environments may require special precautions:

- Greater distance between the toroid wires and power circuits
- Use of shielded, twisted cables with the shielding connected at each end.
It is necessary to check that equipotential bonding exists between the exposed conductive parts to which the shielding is connected on the toroid side and those to which the shielding is connected on the VigiPacT side.
If that is not the case, the shielding may act as the equipotential bond for the low-frequency currents and that is not its job. There is the risk that the cable may be damaged and/or the VigiPacT device may malfunction. A PE conductor is required for equipotential bonding.
- Reduction to the shortest length possible for the cable between the toroid and the relay
- Use of a dedicated supply with galvanic isolation to eliminate conducted disturbances.



VigiPacT Devices

Questions and Answers

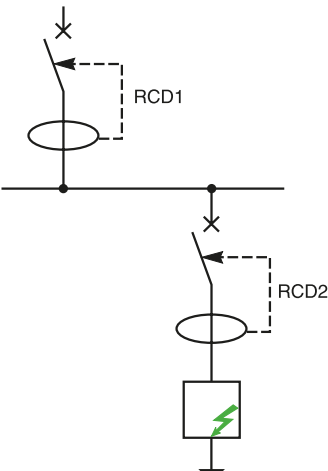
Combinations of RCDs

Is it possible to combine different types of RCDs (type AC, A and B)?

To confirm the validity of the combination, it is necessary to check the type of insulation fault downstream that the RCD combination will have to monitor. If each of the RCDs in the combination is compatible with all the possible types of faults, selectivity between the RCDs is achieved, even when different types are employed, as long as the selectivity rules are observed.

The table below sums up the possible combinations:

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The diagram shows a power line with two RCDs. RCD1 is upstream of RCD2. A fault (lightning bolt) is shown downstream of RCD2.

Possible combinations of RCD types				Optimized solutions for type B fault	
RCD1 type	AC or A or B	A or B	B	A	A and check proper coordination See Guide RCD CA908066E
RCD2 type ^[1]	AC or A or B	A or B	B	B + isolating transformer or A + class 2 insulation	B
Type of fault	AC	A	B	B	B

[1] Capable of handling the fault.

E



Earth Fault Protection Guide

Leakage-Current Monitoring Using RCDs

An isolation fault causes a zero-sequence leakage current and, depending on the system earthing arrangement, tripping of the protection device specified by the installation rules.

But a zero-sequence current can also be caused by:

- Intentional leakage current, e.g. a high-frequency filter installed between the system and earth
- Non-dangerous leakage currents, e.g. a progressive insulation fault or an insulation fault on the neutral conductor.

These two types of leakage current do not create dangerous situations and the continuity of service must be maintained, consequently the protection devices must not react and operation must continue.

These currents can, however:

- Degrade and become dangerous (risk of fire or electrocution), and as a result force the operator to shut down the dangerous part of the installation
- Create disturbances on the distribution system leading to the malfunction of sensitive equipment.

Measurement of the leakage current is the means to prevent the risk of a dangerous fault.

Monitoring the Neutral Conductor in TN-S Systems

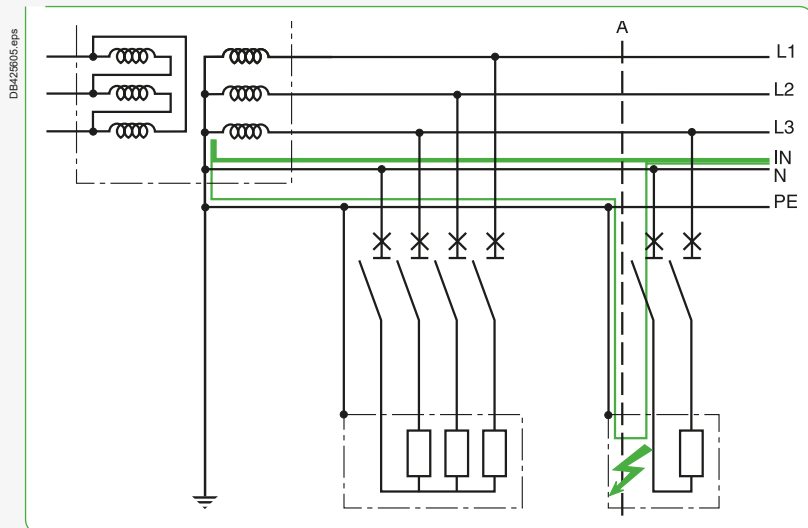
In the TN-S system, the neutral conductor is connected to the PE at the head of the installation. The neutral conductor can be accidentally earthed due to an insulation fault.

■ Safety of life and property

There is no problem because no dangerous touch voltages are created given that the natural voltage of the neutral conductor is the same as that of the PE.

■ Power quality

In the TN-S system, accidental earthing of the neutral conductor can cause malfunctions due to the flow of currents from the neutral conductor to the protective conductor and the exposed conductive parts. This type of fault in fact transforms the TN-S system into a TN-C, which is forbidden for the supply of sensitive equipment.



Insulation fault on the neutral conductor. The system is TN-C upstream of A.

Tolerance for an insulation fault on the neutral conductor depending on the system earthing arrangement

	TN-C	TN-S	TT	IT
Equipment sensitive to EM disturbances	Forbidden PE and neutral are the same	OK But PE and neutral must not be in contact	Excellent No problem even if PE and neutral are in contact	Excellent No problem even if PE and neutral are in contact

Leakage-Current Monitoring Using RCDs

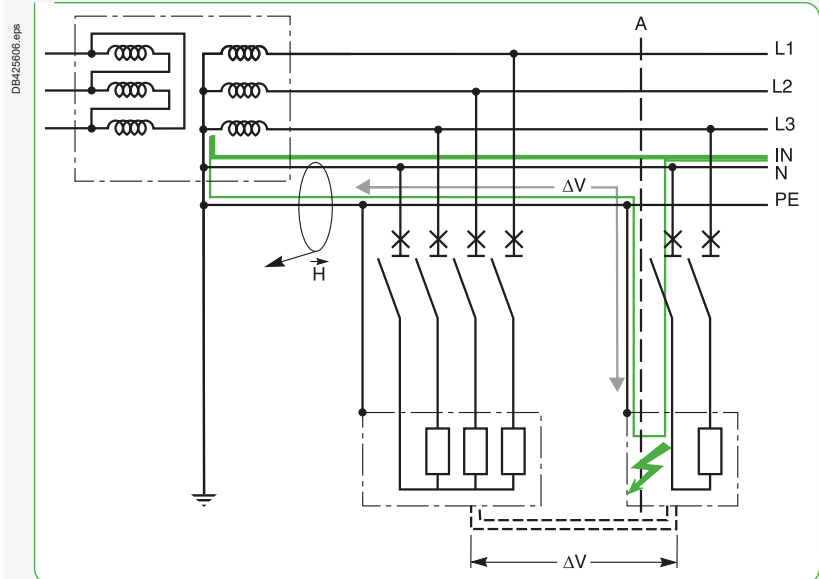
Consequences of an Isolation Fault on the Neutral Conductor

In the TN-S system, an earth fault on the neutral causes:

- "noise" in the earthing circuits for sensitive equipment
- Emission of EM fields (disturbances).

Note: the currents in the exposed conductive parts are zero-sequence currents, i.e. with significant EM radiation. What is more, computer equipment is sensitive. A force of 1 A at a distance of one meter disturbs the screen of a PC.

- Differences in potential between the 0V of the different equipment.



Effects of a fault on the neutral conductor in the TN-S system.

The gravity of these phenomena is increased by:

- The presence of non-linear loads with high THDI values
- The presence, often significant, of third-order harmonics and their multiples.

In this case, the neutral current represents from 50 to over 100 % of the current in the phases.

These new constraints require the use of a device to monitor the zero-sequence currents.

Leakage-Current Monitoring Using RCDs

Measurement of Leakage Currents

■ Management of leakage currents

RMH and RM12T devices provide the means to monitor circuit loading and equipment layout and make sure the leakage currents are distributed correctly and do not disturb the protection system.

■ Table for leakage currents

Electrical equipment		Measured leakage current (mA)
Printer		< 1
Workstation (UC, screen and printer)		1 to 3
Photocopy machine		0.5 to 1.5
Floor heating		1 mA/kW
Single-phase and three-phase filters		1 mA/load
Computer equipment as per standard IEC 60950		Maximum leakage current (mA)
Class 2	All equipment	0.25
Class 1	Portable	0.75
Class 1	A-type fixed or mobile ^[1]	3.5
Class 1	B-type fixed ^[2]	3.5 or 5 % I _n

^[1] A-type equipment: equipment intended for connection to the electrical installation of building via a non-industrial outlet, a non-industrial connector or both.

