

Residual Current Monitoring System



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1. DOCUMENTATION

All documentation relating to the DIRIS Digiware RCM system, its current sensors and residual current transformers is available on the SOCOMEC website at the following address:

www.socomec.com

2. HAZARDS AND WARNINGS

The term "unit" used in the following paragraphs encompasses DIRIS Digiware RCM, its associated residual current transformers (Δ IC, Δ IP-R, WR and TFR, also called residual CTs in this instruction manual) and current sensors (TE, TR / iTR or TF). The assembly, use, servicing (including cleaning) and maintenance of this equipment must only be carried out by trained, qualified professionals (in case of failure, please contact our Customer Services). SOCOMEC shall not be held responsible for failure to comply with the instructions in this manual.

2.1. Risk of electrocution, burns or explosion

	Caution: risk of electric shock	Ref. ISO 7000-0434B (2004-01)
	Caution: refer to the accompanying documentation each time this symbol is shown	Ref. ISO 7010-W001 (2011-05)

- This device must only be installed and serviced (cleaning with a dry cloth) by qualified personnel who have in-depth knowledge of installing, commissioning and operating the device and who have had appropriate training. He or she should have read and understood the various safety measures and warnings stated in the instructions.
- Use connection cables compatible with the voltage and connection terminals of the devices.
- Prior to any work on or in the unit, disconnect all power sources (voltage inputs, the unit's auxiliary power supply and dry contact supplies).
- The isolation options must be:
 - within the electrical installation itself
 - located somewhere convenient and easily accessible
 - labelled as the unit's power switching device
- Always use an appropriate voltage detection device to confirm the absence of voltage.
- Replace all devices, doors and covers before turning on power to this equipment.
- Always power the device with the correct rated voltage.
- Install the unit following the recommended installation instructions and in a suitable electrical cabinet.
- These devices are designed to be integrated; they must be installed in an additional enclosure providing protection against electric shocks and fire.
- Always connect residual CTs, TE, TR/iTR or TF current sensors using the recommended connection cables and observing the maximum prescribed currents.
- For safety reasons, only use accessories that conform to the manufacturer's specifications.
- During installation, the safety of any system integrating the device is the responsibility of the system installer.



Do NOT clamp or pull out NON-INSULATED conductors carrying DANGEROUS VOLTAGE which could cause an electric shock, burn or arc flash. Ref. IEC 61010-2-032

Failure to take these precautions could cause death or serious injuries.

If there is a problem, please contact
SOCOMEC, 1 rue de Westhouse, 67235 BENFELD, FRANCE
Tel. +33 3 88 57 41 41
info.scp.isd@socomec.com

2.2. Risk of damaging the unit

To ensure that the unit operates correctly, make sure that:

- The unit is correctly installed.
- The auxiliary power supply voltage indicated on the device: $24\text{ VDC} \pm 10\%$.
- Use a 230 VAC / 24 VDC SOCOMEC power supply (4829 0120). If a different power supply is used, a 1 A gG 24 VDC fuse must be added.
- The 24VDC power supply should be a SELV (safety extra-low voltage).
- Always connect residual CTs, TE, TR/iTR and TF current sensors using the recommended connection cables and observing the maximum prescribed currents.
- Only use RJ45 SOCOMEC cables to interconnect the modules via the Digiware bus.
- During specific checks, disconnect the devices from the network before attempting to insulate or carry out dielectric testing.
- The devices are designed for indoor use.
- If the ambient temperature exceeds $+50^{\circ}\text{C}$, the minimum temperature of the copper conductors to connect to terminals should be $+85^{\circ}\text{C}$.

Failure to respect these precautions could cause damage to the unit or cause an electrical shock.

2.3. Responsibility

- Assembly, connection and use must be carried out in accordance with the installation standards currently in force.
- The unit must be installed in accordance with the rules given in this manual.
- Failure to observe the rules for installing this unit may compromise the device's intrinsic safety.
- The unit must be positioned within an installation which complies with the standards currently in force.
- Any cable which needs to be replaced may only be replaced with a cable with the correct rating.

3. BEFORE YOU START

To ensure the safety of personnel and the product, please carefully read the contents of these instructions before installation. Check the following points as soon as you receive the package containing the unit, one or several sensors:

- The packaging is in good condition
- The unit has not been damaged during transportation
- The device reference number conforms to your order
- The packaging includes the unit fitted with removable terminal blocks and a Quick Start guide.

4. PRESENTATION

4.1. About DIRIS Digiware RCM

DIRIS Digiware RCM is a multi-circuit energy and power monitoring system (PMD*) with Residual Current Monitoring functions.

DIRIS Digiware RCM essentially allows you to monitor the insulation of TN and TT earthing systems, by measuring the residual current (I_A) also called leakage current and delivering alarms if the residual current reaches a threshold set by the operator.

On DIRIS Digiware R-60 modules, six measuring channels (which can measure both residual currents or load currents) manage one or multiple circuits at once. Several modules can be connected to the Digiware bus to ensure the full residual current and power monitoring of a large number of circuits.

Wiring residual current transformers (CTs) and current sensors is easy and without errors thanks to colour-coded RJ12 cables.

