EcoStruxure
Innovation At Every Level

PacT Series

VigiPacT

Catalog 2023

Residual-Current Protection Relays

se.com

Life Is On Schneider Electric

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Green Premium™

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- REACh substance information
- Industry leading # of PEP's*
- Circularity instructions

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Discover what we mean by green
Check your products!

*PEP: Product Environmental Profile (i.e. Environmental Product Declaration)

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435E1000

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, Com**PacT** 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 Vigi**PacT** 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).

Environmentally friendly 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.

Green Premium™

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.

Vigi**PacT**

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 Vigi**PacT** relay

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

RH197M/RH197P

RHUs and RHU

RHB

3 Protection
with the circuit breaker

Com**PacT** NSX100 to 630

Com**PacT** NSXm

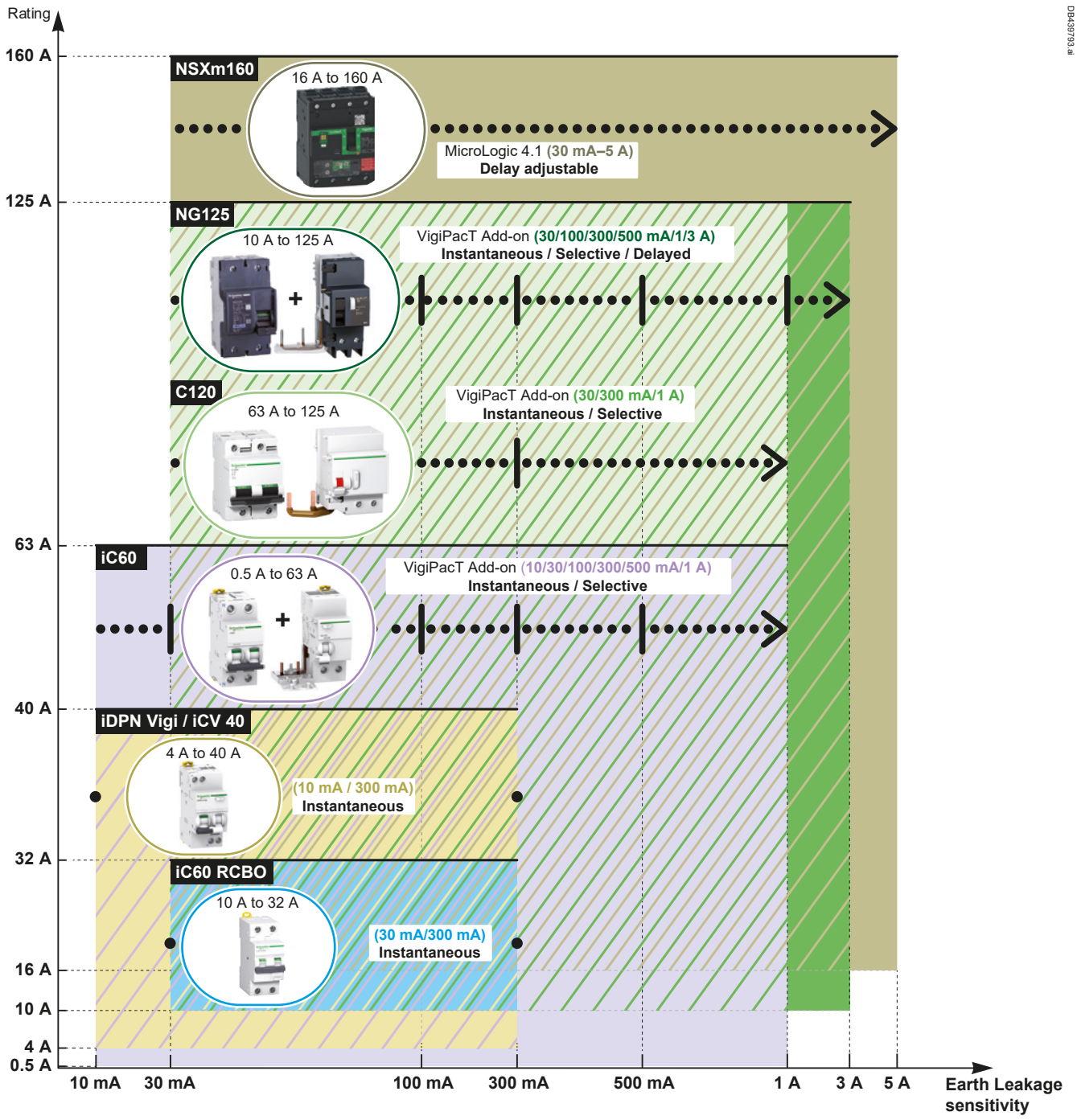
NG125

C120

Selecting The Appropriate Risidual Current Device

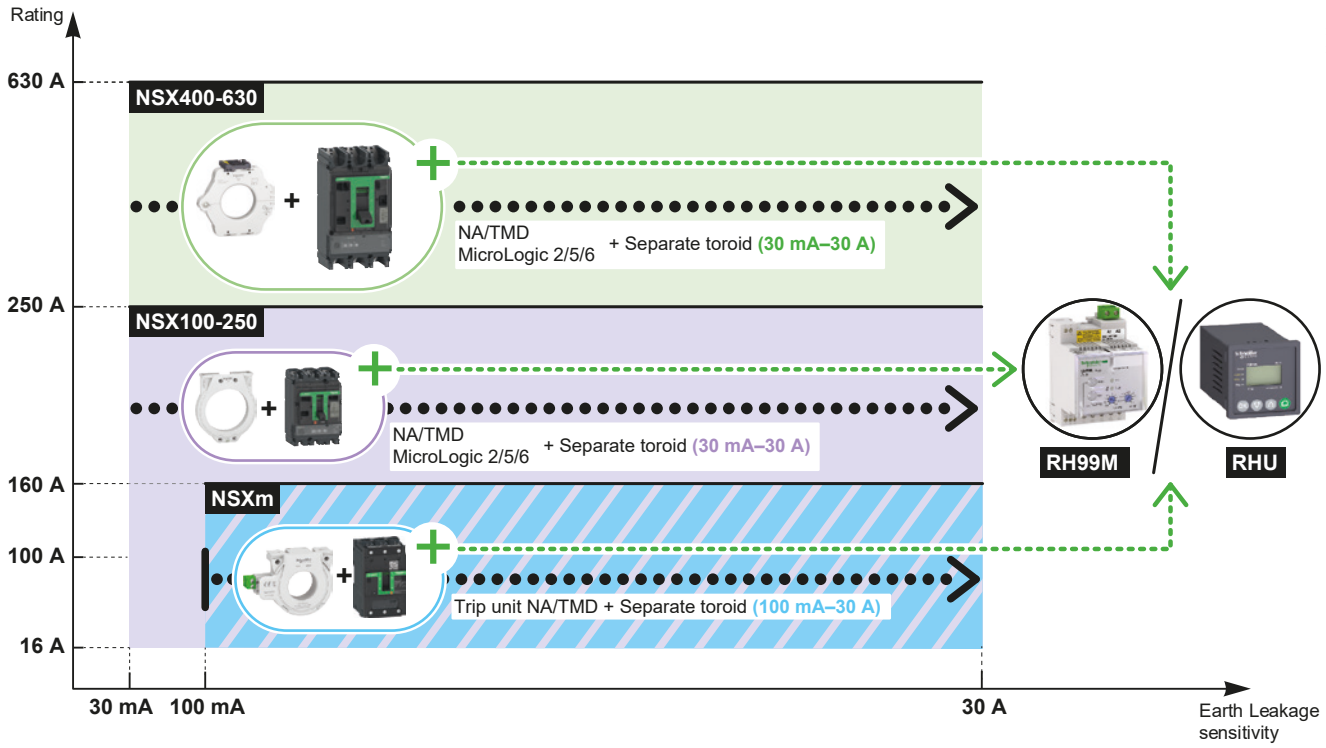
Residual current devices (RCDs) should be coordinated properly to achieve total selectivity, in addition to overcurrent protection. The selection of the appropriate type of RCD, in particular the type (AC, A, B, etc.) follows the same fire prevention as for protection against electric shock. See when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

The tables below are an illustration of breakers with appropriate RCD

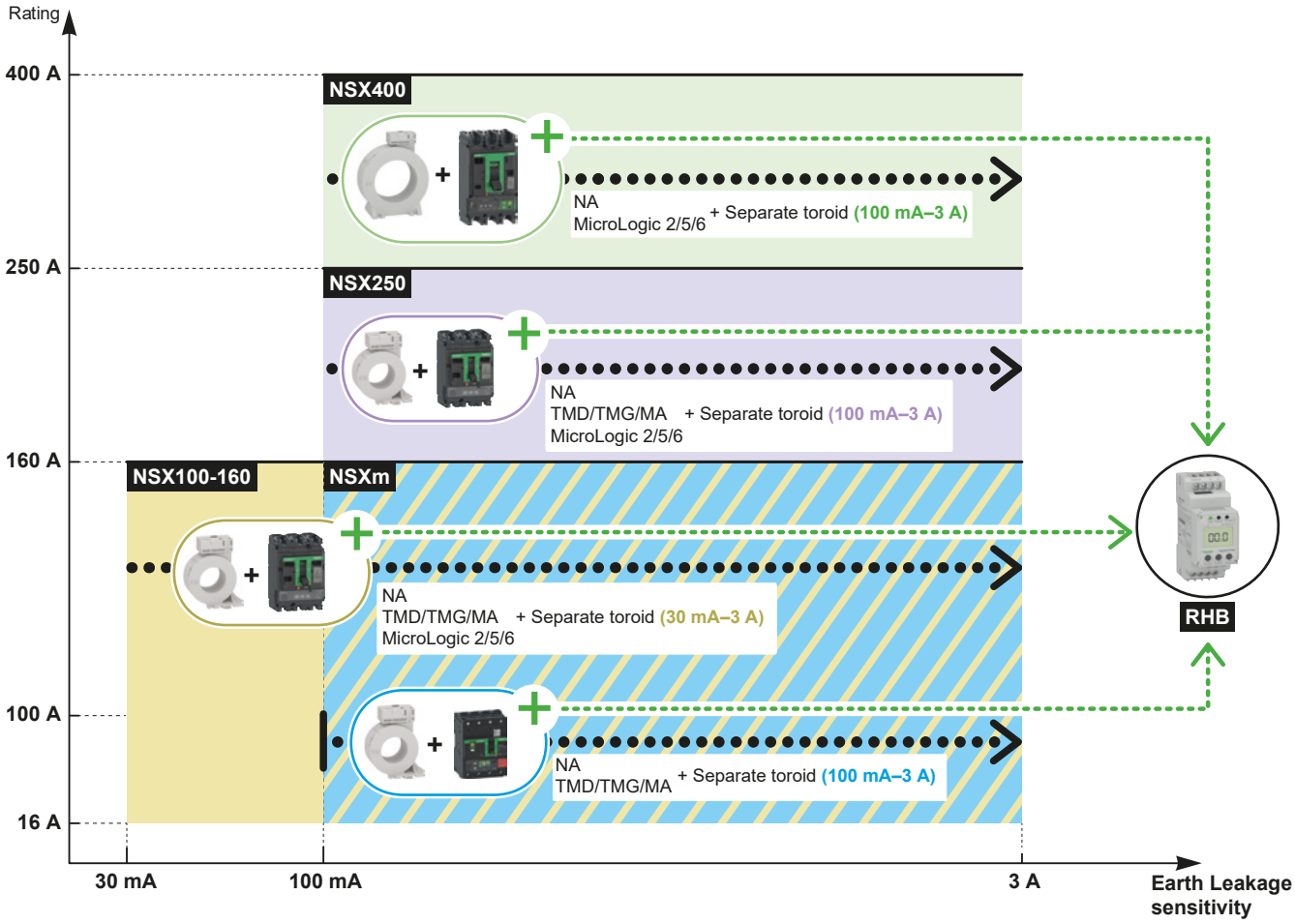


Selecting The Appropriate Residual Current Device

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

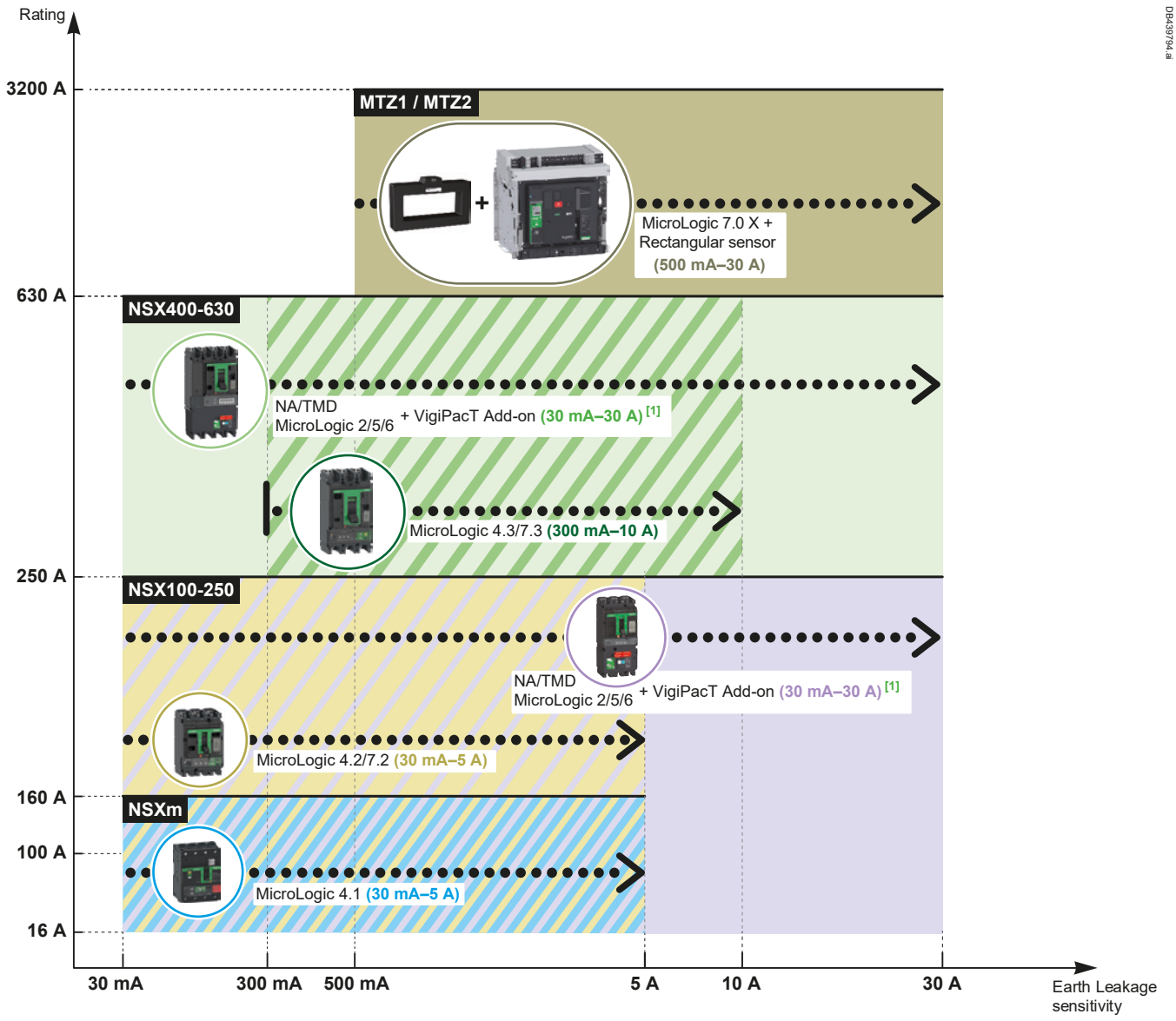


Overview of circuit breakers with separate earth leakage relay type B



Selecting The Appropriate Residual Current Device

Sous-titre à définir



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.

General contents

VigiPacT
(Residual-Current Protection Relays)

Other Information

> ComPacT

ComPacT NSX & NSXM
Catalog
LVPED221001EN

ComPact NS
Catalog
LVPED211021EN

> MasterPact

MasterPact NT & NW
Catalog
LVPED208008EN

MasterPact MTZ
Catalog
LVPED216026EN

> PowerPacT

PowerPacT 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

A

Selection Guide

Protection [1] Relays

	RH10	RH21	RH68
	 	 	
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			
IΔn	**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			
IΔn	**Instantaneous**	**1 user-selectable time delay** instantaneous or 0.06 s for IΔIn = 0.3 A	**Instantaneous** for IΔn = 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 IΔn (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 A and TOA toroids up to 630 A	■	■	■
Schneider Electric L rectangular sensors up to 3200 A	■	■	■
Schneider Electric TB toroids up to 400 A	-	-	-

[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

A

	RH86	RH99	RH197	RHUs or RHU	RHB
	 PB108176-22.eps	 PB100434_SE.eps  PB100432-19_SE.eps	 PB104914-R.eps  PB100715-19_SE.eps	 PB113909-R3.eps	 PB121667_L94.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	-	-	-
	-	RH99M, RH99P	RH197M, RH197P	RHUs, RHU	-
	RH86M	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 ajustable threshold** from 0.03 A to 3 A
	-	-	Fixed: 50 % IΔn or 100 % IΔn	**1 adjustable threshold** from 0.015 A to 30 A	**1 ajustable threshlod** from 0.015 A to 3 A
	Instantaneous for IΔIn = 0.03 A **6 user-selectable time delay** instantaneous to 0.5 s	**Instantaneous** for IΔIn = 0.03 A **9 user-selectable time delay** instantaneous to 4.5 s	**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
	-	-	**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

Selection Guide

Monitoring Relays

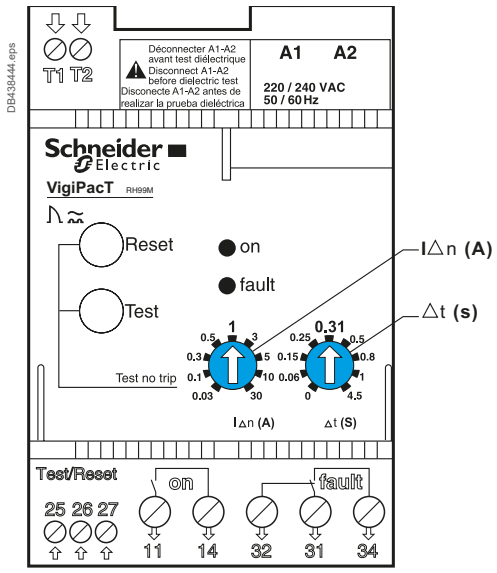
	RH99	RH197
	 PB100434_SE.eps  PB100432-19_SE.eps	 PB104914-R.eps  PB100715-19_SE.eps
Failsafe mode or non-failsafe mode	by wiring	by settings
Protection	■	■
Monitoring	■	■
Compliant with IEC 60947-2 Annex M setting = 30 mA ComPacT NSX (opening in 60ms)	■	■
Compliant with IEC 60947-2 Annex M setting >30 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 13\0 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		
IΔn	**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 % IΔn or 100 % IΔn
Time delay		
IΔn	**Instantaneous** for IΔIn = 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 IΔn (LED and relay)	■	■
Threshold overrun 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

A

	RHUs or RHU	RMH
	 PB113909-R3.eps	 PB114667-R2.eps +  [1] 059485-20_SE.eps
	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



IΔn (A): residual operating-current setting (the relay operates for a fault current ≥ IΔn)
Schneider Electric guarantees non-operation for all fault currents < 0.8 IΔn
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 IΔn is overrun.
Depending on the relay, you can fix a threshold (IΔn).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 IΔn
- 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 IΔn
- 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.

A

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 UL1053 “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 IΔn threshold (a number of choices) and no time delay (instantaneous) or
  - Selectable IΔn 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 130V AC or 220 to 240 V AC, 50/60 Hz, or
  - DC: 12 to 48 V DC
- Maximum consumption: 4 W

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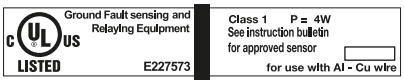

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General Characteristics

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Front-panel mount device

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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.

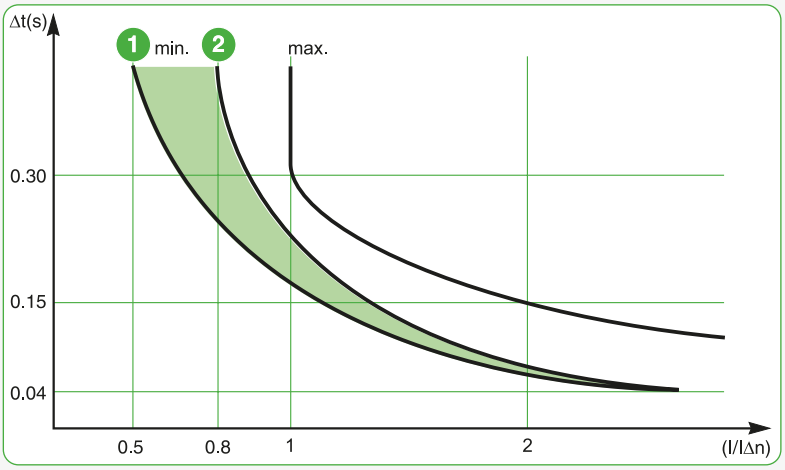
Recycling

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 IΔn 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 IΔn. VigiPacT relays trip between 0.8 and 1 x IΔn, thus increasing immunity to nuisance tripping by 60 %.



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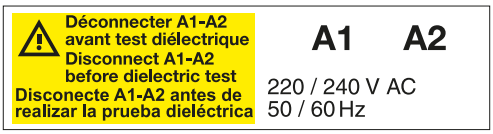
Operating tolerances for the protection threshold IΔn:

1 Standards

2 VigiPacT

Gain in immunity to nuisance tripping with VigiPacT



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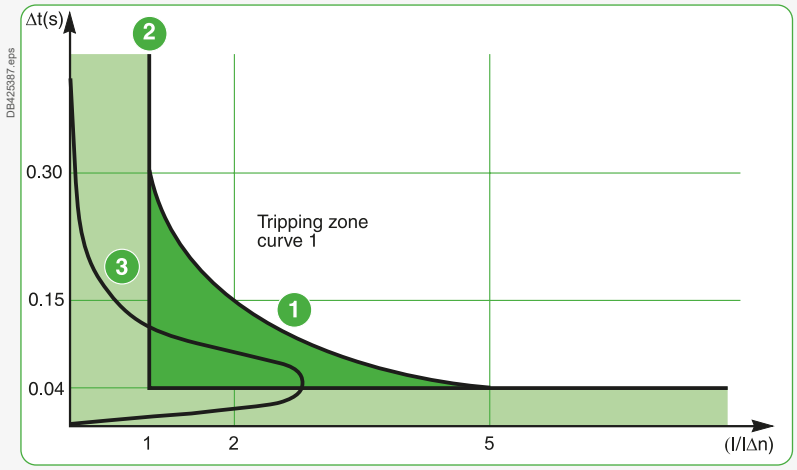
Information on the case

General Characteristics

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

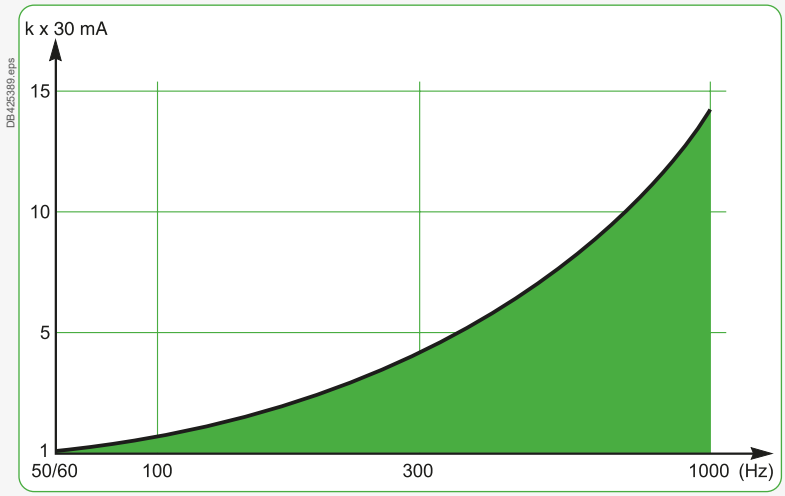
2 Curve 2: tripping curve with fixed threshold I = IΔn

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).



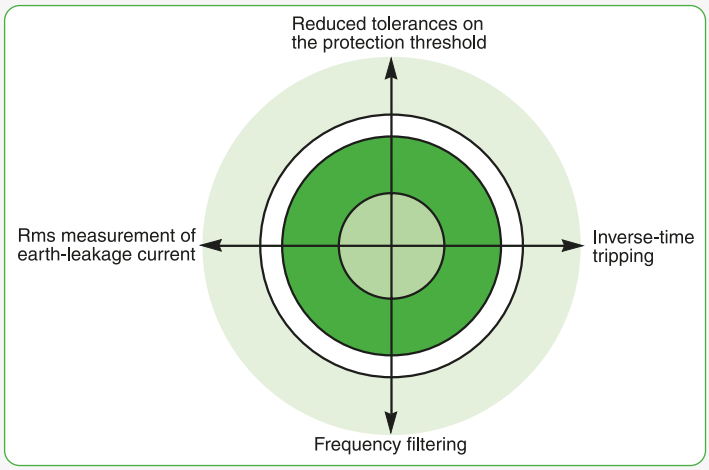
Variation in the ventricular-fibrillation threshold depending on the frequency from 50/60 Hz up to 1000 Hz

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.

General Characteristics

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.

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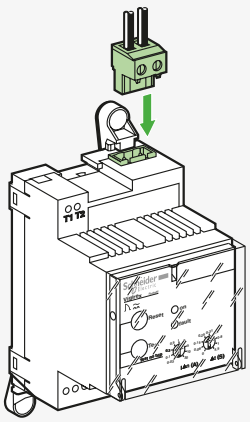

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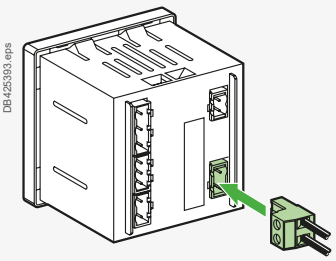

Supply connections for the DIN and front-panel mount formats

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).

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DIN device with mounting lugs fixed to a mounting plate

DIN device

DIN device with clip-in toroid

Front-panel mount device

Lead-sealable cover

Formats for All Installation Systems (Cont.)

Automatic control panel or machine panel

Power distribution switchboard

Main LV switchboard

Motor Control Centre (MCC)

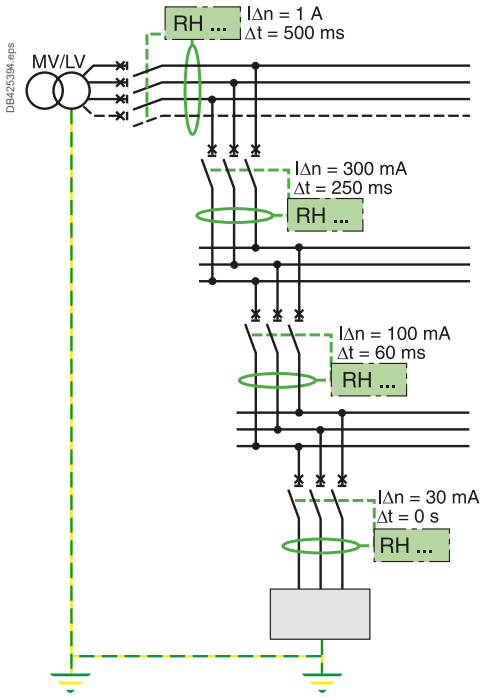
Installation Systems

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

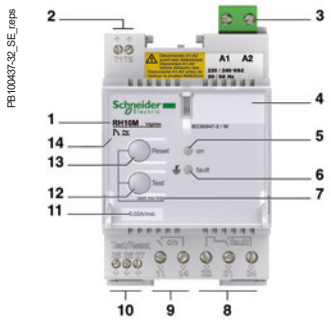
VigiPacT relays are immune to:
- Overvoltages produced by switching (e.g. lighting circuits)
- Overvoltages produced by atmospheric disturbances
- Radio-frequency waves emitted by devices such as mobile telephones, radio transmitters, walky-talkies, radar, etc.
- Electrostatic discharges produced directly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

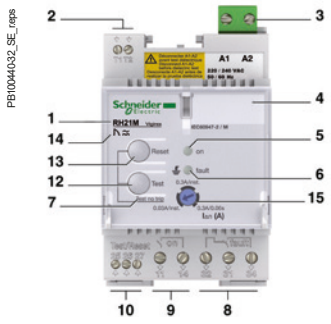
The high immunity levels of VigiPacT relays ensure safety without nuisance tripping.

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.

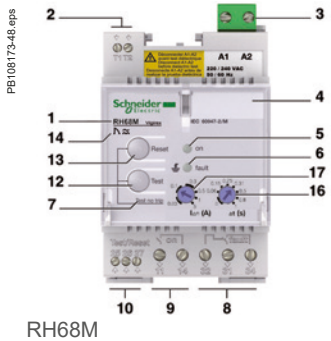
Description
RH10M, RH21M, RH68M, RH86M and RH99M Relays



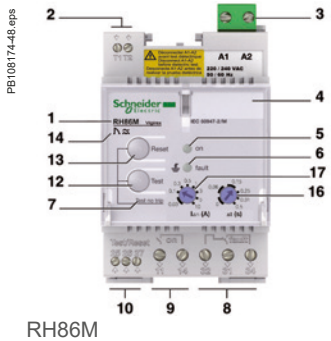
RH10M



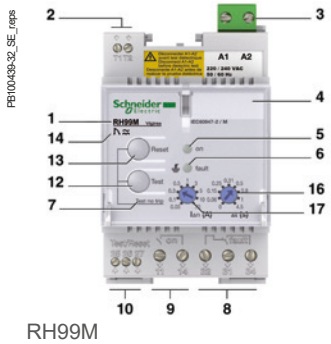
RH21M



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 IΔN 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): IΔn (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): IΔn (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): IΔn (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

A

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 IΔn reaching 50, 40, 30 and 20 % (respectively) of IΔn setting. When 70 % of the IΔn 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 IΔn or 100 % of IΔn).
- Selector gain for IΔn.