^[2] B-type equipment: equipment intended for connection to the electrical installation of building via an industrial outlet, an industrial connector or both in compliance with standard IEC 60309 or similar national standards.

In addition to sensitive equipment and loads, the lighting circuits must also be monitored.

The starters for fluorescent lighting have more or less significant levels of natural leakage current. Damage to a starter often causes a major increase in the leakage current.

Leakage-Current Monitoring Using RCDs

RHUs and RHU Application Diagram

Small Distribution Systems

The RHUs and RHU may be used to measure the leakage currents.

Selection table

Products	Part no.
RHUs or RHU	LV481000 to LV481003
A-type toroids ^[1]	50437 to 50442
TOA-type toroids ^[2]	50420 or 50421

■ New.

■ Renovation.

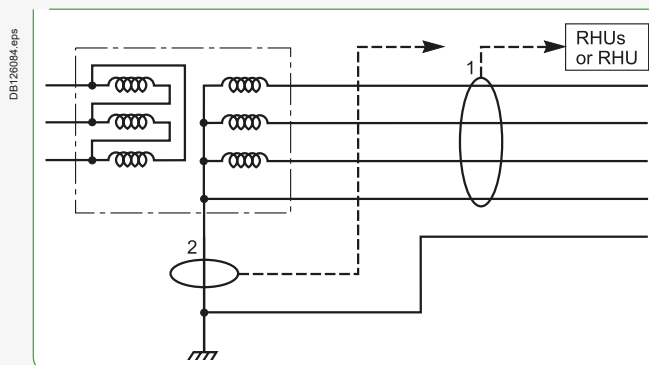
[2] In this case, the diameter of the toroid is generally much smaller than [1].

Setting

Depending the leakage currents of the supplied equipment, from 30 mA to 1 A.

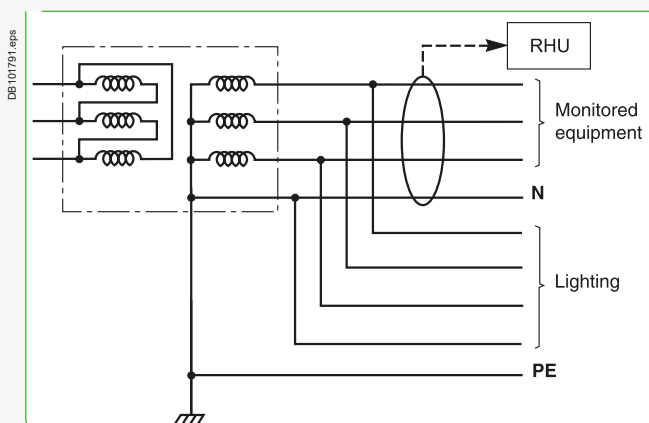
Installation

- Head of LV distribution system



Small distribution systems.

- The natural leakage currents caused by lighting are significant and interfere with insulation monitoring of the monitored equipment. Measurements are made directly on the monitored equipment.



Leakage-Current Monitoring Using RCDs

RMH Application Diagram

Computer Rooms

Selection table

Products	Part no.
RMH	LV481004
RM12T	28566
A-type toroids ^[1]	50437 to 50442
TOA-type toroids ^[2]	50420 or 50421

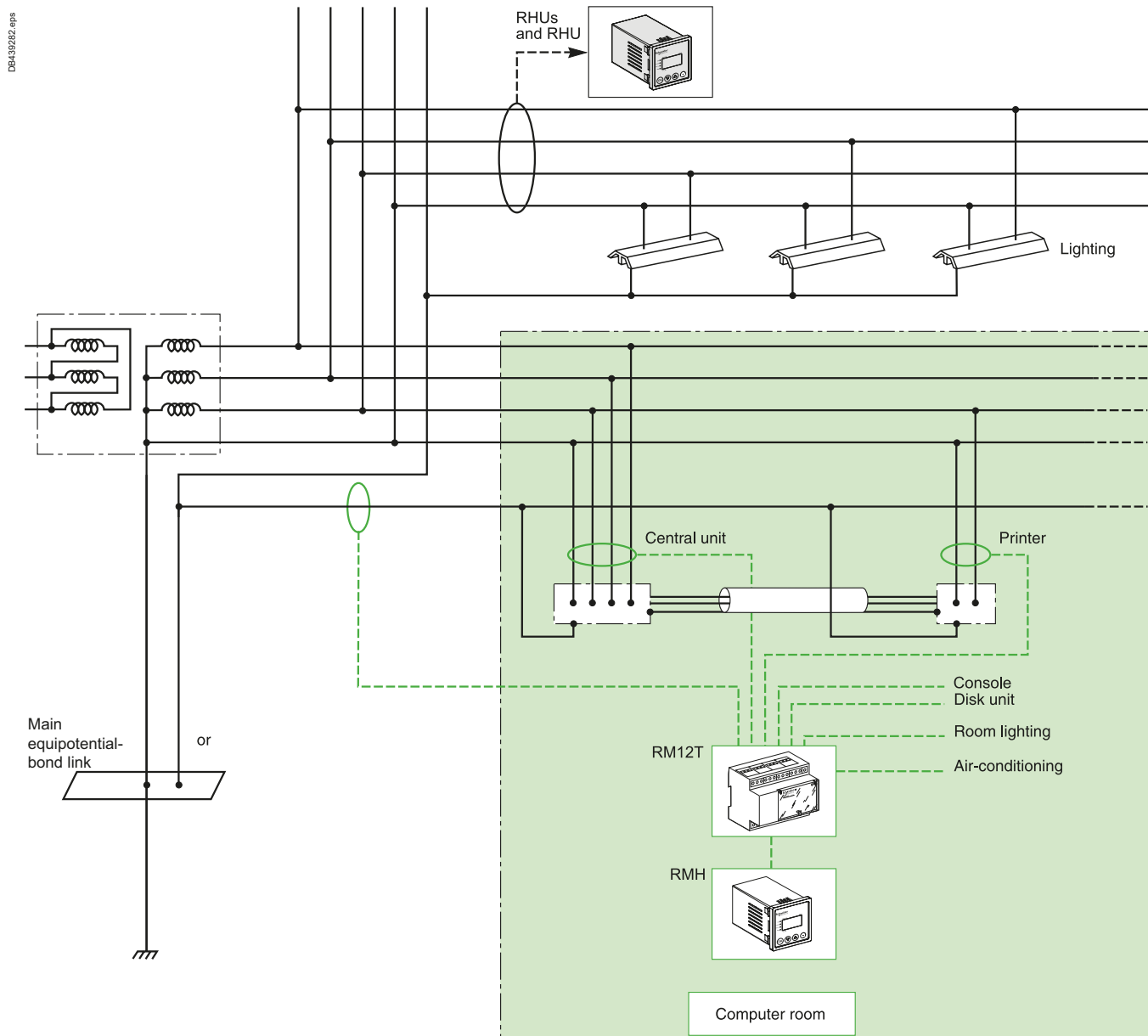
■ New. ■ Renovation.

[2] In this case, the diameter of the toroid is generally much smaller than [1].

Setting

These relays are installed in situations where the leakage currents can be high, up to 5 % of the rated load current:

- A few amperes for the shielding earthing
- From 0.3 to 1 A for each device and the lighting.



Computer room.