The type of current sensor and rating is automatically detected by the DIRIS Digiware R-60 module which significantly reduces the risk of commissioning errors.

The Digiware concept allows a great flexibility and scalability. The connection between modules is quick thanks to RJ45 cables. This allows the addition of R-60 modules to an existing DIRIS Digiware system without tools.

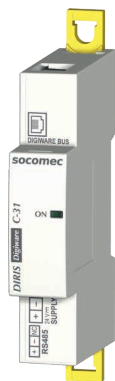
DIRIS Digiware RCM can be configured from the DIRIS Digiware D-50/D-70 remote display or via the Easy Config System software. You can view the readings on the WEBVIEW-M web server embedded in the DIRIS Digiware D-70 display, integrating the functions of energy and power monitoring data and residual current monitoring.

Thanks to its architecture and its compatibility with multiple open protocols, DIRIS Digiware RCM can be easily integrated into a third-party building automation system or energy management system

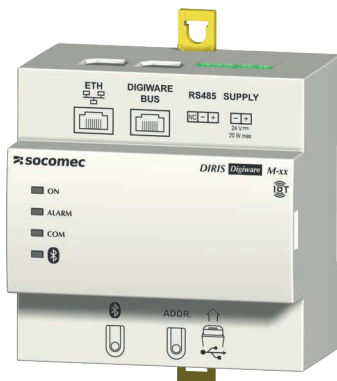
* PMD: Power Metering and Monitoring Device in accordance with the product standard IEC 61557-12.

4.1.1. Range

Communication and power supply interface



**DIRIS Digiware C
System interface**
DIRIS Digiware C-31
Ref. 4829 0101
DIRIS Digiware C-32
Ref. 4829 0103



**DIRIS Digiware M
Communication gateway**
DIRIS Digiware M-50
Ref. 4829 0221
DIRIS Digiware M-70
Ref. 4829 0222



**DIRIS Digiware D
Multi-point display**
DIRIS Digiware D-50
Ref. 4829 0204
DIRIS Digiware D-70
Ref. 4829 0203

Voltage measurement module



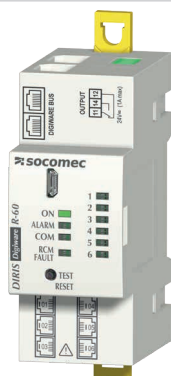
DIRIS Digiware U-x Voltage measurement

DIRIS Digiware U-10 - Ref. 4829 0105

DIRIS Digiware U-20 - Ref. 4829 0106

DIRIS Digiware U-30 - Ref. 4829 0102

Residual Current Monitoring (RCM)



Residual current monitoring module, 6 circuits

DIRIS Digiware R-60

Ref. 4829 0114

Adaptor



RJ12 adaptor for residual CTs

DIRIS Digiware T-10

Ref. 4829 0620

Other DIRIS Digiware modules may be used within the same system, such as DIRIS Digiware I, S or IO modules.