P Threshold IΔn (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

Version : 1.4 - 19/07/2023
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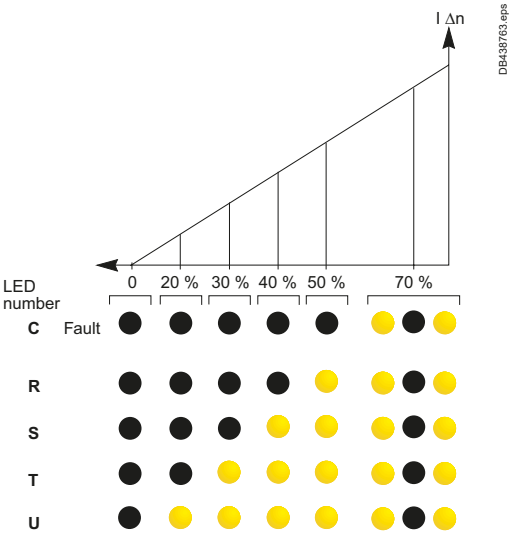
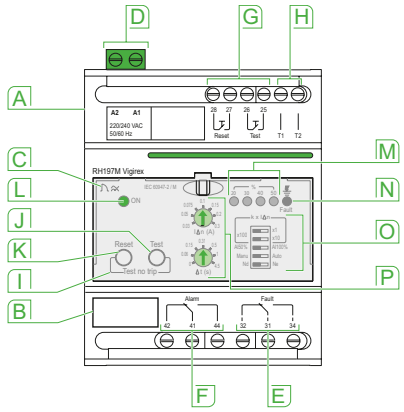


Status of the indication LEDs according to the measured fault current (% IΔn)



RH197M

Position of O	Actual trip threshold IΔn (A)
x100 x1 x10	IΔn (A)
x100 x1 x10	10 IΔn (A)
x100 x1 x10	100 IΔn (A)
x100 x1 x10	IΔn (A)

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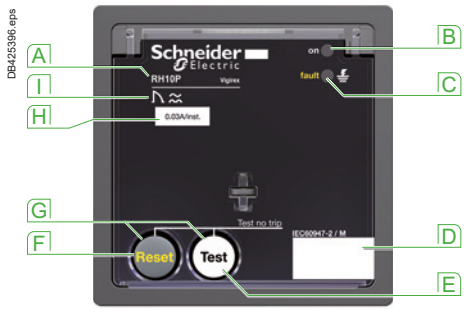
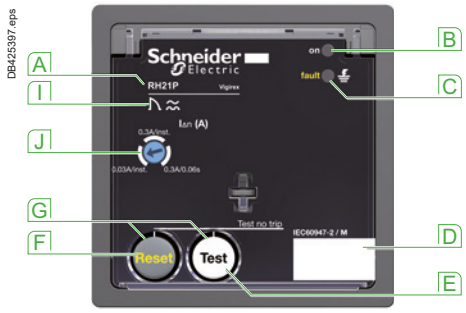
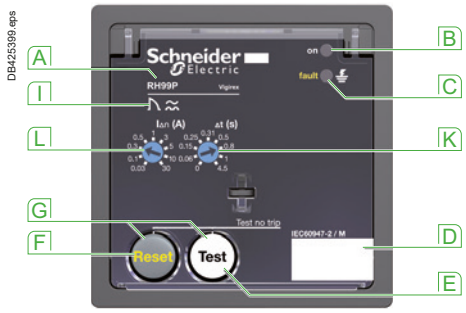
Description
RH10P, RH21P and RH99P Relays



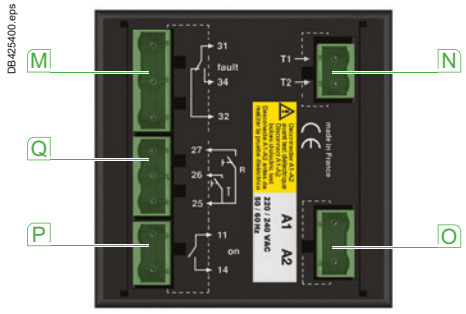
RH10P



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): IΔn (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): IΔn (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: IΔn (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

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 IΔn reaching 50, 40, 30 and 20 % (respectively) of IΔn setting. When 70 % of the IΔn 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

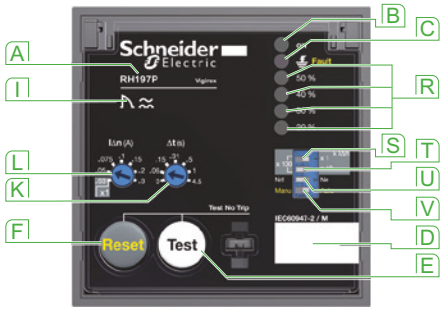
V "Auto/Manual" switch used to select fault relay reset mode
- In "Manual" position: latching relay requiring the Reset button to be pressed after fault clearing
- In "Auto" position: automatic reset of fault relay (after fault clearing)
- 10 resets are possible according to the following algorithm:

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.

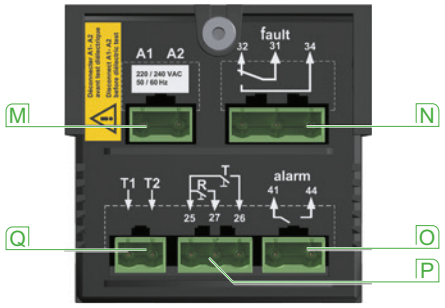
Connection

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 (IΔn):
The IΔn = 0.030 A setting is not modified by the gain selector



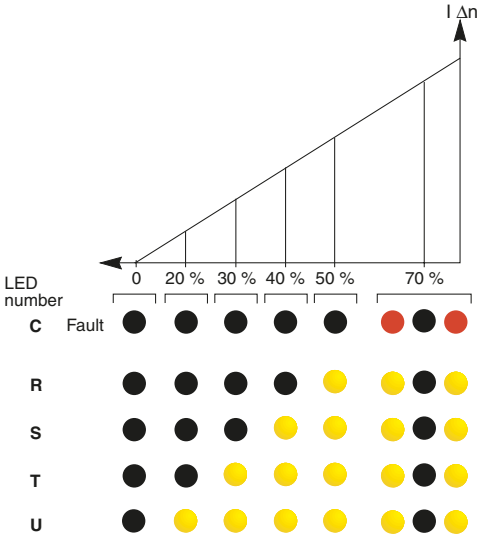
DB438764.eps

RH197P



DB425402.eps

Connections on the back of the relay



DB425403.eps

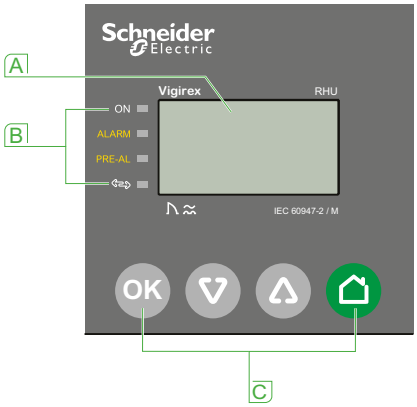
Status of the indication LEDs according to the measured fault current (% IΔn)

Position of S and T	Actual trip threshold IΔn (A)
DB425404.eps x100 x1 x10	IΔn (A)
DB425405.eps x100 x1 x10	10 IΔn (A)
DB425406.eps x100 x1 x10	100 IΔn (A)
DB425407.eps x100 x1 x10	IΔn (A)

Description
RHUs and RHU Relays

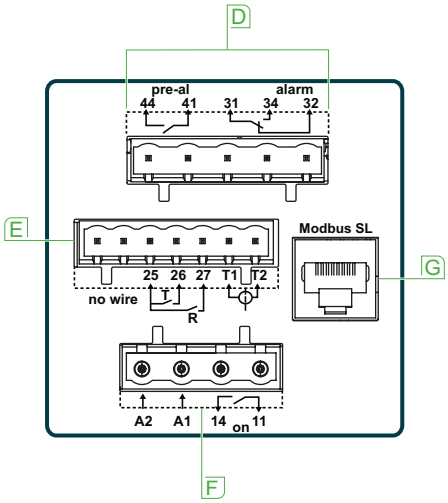
PB113909-36.eps

DB425408.eps



DB419277.eps

DB425410.eps



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 IΔN 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		Allows to move to: ■ The next screen. ■ The next menu item. Allows to decrease the numerical value while setting the parameters.
Up		Allows to move to: ■ The previous screen. ■ The previous menu item. Allows to increase the numerical value while setting the parameters.
Home		■ 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

PB114667.eps

A

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

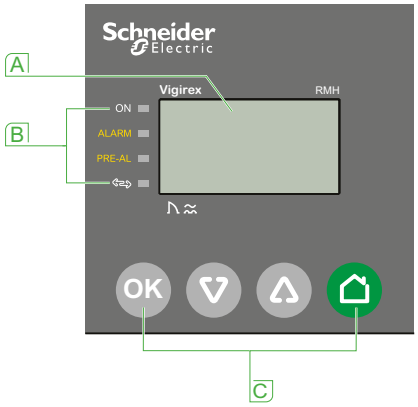
A pre-alarm is active when the measured residual current is greater than the set pre-alarm threshold on at least one channel for a period of time greater than the set pre-alarm trip delay (t pre-alarm in milliseconds or seconds) for that particular toroid.

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



DB425409.eps

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

DB419277.eps

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.

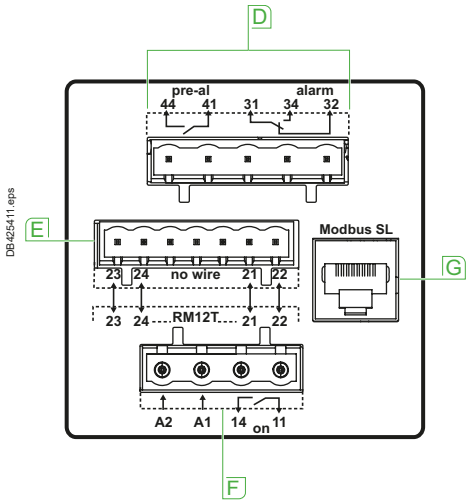
Navigation Buttons

Button	Icon	Description
Validation	OK	Allows to: ■ 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.

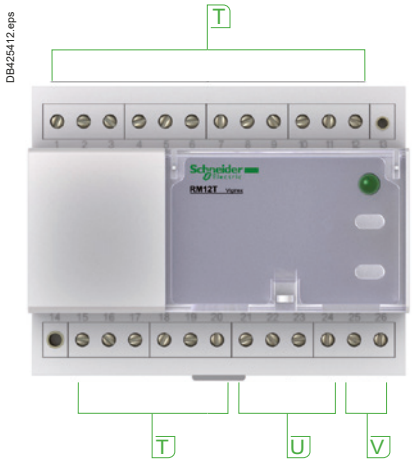
User guide RMH
DOCA0108EN

Instruction sheet RMH
NHA34635

Description
RMH Relay and RM12T Multiplexer



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 IΔN 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 an 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.

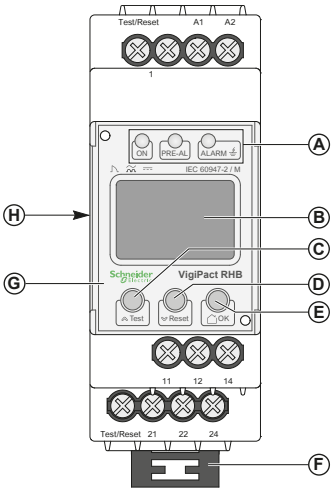
Pre-Alarm Detection
The pre-alarm threshold I pre-alarm corresponds to an earth leakage level that must be eliminated before being dangerous for the installation.
A pre-alarm is active when the measured residual current is greater than the set pre-alarm threshold for a period of time greater than the set pre-alarm trip delay (t 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 cublicle)
- Screwed on a plate (with optional kit LV..., sold separately)
- Install the connectors delivered with the RHB.

PB121667.eps

VigiPacT RHB



DB438677.ai

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

Description
Sensors

059470-28_SE.eps

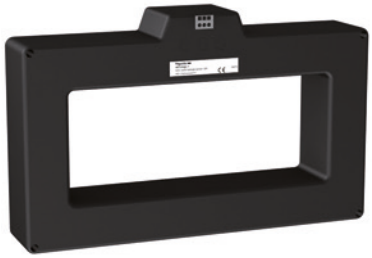
A type passive closed toroid

PB115812.eps

PB115819_L16.eps

OA type passive split toroid

059476-49_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 °C/+70 °C
  - Rectangular sensors: -35 °C/+80 °C
  - B type toroids: -25 °C/+70 °C
- The temperature range for toroid storage is:
  - A/OA type toroids: -55 °C/+85 °C
  - L type rectangular sensors: -55 °C/+100 °C.
  - B type toroids: -25 °C/+70 °C.

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 Ue	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	RH10M only	■	
	440 to 525 V AC	50/60 Hz	-	-	
Operational voltage tolerances	Ue: 12 to 24 V AC - 12 to 48 V DC		55 % to 120 % Ue [2]	55 % to 120 % Ue [2]	
	Ue: 48 V AC - 24 to 130 V DC		-	-	
	Ue: 48 to 415 V		55 % to 110 % Ue	55 % to 110 % Ue	
	Ue: 110 to 415 V		-	-	
	Ue: 220 to 240 V		-	-	
	Ue > 415 V		70 % to 110 % Ue	70 % to 110 % Ue	
Overvoltage category			4	4	
Rated impulse withstand voltage up to Ue = 525 V AC		Uimp (kV)	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 %	
	Display refresh time		-	-	
IΔn current detection	Threshold IΔn		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	
	IΔn-current detection range		80 % IΔn to 100 % IΔn	80 % IΔn to 100 % IΔn	
	Time delay Δt		instantaneous	instantaneous for IΔn = 0,03 A 1 user-selectable time delay instantaneous or 0.06 s for IΔn = 0.3 A	
	Δt settings (s)		0	0	0.06
	Maximum non-operating time at 2 IΔn (s)		-	-	0.06
	Maximum operating time at 5 IΔn (s) (residual-current relay alone)		0.015	0.015	0.13
	Maximum total time at 5 IΔn [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		-	-	
	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		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 % Ue if Ue < 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 % Ue [2]
	-	-	-
	55 % to 110 % Ue	55 % to 110 % Ue	55 % to 110 % Ue
	-	-	-
	55 % to 110 % Ue	55 % to 110 % Ue	-
	-	-	70 % to 110 % Ue
	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 % IΔn to 100 % IΔn	80 % IΔn to 100 % IΔn	80 % IΔn to 100 % IΔn
	instantaneous for IΔn = 0.03 A 8 user-selectable time delays instantaneous to 1 s	instantaneous for IΔn = 0.03 A 6 user-selectable time delays instantaneous to 0.5 s	instantaneous for IΔn = 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

Characteristics

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

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: rated operational voltage Ue	12 to 24 V AC -12 to 48 V DC	50/60 Hz/DC
	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	Ue: 12 to 24 V AC - 12 to 48 V DC	
	Ue: 48 V AC - 24 to 130 V DC	
	Ue: 48 to 415 V	
	Ue: 110 to 415 V	
	Ue > 415 V	
Overvoltage category		
Rated impulse withstand voltage up to Ue = 525 V AC		Uimp (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 IΔn	
	Fault-current detection range	
	Time delay Δt	
	Δt settings (s)	
	Maximum non-operating time at 2 IΔn (s)	
	Maximum operating time at 5 IΔn (s) (residual-current relay alone)	
	Maximum total time at 5 IΔn [2] (s)	
	Setting	
	Output contact	
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 VAC only.
[4] 85 % during energisation.
[5] < 20 % of IΔn: display = 0 and > 200 % of IΔn: 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 = 0.03A 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	selector	keypad	keypad
	changeover with latching in manual position; 10 automatic resets in auto position (see algorithm)	changeover with latching in manual position; 10 automatic resets in auto position (see algorithm)	changeover with latching	changeover with latching
	setting by Dip switch at 50 % of IΔn or 100 % of IΔn	fixed at 50 % of IΔn or 100 % of IΔn [6]	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
	80 % I alarm to 100 % I alarm	80 % I alarm to 100 % I alarm	80 % I alarm to 100 % I alarm	50 % I alarm 1 to 100% I alarm 1
	instantaneous	instantaneous	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

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					
Rated operational current (A)	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	-	-	-	-	-
	440 V		-	-	-	-	-	-
	660-690 V		-	-	-	-	-	-
Display and indications	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		■					
	TB Type toroids		-					
Cables	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											
	-						-						■					

Characteristics

Monitoring Relays with Output Contact That Automatically Resets After Fault Clearance

PB100434_SE.eps

RH99M

PB100432-36_SE.eps

RH99P

PB113909-R4.eps

RMH

+

059485-51_SE.eps

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: rated operational voltage Ue	12 to 24 V AC - 12 to 48 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
Operational voltage tolerances	Ue: 12 to 24 V AC -12 to 48 V DC	
	48 V ⩽ Ue ⩽ 415 V	
	Ue > 415 V	
Overvoltage category		
Rated impulse withstand voltage up to Ue = 525 V AC		Uimp (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 % Ue if Ue < 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 IΔn	from 20 % [4] to 200 % of IΔn
	-	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 % IΔn to 100 % IΔn	80 % IΔn à 100 % IΔn	80 % IΔn à 100 % IΔn
	instantaneous for IΔn = 0.03 A 9 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 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 % IΔn 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 % 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 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

Characteristics

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

PB100434_SE.eps

RH99M

PB100432-36_SE.eps

RH99P

PB113909-R4.eps

059485-51_SE.eps

RM12T

VigiPacT Monitoring Relays

Electrical characteristics (cont.)		
Characteristics of output contacts as per standard IEC 60947-5-1	Rated thermal current (A)	
	Minimum load	
Rated operational current (A)	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 IΔn ≥ 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						8						8					
	10 mA at 12 V						10 mA at 12 V						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**			**DIN**		
	6 modules x 9 mm		72 x 72 mm				72 x 72 mm						72 x 72 mm			12 modules x 9 mm		
	0.3 kg		0.3 kg				0.3 kg						0.3 kg			0.42 kg		
	2		2				2						2			-		
	-		-				2						2			-		
	IP40		IP40				IP40						IP40			IP40		
	IP30		IP30				IP30						IP30			IP30		
	IP20		IP20				IP20						IP20			IP20		
	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		
	■		■				■						■			■		
	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					
	KB test, severity 2						KB test, severity 2						KB test, severity 2					
	3						3						3					
	Level 4						Level 4						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					
	■						■						■					
	■						■						■					
	-						-						-					
	■						■						■					
	-						-						-					

Characteristics
Sensors

50437_L32.eps 
50438_L32.eps 

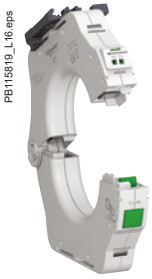
A type closed toroid: PA30 and PA50

50440_L27.eps 

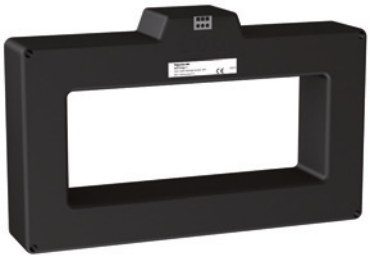
A type closed toroid: MA120

059470-27_SE.eps 

A type passive closed toroid: IA80

PB115811.eps 
PB115819_L16.eps 

OA type passive split toroid: TOA80

059476-48_SE.eps 

Type L rectangular sensor

LV481012_image.eps 

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)

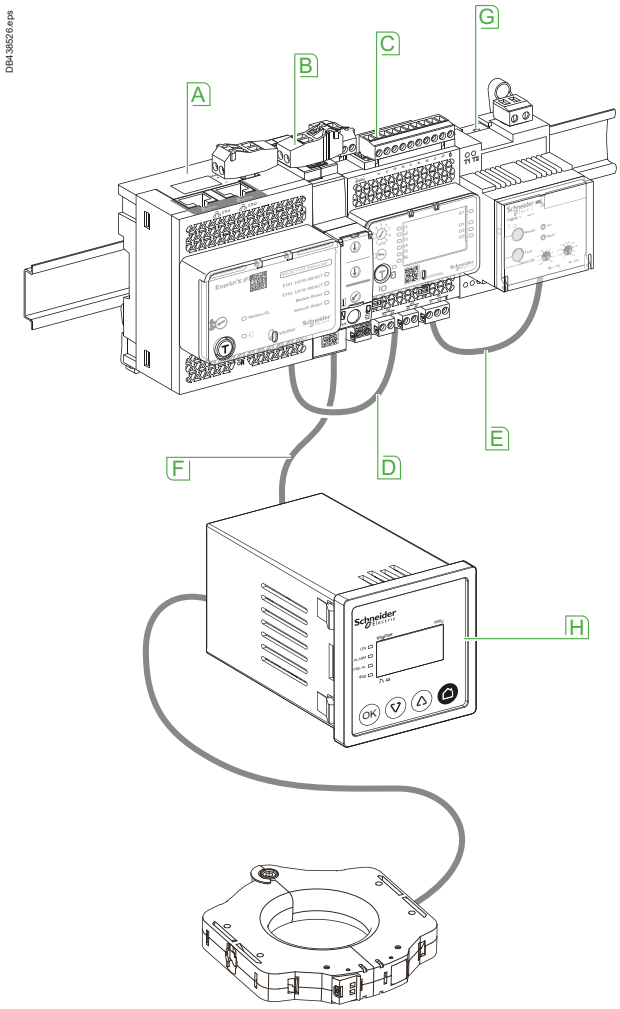
[1] With RH10, RH21, RH99, RH197, RHUs and RHU, IΔn must be ⩾ 300 mA
[2] From 0.5 to 2.5 mm².

A

	A Type Closed Toroid						TOA Type Split Toroid		L Type Rectangular Sensor [1]		B Type Closed Toroid			
	RH99, RMH, RHUs and RHU						RH99, RMH, RHUs and RHU		RH99, RMH, RHUs and RHU		-			
	RH10, RH21, RH68, RH86, RH99, RH197, RHUs and RHU						RH10, RH21, RH68, RH86, RH99, RH197, RHUs and RHU		RH10, RH21, RH68, RH86, RH99, RH197, RHUs and RHU		RHB			
	BT 50/60/400 Hz						BT 50/60/400 Hz		BT 50/60/400 Hz		BT 50/60/2000 Hz			
	1000 V						1000 V		1000 V		800 V			
	■						-		■		■			
	-						■		-		-			
	-35 °C/+70 °C						-35 °C/+70 °C		-35 °C/+80 °C		-25 °C/+70 °C			
	-55 °C/+85 °C						-55 °C/+85 °C		-55 °C/+100 °C		-25 °C/+70 °C			
	IP30 (connections IP20)						IP40 (connections IP20)		IP30 (connections IP20)		IP40 (connections IP20)			
	1/1000						1/1000		1/1000		1/600			
	4						4		4		3			
	12						12		12		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			

Communication
RH99, RHU and RMH

VigiPacT in Communication Architecture



- 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

ULP system

IFE interface
ULP to Ethernet interface module

IFM
ULP to Modbus Interface module

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	◉	◉

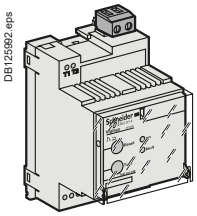
Installation Recommendations

B

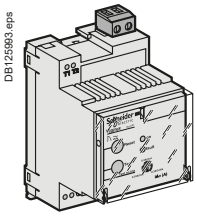
Relays and Associated Toroids

Residual-current protection relay

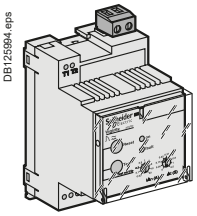
Modular format (DIN rail mount)



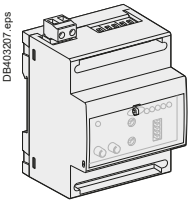
RH10M



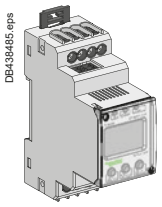
RH21M



RH68M, RH86M, RH99M

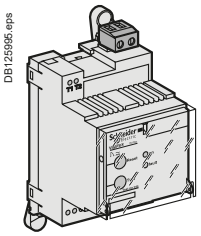


RH197M

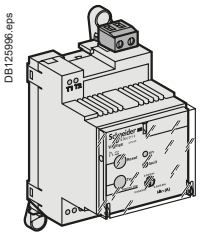


RHB

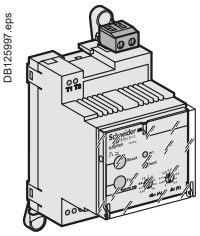
Modular format (with mounting accessories [1])



RH10M



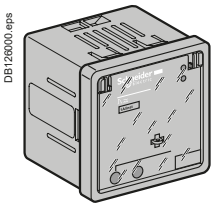
RH21M



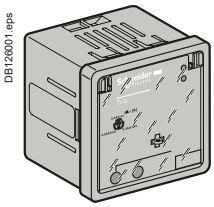
RH99M

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

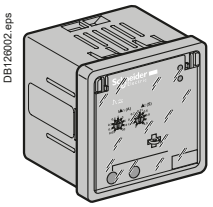
Front-panel mount format



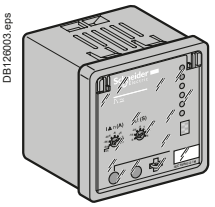
RH10P



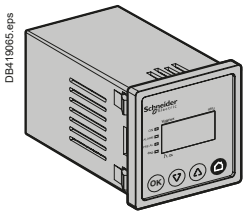
RH21P



RH99P



RH197P

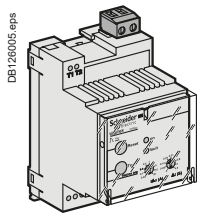


RHUs and RHU

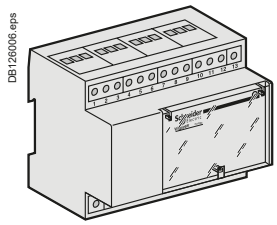
Residual Current Monitoring Relays

Modular format

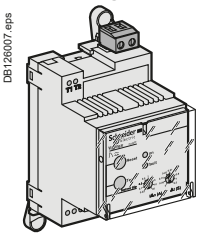
Mounting accessories [1]



RH68M, RH86M, RH99M



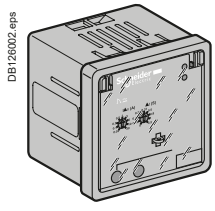
RM12T



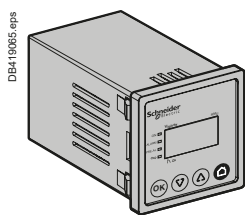
RH99M

[1] Supply as an option.

Front-panel mount format



RH99P



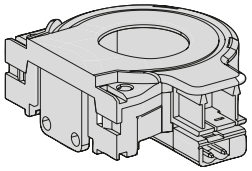
RMH

The VigiPacT RMH always requires a RM12T multiplexer.

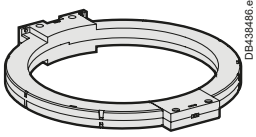
Toroids

Closed from 30 to 300 mm

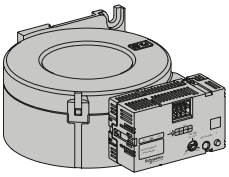
Split (for retrofit)

DB432451.eps


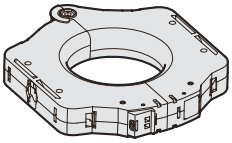
A toroid

DB403797.eps


GA300 toroid

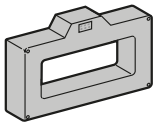
DB438486.eps


TB60-TB60P

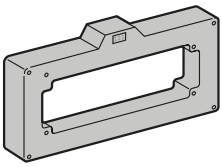
DB419067.eps


TOA toroid

Rectangular sensors

DB126013.eps


L1 = 280 x 115 mm

DB126014.eps


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.