Leakage-Current Monitoring Using RCDs

PC Network

Selection table

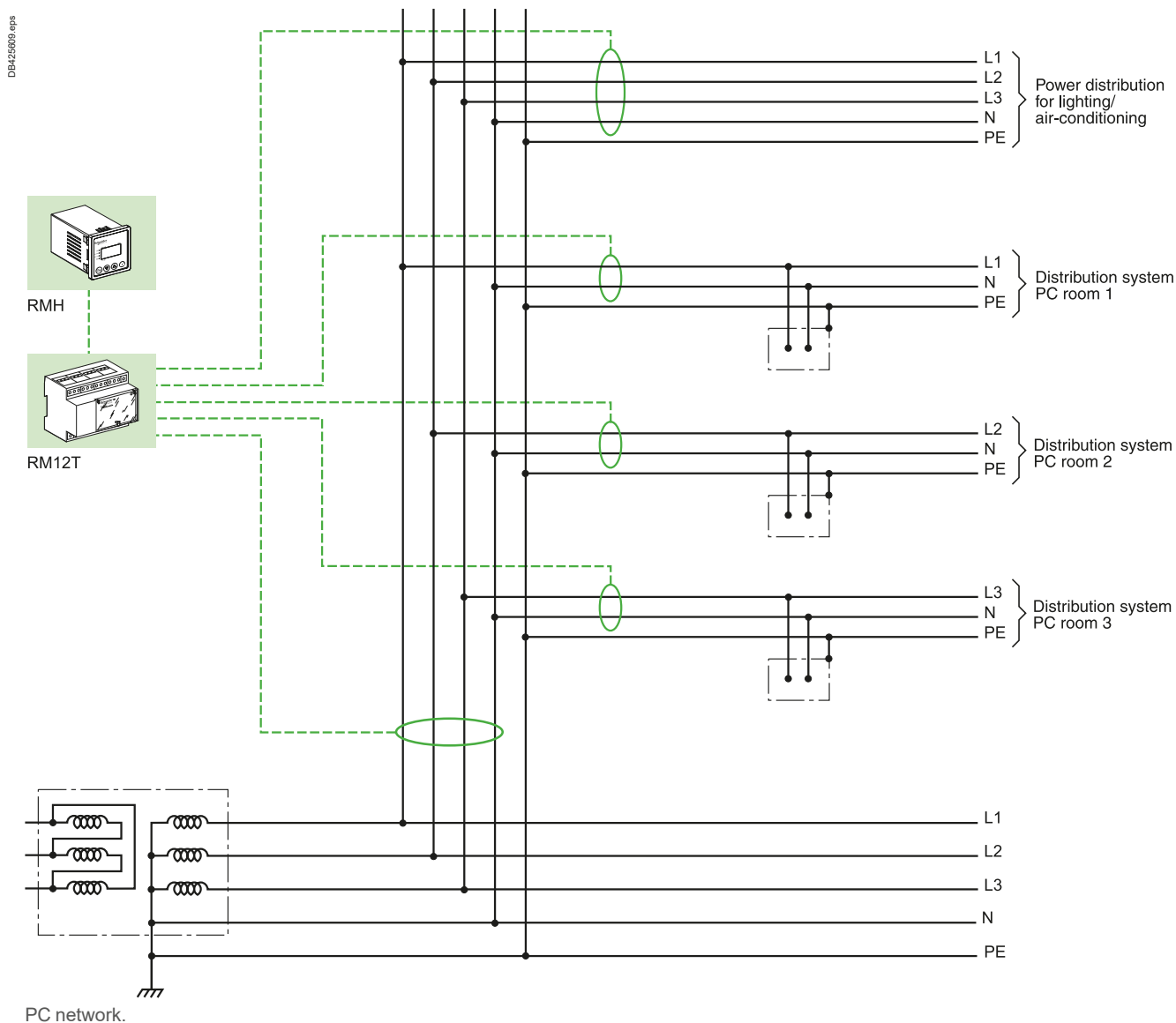
Products	Part no.
RMH	LV481004
RM12T	28566
A-type toroids ^[1]	50437 to 50442
TOA-type toroids ^[2]	50420 or 50421

■ New ■ Renovation

[2] In this case, the diameter of the toroid is generally much smaller than [1].

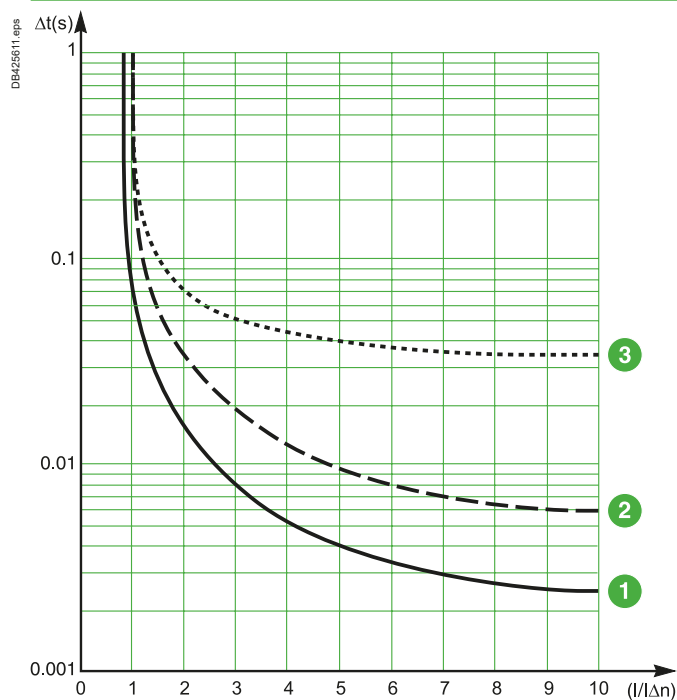
- Check on the overall leakage current, from 1 to a few amperes
- Check on the distribution of the leakage currents in each distribution system,
 $I_{\text{leakage}} = 300 \text{ mA to } 1 \text{ A}$
- Fluorescent lighting from 0.3 to 1 A.

If there is a significant difference between each supply, reconsider the supply for the workstations.

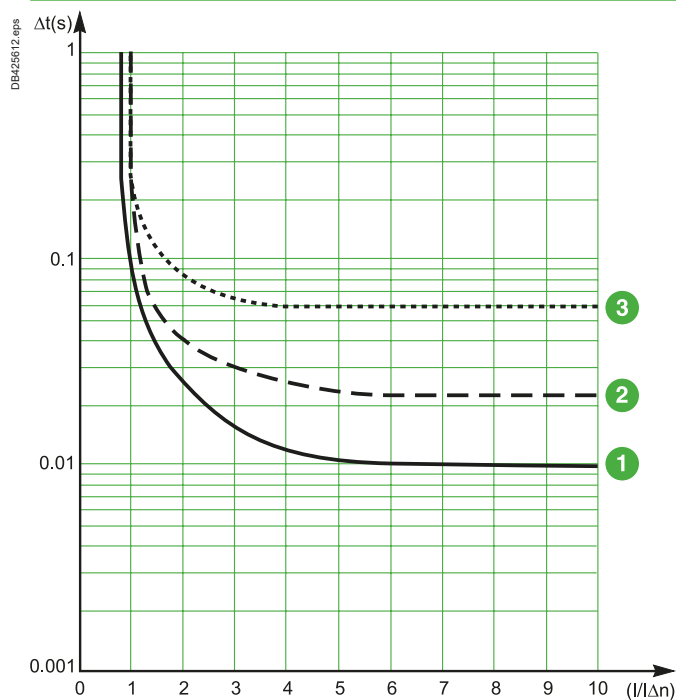


Tripping Curves and Frequency Filtering

RH10, RH21, RH68, RH86 and RH99

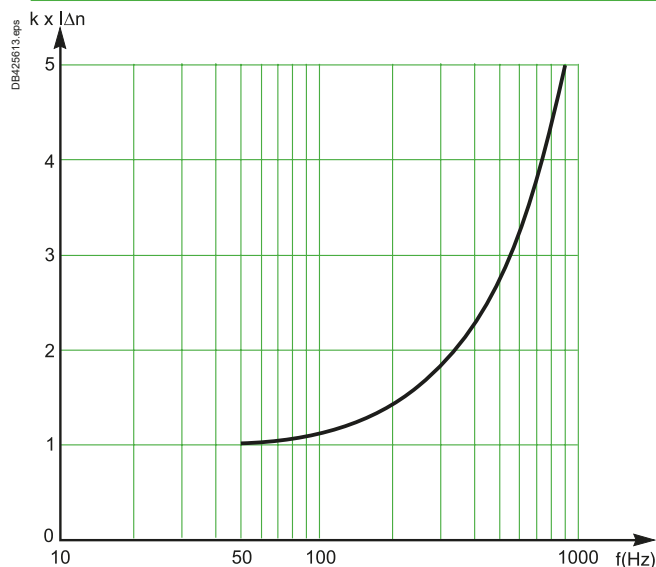
Instantaneous Relay, $I\Delta n$ Setting = 30 MA

- 1 Non-operating time.
- 2 Operating time.

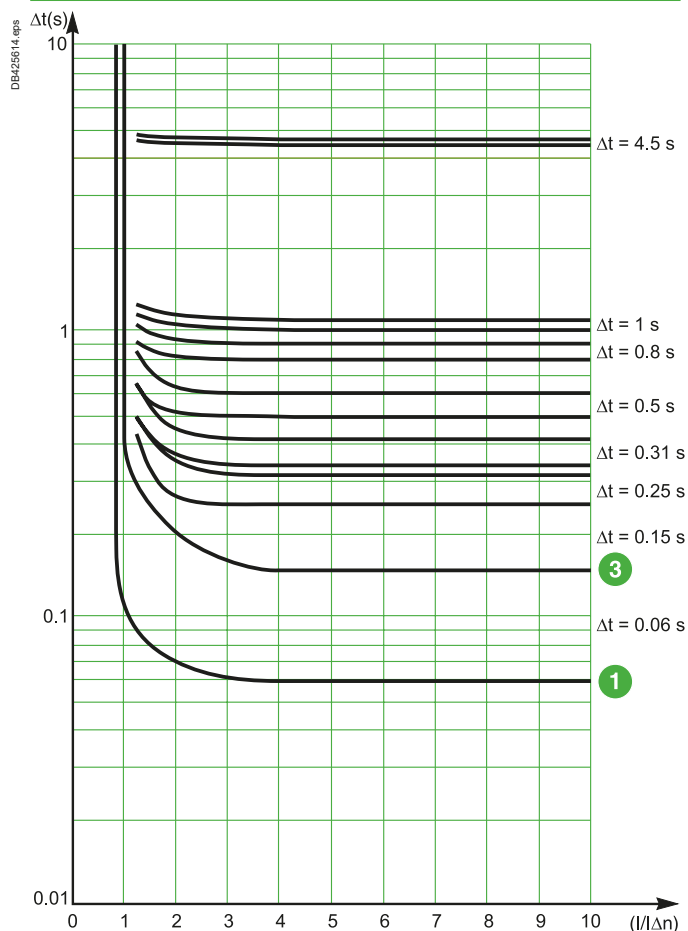
Instantaneous Relay, $I\Delta n$ Setting > 30 MA

- 3 Total break time.