Current measurement module



DIRIS Digiware I-3x 3 current measurement inputs

DIRIS Digiware I-30

Ref. 4829 0110

DIRIS Digiware I-31

Ref. 4829 0111

DIRIS Digiware I-33

Ref. 4829 0128

DIRIS Digiware I-35

Ref. 4829 0130



DIRIS Digiware I-4x 4 current measurement inputs

DIRIS Digiware I-43

Ref. 4829 0129

DIRIS Digiware I-45

Ref. 4829 0131



DIRIS Digiware I-6x 6 current measurement inputs

DIRIS Digiware I-60

Ref. 4829 0112

DIRIS Digiware I-61

Ref. 4829 0113

Current measurement module



DIRIS Digiware S 3 current measurement inputs

DIRIS Digiware S-130

Ref. 4829 0160

DIRIS Digiware S-135

Ref. 4829 0161

DIRIS Digiware S-Datacenter

Ref. 4829 0162

IO input/output modules



DIRIS Digiware IO-10 Digital inputs/outputs

DIRIS Digiware IO-10

Ref. 4829 0140

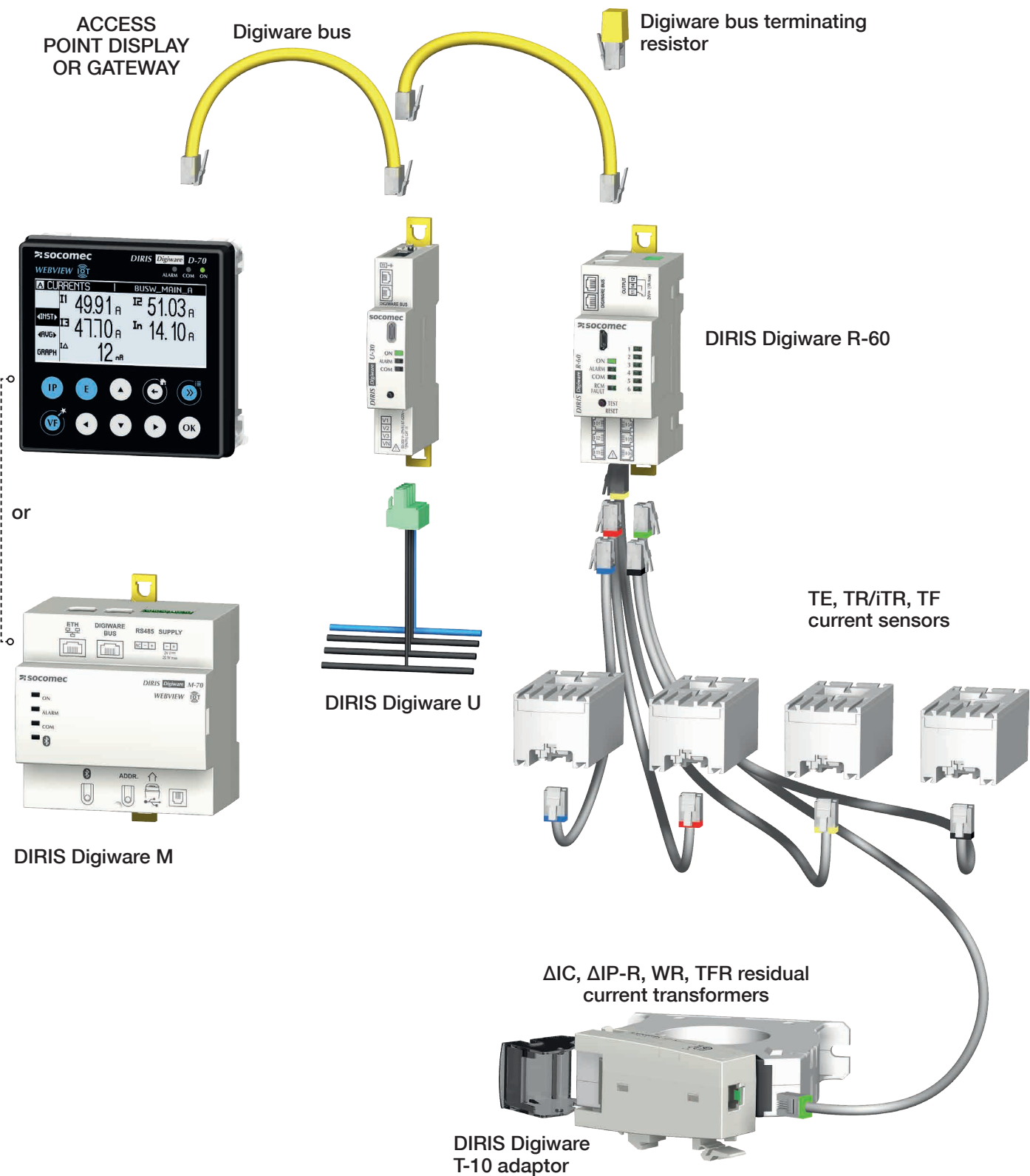


DIRIS Digiware IO-20 Analogue inputs

DIRIS Digiware IO-20

Ref. 4829 0145

4.1.2. Principle



4.1.3. Functions

DIRIS Digiware offers a number of options, including:

Residual Current Monitoring

- Residual current I_{Δ} .
- Protective Earth current I_{PE} in PE conductor.

RJ12 inputs

- Connection of TE solid-core, TR/ITR split-core and TF flexible current sensors and residual current transformers.
- Measuring/monitoring 6 currents or 6 circuits.
- Automatic detection of the current sensor type and rating.
- Simultaneous management of several single-phase, two-phase and three-phase loads.
- Class 0.5 for active energy and active power for the global measurement chain (including current sensors) according to IEC 61557-12.

General measurements (with DIRIS Digiware U module)

- Multi-load current measurement.
- Voltage measurement.
- Operation across 4 quadrants.
- Guarantees the overall accuracy of the DIRIS Digiware + current sensor measurement chain in terms of power and active energy up to class 0.5, as per the IEC 61557-12 standard.

Quality of the voltage (with module DIRIS Digiware U-30)

- Direct, inverse and zero-sequence voltages.
- THD and harmonics up to 63rd for voltage.
- Voltage unbalance.
- EN 50160 power quality events (U_{swl} , U_{dip} , U_{int}).

Data-logging

- Trends for I_{Δ} and I_{PE} .

Metering

- Partial and total apparent, reactive and active power.
- Multi-tariff (max. 8).
- Load curves.

Timestamped Alarms

- RCM alarm on I_{Δ} and I_{PE} .
 - Dynamic thresholds adapted to various load levels
 - Automatic learning mode and configuration of thresholds
- High neutral current (I_n).
- Protection alarm.
 - Opening of protective device.
 - Trip of protective device with identification of trip cause.
 - Defective protective device.
 - Defective RCD.
- System alarms (CT disconnected, VI association etc.).

Communication & services (with DIRIS Digiware M gateways and DIRIS Digiware D displays)

- Ethernet Modbus TCP, BACnet IP, SNMP v1, v2, v3 & Traps.
- Embedded web server WEBVIEW-M available on the DIRIS Digiware D-70 display and M-70 gateway.
- SNTP time synchronization.
- SMTP: email notifications in case of alarms.
- Auto-discovery and auto-addressing of devices connected to DIRIS Digiware M gateways and D displays.