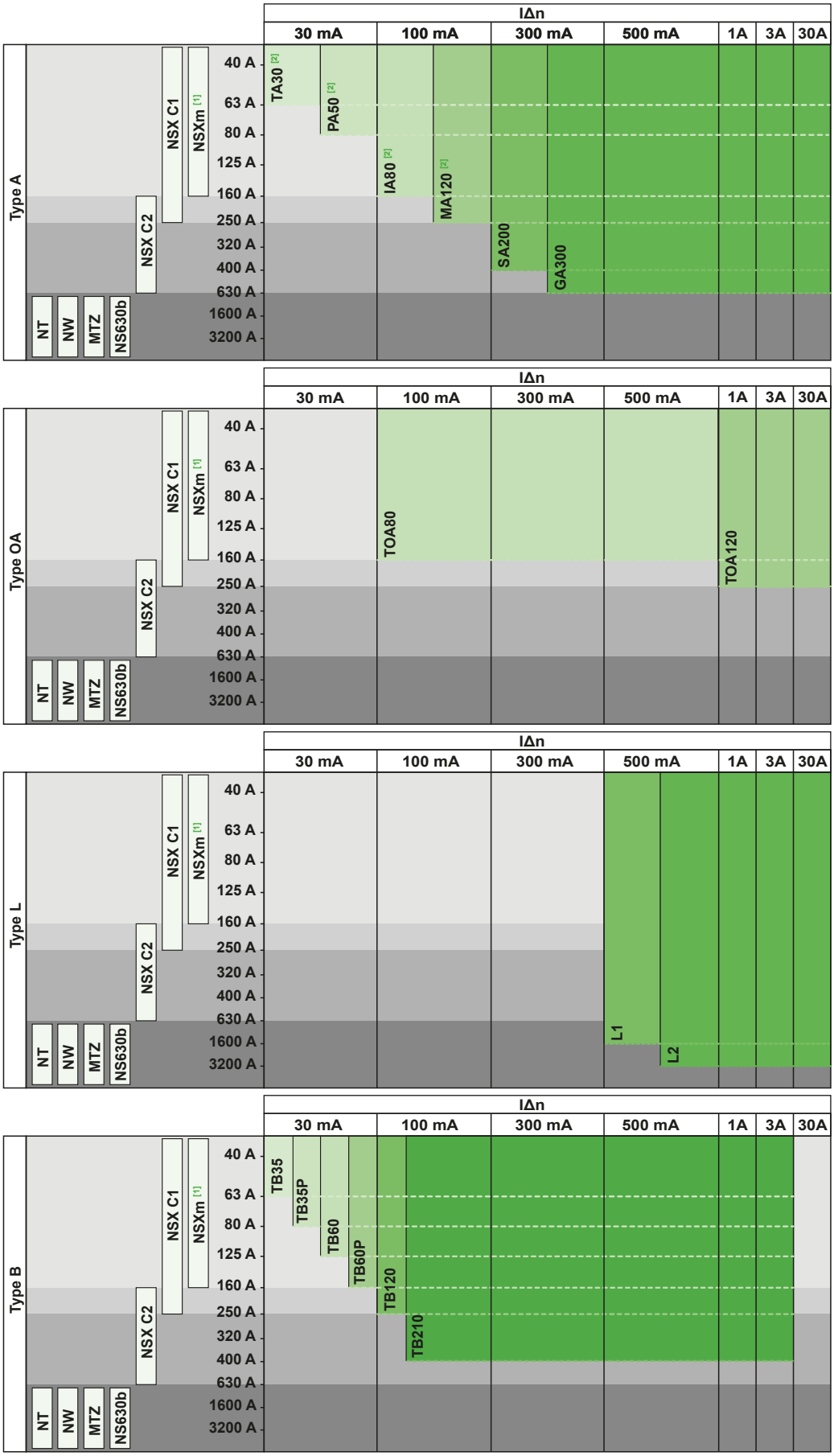
Sensor restrictions table

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	$I_{\Delta n} \geq 0.5$ A	-
B type closed toroid	-	see page B-4

Toroid Compatibility with ComPacT NSX

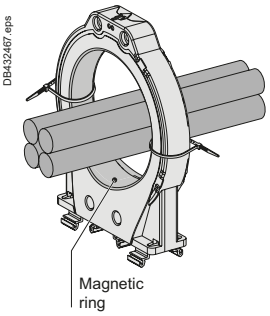
Toroid selection table to be fully compliant with IEC 60947-2 annex M standard

DB439278.ai



For circuits with high transient currents (6 In)

DB432467.eps



[1] NSXm not compliant with 30 mA setting.

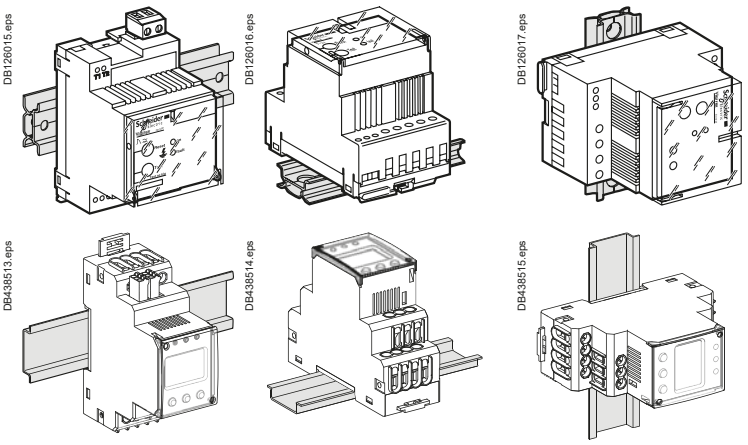
[2] The addition of a shielding ring allows immunisation with respect to false zero-sequence currents (tested at 6 In as per IEC 60947-2 annex M) to help prevent nuisance tripping for the settings indicated in table below.
(Doted line to show toroid range covers. Ie: TA30 can be used from IΔn=30 mA to 30A).

Possible Installation Positions

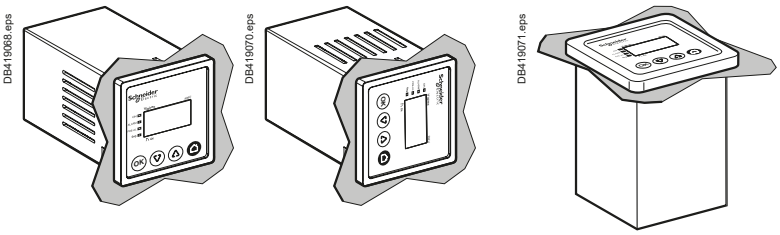
RH10-21-68-86-99M/P, RH197M/P, RHUs, RHU, RMH and RHB

Possible installation positions

Modular format



Front-panel mount format



Relay mounting possibilities

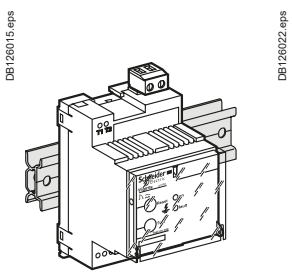
Mounting of modular format relays RH10M-21M-68M-86M-99M-RH197M RHB
The relay can be mounted in three ways:

- 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).

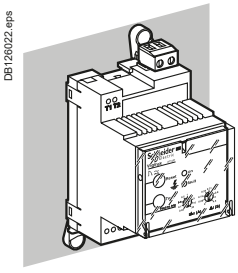
Mounting of front-panel mount relays RH10P-21P-86P-99P, RHUs, RHU and RMH
No special tools are required to mount the relay. Simply insert the device through the cutout. The size of the cutout complies with standard DIN 43700.
Front panel thickness: 1 mm minimum/2.5 mm maximum.
The relay clips onto the 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.

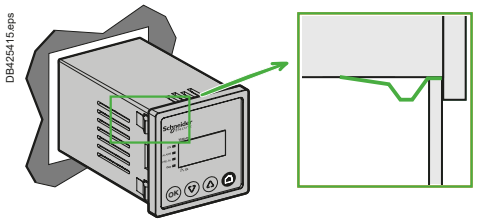
Mounting of RM12T multiplexer
The multiplexer must always be mounted on a DIN rail.



DIN rail

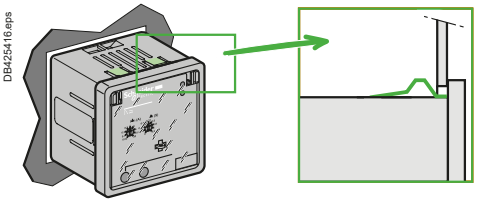


Mounting plate



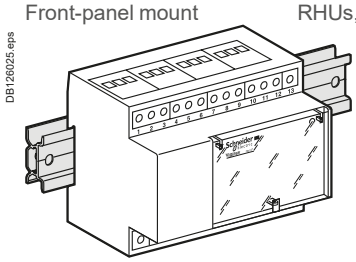
Front-panel mount

RHUs, RHU and RMH details

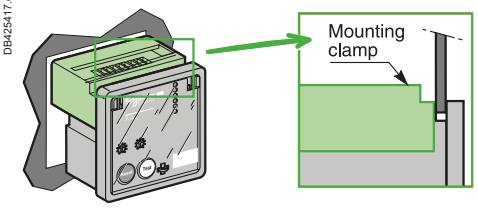


Front-panel mount

RH10P, RH21P and RH99P detail



RM12T: DIN rail only



Front-panel mount

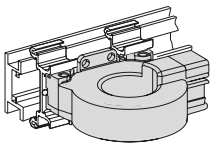
RH197P detail

Possible Installation Positions
A and OA Type Toroids and Rectangular Sensors

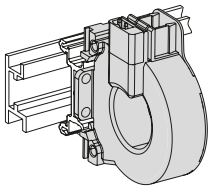
Toroid mounting possibilities

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

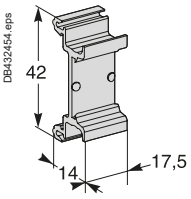
DB432452.eps



DB432453.eps



DB432454.eps

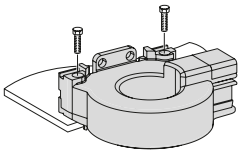


Accessory

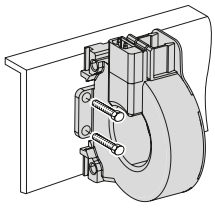
On a plate (TA30, PA50, IA80, MA120, SA200, GA300, TOA80 and TOA120) or bracket

Screws not supplied

DB432455.eps



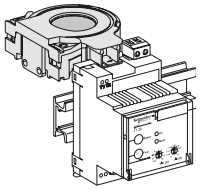
DB432456.eps



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

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

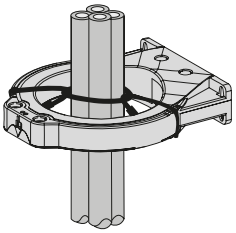
DB432457.eps



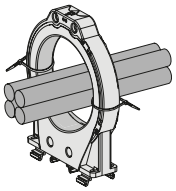
Tied to cables (IA80, MA120, SA200 and GA300), cable-ties not supplied

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

DB432458.eps

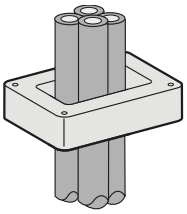


DB432459.eps

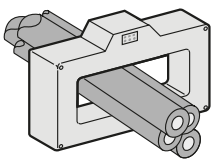


Tied to cables (rectangular sensors)

DB126035.eps

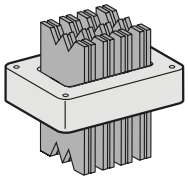


DB126036.eps

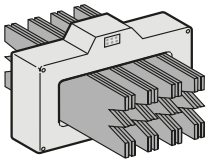


On bars with chocks (rectangular sensors)

DB126037.eps



DB126038.eps

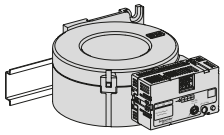


Possible Installation Positions
B Type Toroids and Rectangular Sensors

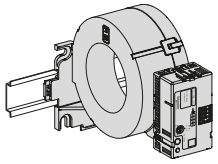
Toroid mounting possibilities

On DIN rail (TB35 and TB35P) using supplied accessories

DB438501.eps

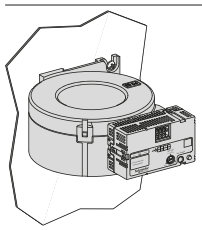


DB438502.eps

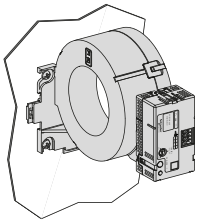


On a plate (TB35, TB35P, TB60, TB60P, TB120 and TB210)

DB438503.eps



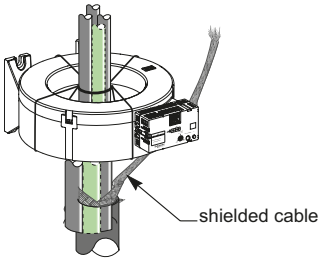
DB438504.eps



Screw Ø5	Screw Ø6
TB35	TB60
TB35P	TB60P
	TB120
	TB210

Tied to cables cable-ties not supplied

DB438525.eps

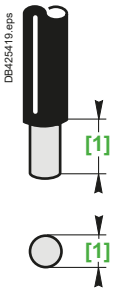


Connection
Relays and Sensors

Product, terminal or screw	Cable type	Terminal capacity (mm^2)						Conduct. size	Stripping		Tightening torque	
		Rigid		Flexible		Flexible with ferrule		AWG	Rigid/flexible			
		min.	max.	min.	max.	min.	max.		(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	-	-

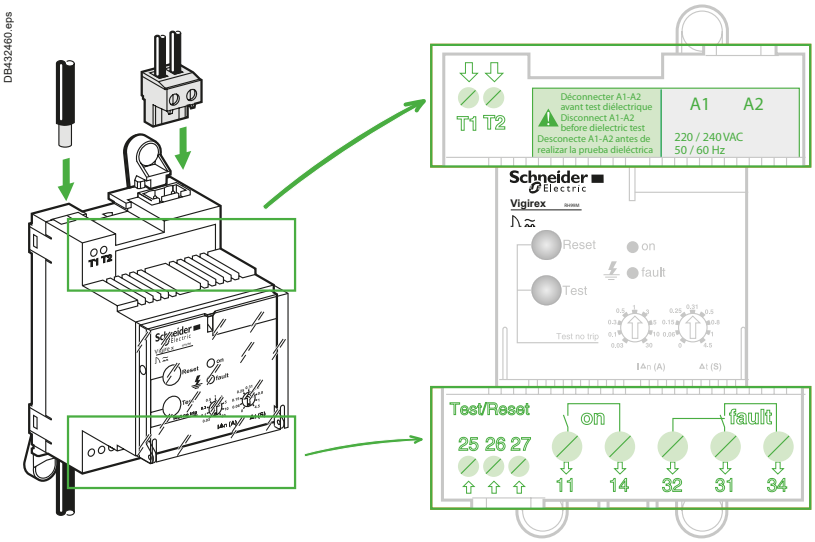
[1] RHU only.

Connection of relays

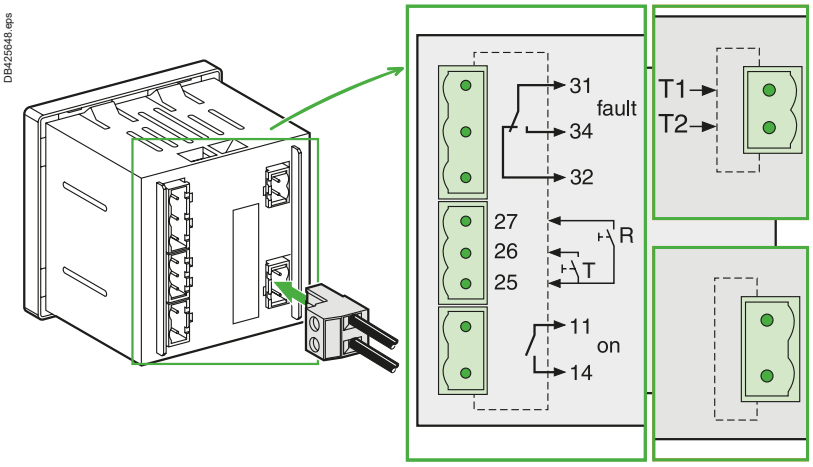


[1] See table page B-8.

Modular format



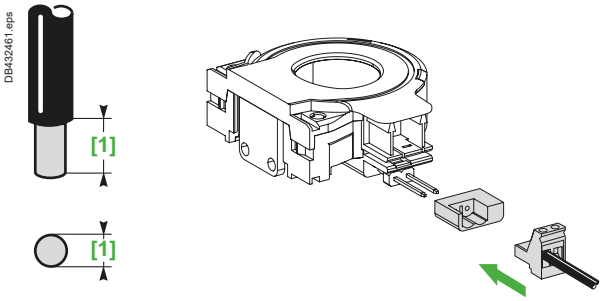
Front-panel mount format



MFR39443

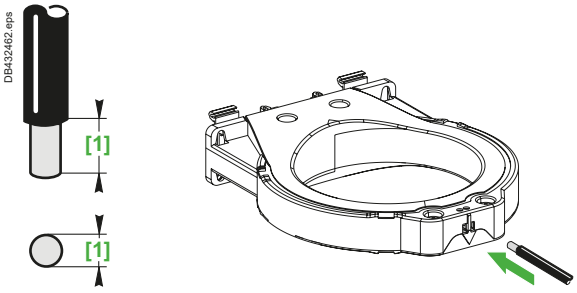
Connection of toroids

TA30 and PA50 closed toroids (connectors supplied)



[1] See table page B-8.

IA80, MA120, SA200 and GA300 closed toroids

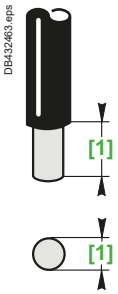


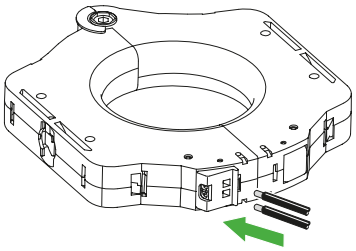
[1] See table page B-8.

Connection
Toroids and Rectangular Sensors

Connection of toroids (cont.)

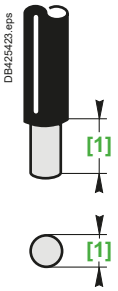
TOA80 and TOA120 split toroids (Ø5 mm round lugs not supplied)



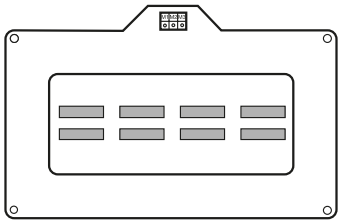


[1] See table page B-8.

Connection of rectangular sensors and conductor layout

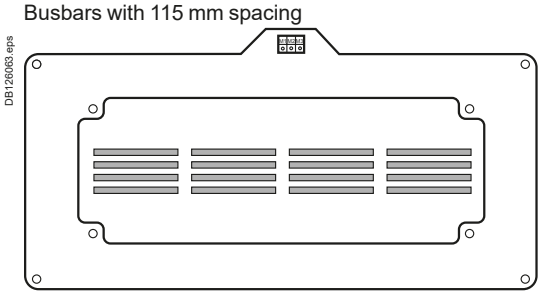


L1: frame 280 x 115 mm
Busbars with 70 mm spacing



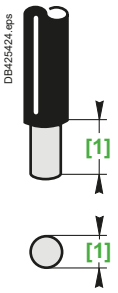
2 bars 50 x 10 mm (1600 A)
The neutral can be located on the right or the left.

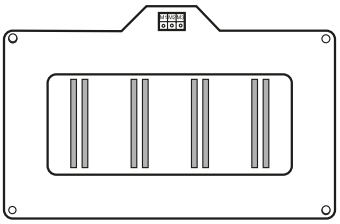
L2: frame 470 x 160 mm
Busbars with 115 mm spacing



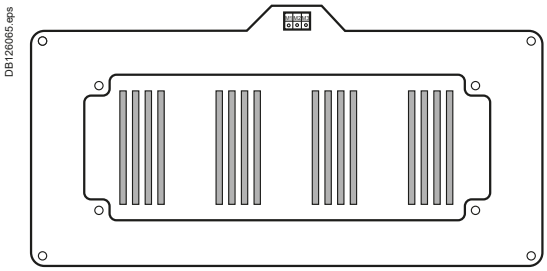
4 bars 100 x 5 mm (3200 A)
The neutral can be located on the right or the left.

[1] See table page B-8.



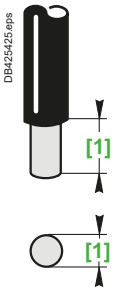


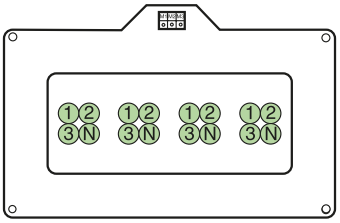
2 bars 100 x 5 mm (1600 A)
The neutral can be located on the right or the left.



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

[1] See table page B-8.





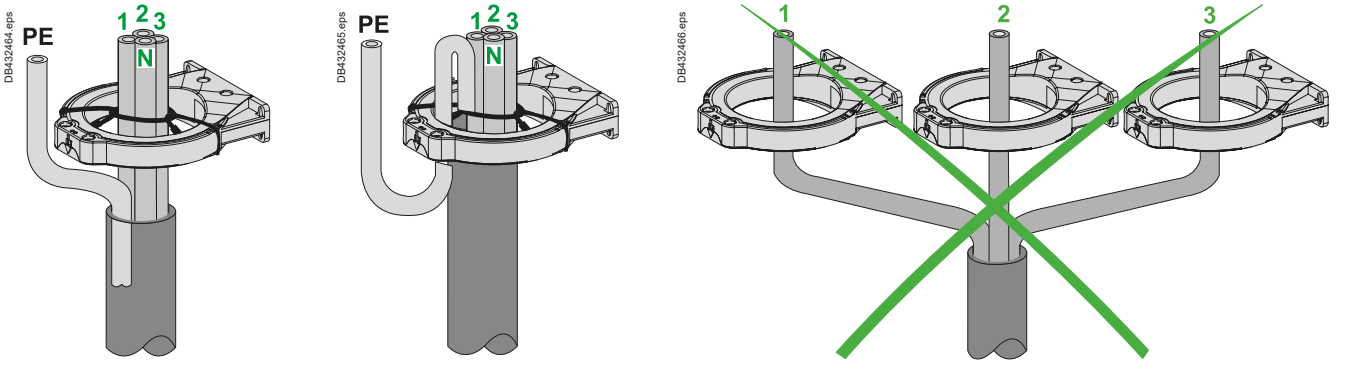
4 cables 240 mm² (1600 A)

[1] See table page B-8.

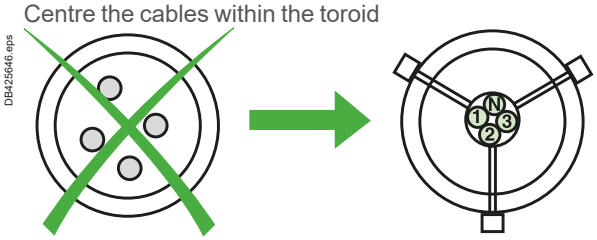
Note: connect M1 and M2 with VigiPacT.

Selection and Installation Instructions for Toroids and Rectangular Sensors

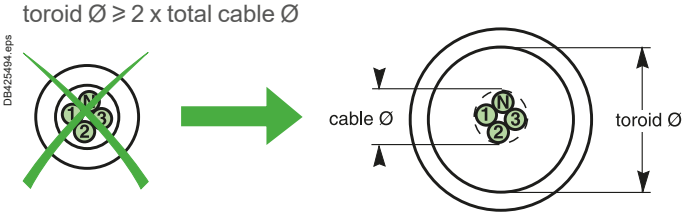
Cable layout



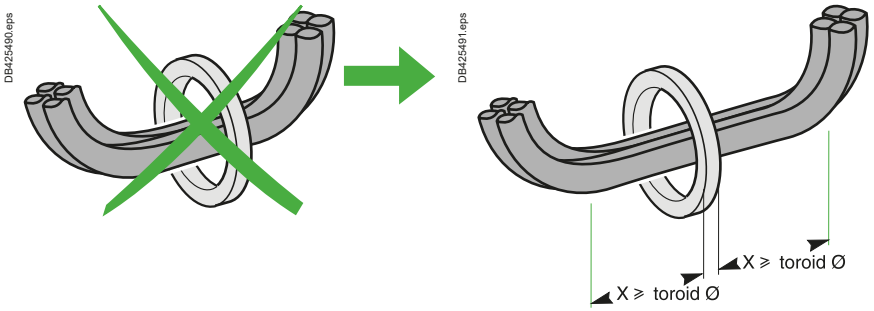
Centre the cables within the toroid



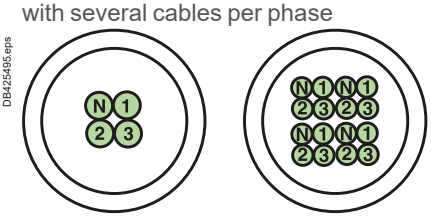
toroid Ø ≥ 2 x total cable Ø



Do not bend cables near the toroids



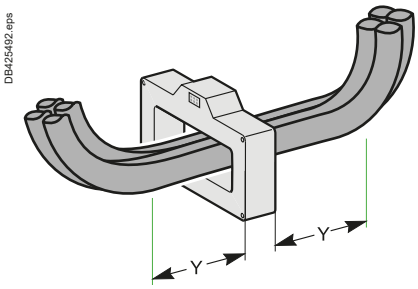
Single-phase or three-phase loads with several cables per phase



1 cable per phase

Several cables per phase

Do not bend cables near the sensors



Note: Y ≥ 25 cm for 280 x 115 mm sensor.
Note: Y ≥ 30 cm for 470 x 160 mm sensor.

Selection of rectangular sensors according to circuit power

3P + N copper bars

Rated operational current (Ie)	Max. cross-section/phase	Sensors
1600 A	2 bars 50 x 10 mm²	L1
	2 bars 100 x 5 mm²	
3200 A	4 bars 100 x 5 mm²	L2
	4 bars 125 x 5 mm²	

Selection and Installation Instructions for Toroids and Rectangular Sensors

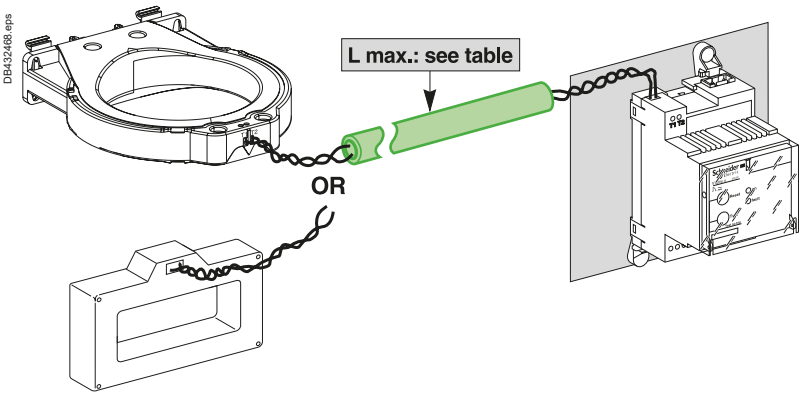
Connection between Vigi**PacT** relays and sensors

Vigi**PacT** relays must be connected to the sensors as indicated:

Cross-section (Cu)	Maximum length
Toroids	
0.22 mm² [1]	18 m
0.75 mm² [1]	60 m
1 mm² [1]	80 m
1.5 mm² [1]	100 m
Rectangular sensors	
0.5 mm² min./2.5 mm² max.	10 m

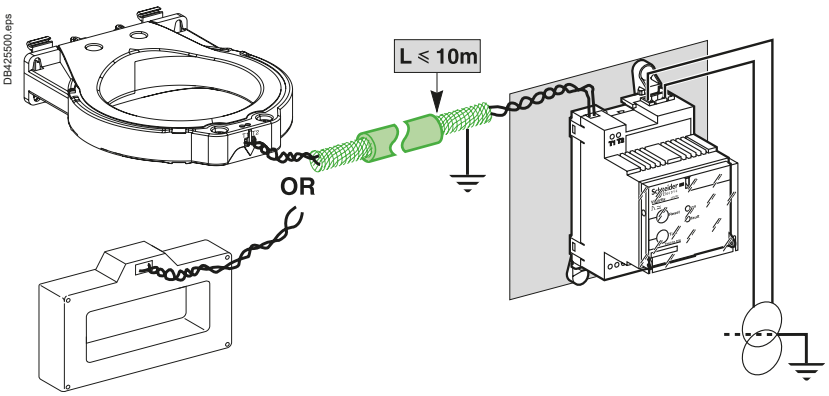
[1] Wire size for resistance R maximum = 3 W.