Frequency Filtering



Example
 At 50 Hz, the tripping threshold is $I\Delta n$.
 At 900 Hz, the tripping threshold is $k \times I\Delta n$ (where $k = 5$).

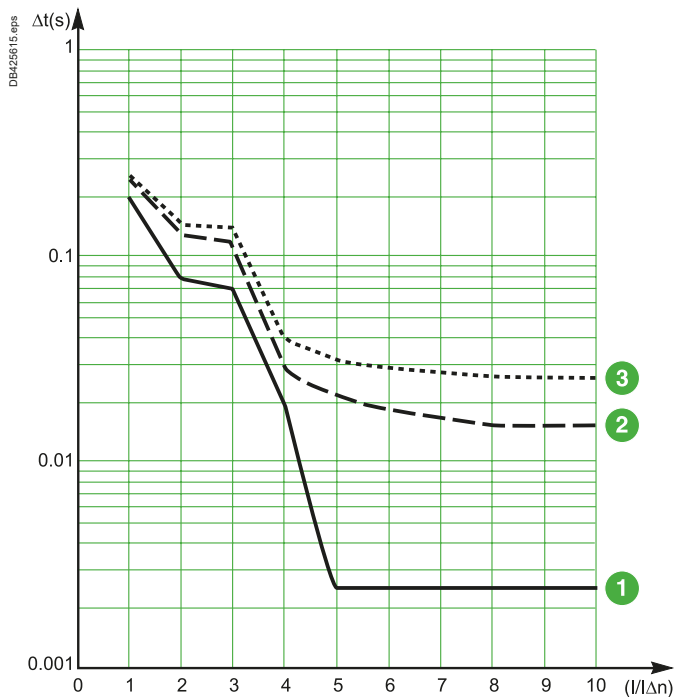
Delayed Relay for $I\Delta n > 30$ MA

E

Tripping Curves and Frequency Filtering

RH197M

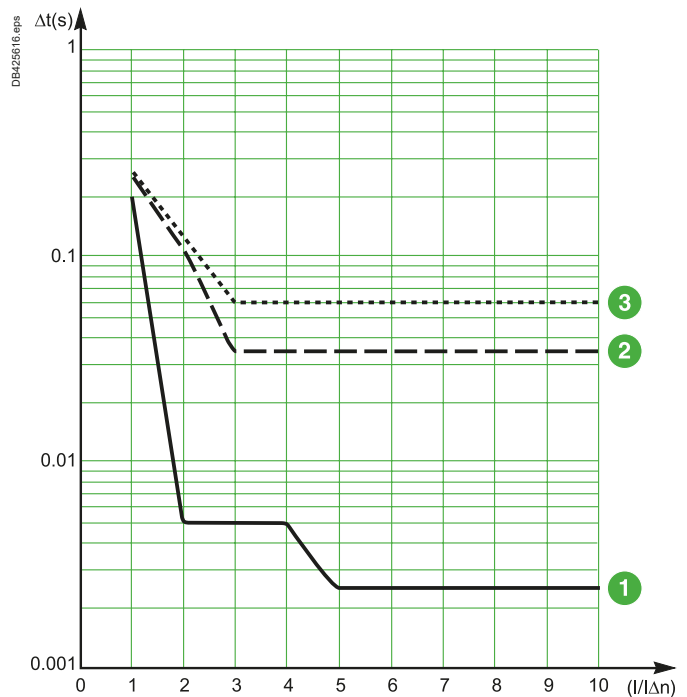
Instantaneous Relay, $I\Delta n$ Setting = 30 MA



1 Non-operating time.

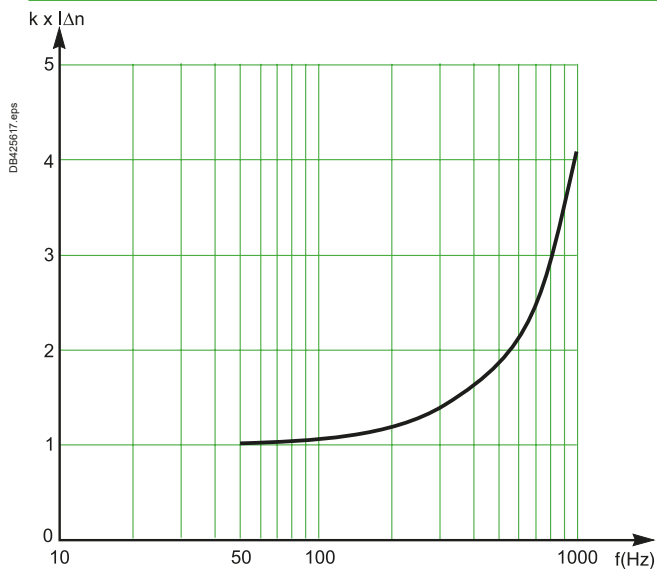
2 Operating time.

Instantaneous Relay, $I\Delta n$ Setting > 30 MA



3 Total break time.

Frequency Filtering

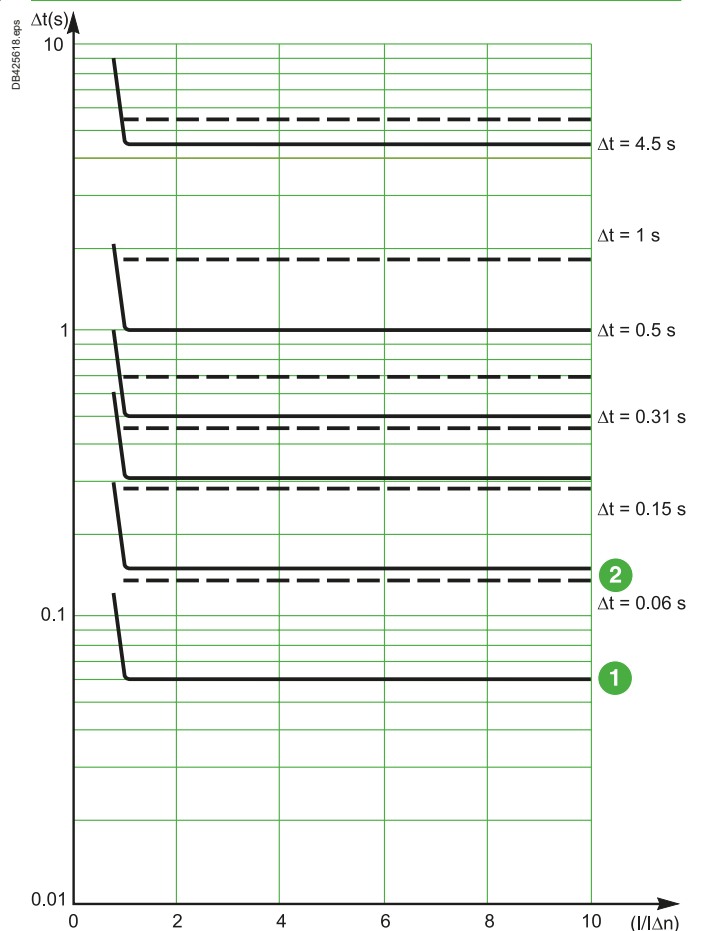


Example

At 50 Hz, the tripping threshold is $I\Delta n$.