4.1.4. System interfaces, displays and gateways

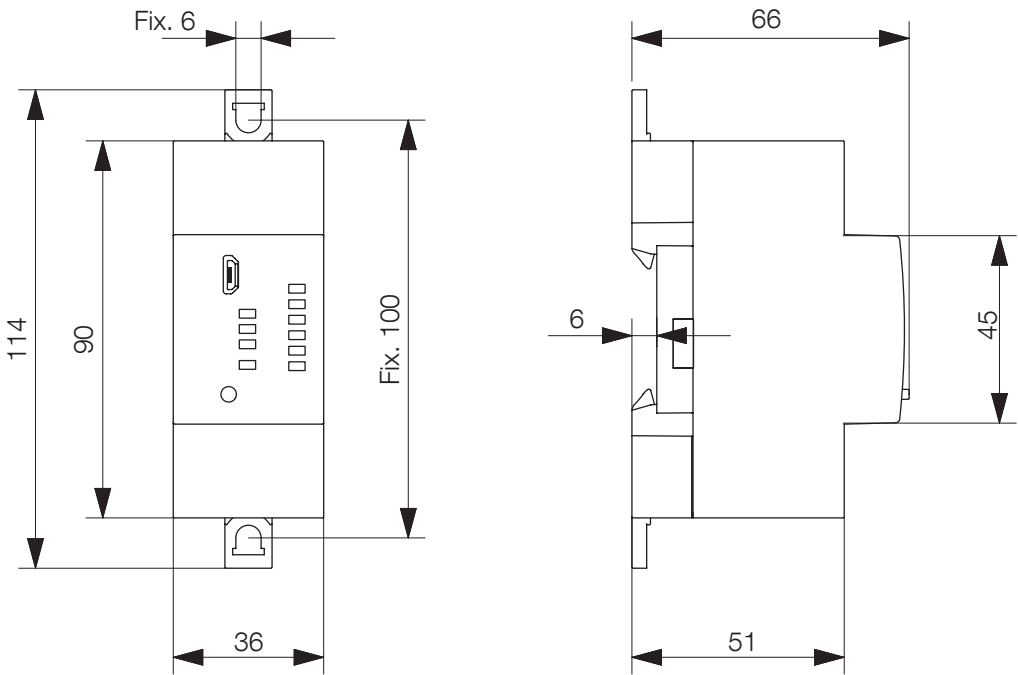
	DIRIS DIGIWARE				
	C-31	M-50	M-70	D-50	D-70
FUNCTION					
Basic system interface	•				
Multi-point display				•	•
Multifunction gateway		•	•	•	•
POWER SUPPLY					
24 VDC	•	•	•	•	•
COMMUNICATION					
Master RS485		•	•	•	•
Slave RS485	•	•	•	•	•
Digiware bus	•	•	•	•	•
Ethernet Modbus TCP		•	•	•	•
BACnet IP		•	•	•	•
SNMP v1, v2, v3 & Traps		•	•	•	•
WEBVIEW-M webserver			•		•
WEB-CONFIG webserver		•	•	•	•
FORMAT					
Mounting	DIN rail	DIN rail	DIN rail	Panel mounted	Panel mounted
Dimensions	1 module	9 modules	9 modules	96 mm x 96 mm	96 mm x 96 mm
REFERENCE	48290101	48290221	48290222	48290204	48290203

	DIRIS DIGIWARE
	R-60
APPLICATION	Residual Current Monitoring
NUMBER OF MEASUREMENT CHANNELS	6
RCM MEASUREMENTS	
I_{Δ} , I_{PE}	•
METERING	
+/- kWh, +/- kvarh, kVAh	•
Multi-tariff (max. 8)	•
Load curves	•
MULTI-MEASUREMENT	
I_1 , I_2 , I_3 , $\sum P$, $\sum Q$, $\sum S$, $\sum PF$	•
P, Q, S, PF per phase	
Phi	•
ALARMS	
I_{Δ} thresholds	•
I_{PE} thresholds	•
I_n thresholds	•
Comparison	•
Protection	•
System alarms	•
DIGITAL OUTPUT	
Number	1
FORMAT	
Width	36 mm
Number of modules	2
REFERENCE	4829 0114

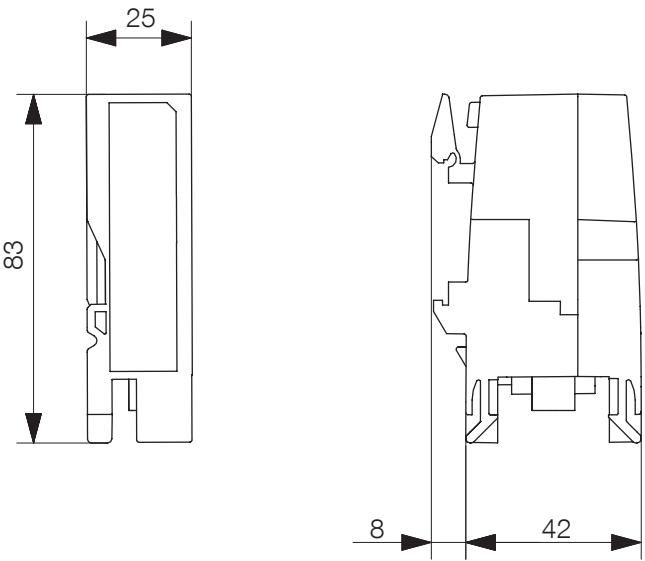
4.1.5. Dimensions

DIRIS Digiware R-60

Dimensions mm



DIRIS Digiware T-10



4.2. Presentation of associated sensors

Various types of current sensors can be connected to the DIRIS Digiware R-60:

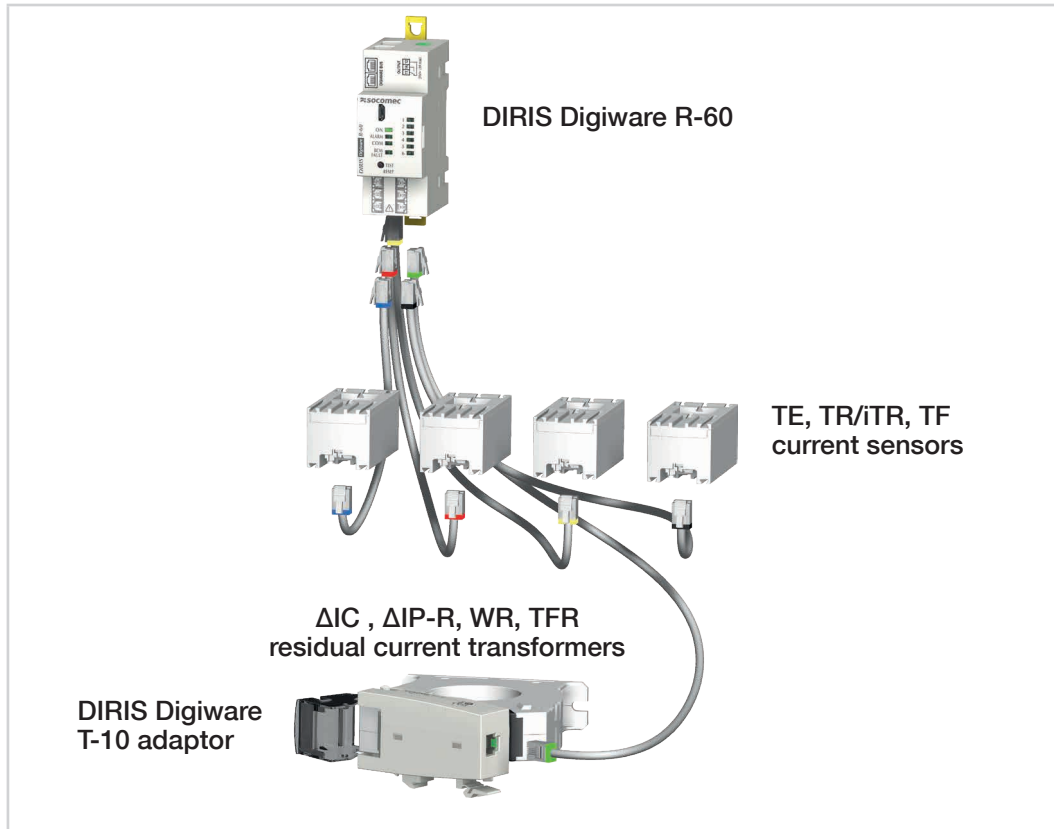
Residual current transformers for measuring residual currents

- Solid-core (Δ IC)
- Split-core (Δ IP-R)
- Rectangular (WR, TFR)

Current sensors for measuring load currents

- Solid-core (TE)
- Split-core (TR/iTR) or flexible (TF).

Sensors and residual CTs can be adapted to any type of new, existing or high-current existing installation. They all use a specific RJ12 link with the DIRIS Digiware R-60. This link provides a quick connection, with no cabling errors. The DIRIS Digiware R-60 module recognises the type of current sensor and its rating.



Important:

To connect the current sensors, use only SOCOMEC cables, RJ12 straight cables, twisted pair, unshielded, 600 V, -10°C / +70°C as per IEC 61010-1 version 3.0. We recommend that all the current sensors be installed in the same direction.

4.2.1. ΔIC, ΔIP-R, WR and TFR residual current transformers

Residual Current Transformers enclose active conductors, providing the differential summation of vector currents which enables the detection of leakage currents.

Solid-core (ΔIC, WR and TFR series) or split-core (ΔIP-R series), and available in all shapes and sizes, they are suitable for any cable/bar size and configuration.

With a choice of multiple mounting accessories (for ΔIC and ΔIP-R), they can be mounted on a DIN rail, on a back plate or attached directly to the cable.

A centering accessory (for ΔIC and ΔIP-R) which uses a flexible clamping allows you to center the cable in residual CT, ensuring accurate measurements and better immunity to disruptions in the mains power. It also allows you to mount the residual CT directly on a cable.

ΔIP-R split-core residual CTs are quick and easy to install with their innovative "one-click" open/close system. This system, designed without any parts, guarantees safe installation.