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

C

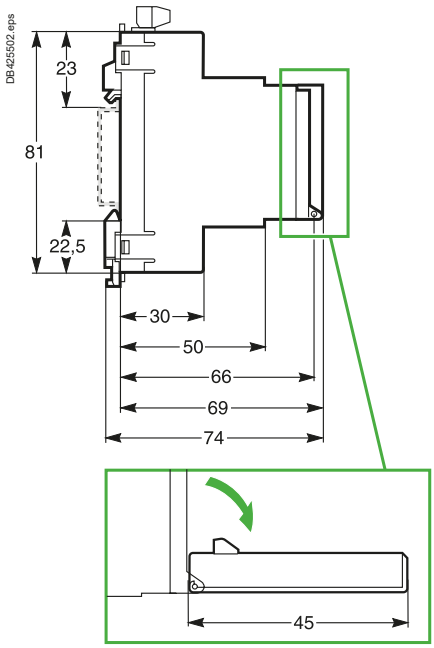
Other Chapters

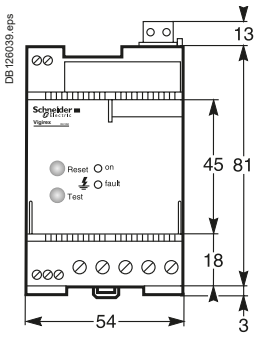
Dimensions

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

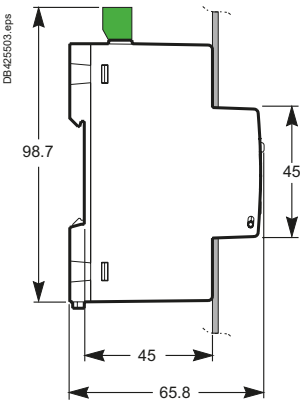
Mounting on a DIN rail

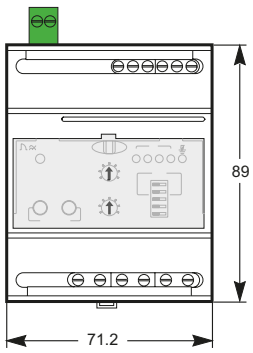
RH10M, RH21M, RH68M, RH86M and RH99M





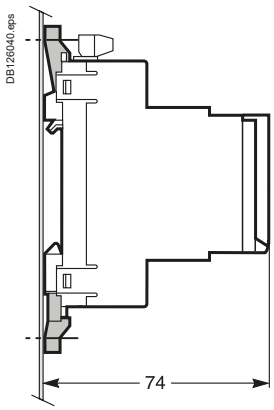
RH197M





Mounting on a mounting plate

RH10M, RH21M, RH68M, RH86M and RH99M



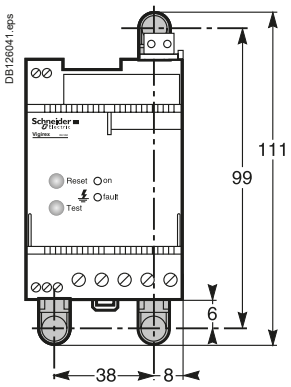
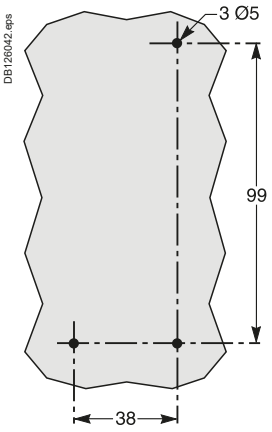
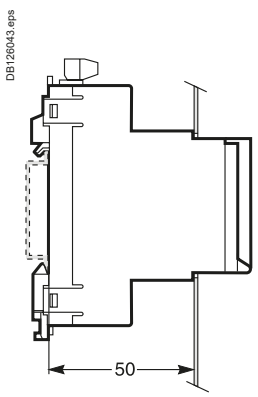


Plate drilling layout

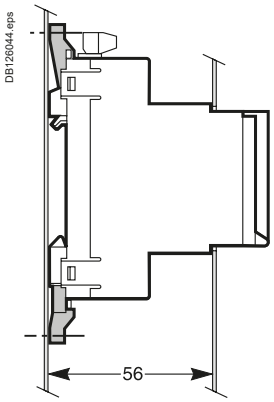


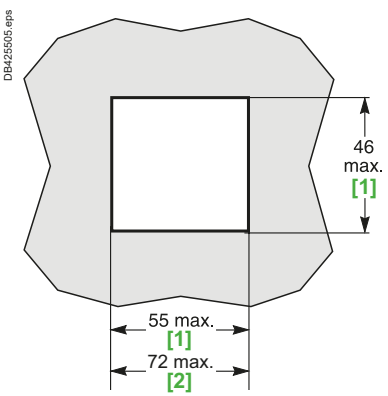
Door cutout

Mounting on a DIN rail



Mounting on a mounting plate



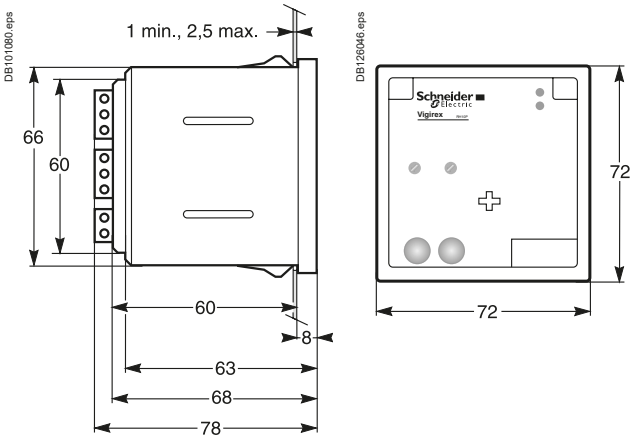


[1] For IP4 requirements.
[2] For RH197M.

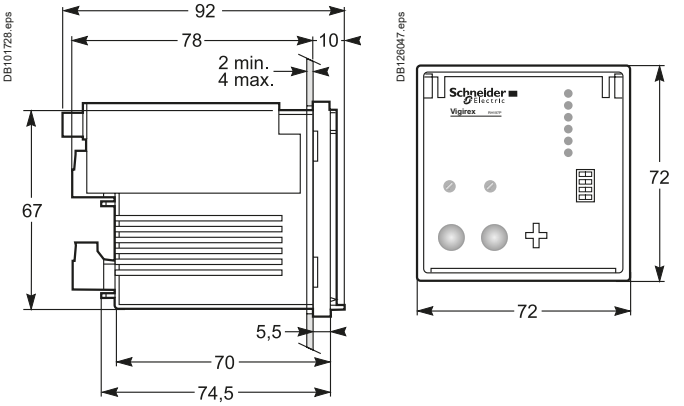
Dimensions
RH10P, RH21P, RH99P, RH197P, RHUs, RHU, RMH and RM12T Relays

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

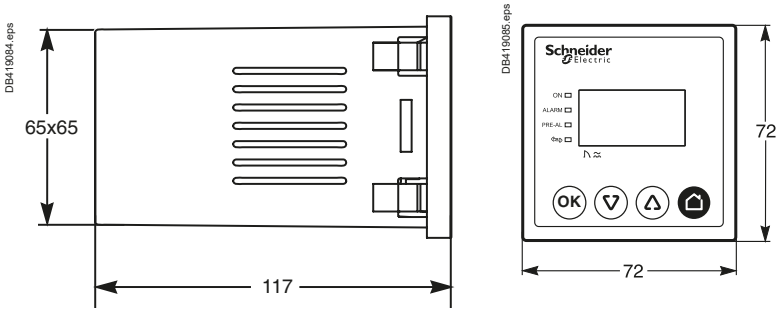
RH10P, RH21P and RH99P



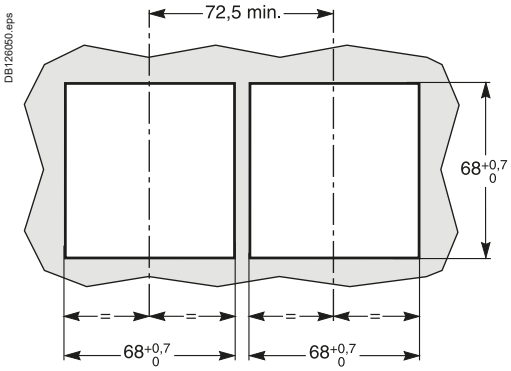
RH197P



RHUs, RHU and RMH

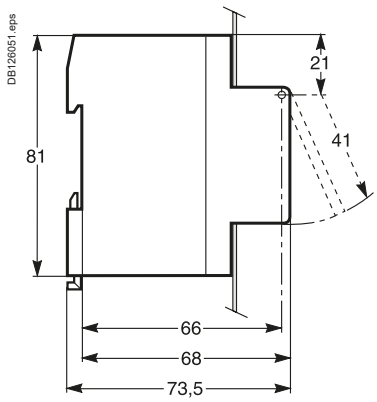


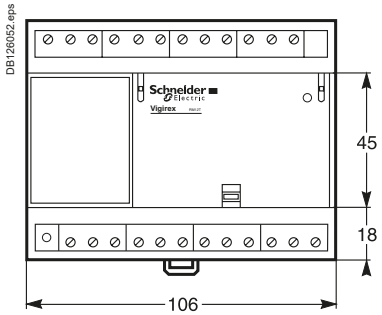
Door Cutout



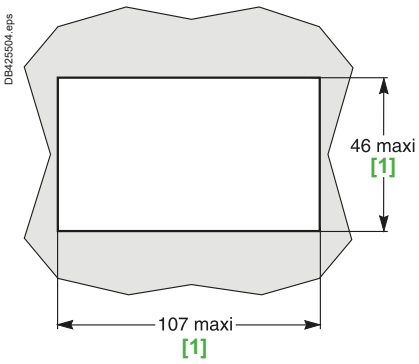
DIN rail mounting only

RM12T





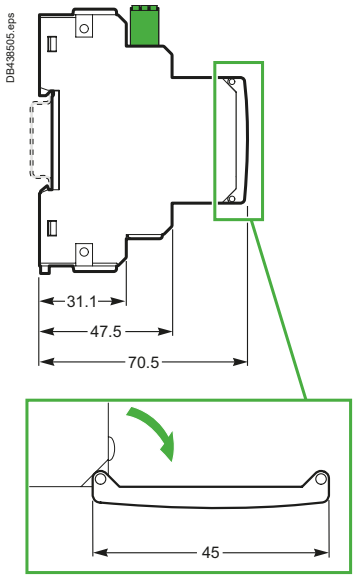
Door cutout

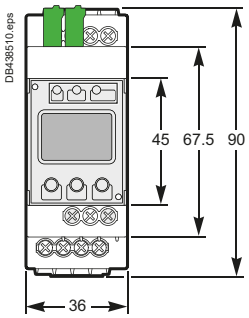


[1] For IP4 requirements.

Dimensions
RHB

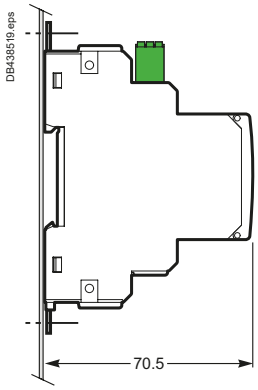
Mounting on a DIN rail





C

Mounting on a mounting plate



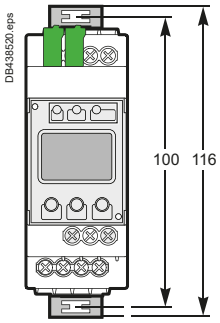
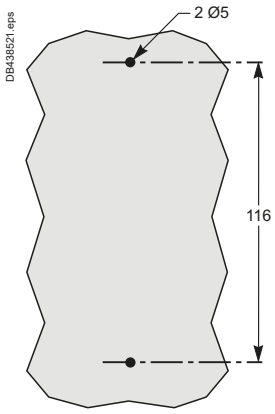
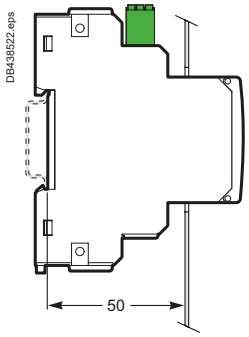


Plate drilling layout

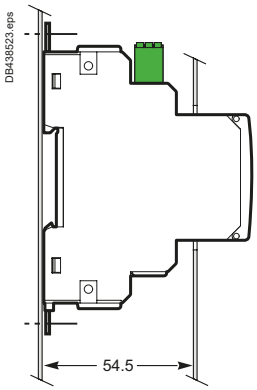


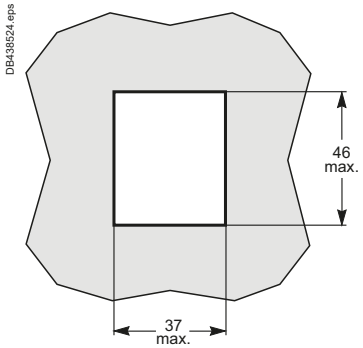
Door cutout

Mounting on a DIN rail



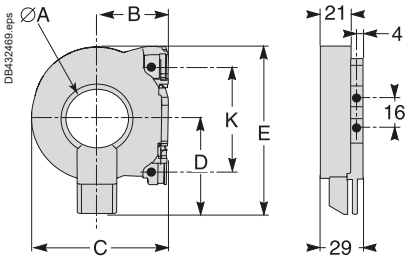
Mounting on a mounting plate



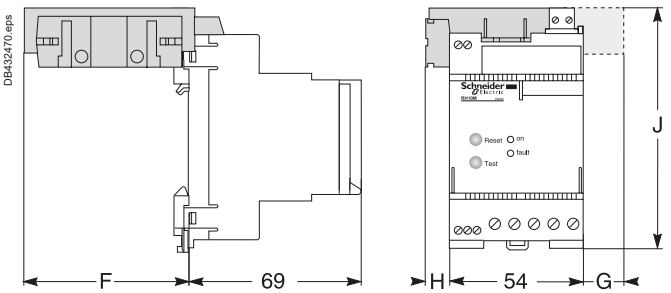


Dimensions
A Type Closed Toroids

TA30 and PA50 toroids

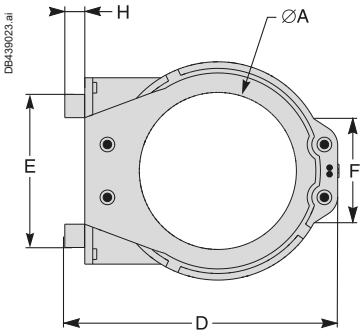


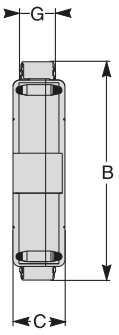
Secured to the back of the relay

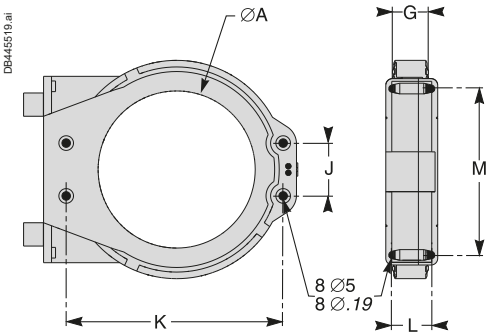


Type	ØA	B	C	D	E	F	G	H	J	K
TA30	20.4	32.5	63	44	74.5	60	-	9	98	50
PA50	50.4	45	88	57	100	86	11	22	96	60

IA80, MA120, SA200 and GA300 toroids







Type	ØA	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

C

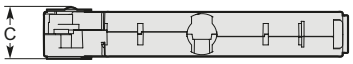
Dimensions

OA Type Split Toroids and Rectangular Sensors

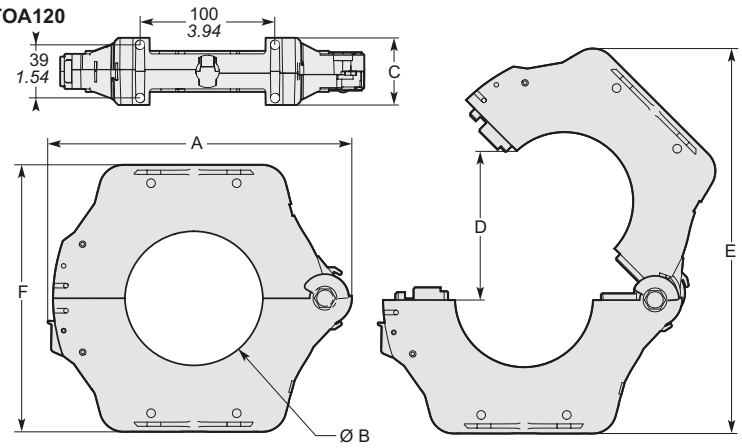
TOA80 and TOA120 toroids

DB419079.eps

TOA80



TOA120

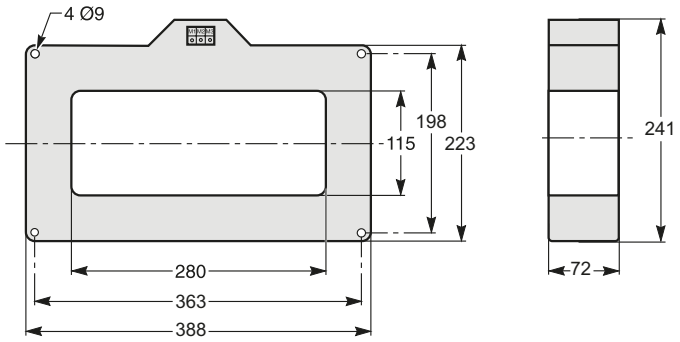


Type	Dimensions (mm)					
	A	ØB	C	D	E	F
TOA80	177	80	28	108	235	156
TOA120	225	120	50	150	303	205

Rectangular sensors

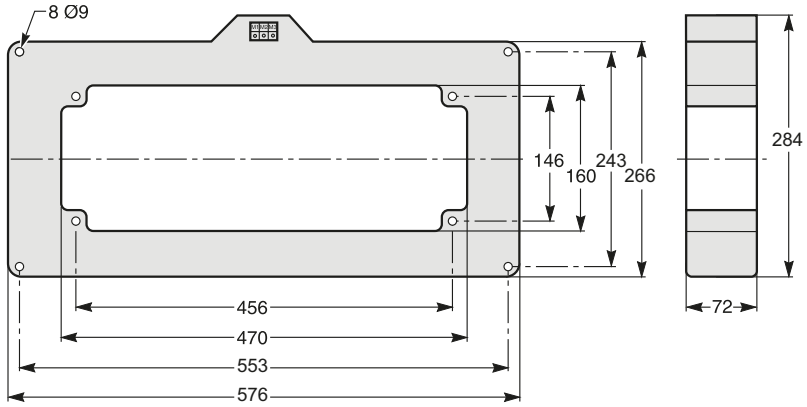
L1: frame 280 x 115 mm

DB425219.eps



L2: frame 470 x 160 mm

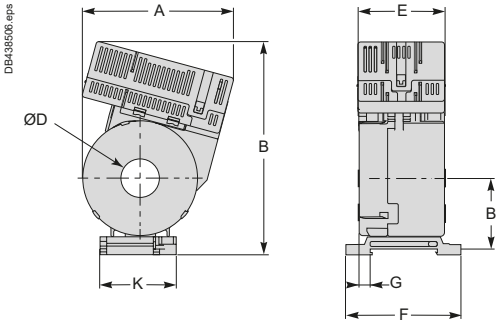
DB425216.eps



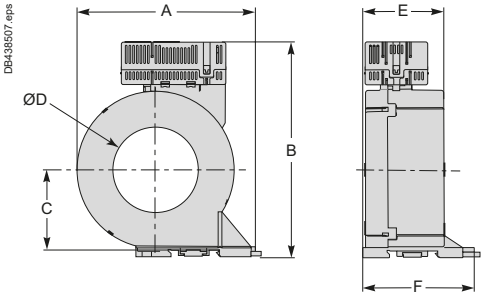
Dimensions

B Type Active Closed Toroids

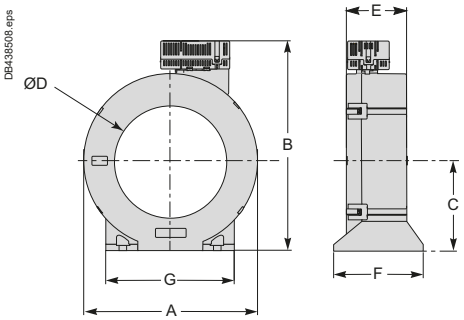
TB35/TB35P toroids



TB60/TB60P toroids

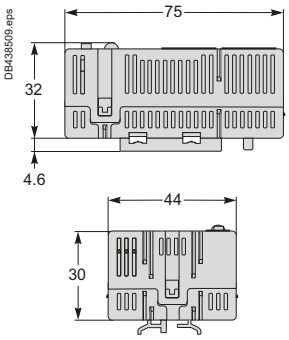


TB120/TB210 toroids



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



C

Wiring Diagrams

Wiring Diagrams

D

Other Chapters

Wiring Diagrams

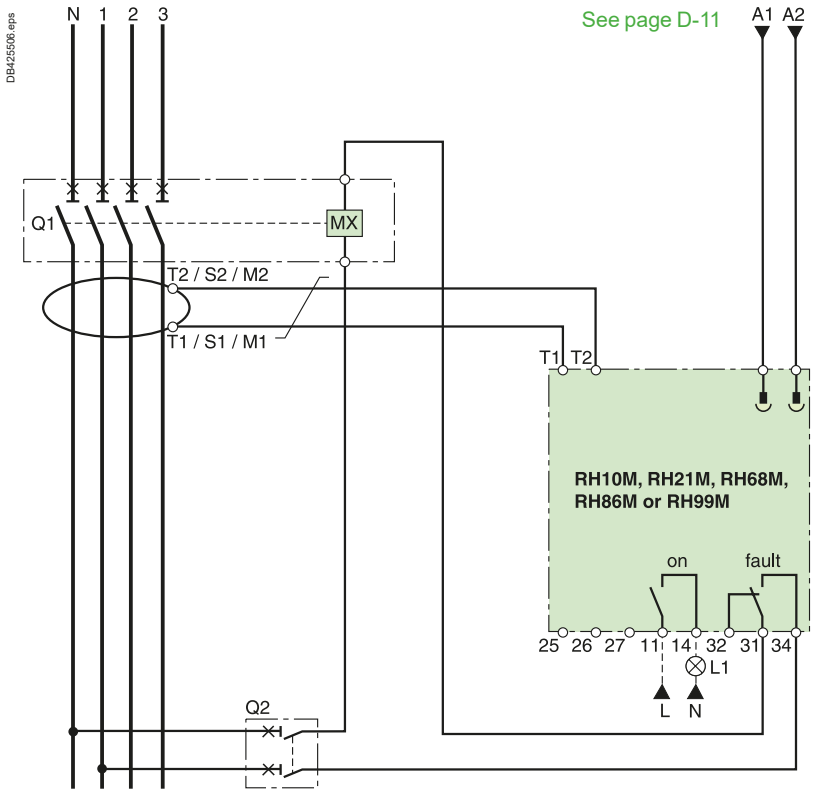
RH10, RH21, RH68, RH86, RH99M, RH10, RH21, RH86 and RH99P

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.

See page D-11



L1: lamp
MX: shunt release
Q_1: circuit breaker protecting the main circuit
Q_2: DPN circuit breaker

RH10M, RH21M, RH68M, RH86M and RH99M:

- **A_1-A_2:** auxiliary power supply
- **T_1-T_2:** A or TOA type toroid or rectangular sensor (if IΔn ⩾ 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**.

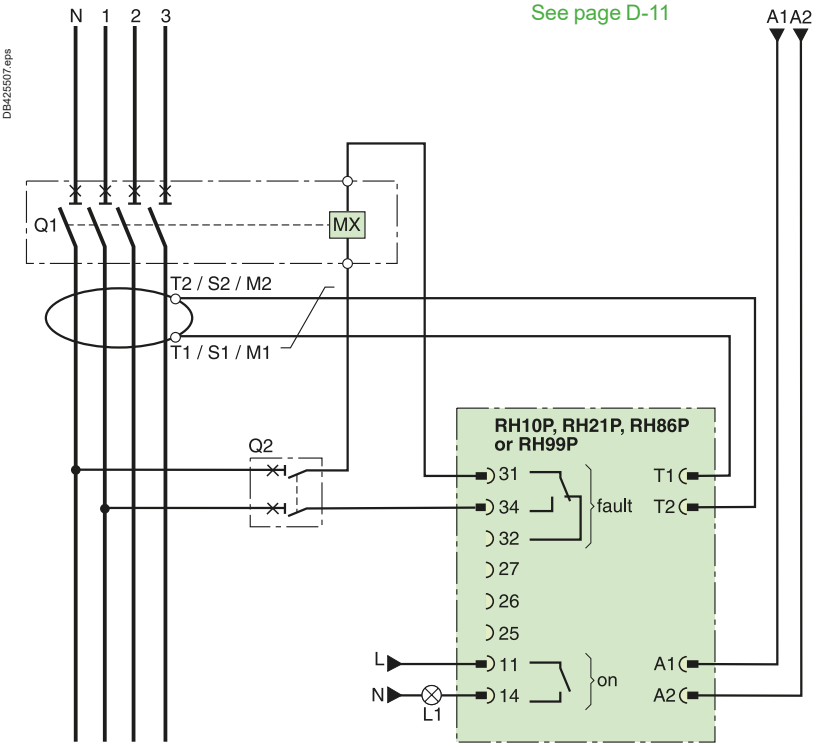
RH10P, RH21P and RH99P Wiring with MX Shunt Release

L1: lamp
MX: shunt release
Q_1: circuit breaker protecting the main circuit
Q_2: DPN circuit breaker

RH10P, RH21P and RH99P:

- **A_1-A_2:** auxiliary power supply
- **T_1-T_2:** A or TOA type toroid or rectangular sensor (if IΔn ⩾ 500 mA)
- **11-14:** "voltage-presence" contact
- **26-25:** relay test
- **27-25:** "fault" reset
- **31-32-34:** "fault" contact.

See page D-11



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

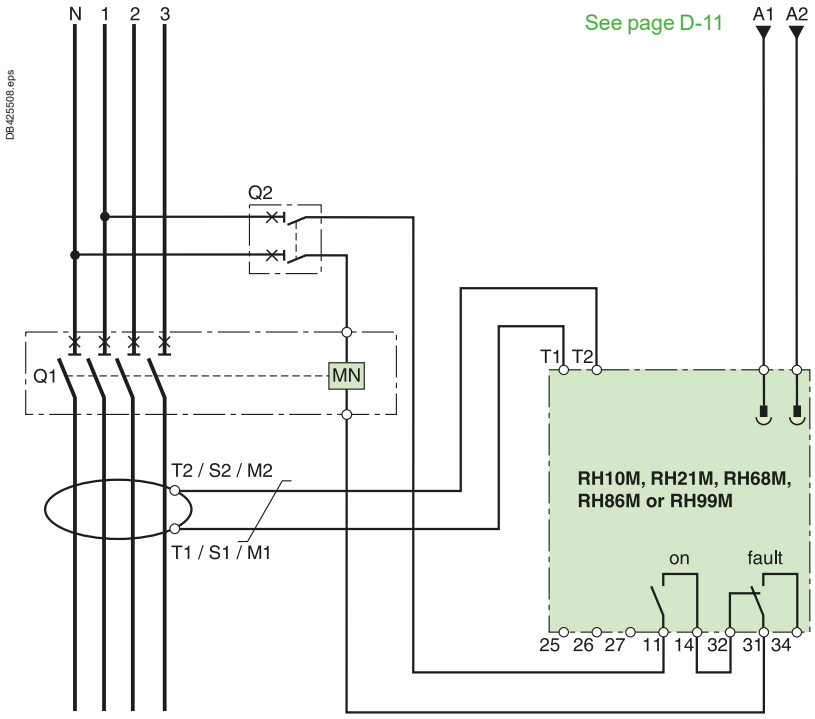
All diagrams are shown with circuits de-energized, all devices open and relays in released position.

See page D-11

MN: undervoltage release
Q_1: circuit breaker protecting the main circuit
Q_2: DPN circuit breaker

RH10M, RH21M, RH68M, RH86M and RH99M:

- **A_1-A_2:** auxiliary power supply
- **T_1-T_2:** A or TOA type toroid or rectangular sensor (if IΔn ⩾ 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.**

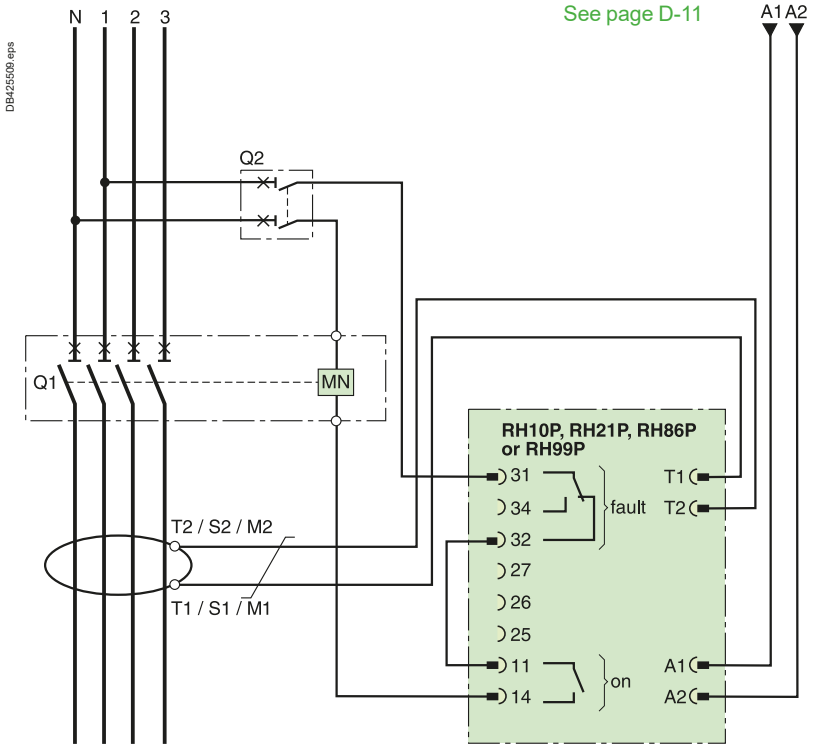
RH10P, RH21P and RH99P Wiring with MN Undervoltage Release

MN: undervoltage release
Q_1: circuit breaker protecting the main circuit
Q_2: DPN circuit breaker

RH10MP, RH21P and RH99P:

- **A_1-A_2:** auxiliary power supply
- **T_1-T_2:** A or TOA type toroid or rectangular sensor (if IΔn ⩾ 500 mA)
- **11-14:** “voltage-presence” contact
- **26-25:** relay test
- **27-25:** “fault” reset
- **31-32-34:** “fault” contact.