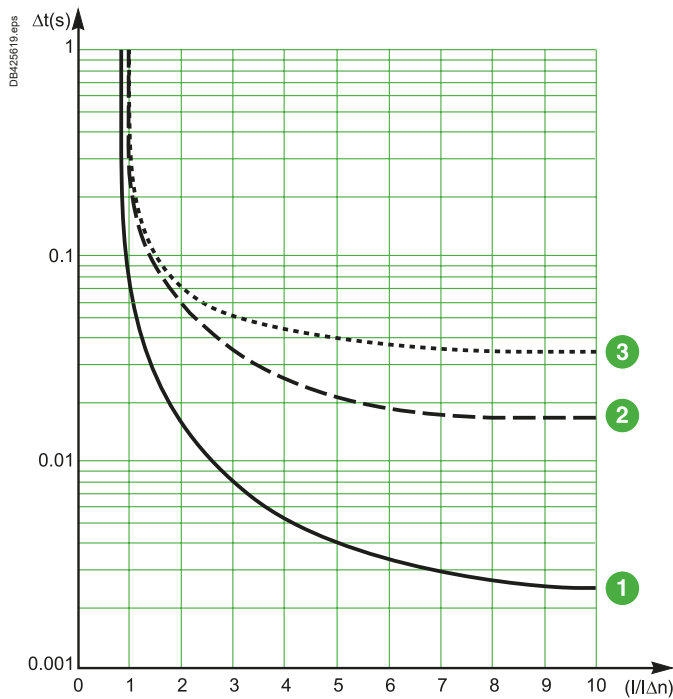
At 900 Hz, the tripping threshold is $k \times I\Delta n$ (where $k = 5$).

Delayed Relay for $I\Delta n > 30$ MA

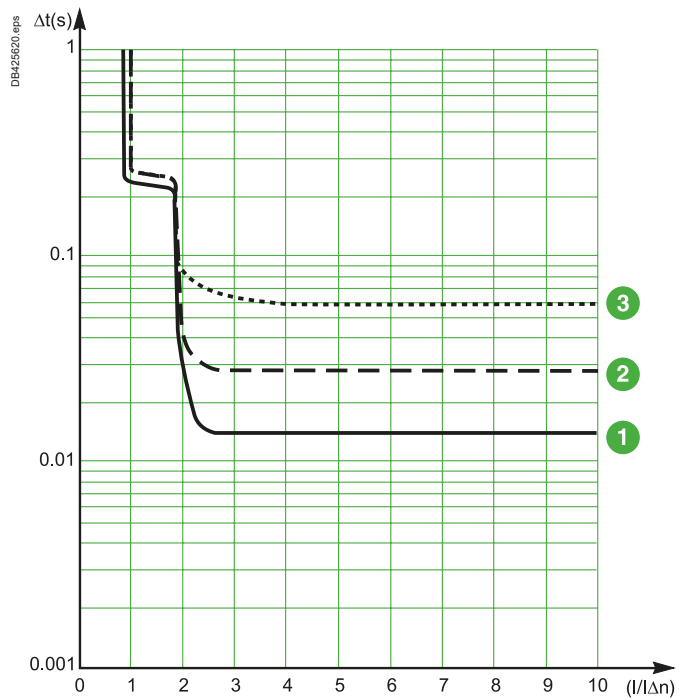


Tripping Curves and Frequency Filtering

RH197P

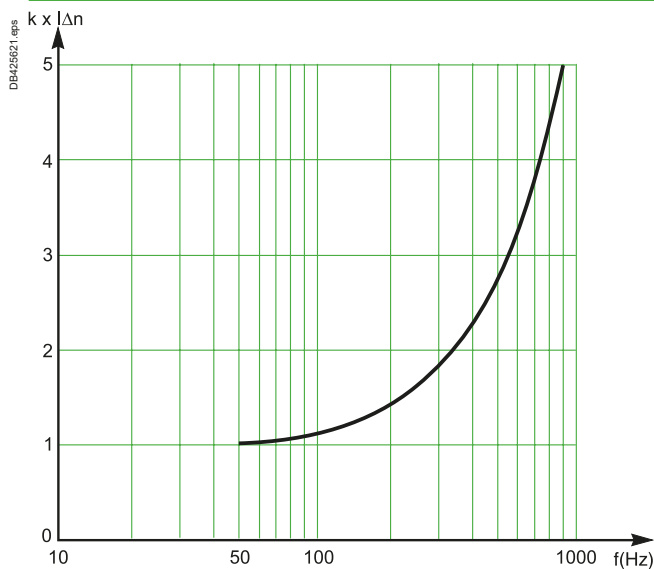
Instantaneous Relay, $I\Delta n$ Setting = 30 MA

- 1 Non-operating time.
- 2 Operating time.

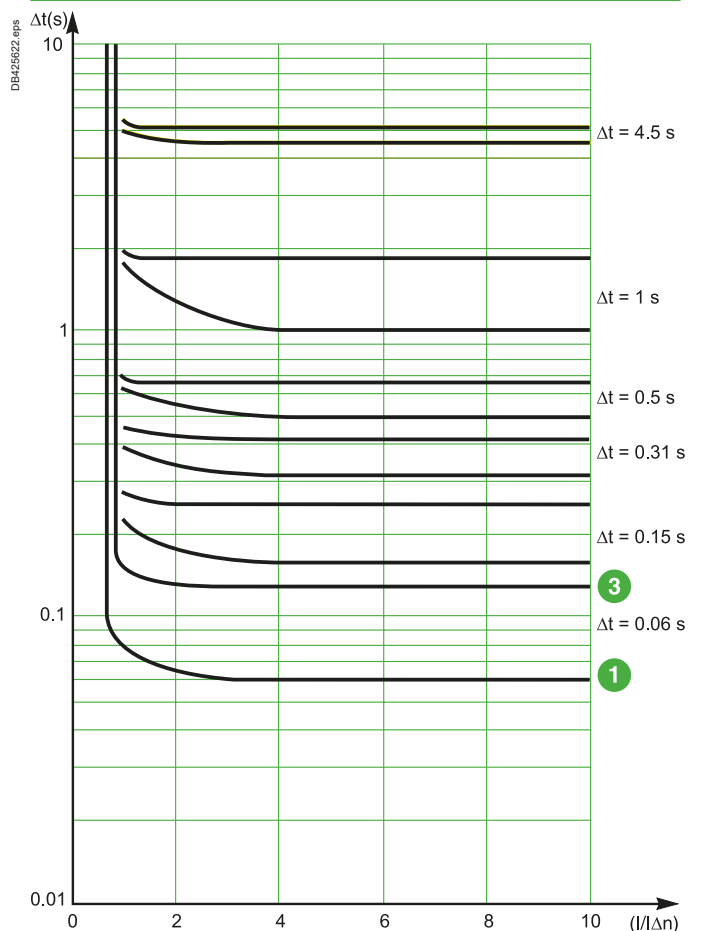
Instantaneous Relay, $I\Delta n$ Setting > 30 MA

- 3 Total break time.

Frequency Filtering



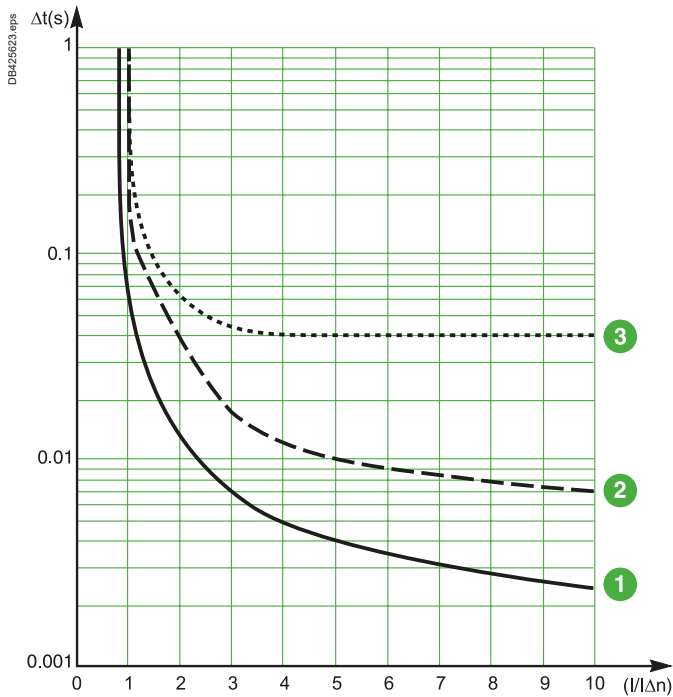
Example
At 50 Hz, the tripping threshold is $I\Delta n$.
At 900 Hz, the tripping threshold is $k \times I\Delta n$ (where $k = 5$).