4.2.1.1. Range

Connection cables for current sensors:

RJ12 CONNECTION CABLES	CABLE LENGTH (M)									
	0.1	0.2	0.3	0.5	1	2	3	5	10	50 M REEL + 100 CONNECTORS*
NUMBER OF CABLES	REF.	REF.	REF.	REF.	REF.	REF.	REF.	REF.	REF.	REF.
1	-	-	-	-	-	-	4829 0606	4829 0602	4829 0603	4829 0601
3	4829 0580	4829 0581	4829 0582	4829 0595	4829 0583	4829 0584	-	-	-	-
4				4829 0596	4829 0588	4829 0589	-	-	-	-
6	4829 0590	4829 0591	4829 0592	4829 0597	4829 0593	4829 0594	-	-	-	-

* When producing cables, do not exceed a maximum length of 10 meters.

ΔIC circular solid-core residual current transformers

								
	ΔIC8	ΔIC15	ΔIC30	ΔIC50	ΔIC80	ΔIC120	ΔIC200	ΔIC300
DIAMETER	8 mm	15 mm	30 mm	50 mm	80 mm	120 mm	200 mm	300 mm
RESIDUAL CURRENT RANGE	3 mA - 3 A							
REFERENCE	4829 0520	4950 6015	4950 6030	4950 6050	4950 6080	4950 6120	4950 6200	4950 6300

ΔIP-R circular split-core residual current transformers

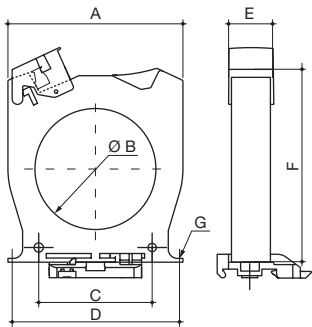
			
	ΔIP-R50	ΔIP-R80	ΔIP-R120
DIAMETER	50 mm	80 mm	120 mm
RESIDUAL CURRENT RANGE	3 mA - 3 A		
REFERENCE	4750 6051	4750 6081	4750 6121

WR/TFR rectangular solid-core residual current transformers

				
	WR70X175	WR115X305	WR150X350	TFR200X500
DIAMETER	70 x 175 mm	115 x 305 mm	150 x 350 mm	200 x 500 mm
RESIDUAL CURRENT RANGE	3 mA - 3 A			
REFERENCE	4795 0717	4795 1130	4795 1535	4795 2050

4.2.1.2. Dimensions

ΔIC circular solid-core residual current transformers



TYPE	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	WEIGHT (kg)
ΔIC Ø 15	53	17.3	25	50	26	81	M4	0.10
ΔIC Ø 30	92	30	50	85	26	103.5	M4	0.15
ΔIC Ø 50	102.5	50	50	90	26	125	M5	0.27
ΔIC Ø 80	116	80	75	105	26	142.5	M5	0.38
ΔIC Ø 120	163	120	100	150	26	182.5	M6	0.72
ΔIC Ø 200	253	200	150	175x41.2	51	274	M6	1.74
ΔIC Ø 300	370	300	200	250x41.5	50	390	M6	3.60