See page D-11



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

D

Wiring Diagrams
RH86, RH99 Monitor
Auto-reclosing application for unattended stations

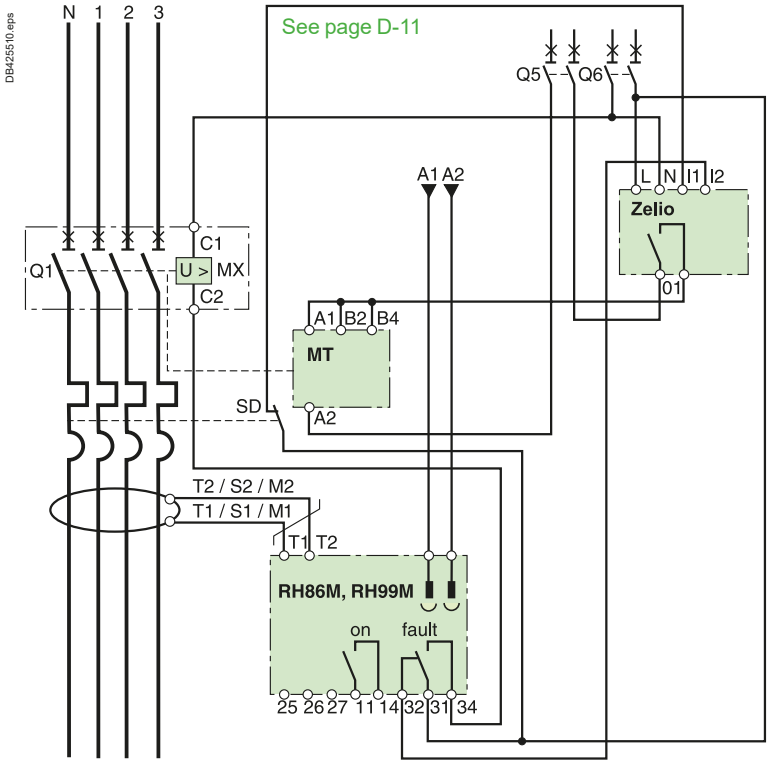
RH86M, RH99M Monitor Wiring with ATm Auto-Reclosing Controller

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
Q_1: circuit breaker protecting the main circuit
Q_4 to Q_6: DPN circuit breakers

RH86M, RH99M monitor:
- **A_1-A_2:** auxiliary power supply
- **T_1-T_2:** A or TOA type toroid or rectangular sensor (if IΔn ≥ 500 mA)
- **11-14:** "voltage-presence" contact
- **26-25:** relay test
- **27-25:** "fault" reset
- **31-32-34:** "fault" contact

S_1 et S_2: single-pole switch
SD: auxiliary fault indication contact
T: sensor

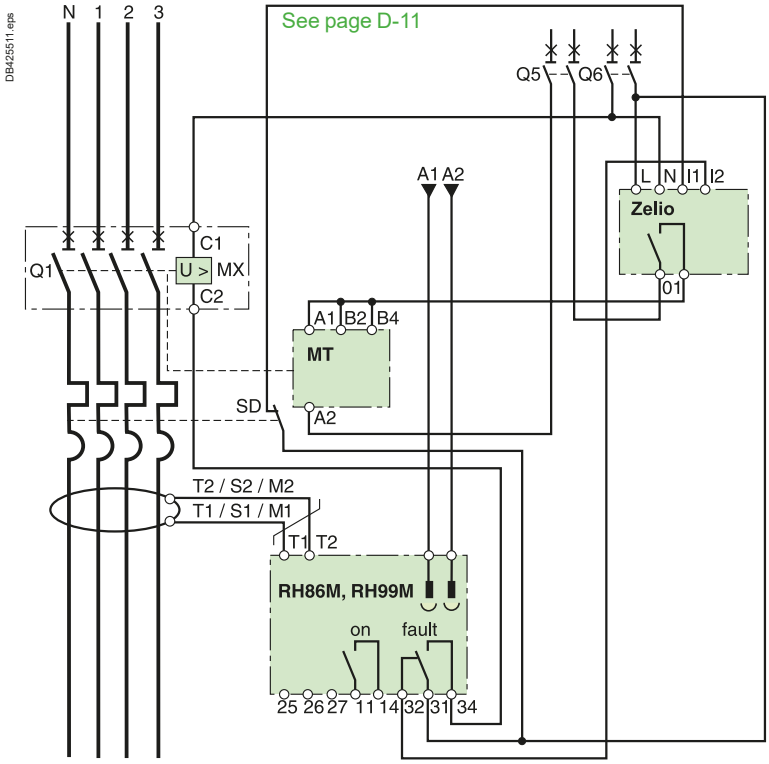


RH99P Monitor Wiring with ATm Auto-Reclosing Controller

Zelio Logic: Programmable logic controller
H: red light
MT: motor mechanism module
MX: shunt release
Q_1: circuit breaker protecting the main circuit
Q_4 to Q_6: DPN circuit breakers

RH99P monitor:
- **A_1-A_2:** auxiliary power supply
- **T_1-T_2:** A or TOA type toroid or rectangular sensor (if IΔn ≥ 500 mA)
- **11-14:** "voltage-presence" contact
- **26-25:** relay test
- **27-25:** "fault" reset
- **31-32-34:** "fault" contact

S_1 et S_2: 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 overides 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

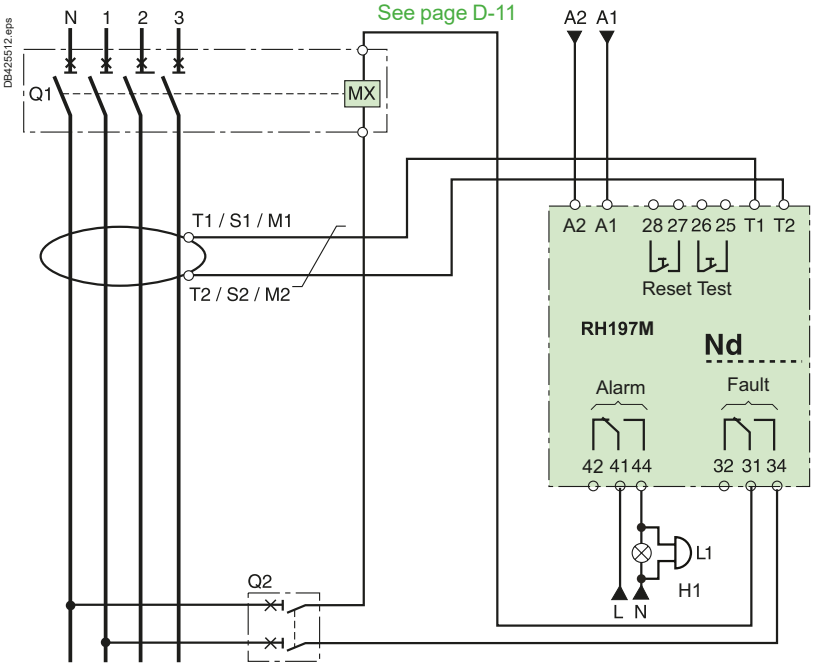
All diagrams are shown with circuits de-energized, all devices open and relays in released position.

Switch setting:

DB425514.eps

L1: lamp and audio alarm
MX: shunt release
Q_1: circuit breaker protecting the main circuit
Q_2: DPN circuit breaker

RH197M:
- **A_1-A_2:** auxiliary power supply
- **T_1-T_2:** A or TOA type toroid or rectangular sensor (if IΔn ⩾ 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.

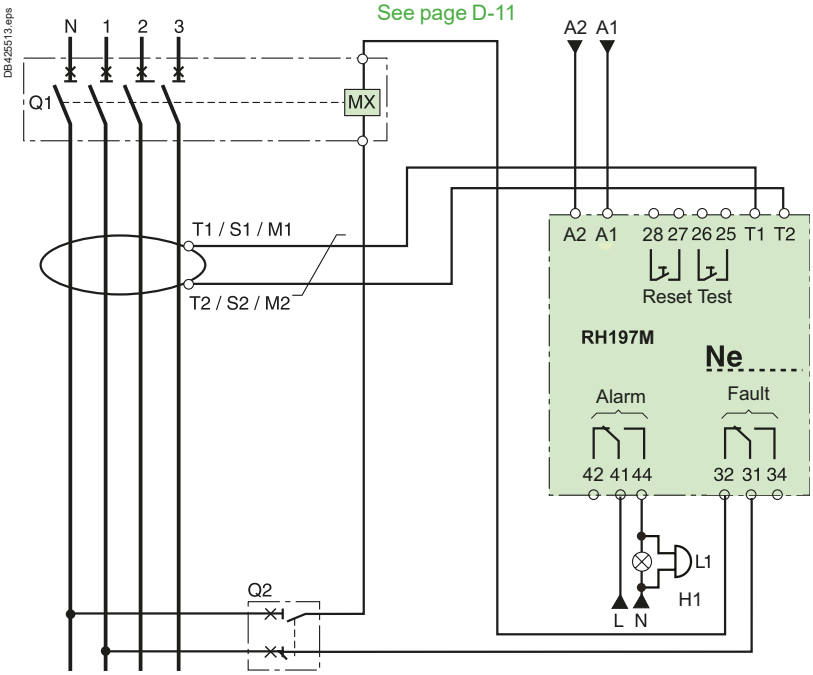
Switch setting:

DB425515.eps

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

L1: lamp and audio alarm
MX: shunt release
Q_1: circuit breaker protecting the main circuit
Q_2: DPN circuit breaker

RH197M:
- **A_1-A_2:** auxiliary power supply
- **T_1-T_2:** A or TOA type toroid or rectangular sensor (if IΔn ⩾ 500 mA)
- **41-44:** "alarm contact"
- **26-25:** relay test
- **27-25:** "fault" reset
- **31-32-34:** "fault" contact



D

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:

DB425518.eps

L1: lamp and audio alarm
MN: undervoltage release
Q_1: circuit breaker protecting the main circuit
Q_2: DPN circuit breaker

RH197M:
- **A_1-A_2:** auxiliary power supply
- **T_1-T_2:** A or TOA type toroid or rectangular sensor (if IΔn < 500 mA)
- **41-44:** “alarm contact”
- **26-25:** relay test
- **27-25:** “fault” reset
- **31-32-34:** “fault” contact

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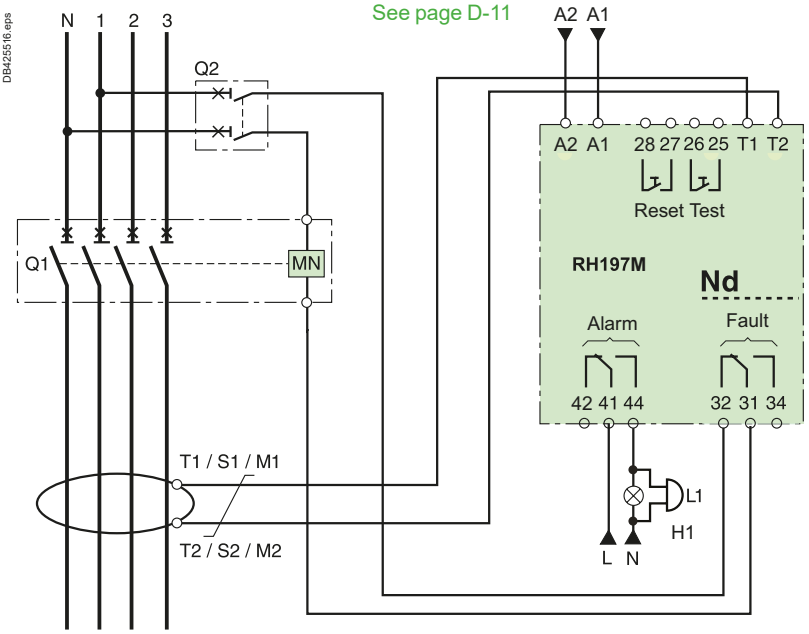

See page D-11

D

RH197M Wiring for Optimum Protection

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

Switch setting:

DB425519.eps

L1: lamp and audio alarm
MN: undervoltage release
Q_1: circuit breaker protecting the main circuit
Q_2: DPN circuit breaker

RH197M:
- **A_1-A_2:** auxiliary power supply
- **T_1-T_2:** A or TOA type toroid or rectangular sensor (if IΔn ⩽ 500 mA)
- **41-44:** “alarm contact”
- **26-25:** relay test
- **27-25:** “fault” reset
- **31-32-34:** “fault” contact

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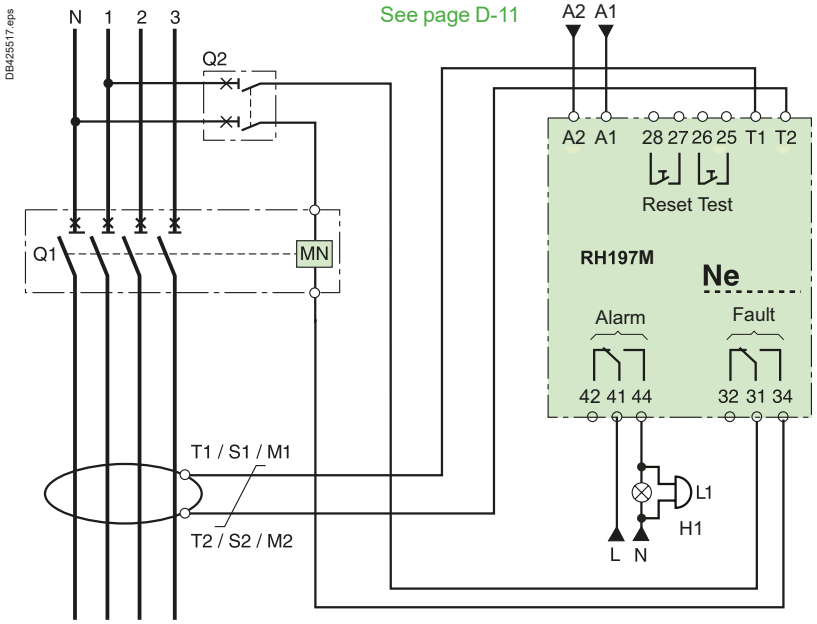

See page D-11

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:

DB425522.eps

L1: lamp and audio alarm
MX: shunt release
Q_1: circuit breaker protecting the main circuit
Q_2: DPN circuit breaker

RH197P:
- **A_1-A_2:** auxiliary power supply
- **T_1-T_2:** A or TOA type toroid or rectangular sensor (if IΔn ⩽ 500 mA)
- **41-44:** "alarm contact"
- **26-25:** relay test
- **27-25:** "fault" reset
- **31-32-34:** "fault" contact

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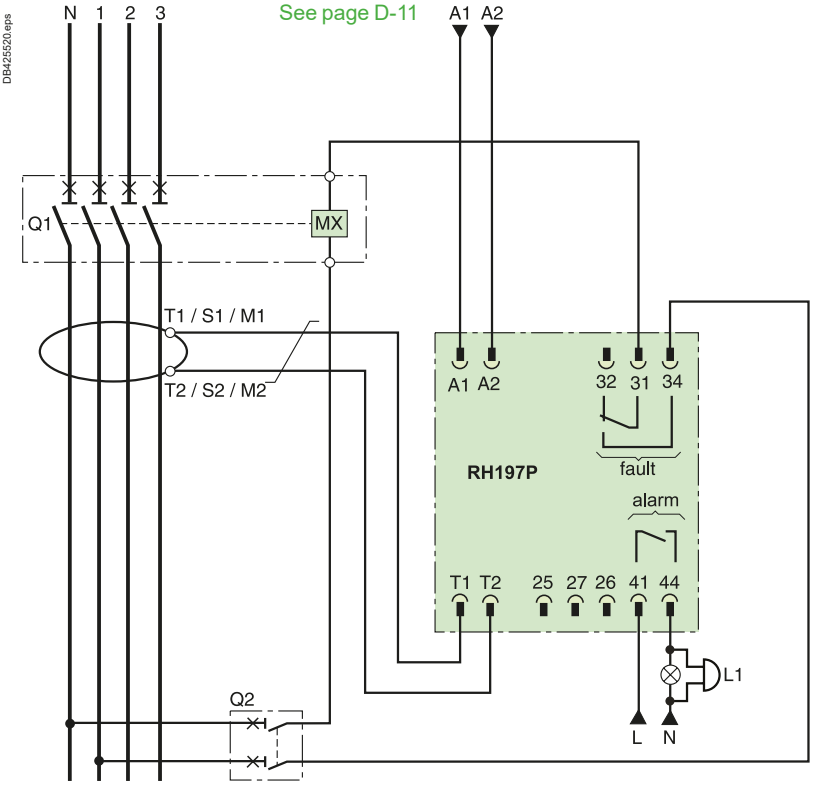
See page D-11



RH197P Wiring for Optimum Protection

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

Switch setting:

DB425523.eps

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

L1: lamp and audio alarm
MX: shunt release
Q_1: circuit breaker protecting the main circuit
Q_2: DPN circuit breaker

RH197P:
- **A_1-A_2:** auxiliary power supply
- **T_1-T_2:** A or TOA type toroid or rectangular sensor (if IΔn ⩽ 500 mA)
- **41-44:** "alarm contact"
- **26-25:** relay test
- **27-25:** "fault" reset
- **31-32-34:** "fault" contact

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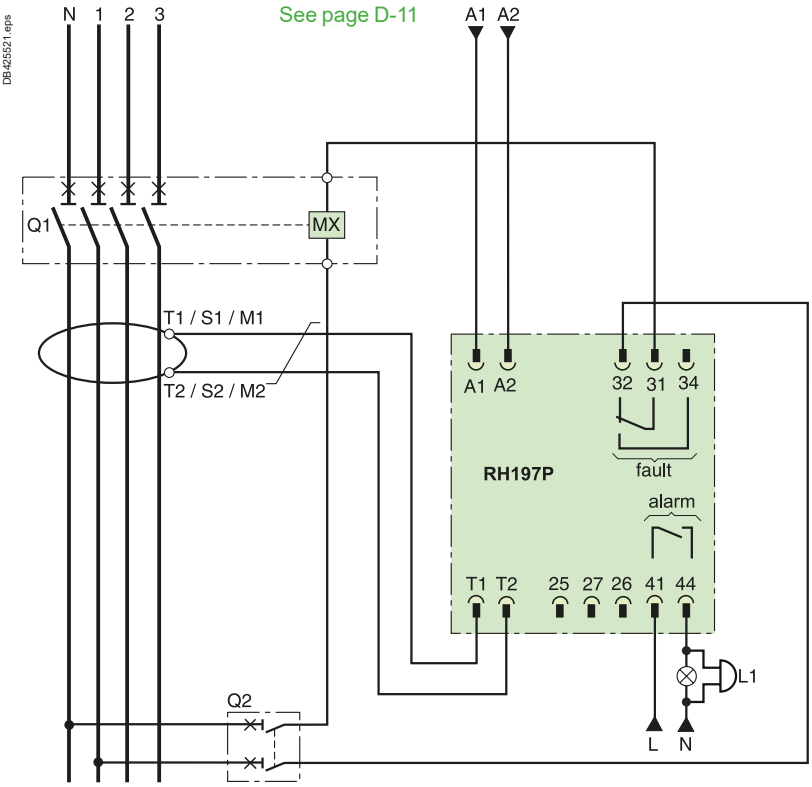
See page D-11



D

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:

DB425526.eps

L1: lamp and audio alarm
MN: undervoltage release
Q_1: circuit breaker protecting the main circuit
Q_2: DPN circuit breaker

RH197P:
- **A_1-A_2:** auxiliary power supply
- **T_1-T_2:** A or TOA type toroid or rectangular sensor (if IΔn < 500 mA)
- **41-44:** "alarm contact"
- **26-25:** relay test
- **27-25:** "fault" reset
- **31-32-34:** "fault" contact

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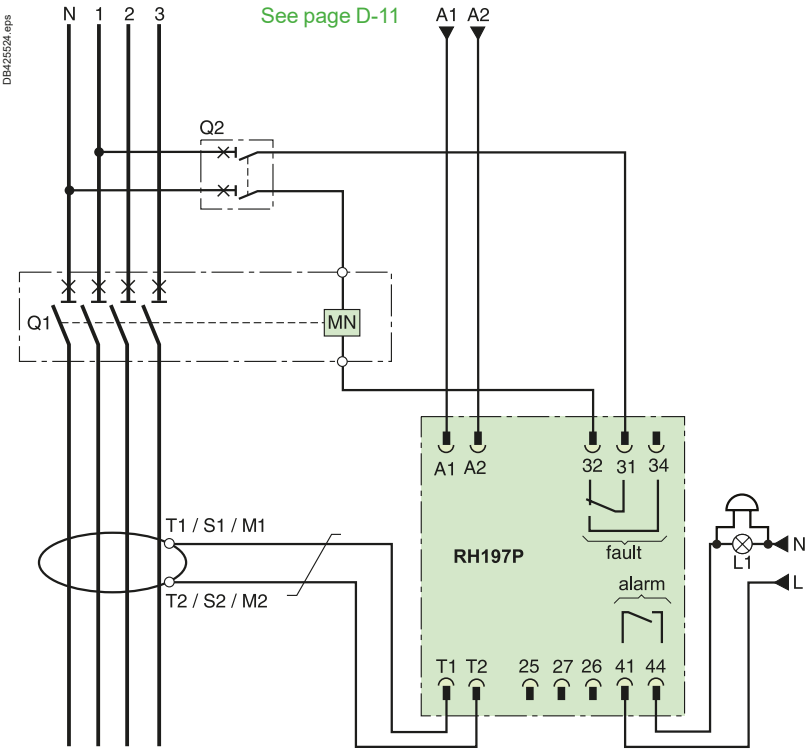
See page D-11



RH197P Wiring for Optimum Protection

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

Switch setting:

DB425527.eps

L1: lamp and audio alarm
MN: undervoltage release
Q_1: circuit breaker protecting the main circuit
Q_2: DPN circuit breaker

RH197P:
- **A_1-A_2:** auxiliary power supply
- **T_1-T_2:** A or TOA type toroid or rectangular sensor (if IΔn ⩽ 500 mA)
- **41-44:** "alarm contact"
- **26-25:** relay test
- **27-25:** "fault" reset
- **31-32-34:** "fault" contact

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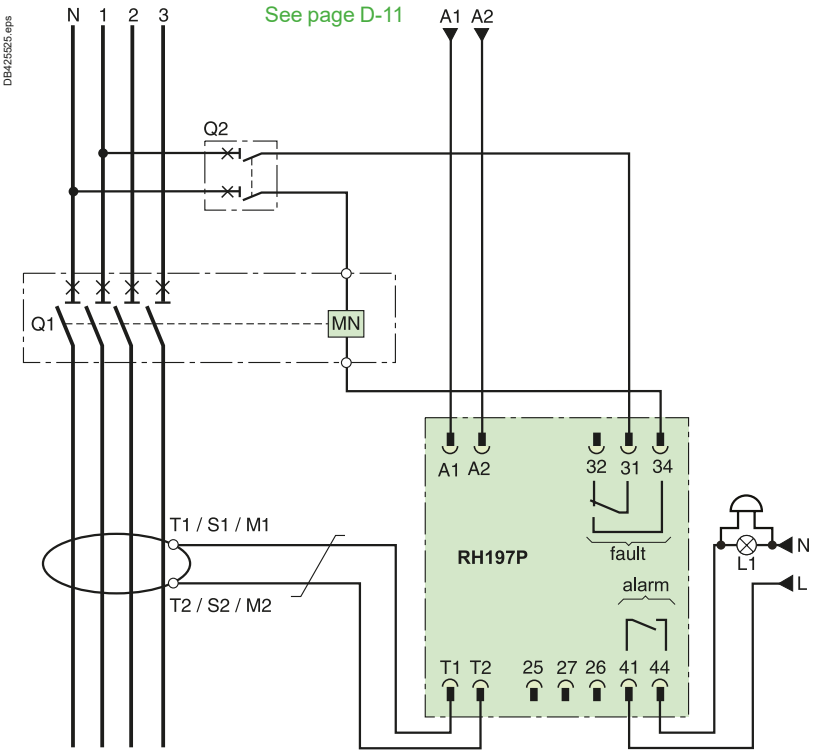
See page D-11



D

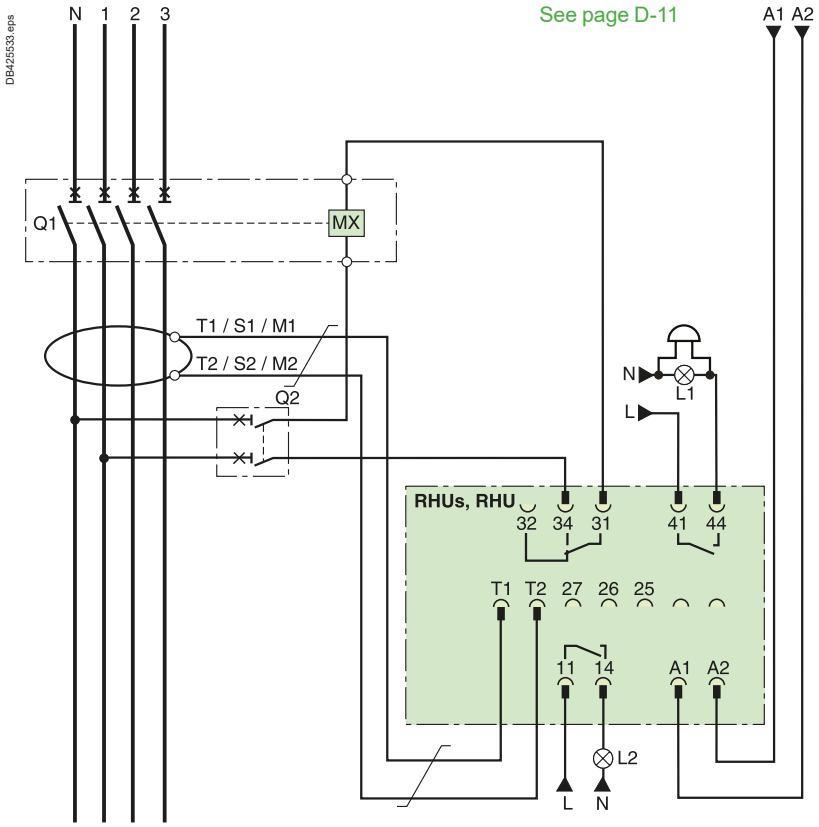
RHUs and RHU Wiring with MX Shunt Release: Optimum Continuity of Service

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
Q_1: circuit breaker protecting the main circuit
Q_2: DPN circuit breaker

RHUs and RHU:
- **A_1-A_2:** auxiliary power supply
- **T_1-T_2:** A or TOA type toroid or rectangular sensor (if IΔn ⩾ 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”.



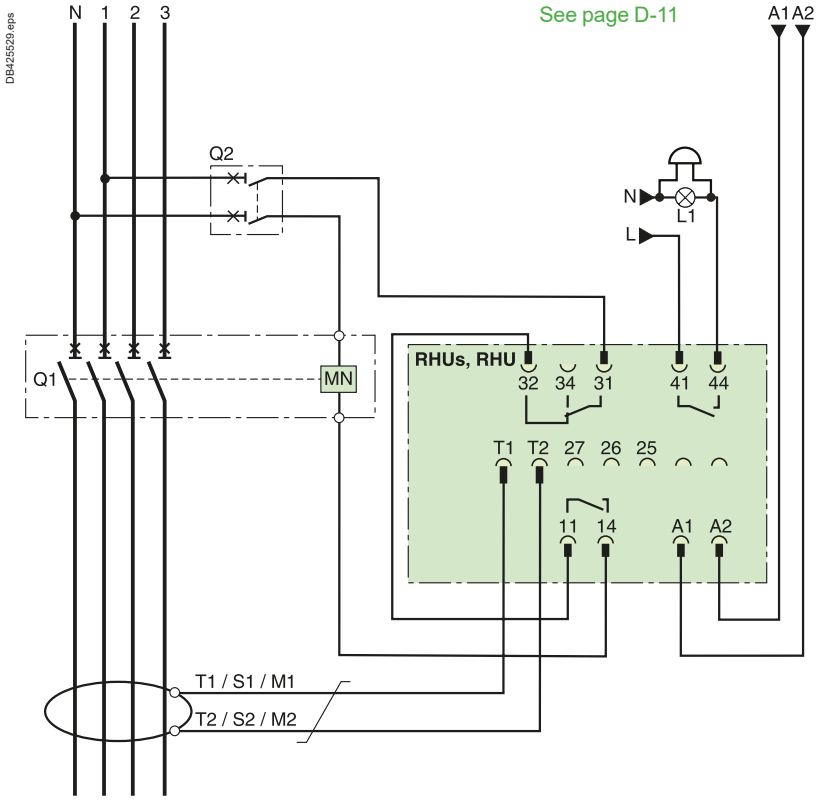
[1] RHU only.

RHUs and RHU Wiring with MN Undervoltage Release: Optimum Protection

L1: lamp and audio alarm
MN: undervoltage release
Q_1: circuit breaker protecting the main circuit
Q_2: DPN circuit breaker

RHUs and RHU:
- **A_1-A_2:** auxiliary power supply
- **T_1-T_2:** A or TOA type toroid or rectangular sensor (if IΔn ⩾ 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.