Delayed Relay for $I\Delta n > 30$ MA

E

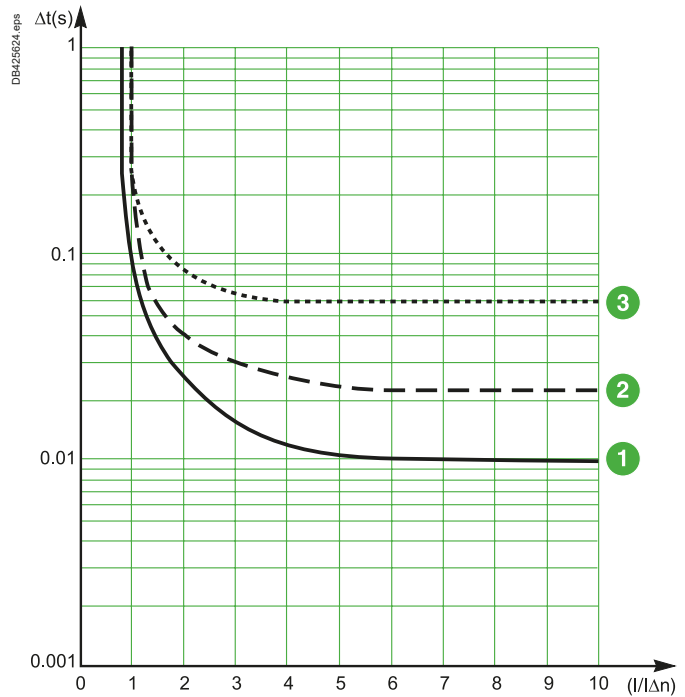
Tripping Curves and Frequency Filtering

RHUs and RHU

Instantaneous Relay, $I\Delta n$ Setting = 30 MA

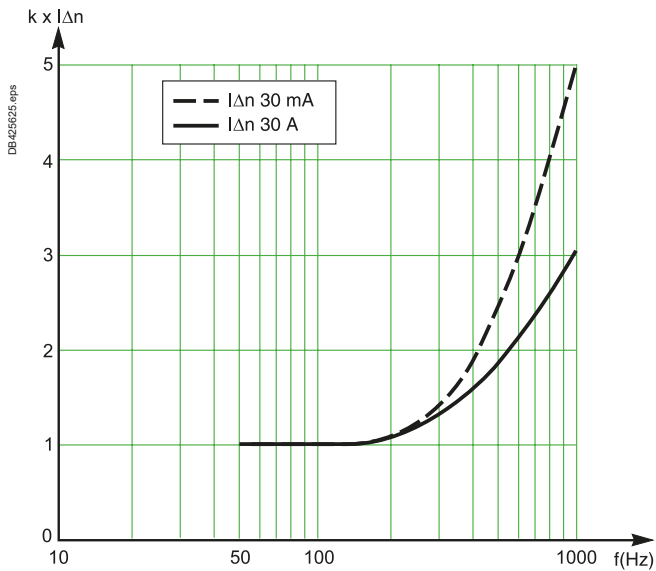
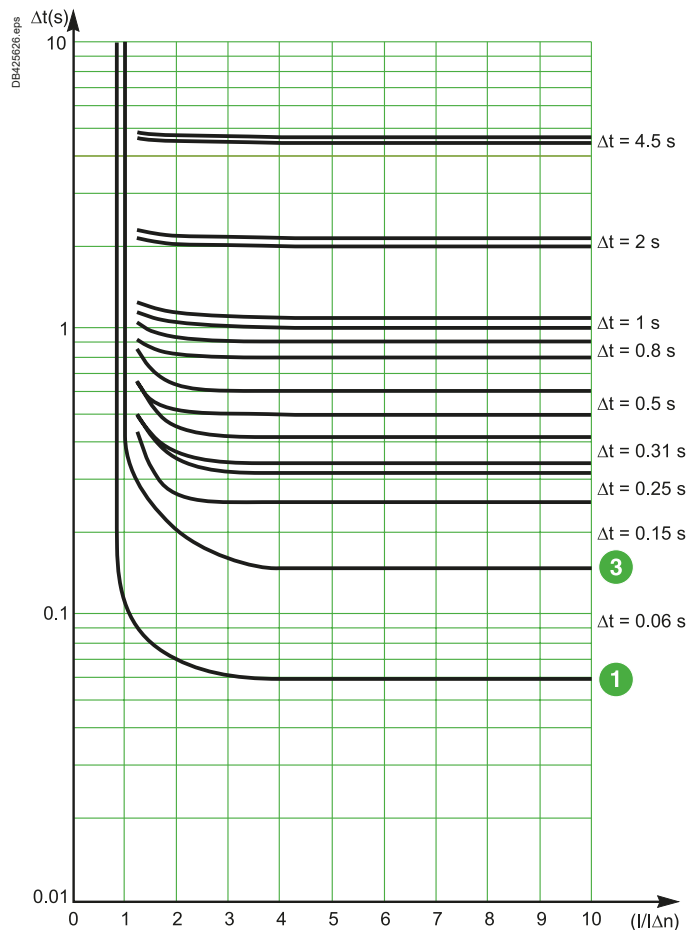
1 Non-operating time.