- A. Width

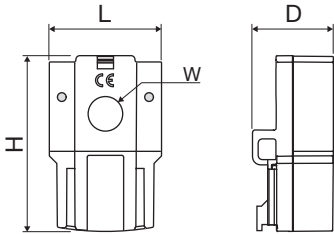
B. Diameter

C. Spacers

D. Rear bracket spacers

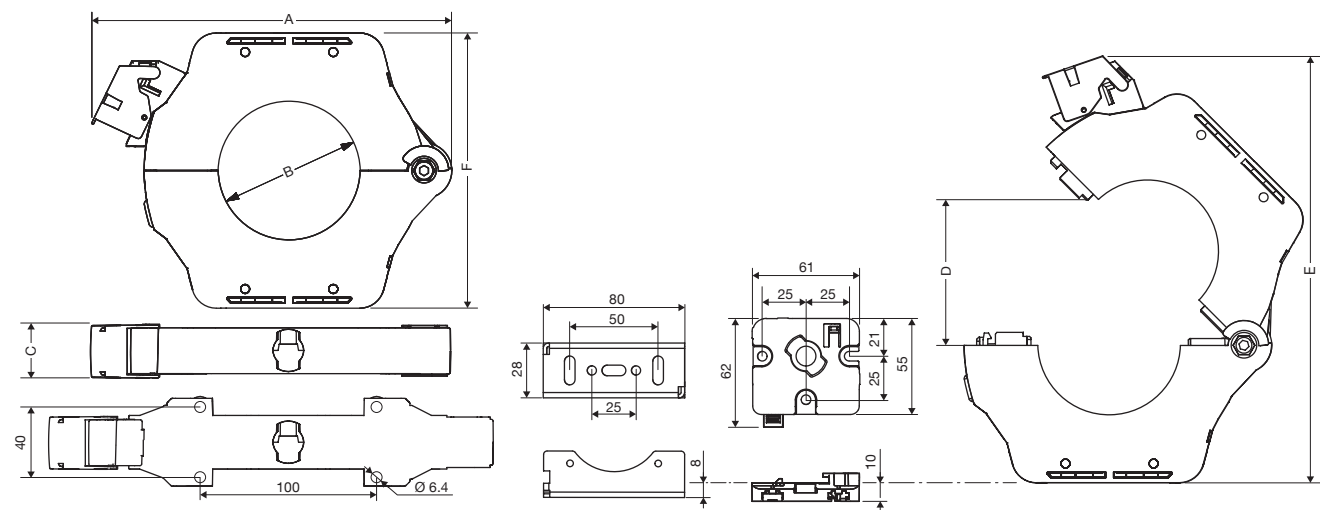
E. Depth
- F. Height

G. Diameter of fixing screws



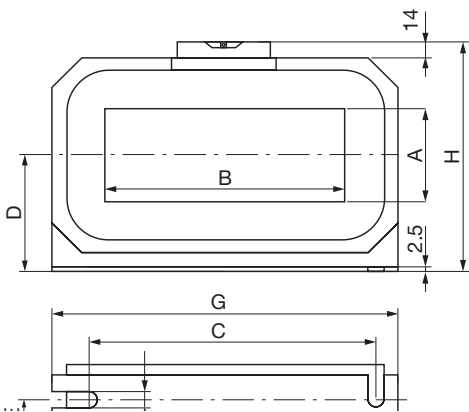
Dimensions (mm)	ΔIC Ø 8
PITCH	18
LXHXD	28 x 45 x 20
Ø W	ø 8.4

ΔIP-R circular split-core residual current transformers



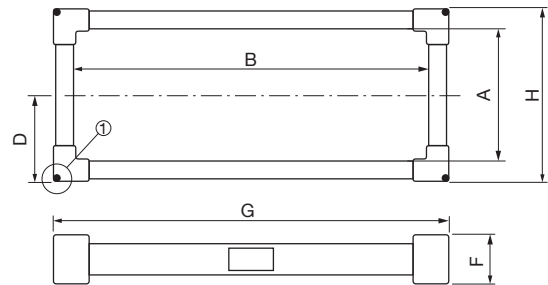
ΔIP-R	Ø 50 mm	Ø 80 mm	Ø 120 mm
A (mm)	160	204	252
B (mm)	49	79	119
C (mm)	30	30	30
D (mm)	77	108	149
T (mm)	200	260	328
F (mm)	116	156	204
Weight (g)	380	850	1500

WR/TFR rectangular solid-core residual current transformers



TYPE	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	H (mm)	I (mm)	WEIGHT (kg)
WR 70x175	70	175	225	85	22	46	261	176	7.5	2.9
WR 115x305	115	305	360	116	25	55	402	240	8	6.3
WR 150x350	150	350	415	140	28	55	460	285	8	8.2

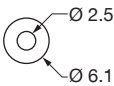
- A. Window width
B. Window length
C. Spacers
D. Half-height
E. Depth of mounting spacer
F. Depth
G. Width
H. Height
I. Width of oblong fixing holes



TYPE	A (mm)	B (mm)	D (mm)	F (mm)	G (mm)	H (mm)	WEIGHT (kg)
TFR 200x500	200	500	140	62	585	285	7.2

- A. Window width
B. Window length
D. Half-height
F. Depth
G. Width
H. Height

① Attachments for residual current transformer



4.2.2. DIRIS Digiware T-10 adaptor

Use the T-10 RJ12 adaptor to ensure the conversion and analysis of the signal between the output of the residual CT (Δ IC diameter 15 mm and above, Δ IP-R, WR and TFR residual CTs) and the DIRIS Digiware R-60 RCM module.

It can be mounted directly onto the Δ IC residual CT (diameter ≥ 30 mm), and on a DIN rail or a back plate for other residual CTs (Δ IC $\varnothing$ 15mm, Δ IP-R, WR and TFR).

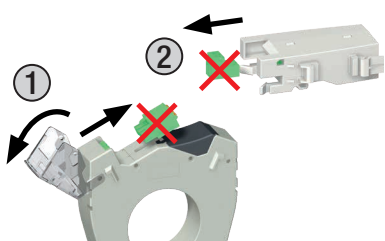
It comes with all the connectivity required for any kind of application.



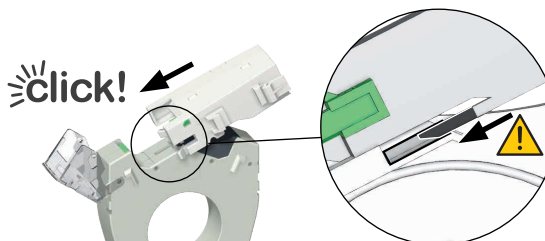
Do not install the adaptor close to or touching any live parts, or close to breakers or other equipment carrying dangerous voltage.

Mounting onto Δ IC (*)

STEP 1

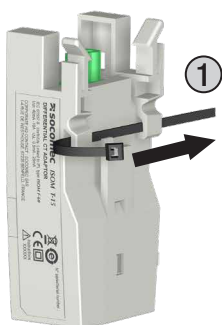


STEP 2



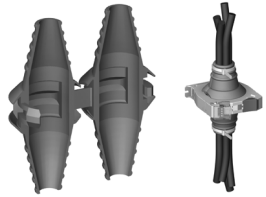
(*) Direct mounting onto residual CT is only possible for Δ IC $\varnothing$ 30mm and above.