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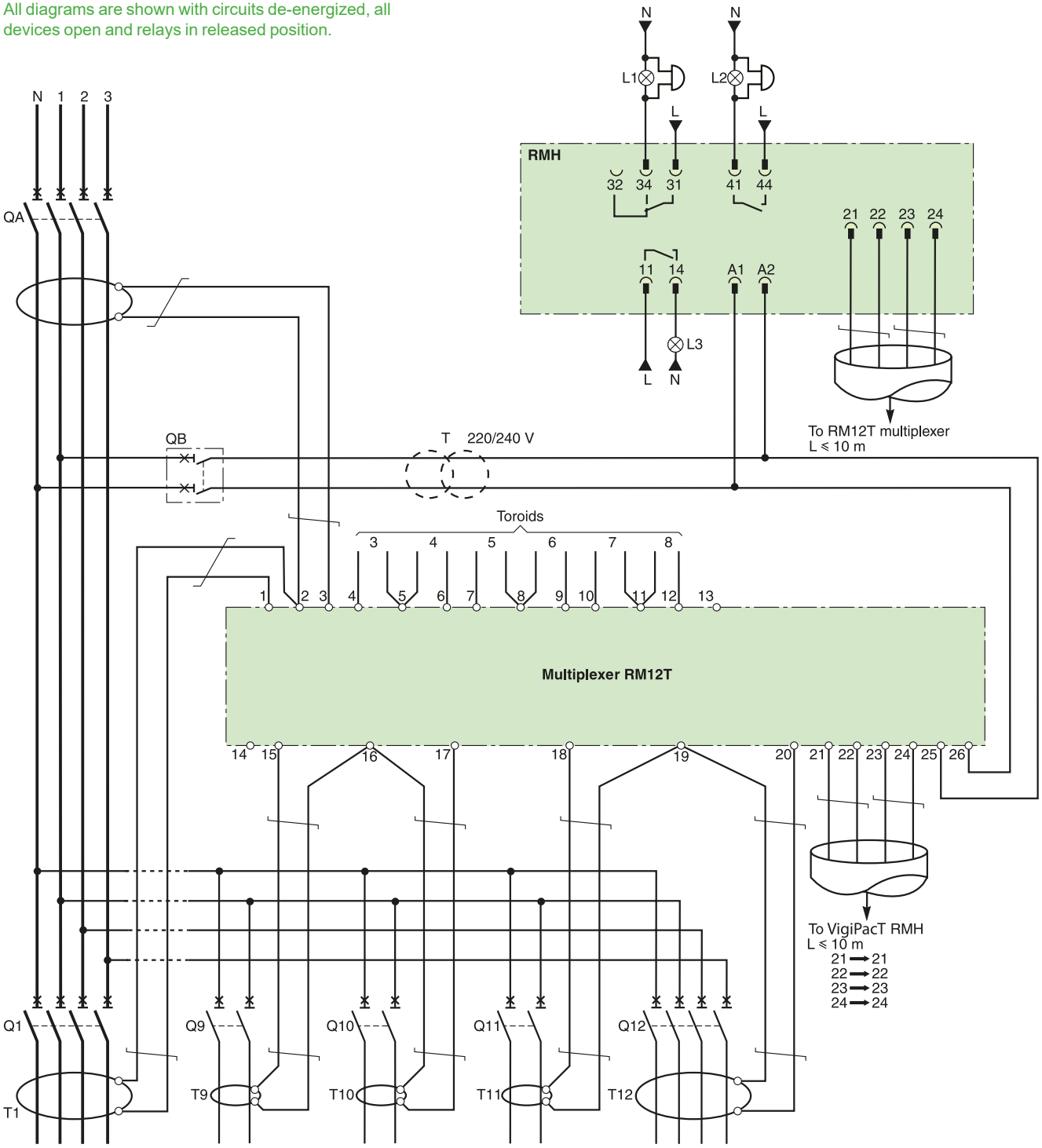


L1, L2: lamp and audio alarm
L3: lamp
Q_A: switchboard incoming circuit breaker for the main circuit
Q_B: circuit breaker protecting the RMH and RM12T power supply circuit
Q_1 to Q_{12}: circuit breakers on main outgoing circuits 1 to 12
T: transformer with 220/240 V secondary (if required), rating ⩾ 4 VA
T_1 to T_{12}: residual current measurement toroids for circuits 1 to 12 (or rectangular sensor if IΔn ⩾ 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.

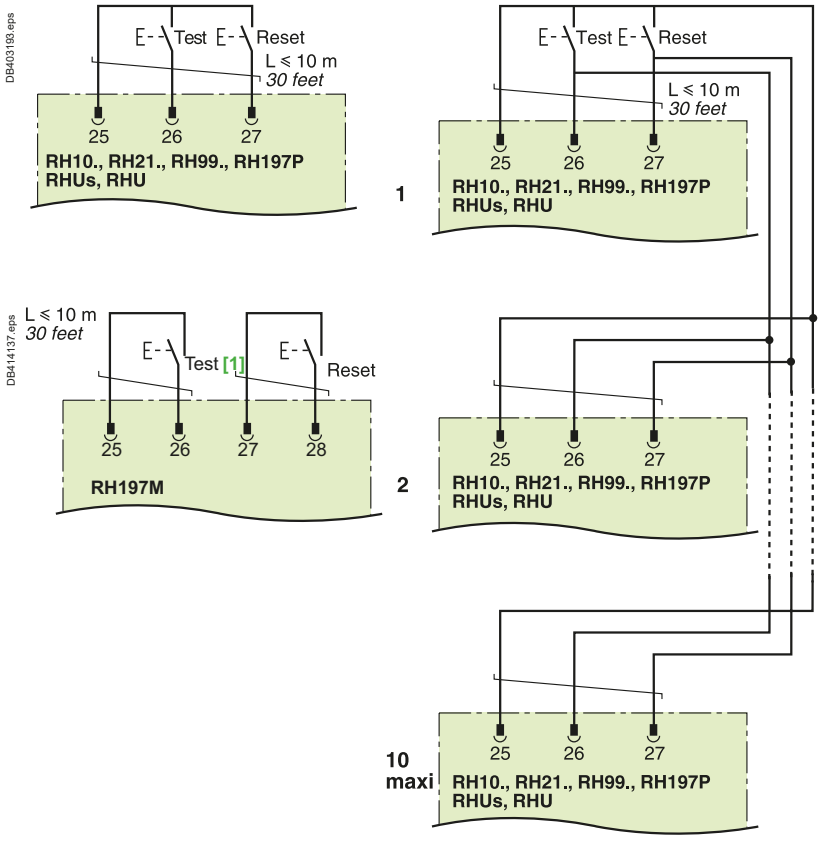
RMH earth leakage monitor
- **A_1-A_2:** auxiliary power supply
- **11-14:** “voltage-presence” contact
- **21 to 24:** connection of RM12T multiplexer
- **31-32-34:** “alarm” contact
- **41-44:** “pre-alarm” contact.

Wiring Diagrams
Communication Bus, Test and Remote Reset Functions, Power Supply

Connection of Test and Remote Reset Functions

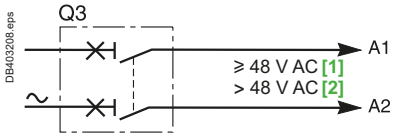
Cable
The cable must not exceed 10 m in length.
Use a cable with 3 twisted wires.

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

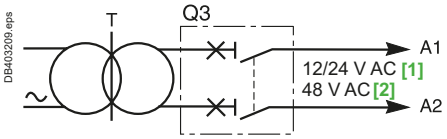


[1] Not available on DC version/Hold on for a time equivalent to the time delay setting for others versions.

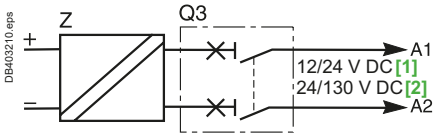
Connection of RH10, RH21, RH99, RH197, RHUs and RHU Power Supply



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



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



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

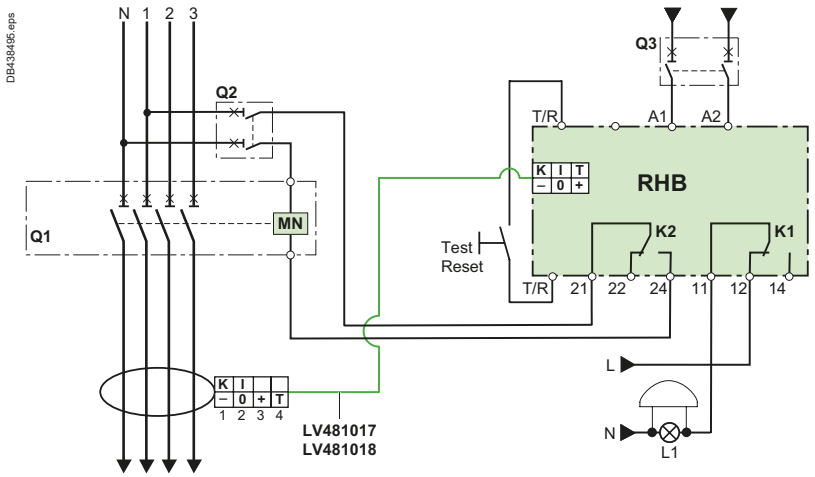
Wiring Diagrams
RHB

Wiring with MN

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

L1: lamp and audio alarm
MN: undervoltage release
Q_1: circuit breaker protecting the main circuit
Q_2: Voltage release protection
Q_3: RHB relay protection:
- 6 A circuit breaker (phase + neutral)
- 6 A fuse.

RHB:
- **A_1-A_2:** connection to supply voltage U_s
- **1:** socket for connection cable of measuring current transformer
- **T/R** : connection for a combined external test and reset button
- **11-12-14:** Output relay K1 (alarm)
- **21-22-24:** Output relay K2

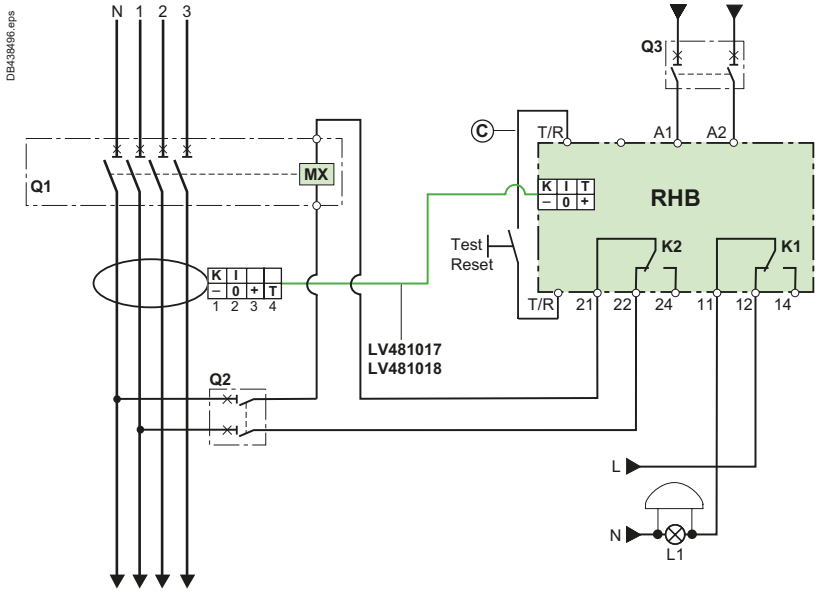


D

Wiring with MX

L1: lamp and audio alarm
MX: shunt release
Q_1: circuit breaker protecting the main circuit
Q_2: DPN circuit breaker
Q_3: RHB relay protection:
- 6 A circuit breaker (phase + neutral)
- 6 A fuse.

RHB:
- **A_1-A_2:** connection to supply voltage U_s
- **1:** socket for connection cable of measuring current transformer
- **T/R** : connection for a combined external test and reset button
- **11-12-14:** Output relay K1 (alarm)
- **21-22-24:** Output relay K2



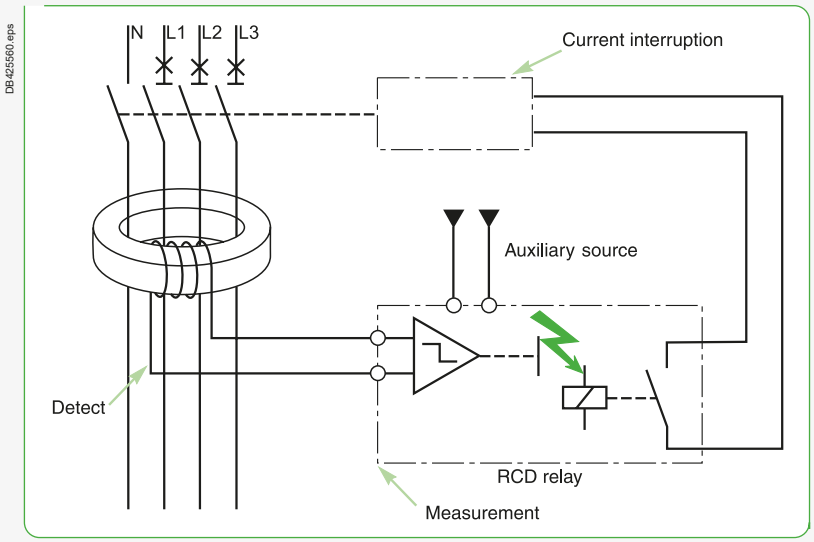
Additional Characteristics

E

Vigi**PacT** Devices
RCD Operating Principle

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

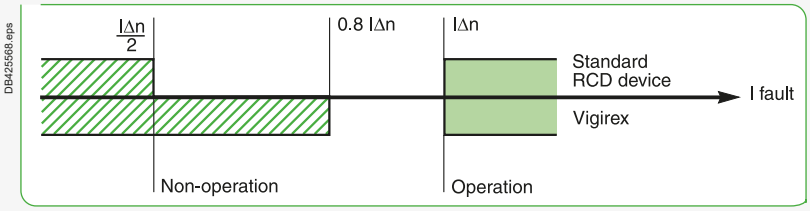
Sensitivity depending on the different needs

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 IΔn 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 IΔn value must:

- **Not operate** for all fault currents ⩽ IΔn/2
- **Operate** for all fault currents ⩾ IΔn.



VigiPact devices are designed for non-operation up to 0.8 IΔn.
Standard IEC 60947-2 annex M allows manufacturers to indicate the level of non-operation if it differs from the general rule.

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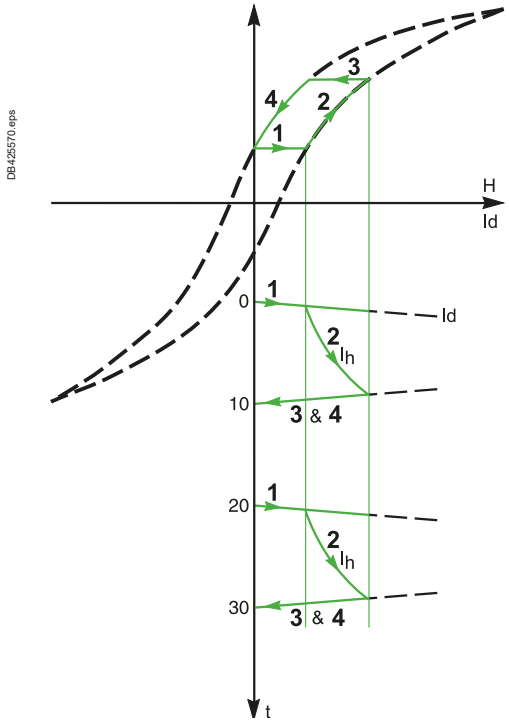


Toroid hysterisis cycle for type A measurements.
Id: primary current
Im = Id - Ih

Toroid Characteristics

The toroids used for Vigi**PacT** 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 μr 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 IΔn/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 Br. This is type A 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.

- Isc: rated short-circuit current
- Icw: rated short-time withstand current
- IΔw: 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 In (where In is the switch rating).
The Vigi**PacT** 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
Icw	100 kA/0.5 s	100 kA/0.5 s
Isc	150 kA	100 kA
IΔw	85 kA/0.5 s	85 kA/0.5 s

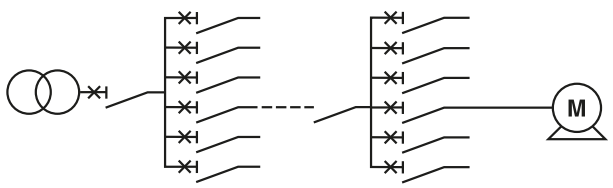
Considering the above, the combination of a VigiPacT device with a ComPacT NS, NSX or NSXm or MasterPact circuit breaker ensures optimal operation regardless of the system earthing arrangement (particularly for TN-S).

Overvoltage Withstand Capacity

The overvoltage withstand capacity of Vigi**PacT** 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 Vigi**PacT** 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 an installation 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

- Vigi**PacT** implementation

The characteristics listed below are specified.

For Type A	Sensors	Supply (for Us > 48 V)	Relay output contacts
Reference voltage	1000 V	525 V	400 V
Category	4	4	4
Uimp	12 kV	8 kV	6 kV
For Type B (RHB)	**Sensors**	**Supply (for Us > 48 V)**	**Relay output contacts**
Reference voltage	800 V	240 V	240 V
Category	3	3	3
Uimp	8 kV	4 kV	4 kV

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 permament high-frequency currents (high-frequency harmonics)
- Low-frequency leakage currents.

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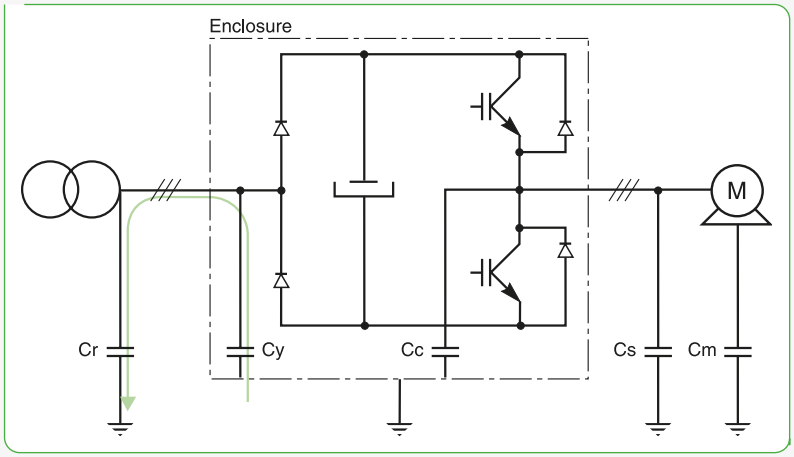

Flow of leakage currents in a frequency converter.

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.

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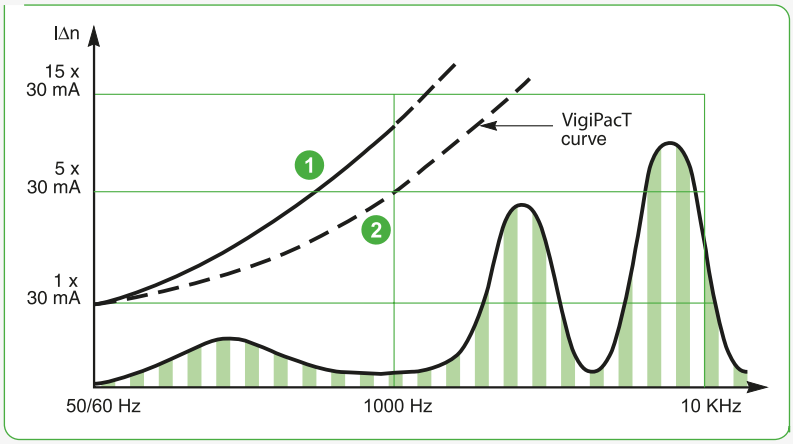


1 Frequency factor for the fibrillation threshold (IEC 60749-2).

2 Limiting values of the natural leakage currents downstream of a rectifier.

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 IΔn/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 =	IΔn	2 IΔn	5 IΔn	10 IΔn
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
IΔn: residual operating current setting

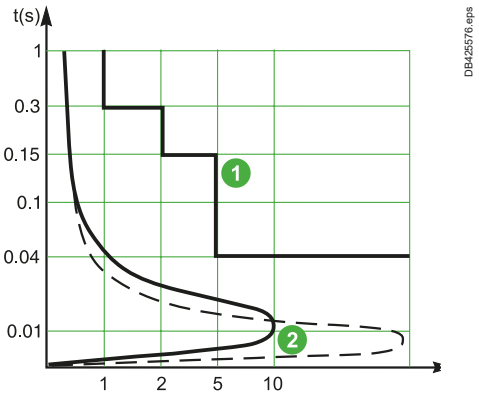
For devices set to 30 mA, 5 IΔn can be replaced by 0.25 A, in which case 10 IΔn is replaced by 0.5 A.

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 IΔn

This function equipping VigiPacT relays significantly increases (from 0.5 IΔn to 0.8 IΔn) 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.

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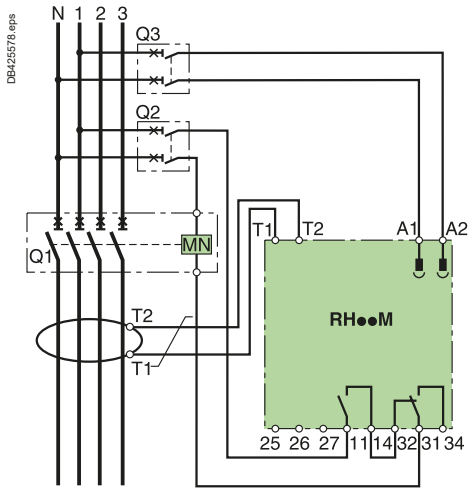
Vigi**PacT** Devices
Residual-Current Measurements



Vigi**PacT** 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 Vigi**PacT** 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	-

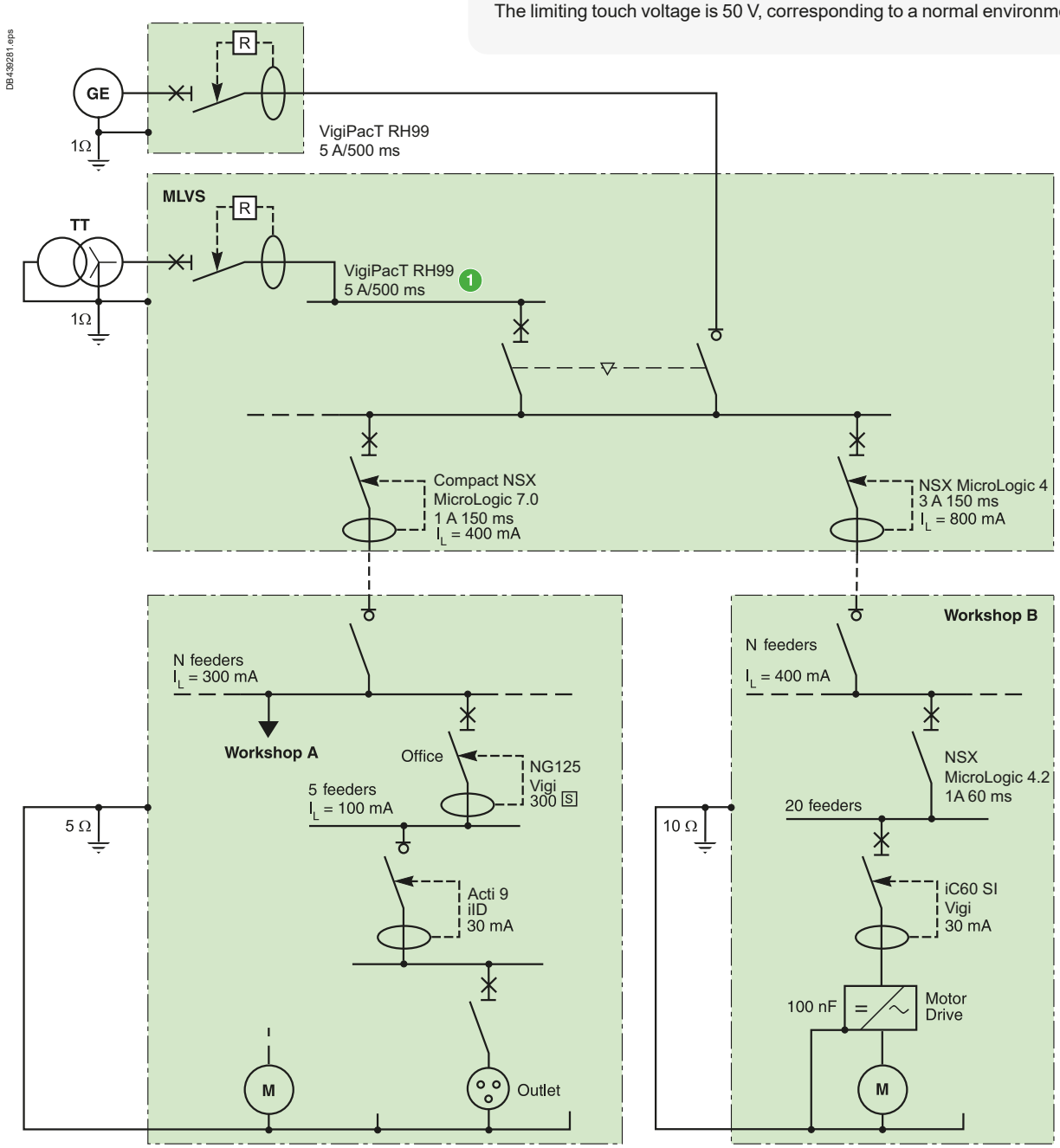
Voltage-Dip Withstand Capacity

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. Vigi**PacT** 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.

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 Ω for the transformer, 1 Ω for the engine-generator set, 5 Ω for workshop A and 10 Ω 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 IΔn = 50 V/10 Ω = 5 A
Note: even though the earthing resistance of the main LV switchboard is 1 Ω, 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. 10 Ω.
(see page E-24)

- **Non-operating time (time delay)**

the non-operating time must not exceed Δt = 1 s. (according to IEC 60364-4-41 see EIG/RCD guide).

Additional protection
Additional protection must mainly be provided or 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 $I_L < 30\ mA/2 = 15\ mA$

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 x 3.5 for 4 PCs = 14 mA < 15 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 x IL, i.e. 1 A.

Taking selectivity into account (see page A-14)

- **Current-based selectivity**

The following two conditions must be satisfied:
  - IΔn of upstream RCD > 2 IΔn of downstream RCD (selectivity requirement)
  - IΔn 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).

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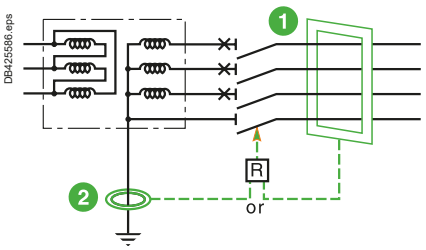


Installation of the Vigi**PacT** measurement toroid at the head of an installation.

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 Vigi**PacT** 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.

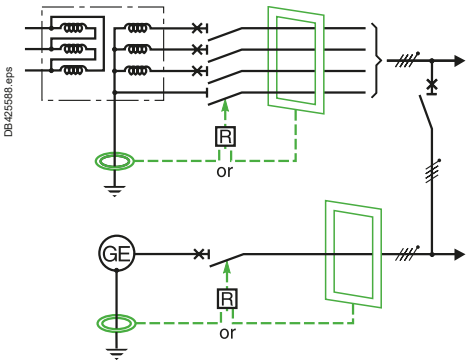
The sources must not be disconnected simultaneously.

Each Source Has a Separate Earth Electrode

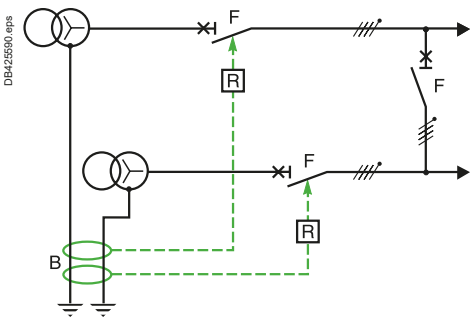
The measurement toroid for the header RCD is positioned in the same manner as for a single source.

- **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**

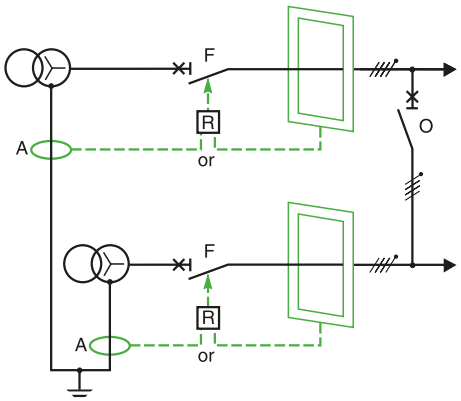
It is not possible to use the system presented above because if a fault occurs, each of the measurement toroids for the RCDs detects only a part of the fault current, i.e. the protection of persons is not ensured.
To correctly set up protection using an RCD, the two earth electrodes must both be run 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.



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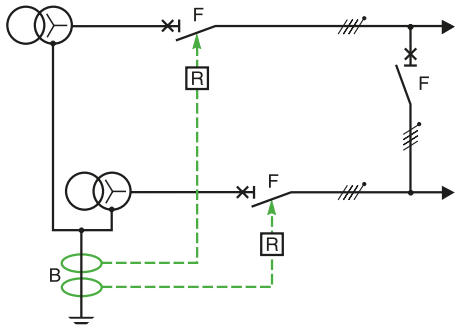
The two sources are never coupled.

■ **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.



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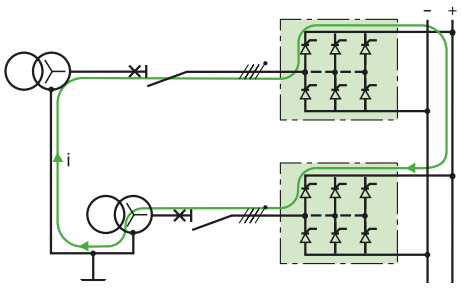
The two sources may be coupled.

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.



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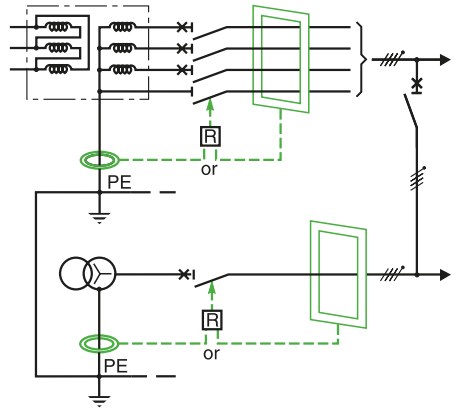
Coupling via the load and DC bus.

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 Isc 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.



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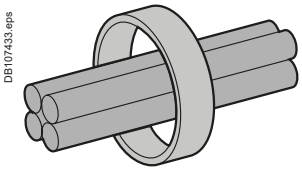
Multi-source diagram with TN system.



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 (≈ 6 In where In is the maximum permissible continuous current for the toroid)
  - The application requires high sensitivity (eg. IΔn = 30 mA)
  - The nominal current fo 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 Vigi**PacT** devices:

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

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 Vigi**PacT** 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 In.
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 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 Vigi**PacT** 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 Vigi**PacT** 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.