2 Operating time.

Instantaneous Relay, $I\Delta n$ Setting > 30 MA

3 Total break time.

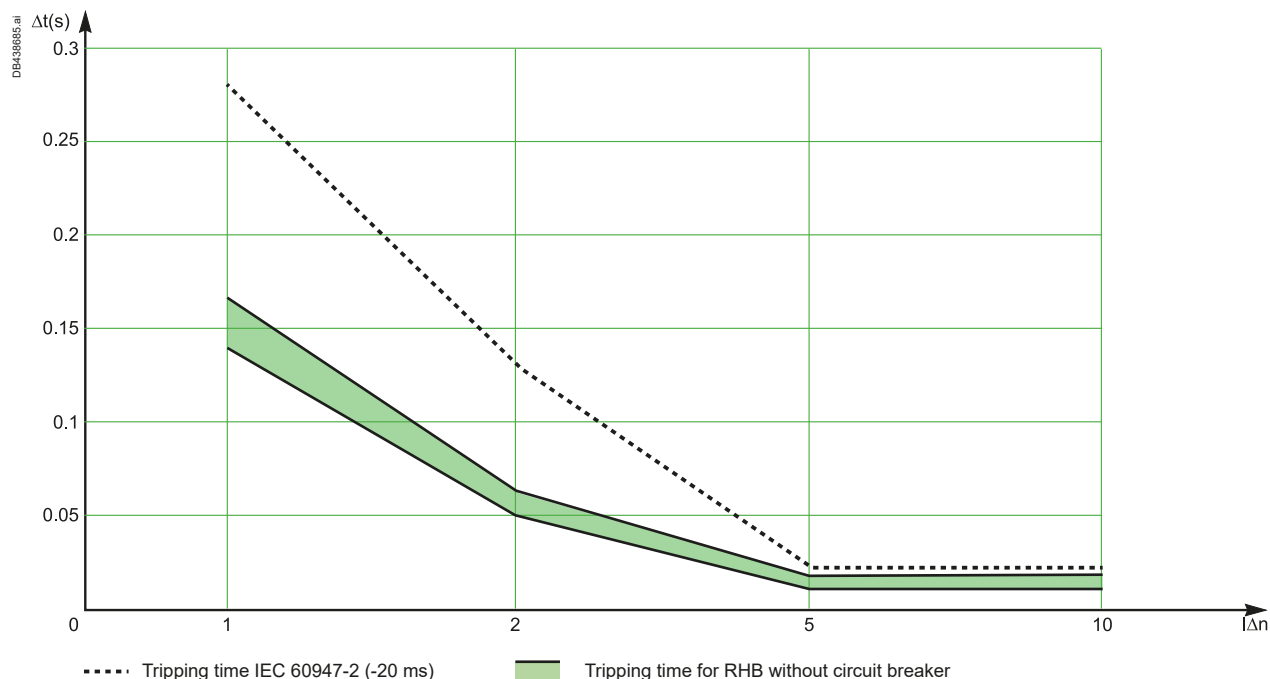
Frequency Filtering

Delayed Relay for $I\Delta n > 30$ MA

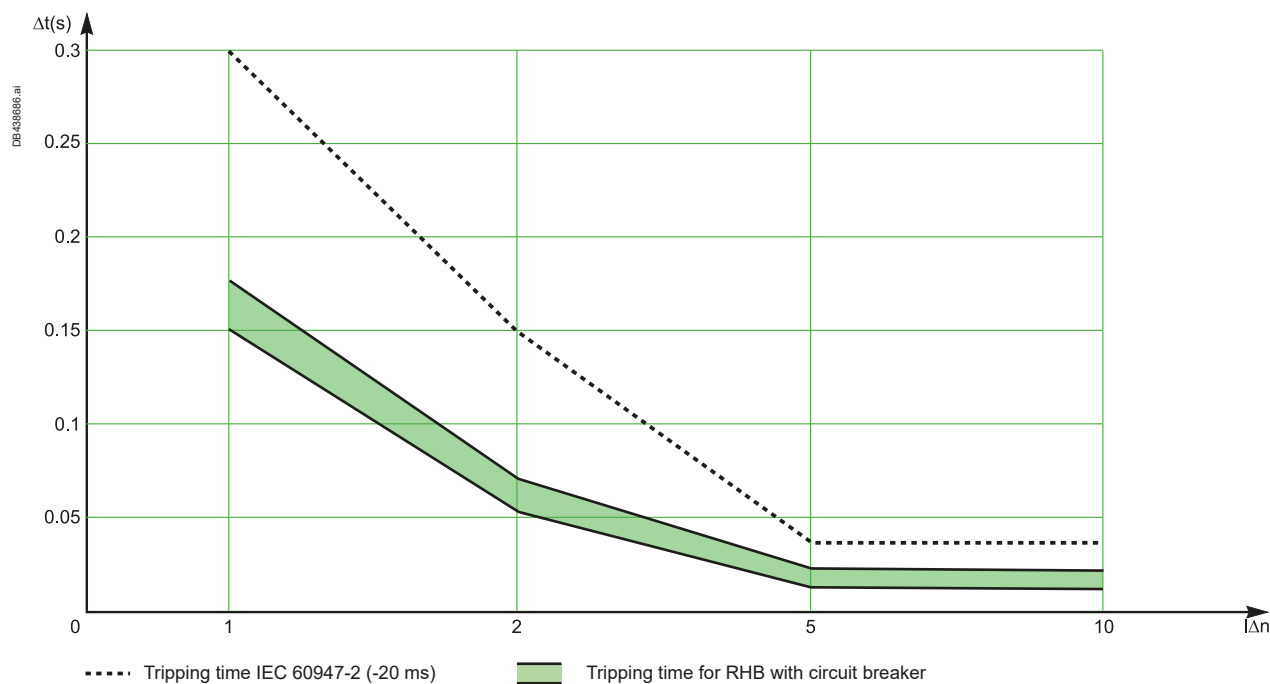
Tripping Curves and Frequency Filtering

RHB

Tripping Time without Circuit Breaker



Tripping Time with UVR and Circuit Breaker

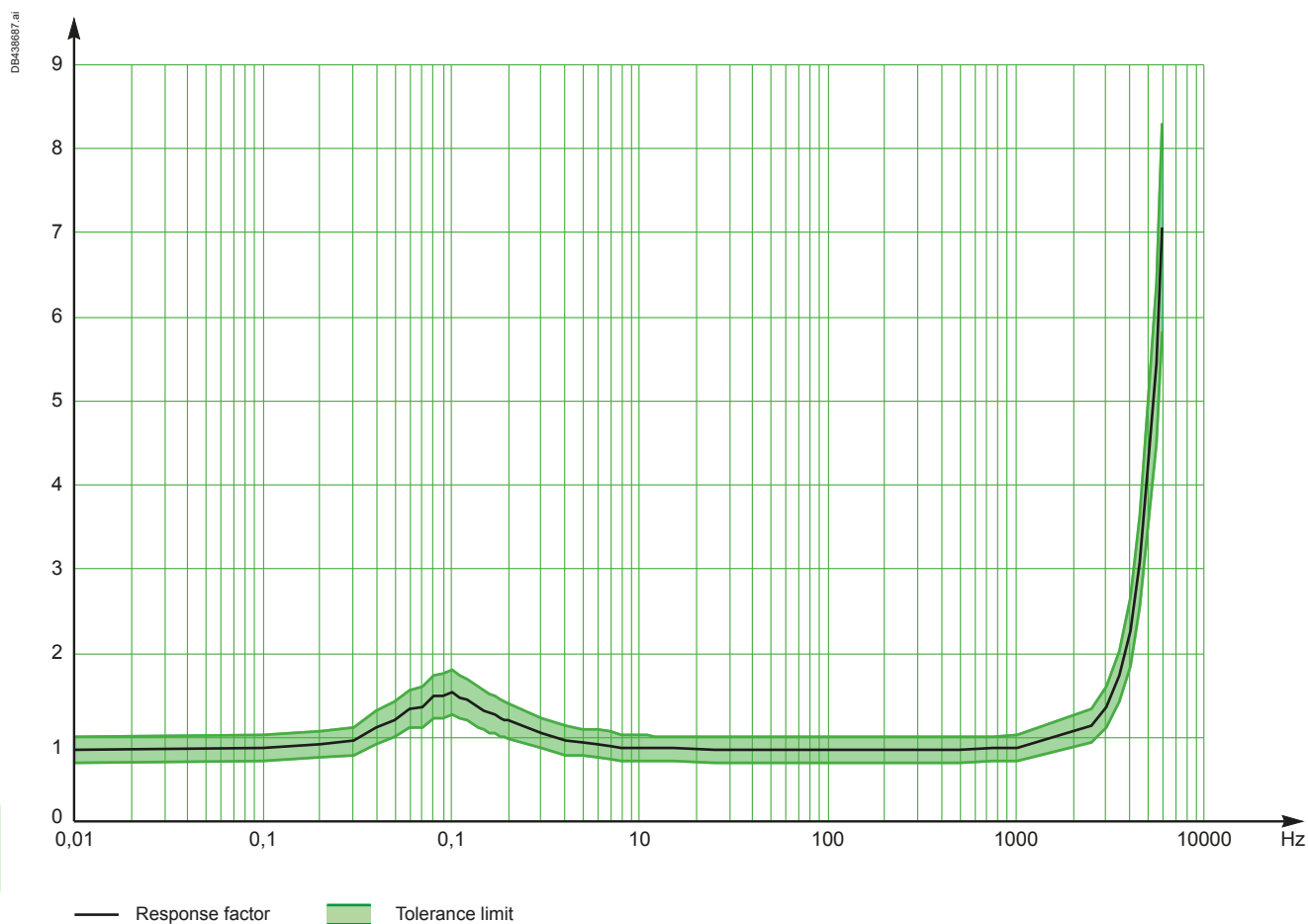


E

Tripping Curves and Frequency Filtering

RHB

Frequency Curve MRCD



Catalog Numbers

Residual-Current Protection Relays	F-2
Residual-Current Protection Relays or Monitoring Relays	F-4
Toroids and Rectangular Sensors, Communication Module, Accessories.....	F-5

F

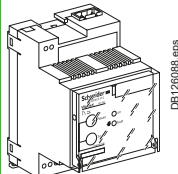
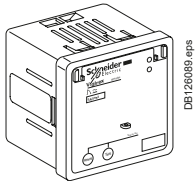
Other Chapters

Functions and Characteristics.....	A-1
Installation Recommendations.....	B-1
Dimensions and Connection	C-1
Wiring Diagrams	D-1
Additional Characteristics.....	E-1

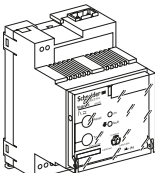
Residual-Current Protection Relays

Residual-Current Protection Relays

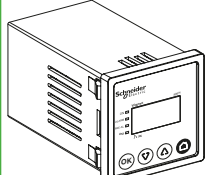
RH10 with Local Manual Fault Reset

System to be protected		LV ≤ 1000 V	 DIN-rail mount.  Front-panel mount.	
Sensitivity 0.03 A - instantaneous				
Power supply	12 to 24 V AC -12 to 48 V DC	50/60 Hz	56100	
	110 to 130 V AC	50/60 Hz	56120	
	220 to 240 V AC	50/60 Hz	56130	56230
	380 to 415 V AC	50/60 Hz	56140	
Sensitivity 0.1 A - instantaneous				
Power supply	110 to 130 V AC	50/60 Hz	56122	
	380 to 415 V AC	50/60 Hz	56142	
Sensitivity 0.25 A - instantaneous				
Power supply	220 to 240 V AC	50/60 Hz		56234
Sensitivity 0.3 A - instantaneous				
Power supply	12 to 24 V AC - 12 to 48 V DC	50/60 Hz	56105	56205
	110 to 130 V AC	50/60 Hz	56125	56225
	220 to 240 V AC	50/60 Hz	56135	56235
	380 to 415 V AC	50/60 Hz	56145	
Sensitivity 0.5 A - instantaneous				
	110 to 130 V AC	50/60 Hz		56226
Power supply	220 to 240 V AC	50/60 Hz	56136	
Sensitivity 1 A - instantaneous				
Power supply	220 to 240 V AC	50/60 Hz	56137	
	380 to 415 V AC	50/60 Hz	56147	

RH21 with Local Manual Fault Reset

System to be protected		LV ≤ 1000 V		
			 DIN-rail mount.	 Front-panel mount.
Sensitivity 0.03 A - instantaneous				
Sensitivity 0.3 A - instantaneous or with 0.06 s time delay				
Power supply	12 to 24 V AC - 12 to 48 V DC	50/60 Hz	56160	
	220 to 240 V AC	50/60 Hz	56163	56263
	380 to 415 V AC	50/60 Hz	56164	56264

RHUs with Local Manual Fault Reset

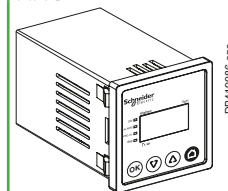
System to be protected		LV ≤ 1000 V	 DB419086.eps	
Alarm: sensitivity 0.015 A to 30 A - instantaneous or with 0 to 4.5 s time delay				
Fault: sensitivity 0.03 A to 30 A - instantaneous or with 0 to 4.5 s time delay				
Single-phase power supply	110 to 130 V AC	50/60 Hz	LV481000	
	220 to 240 V AC	50/60 Hz	LV481001	

Residual-Current Protection Relays

RHU with Local Manual Fault Reset (Communicating)

System to be protected LV ≤ 1000 V

RHU



DB419086.eps

Alarm: sensitivity 0.015 A to 30 A - instantaneous or with 0 to 4.5 s time delay

Fault: sensitivity 0.03 A to 30 A - instantaneous or with 0 to 4.5 s time delay

Single-phase power supply	110 to 130 V AC	50/60 Hz
	220 to 240 V AC	50/60 Hz

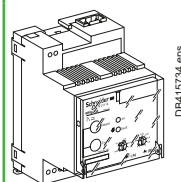
LV481002

LV481003

RH68 with Local Manual Fault Reset

System to be protected LV ≤ 1000 V

RH68M



DB415734.eps

DIN-rail mount.

Sensitivity 30 mA to 3A - instantaneous or with 0 to 1 s time delay

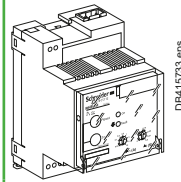
Power supply	220 to 240 V AC	50/60 Hz
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56168

RH86 with Local Manual Fault Reset

System to be protected LV ≤ 1000 V

RH86M



DB415733.eps

DIN-rail mount.

Sensitivity 30 mA to 10A - instantaneous or with 0 to 5 s time delay

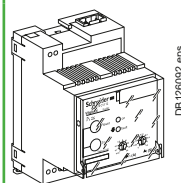
Power supply	220 to 240 V AC	50/60 Hz
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56500

RH99 with Local Manual Fault Reset

System to be protected LV ≤ 1000 V

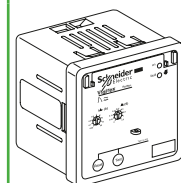
RH99M



DB126092.eps

DIN-rail mount.

RH99P



DB126093.eps

Front-panel mount.

Sensitivity 0.03 A to 30 A - instantaneous or with 0 to 4.5 s time delay

Power supply	12 to 24 V AC - 12 to 48 V DC	50/60 Hz
	48 V AC	50/60 Hz
	110 to 130 V AC	50/60 Hz
	220 to 240 V AC	50/60 Hz
	380 to 415 V AC	50/60 Hz
	440 to 525 V AC	50/60 Hz

56170

56171

56172

56173

56174

56175

56270

56272

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56274

56274

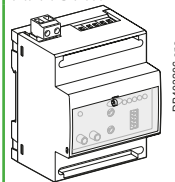
Residual-Current Protection Relays or Monitoring Relays

RH197 with Local Manual or Automatic Fault Reset^[1]

System to protected

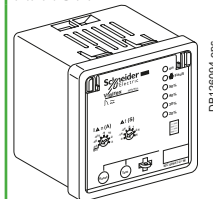
LV ≤ 1000 V

RH197M



DIN-rail mount.

RH197P



Front-panel mount.

Alarm: 50 % of fault threshold - instantaneous

Fault: sensitivity 0.03 A to 30 A - instantaneous or with 0 to 4.5 s time delay

Single-phase power supply

48 V AC - 24 to 130 V DC

50/60 Hz

56515

56505

110 to 130 V AC^[2]

50/60 Hz

56516

56506

220 to 240 V AC^[2]

50/60 Hz

56517

56507

380 to 415 V AC^[2]

50/60 Hz

56518

56508

Alarm: 100 % of fault threshold - instantaneous

Fault: sensitivity 0.03 A to 30 A - instantaneous or with 0 to 4.5 s time delay

Single-phase power supply

48 V AC - 24 to 130 V DC

50/60 Hz

56515

110 to 130 V AC^[2]

50/60 Hz

56516

56512

220 to 240 V AC^[2]

50/60 Hz

56517

380 to 415 V AC^[2]

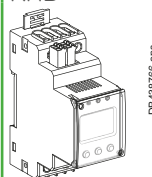
50/60 Hz

56518

^[1] Selected via a switch.^[2] RH197M: 110 V, 230 V, 400 V.

B Type Residual Current Protection Relay

RHB



DIN-rail mount.

Earth leakage relay VigiPacT B type RHB

LV481010

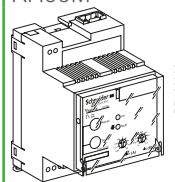
Monitoring Relays

RH99 with Automatic Fault Reset

System to be protected

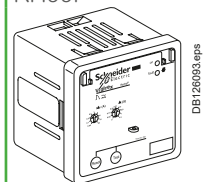
LV ≤ 1000 V

RH99M



DIN-rail mount.

RH99P



Front-panel mount.

Sensitivity 0.03 A - instantaneous

Sensitivity 0.1 A to 30 A - instantaneous or with 0 s to 4.5 s time delay

Power supply

12 to 24 V AC - 12 to 48 V DC

50/60 Hz

56190

56290

110 to 130 V AC

50/60 Hz

56192

56292

220 to 240 V AC

50/60 Hz

56193

56293

380 to 415 V AC

50/60 Hz

56194

440 to 525 V AC

50/60 Hz

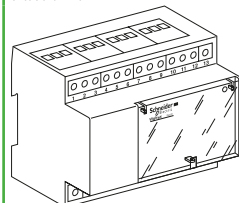
56195

RMH and Multiplexer RM12T (Communicating)

System to be monitored

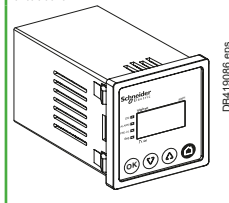
LV ≤ 1000 V

RM12T



DIN-rail mount.

RMH



Front-panel mount.

Pre-Alarm: sensitivity 0.015 A to 30 A - instantaneous or with 0 to 5 s time delay

Alarm: sensitivity 0.03 A to 30 A - instantaneous or with 0 to 5 s time delay

Single-phase power supply

220 to 240 V AC

50/60 Hz

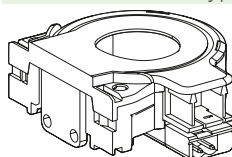
28566

LV481004

Toroids and Rectangular Sensors, Communication Module, Accessories

Sensors

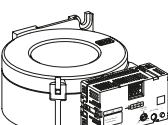
Closed toroids, A type

DB432472.eps		Type	I _e (A) rated operational current	Inside diameter (mm)	
		TA30	65	30	50437
		PA50	85	50	50438
		IA80	160	80	50439
		MA120	250	120	50440
		SA200	400	200	50441
		GA300	630	300	50442

Accessory for closed toroids

DB107032.eps		Magnetic ring	For TA30 toroid	56055
			For PA50 toroid	56056
			For IA80 toroid	56057
			For MA120 toroid	56058

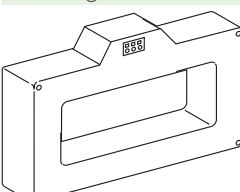
Closed toroids, B Type

DB438497.eps		Type	I _e (A) rated operational current	Inside diameter (mm)	
		TB35	63	35	LV481011
		TB60	125	60	LV481012
		TB120	250	120	LV481013
		TB210	400	210	LV481014
		TB35P	80	35	LV481015
		TB60P	160	60	LV481016

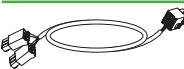
Split toroids, OA-type

DB419087.eps		Type	I _e (A) rated operational current	Inside diameter (mm)	
		TOA80	160	80	50420
		TOA120	250	120	50421

Rectangular sensors

DB126100.eps		Inside dimensions (mm)	I _e (A)	
		L1	1600	280 x 115 56053
		L2	3200	470 x 160 56054

Wiring Kit for Toroids, B Type

DB438498.eps		Wiring kit 1meter B type	LV481017
		Wiring kit 2.5meters B type	LV481018

Communication Module

DB421498.eps		Cable for Modbus serial link 1 x RJ45 and free wires at other end - Cable 3 m	VW3A8306D30
		Connector Modbus adaptor	LV434211



Note: sensor-relay link: twisted cable not supplied (see "Installation and connection" chapter).



Life Is On



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