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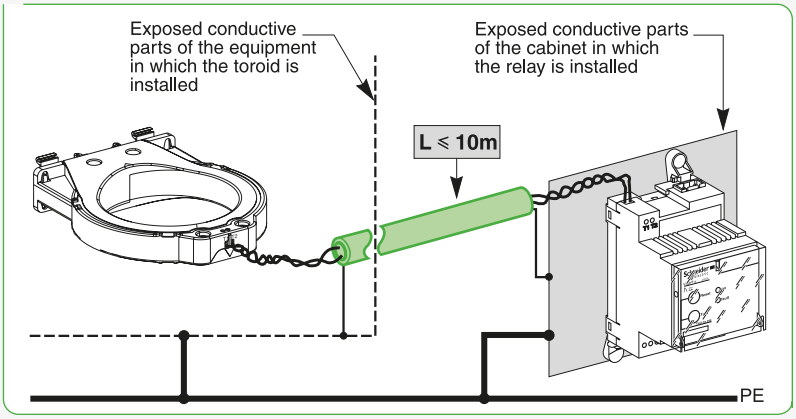
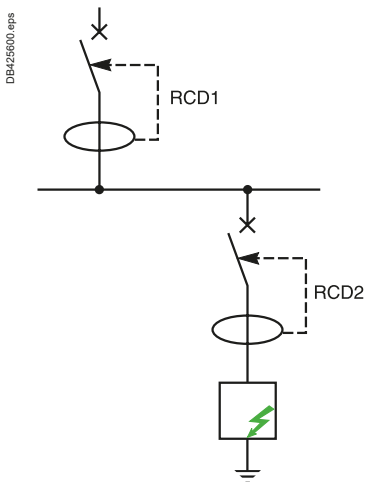


Combinations of RCDs

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:



	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.

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:
- Degenerate 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

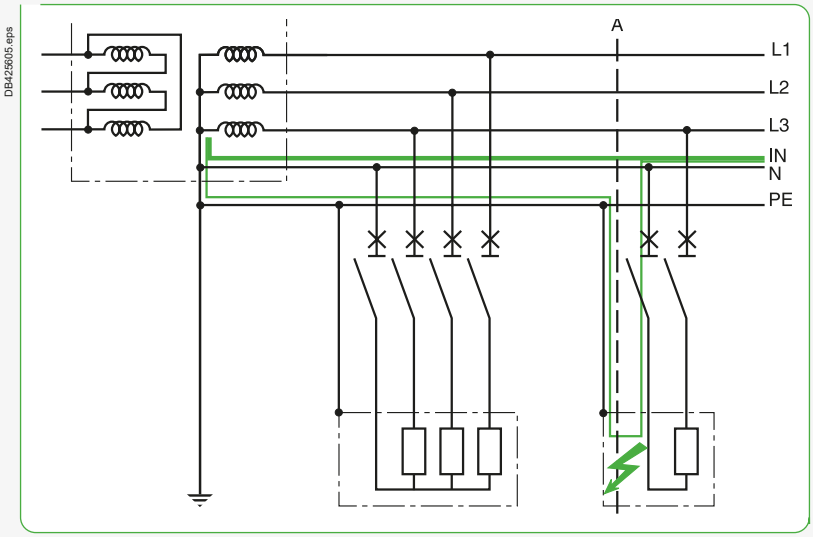
In the TN-S system, the neutral conductor is connected to the PE at the head of the installation. The neutral conductor can be accidentally earthed due to an insulation fault.

- **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

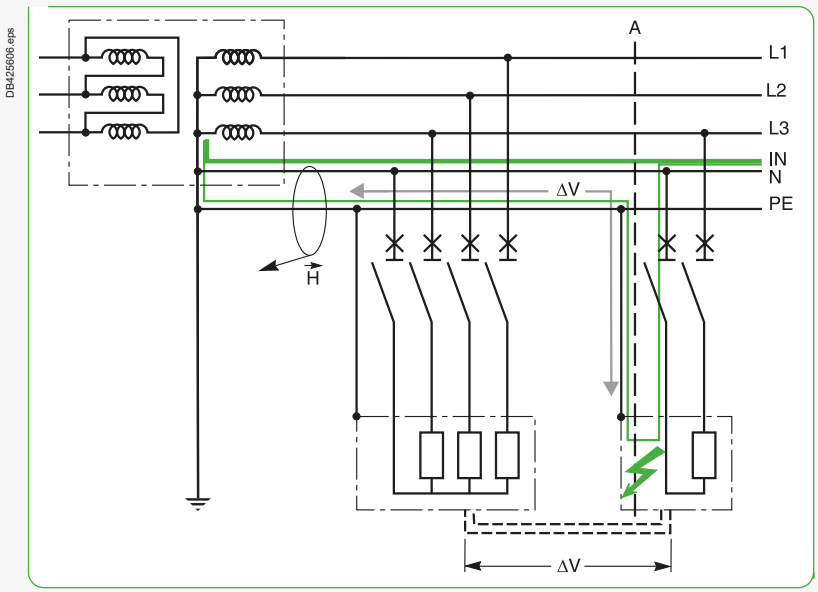
Leakage-Current Monitoring Using RCDs

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.

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 % In

[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.

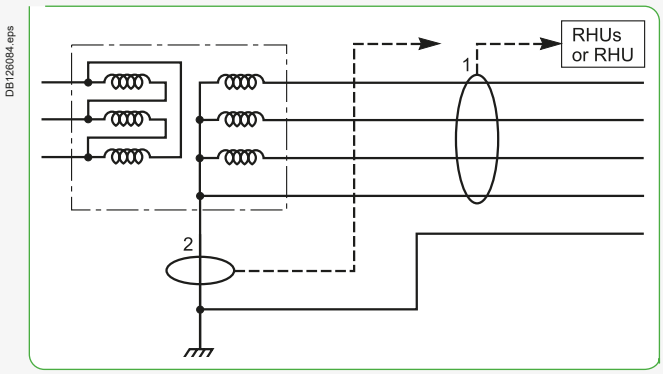
[2] In this case, the diameter of the toroid is generally much smaller than [1].

Setting

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

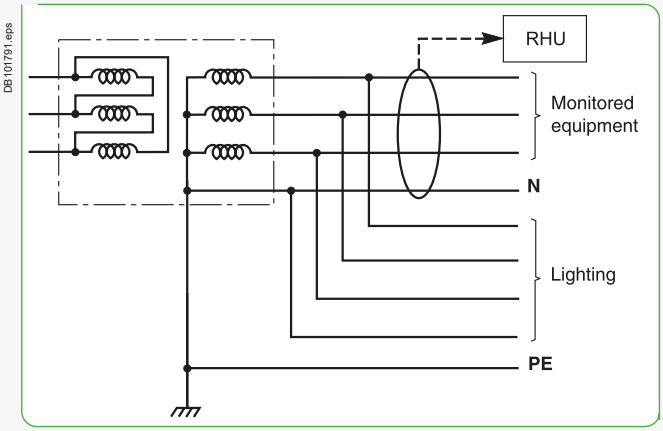
Installation

- 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.



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.

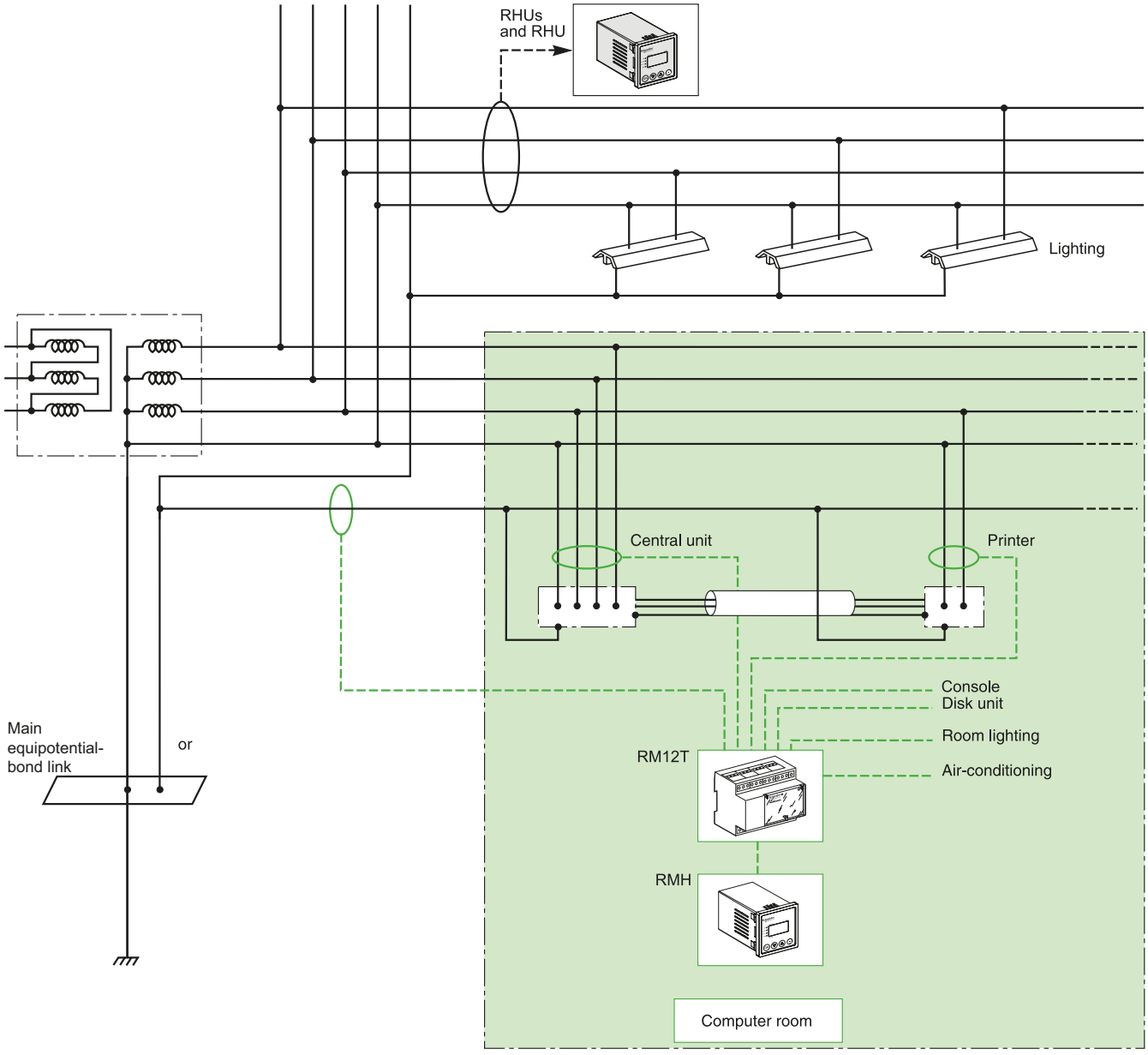
[2] In this case, the diameter of the toroid is generally much smaller than **[1]**.

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.

DB439282.eps



Computer room.

Leakage-Current Monitoring Using RCDs

PC Network

Selection table

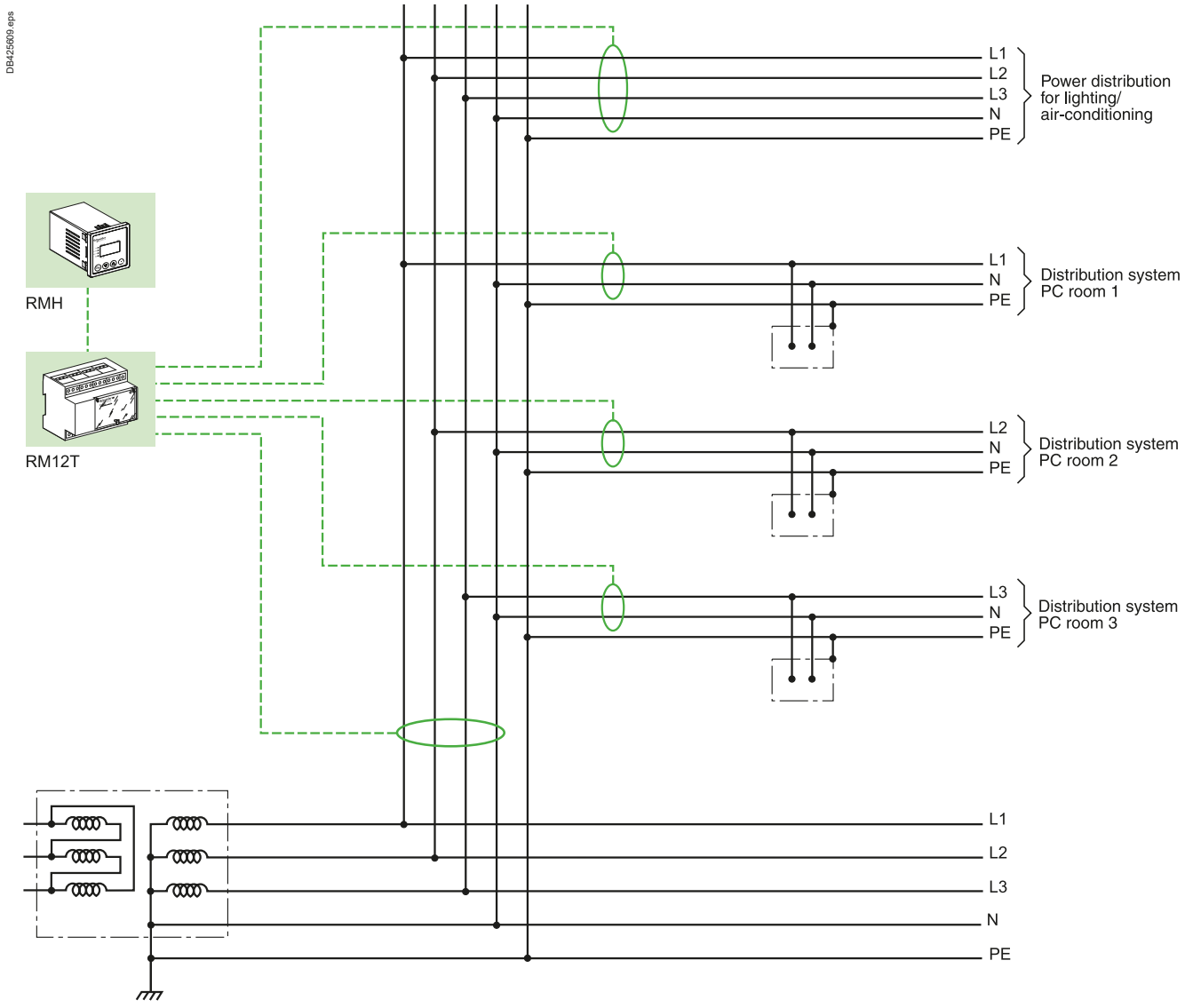
Products	Part no.
RMH	**LV481004**
RM12T	**28566**
A-type toroids [1]	**50437** to **50442**
TOA-type toroids [2]	**50420** or **50421**

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, $I_{leakage}$ = 300 mA to 1 A
- Fluorescent lighting from 0.3 to 1 A.

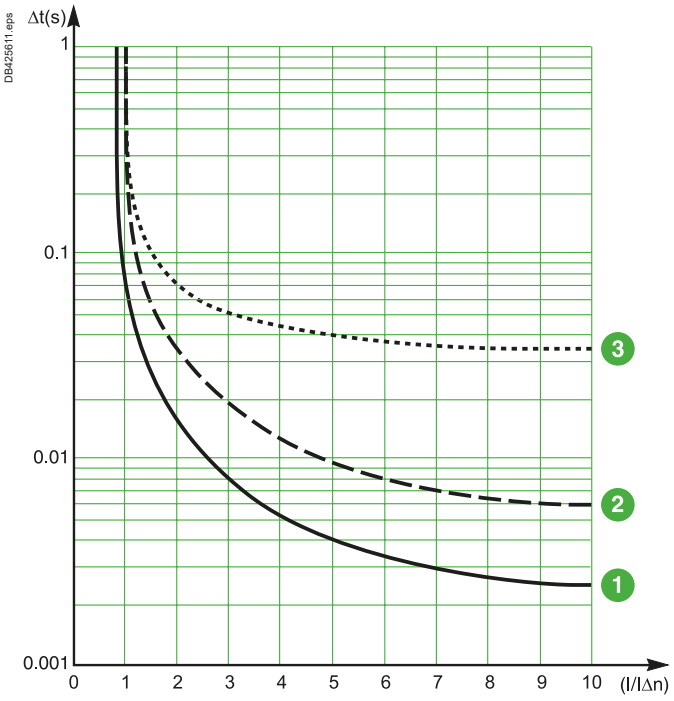
If there is a significant difference between each supply, reconsider the supply for the workstations.



PC network.

Tripping Curves and Frequency Filtering
RH10, RH21, RH68, RH86 and RH99

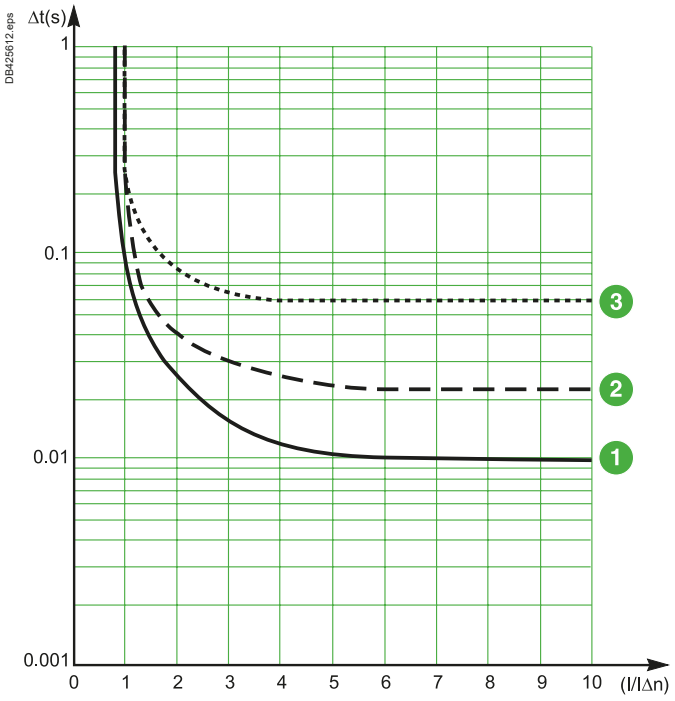
Instantaneous Relay, IΔn Setting = 30 MA



1 Non-operating time.

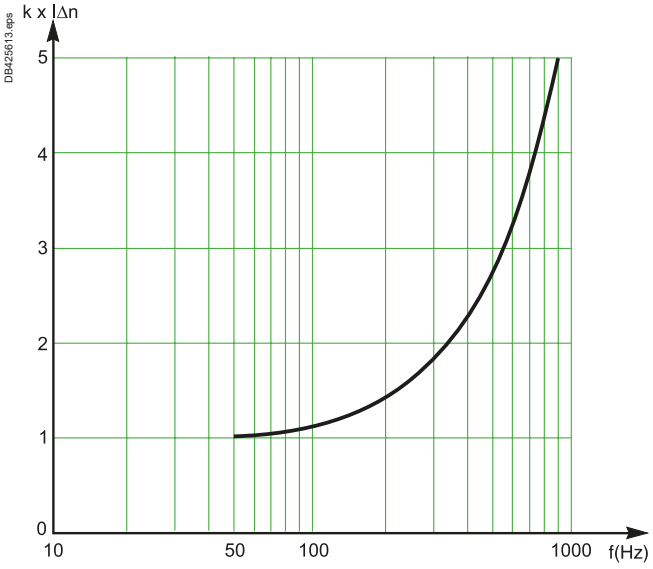
2 Operating time.

Instantaneous Relay, IΔn Setting > 30 MA



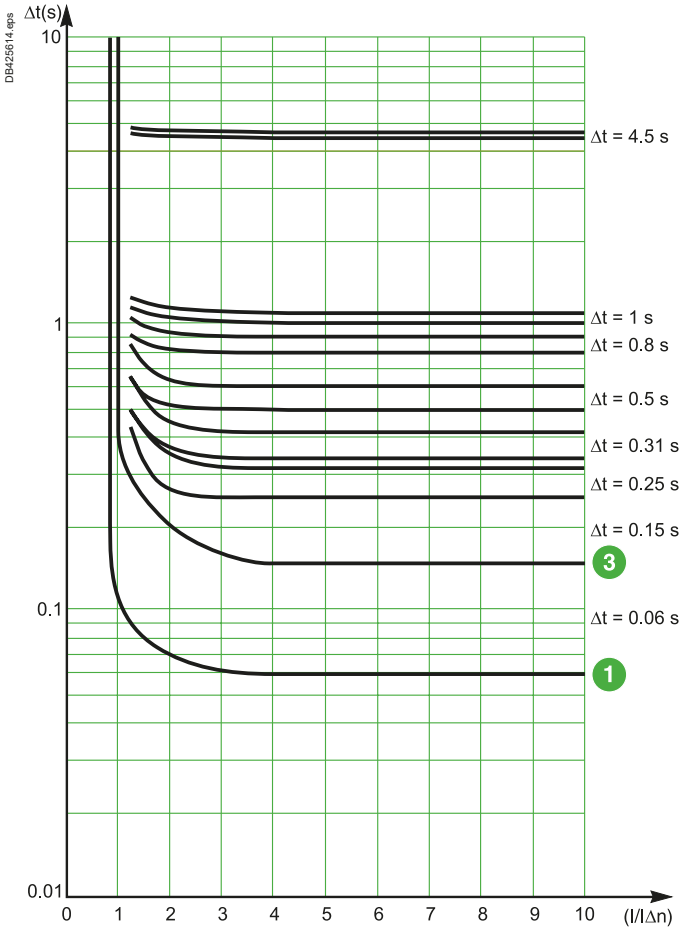
3 Total break time.

Frequency Filtering



Example
At 50 Hz, the tripping threshold is IΔn.
At 900 Hz, the tripping threshold is k x IΔn (where k = 5).

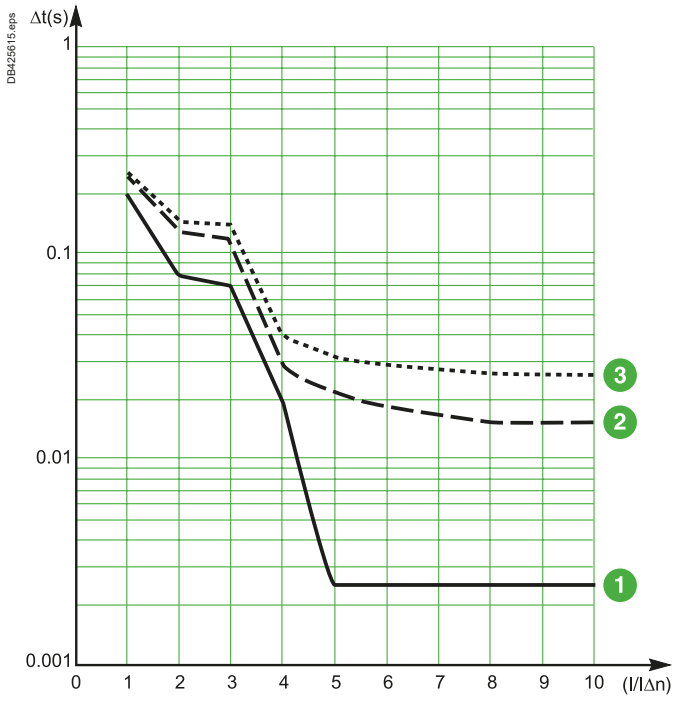
Delayed Relay for IΔn > 30 MA



E

Tripping Curves and Frequency Filtering
RH197M

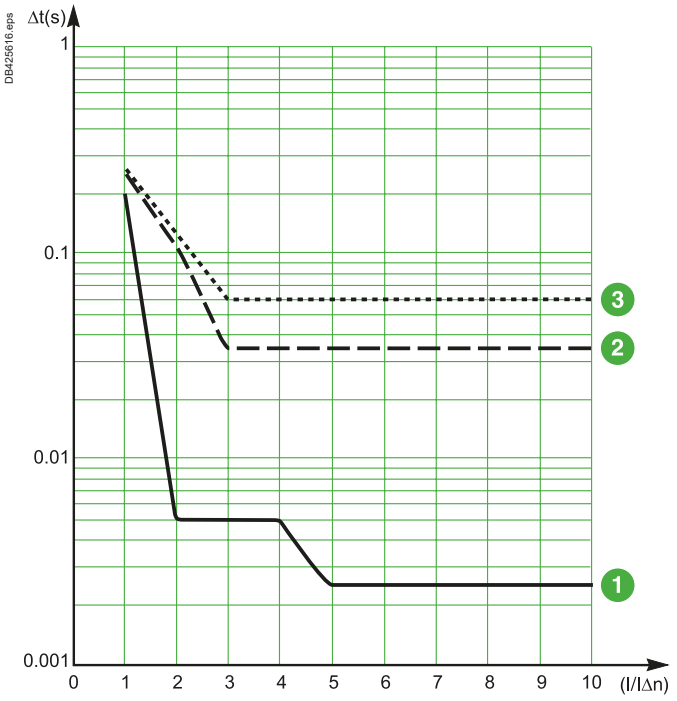
Instantaneous Relay, IΔn Setting = 30 MA



1 Non-operating time.

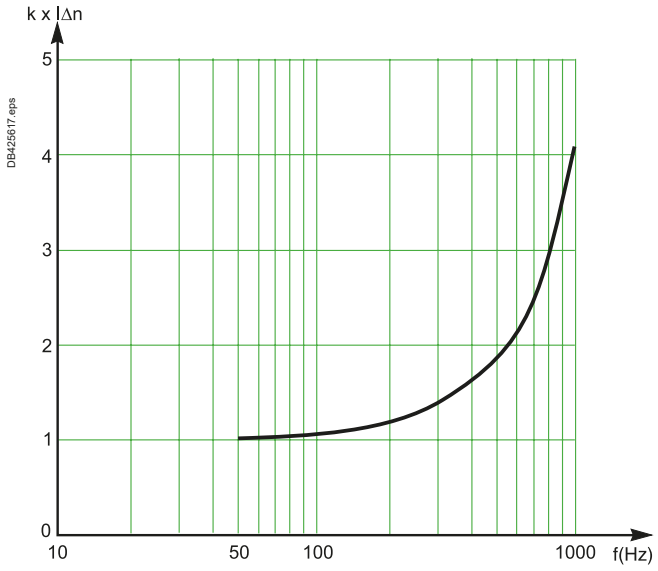
2 Operating time.

Instantaneous Relay, IΔn Setting > 30 MA



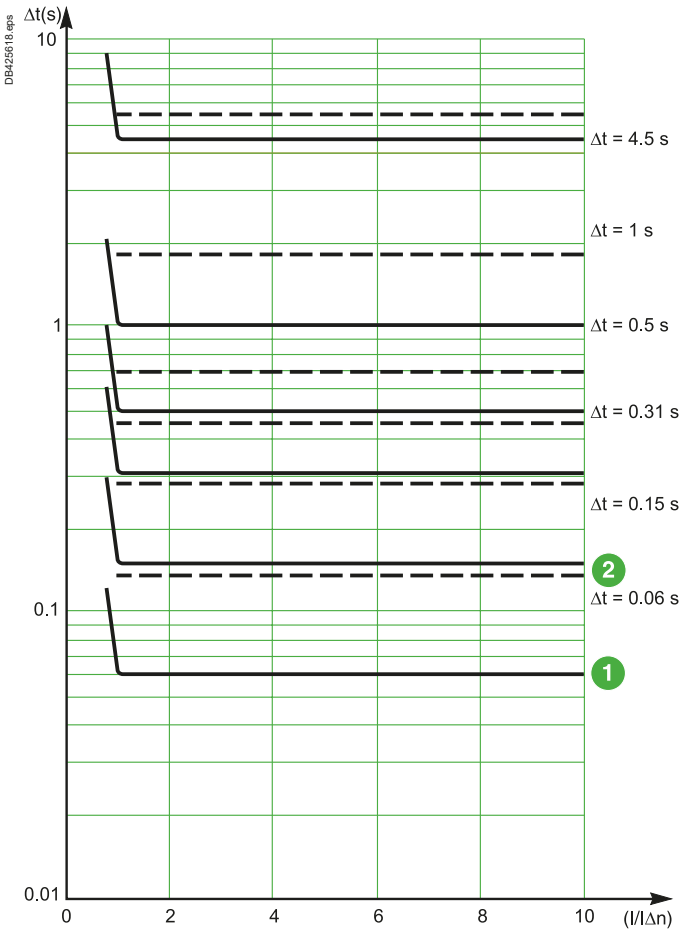
3 Total break time.

Frequency Filtering



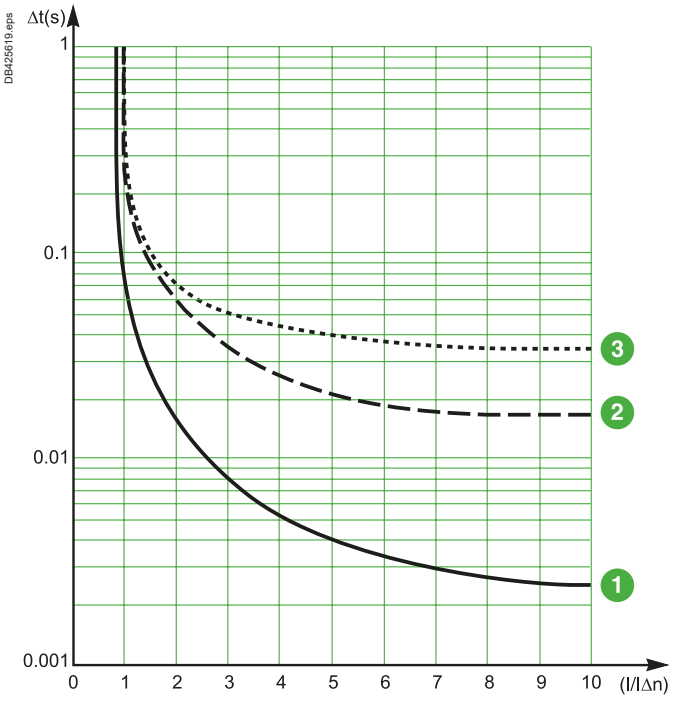
Example
At 50 Hz, the tripping threshold is IΔn.
At 900 Hz, the tripping threshold is k x IΔn (where k = 5).

Delayed Relay for IΔn > 30 MA



Tripping Curves and Frequency Filtering
RH197P

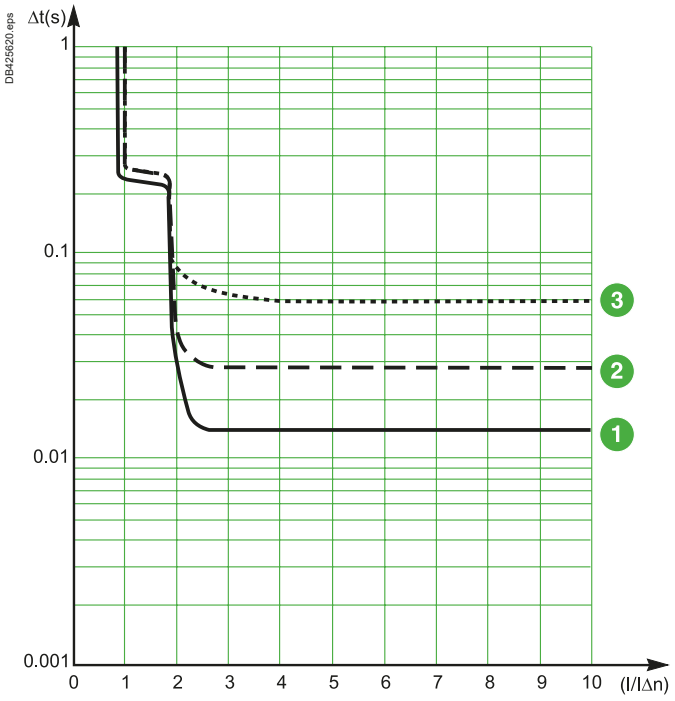
Instantaneous Relay, IΔn Setting = 30 MA



1 Non-operating time.

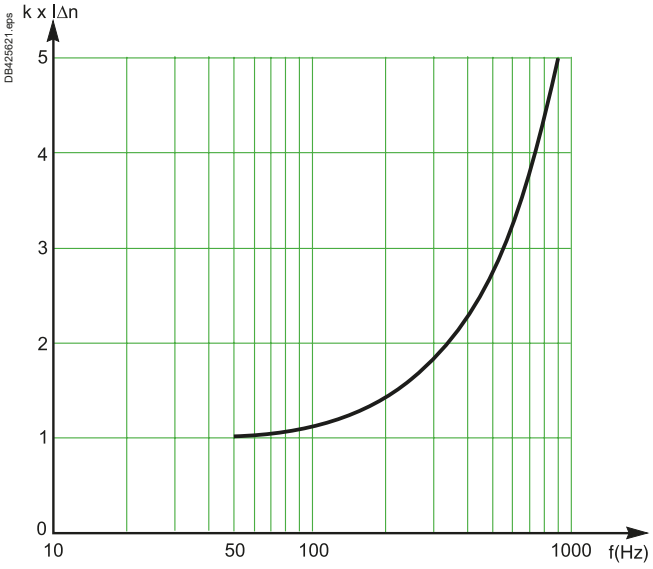
2 Operating time.

Instantaneous Relay, IΔn Setting > 30 MA



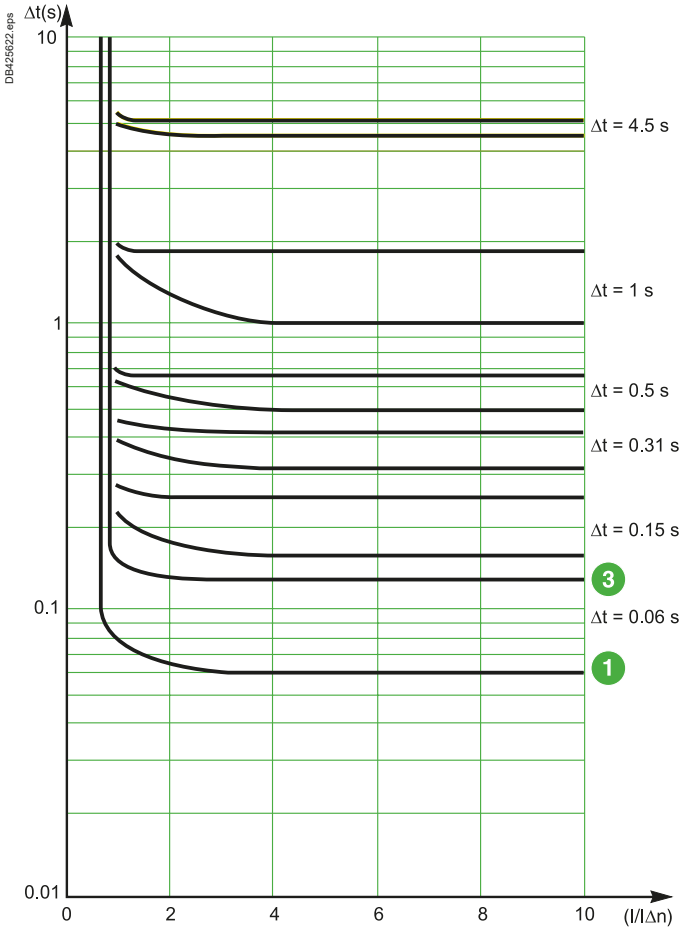
3 Total break time.

Frequency Filtering



Example
At 50 Hz, the tripping threshold is IΔn.
At 900 Hz, the tripping threshold is k x IΔn (where k = 5).

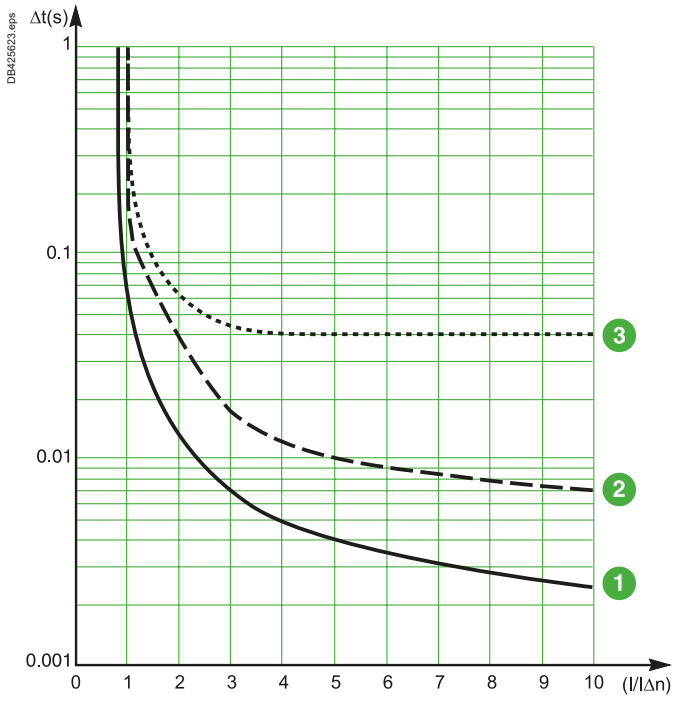
Delayed Relay for IΔn > 30 MA



E

Tripping Curves and Frequency Filtering
RHUs and RHU

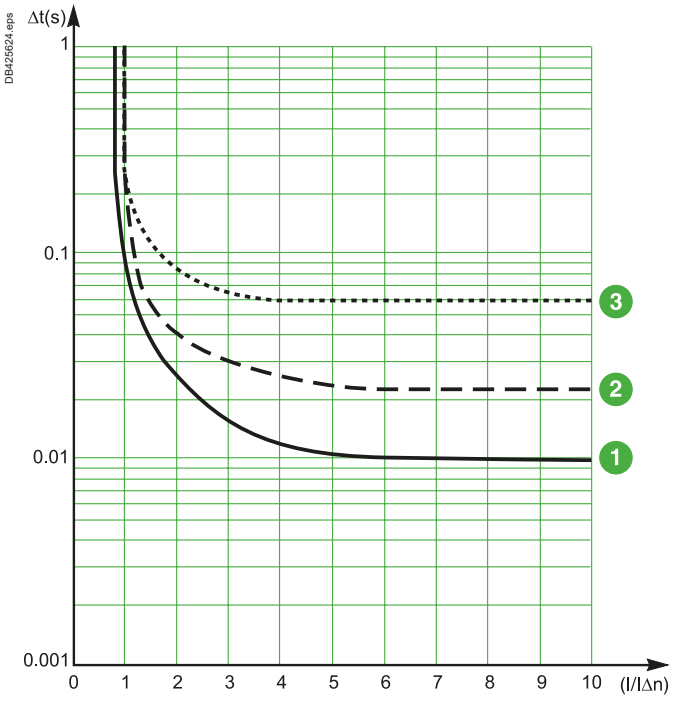
Instantaneous Relay, IΔn Setting = 30 MA



1 Non-operating time.

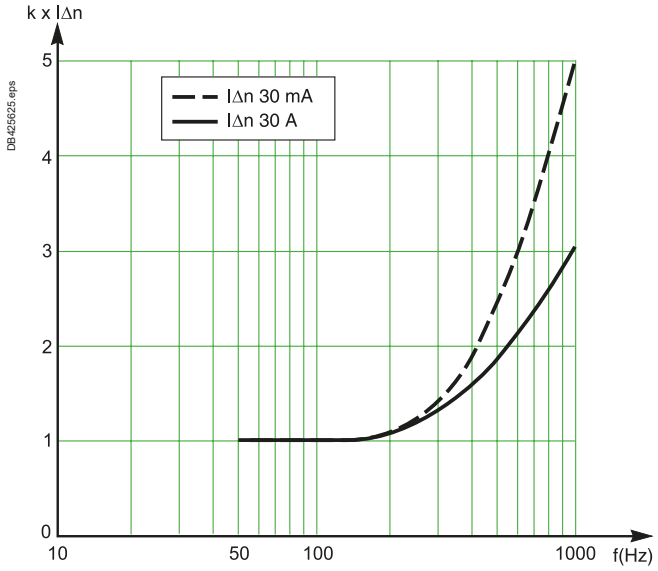
2 Operating time.

Instantaneous Relay, IΔn Setting > 30 MA

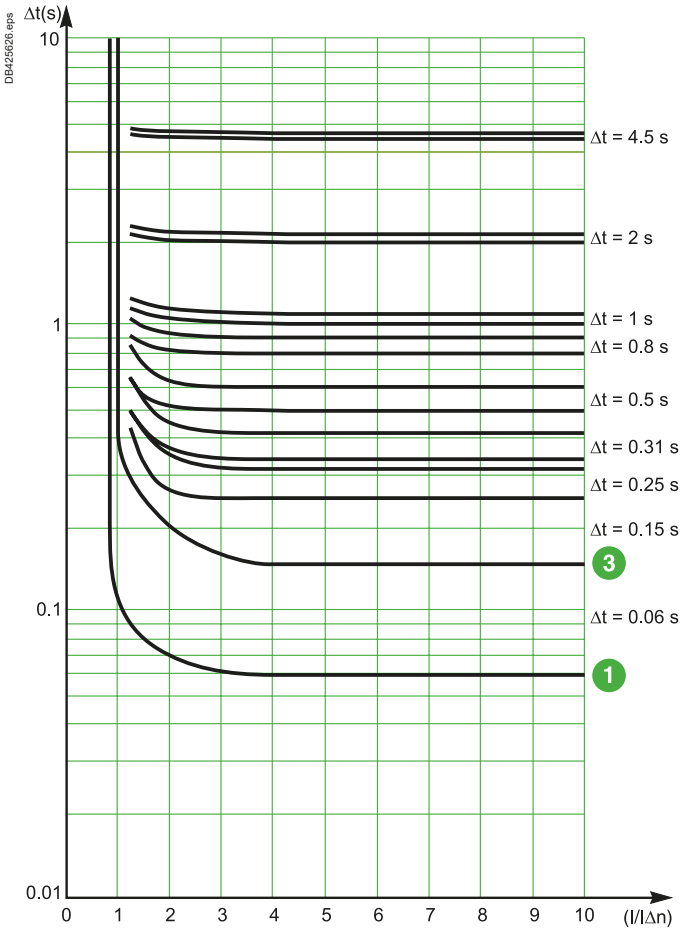


3 Total break time.

Frequency Filtering

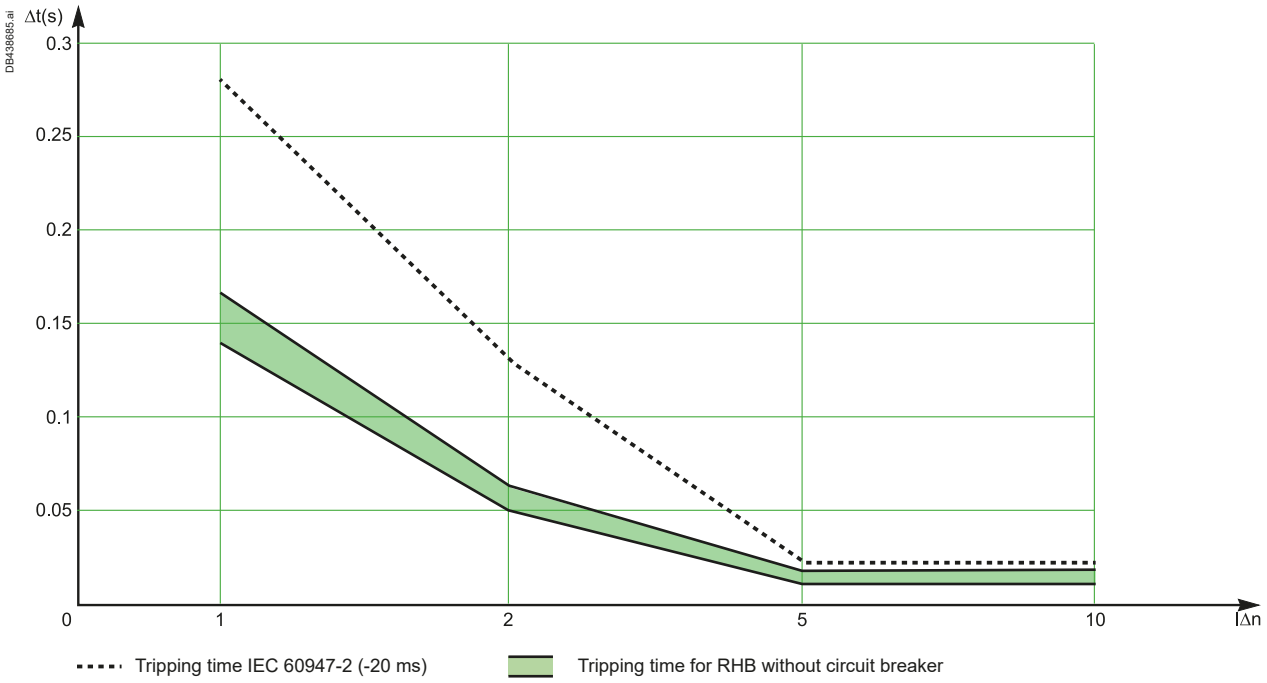


Delayed Relay for IΔn > 30 MA

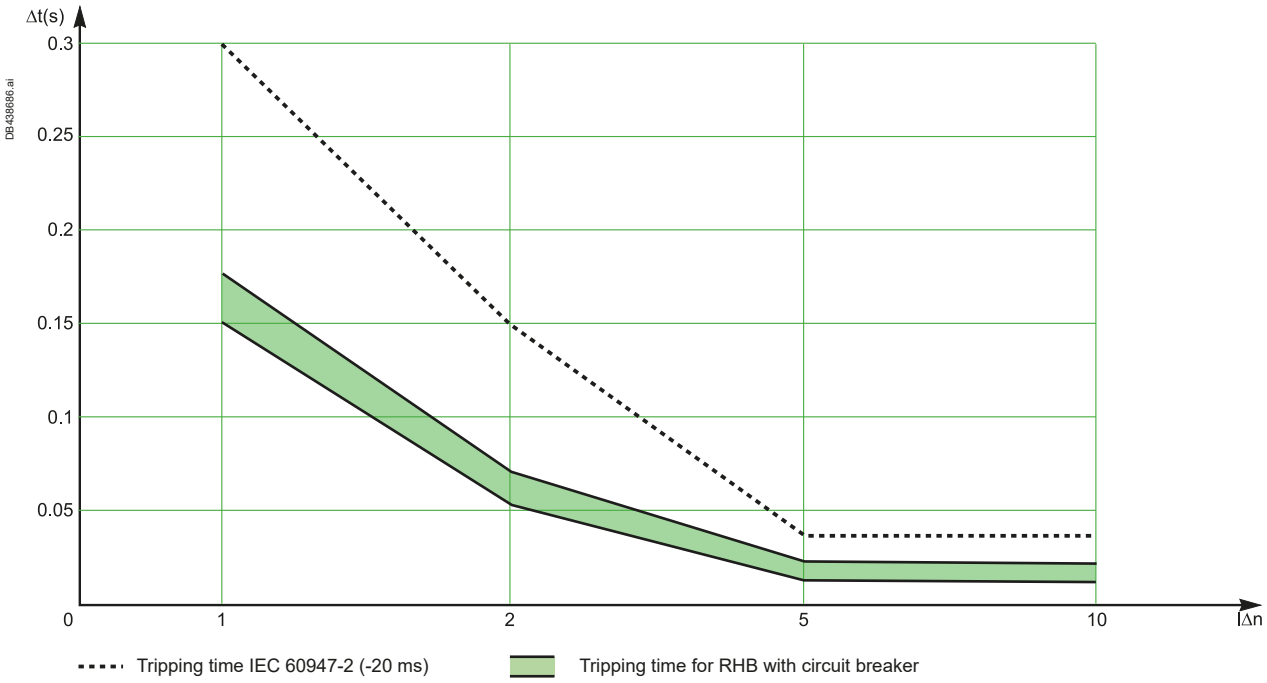


Tripping Curves and Frequency Filtering
RHB

Tripping Time without Circuit Breaker



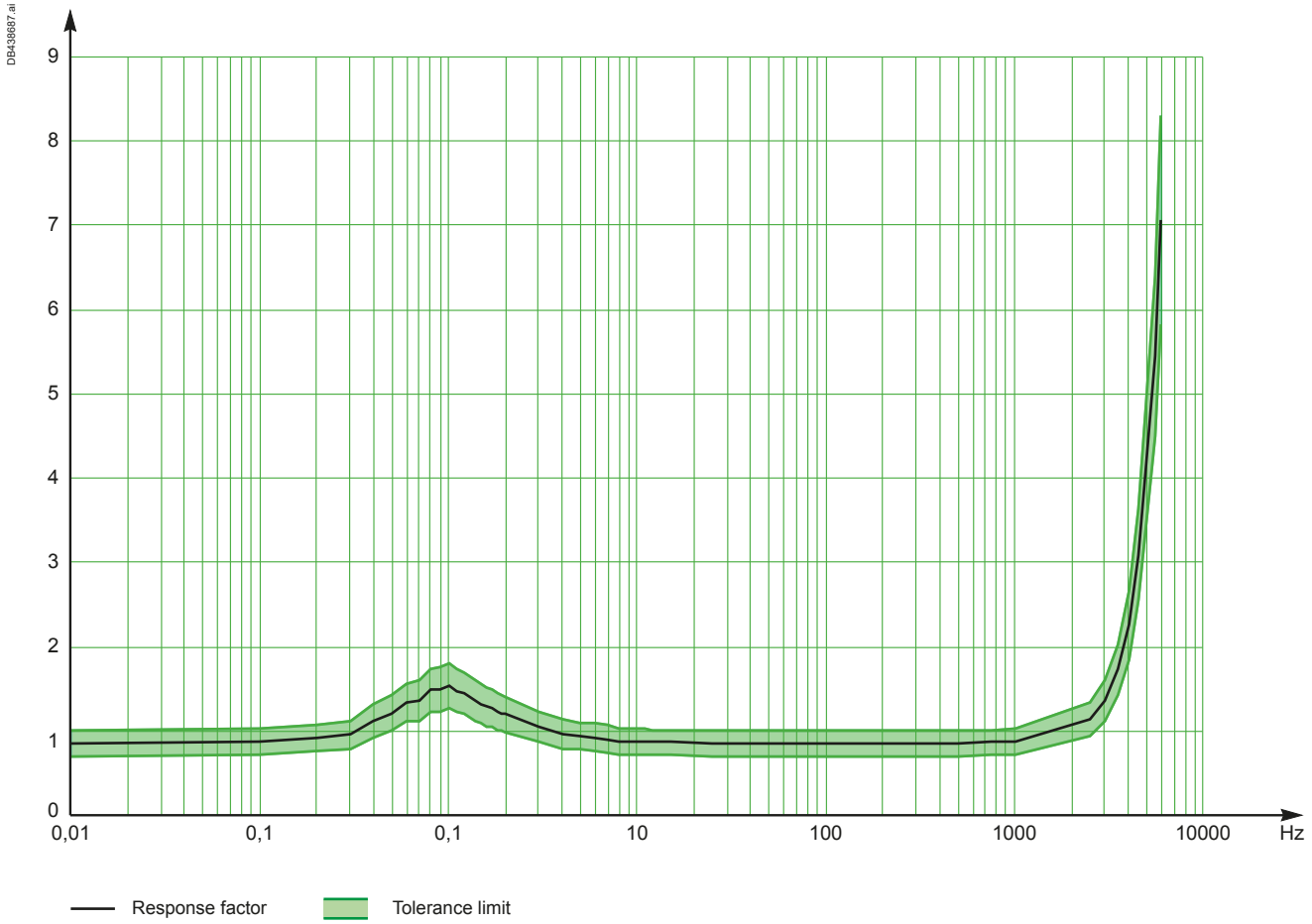
Tripping Time with UVR and Circuit Breaker



E

Tripping Curves and Frequency Filtering
RHB

Frequency Curve MRCD



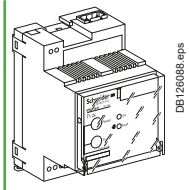
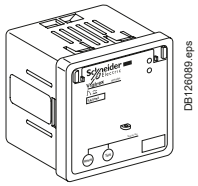
Catalog Numbers

F

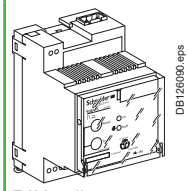
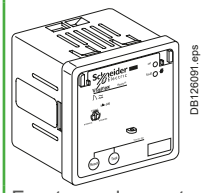
Residual-Current Protection Relays

Residual-Current Protection Relays

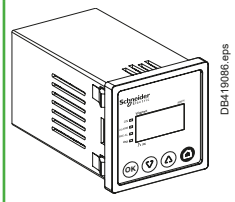
RH10 with Local Manual Fault Reset

System to be protected	LV ⩽ 1000 V		RH10M	RH10P
			 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

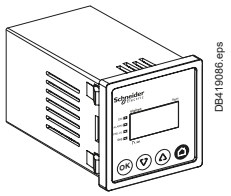
System to be protected	LV ⩽ 1000 V		RH21M	RH21P
			 DIN-rail mount.	 Front-panel mount.
Sensitivity 0.03 A - instantaneous **Sensitivity 0.3 A - instantaneous or with 0.06 s time delay**				
Power supply	12 to 24 V AC - 12 to 48 V DC	50/60 Hz	**56160**	
	220 to 240 V AC	50/60 Hz	**56163**	**56263**
	380 to 415 V AC	50/60 Hz	**56164**	**56264**

RHUs with Local Manual Fault Reset

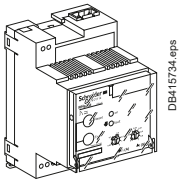
System to be protected	LV ⩽ 1000 V		RHUs
			
Alarm: sensitivity 0.015 A to 30 A - instantaneous or with 0 to 4.5 s time delay **Fault: sensitivity 0.03 A to 30 A - instantaneous or with 0 to 4.5 s time delay**			
Single-phase power supply	110 to 130 V AC	50/60 Hz	**LV481000**
	220 to 240 V AC	50/60 Hz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

Residual-Current Protection Relays

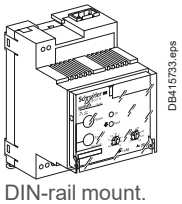
RHU with Local Manual Fault Reset (Communicating)

			RHU
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	**LV481002**
	220 to 240 V AC	50/60 Hz	**LV481003**

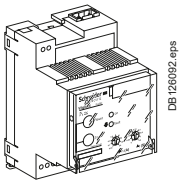
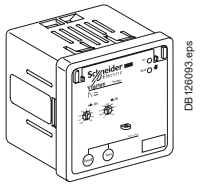
RH68 with Local Manual Fault Reset

			RH68M
System to be protected	LV ⩽ 1000 V		 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	**56168**

RH86 with Local Manual Fault Reset

			RH86M
System to be protected	LV ⩽ 1000 V		 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	**56500**

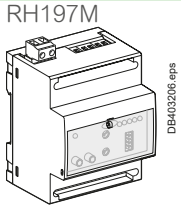
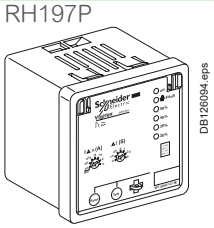
RH99 with Local Manual Fault Reset

			RH99M	RH99P
System to be protected	LV ⩽ 1000 V		 DB126092.eps DIN-rail mount.	 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	**56170**	**56270**
	48 V AC	50/60 Hz	**56171**	
	110 to 130 V AC	50/60 Hz	**56172**	**56272**
	220 to 240 V AC	50/60 Hz	**56173**	**56273**
	380 to 415 V AC	50/60 Hz	**56174**	**56274**
	440 to 525 V AC	50/60 Hz	**56175**	

F

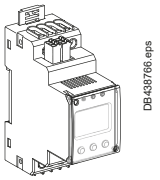
Residual-Current Protection Relays or Monitoring Relays

RH197 with Local Manual or Automatic Fault Reset [1]

			RH197M	RH197P
System to protected	LV ≤ 1000 V		 DB403206.eps DIN-rail mount.	 DB126094.eps 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**	
	220 to 240 V AC [2]	50/60 Hz	**56517**	**56512**
	380 to 415 V AC [2]	50/60 Hz	**56518**	

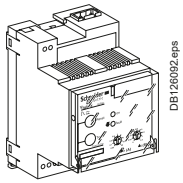
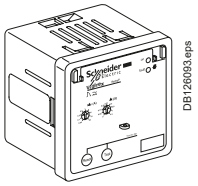
[1] Selected via a switch.
[2] RH197M: 110 V, 230 V, 400 V.

B Type Residual Current Protection Relay

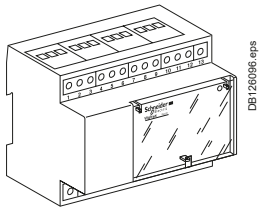
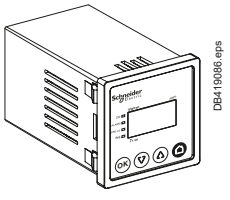
	RHB
	 DB438766.eps DIN-rail mount.
Earth leakage relay VigiPacT B type RHB	**LV481010**

Monitoring Relays

RH99 with Automatic Fault Reset

			RH99M	RH99P
System to be protected	LV ≤ 1000 V		 DB126092.eps DIN-rail mount.	 DB126093.eps 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**	

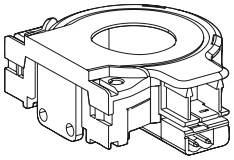
RMH and Multiplexer RM12T (Communicating)

			RM12T	RMH
System to be monitored	LV ≤ 1000 V		 DB126096.eps DIN-rail mount.	 DB419086.eps 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	Ie (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**

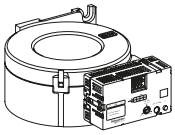
Accessory for closed toroids

Magnetic ring


DB107032.eps

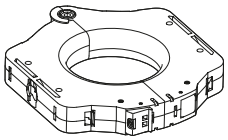
For TA30 toroid			**56055**
For PA50 toroid			**56056**
For IA80 toroid			**56057**
For MA120 toroid			**56058**

Closed toroids, B Type


DB438497.eps

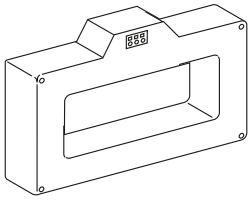
Type	Ie (A) rated operational current	Inside diameter (mm)	
TB35	63	35	**LV481011**
TB60	125	60	**LV481012**
TB120	250	120	**LV481013**
TB210	400	210	**LV481014**
TB35P	80	35	**LV481015**
TB60P	160	60	**LV481016**

Split toroids, OA-type


DB419087.eps

Type	Ie (A) rated operational current	Inside diameter (mm)	
TOA80	160	80	**50420**
TOA120	250	120	**50421**

Rectangular sensors


DB126100.eps

Inside dimensions (mm)	Ie (A)		
L1	1600	280 x 115	**56053**
L2	3200	470 x 160	**56054**

Wiring Kit for Toroids, B Type

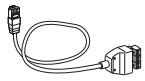

DB438498.eps

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**


LV434211.ai

Connector Modbus adaptor	**LV434211**

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

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Schneider Electric Industries SAS

35, rue Joseph Monier
CS 30323
92506 Rueil Malmaison Cedex
France

RCS Nanterre 954 503 439
Capital social 928 298 512 €
www.schneider-electric.com

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