Mounting onto plate

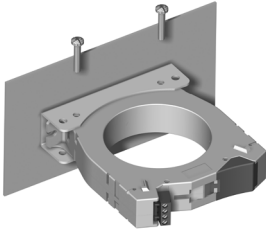


4.2.3. Accessories for ΔIC residual CTs

- Centering accessory

FLEXIBLE CABLE CENTERING ACCESSORY	Ø (mm)	REFERENCE	
Flexible cable centering accessory	30	4950 0011	
Flexible cable centering accessory	50	4950 0012	
Flexible cable centering accessory	80	4950 0013	
Flexible cable centering accessory	120	4950 0014	

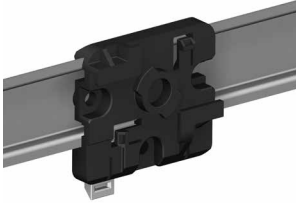
- Metal mounting bracket

METAL MOUNTING BRACKET	Ø (mm)	REFERENCE	
Metal mounting bracket	30	4950 0001	
Metal mounting bracket	50 *	4950 0002	
Metal mounting bracket	80 / 120	4950 0003	
Metal mounting bracket	200	4950 0004	
Metal mounting bracket	300	4950 0005	

* Also compatible with ΔIP-R Ø 80/120 mm residual CTs

- DIN rail mounting accessory

ACCESSORY	REFERENCE
DIN Rail mounting accessory	4950 0031



 **Note:** a DIN rail mounting accessory is provided with the ΔIC 8mm residual CT and the ΔIP-R range.

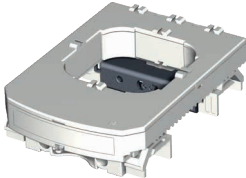
4.2.4. TE solid-core current sensors

The TE solid-core current sensors are used to set up measurement points in a new or existing installation. They are easy to integrate as they are compact and respect the pitch of the circuit breakers. A wide range of accessories are also available for direct fitting on all type of cabling (cable, flexible or rigid busbar) or on a DIN rail support or plate.

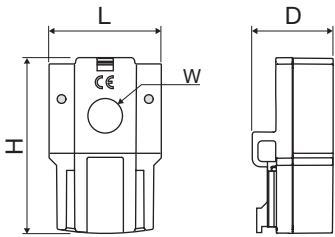
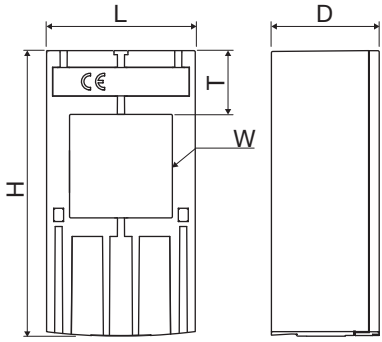
Thanks to the specific link, they are recognised by the DIRIS Digiware R-60 and a high level of overall accuracy for the measurement chain is guaranteed.

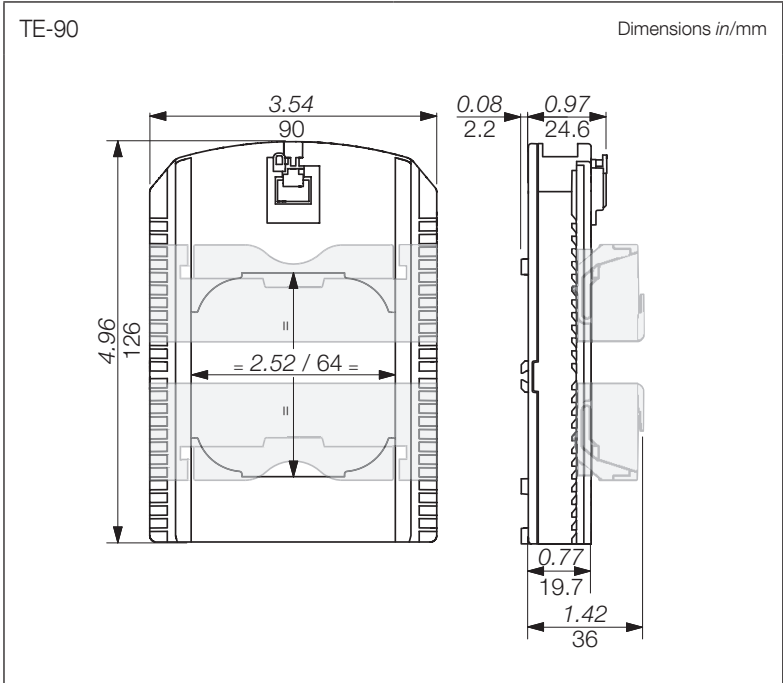
4.2.4.1. Range

						
	TE-18	TE-18	TE-25	TE-35	TE-45	TE-55
PITCH	18 mm	18 mm	25 mm	35 mm	45 mm	55 mm
NOMINAL CURRENT RANGE In	5 - 20 A	25 - 63 A	40 - 160 A	63 - 250 A	160 - 630 A	400 - 1000 A
I max	24 A	75.6 A	192 A	300 A	756 A	1200 A
REFERENCE	4829 0500	4829 0501	4750 6052	4829 0503	4829 0504	4829 0505

	
	TE-90
PITCH	90 mm
NOMINAL CURRENT RANGE In	600 - 2000 A
I max	2400 A
REFERENCE	4829 0506

4.2.4.2. Dimensions

					
Dimensions (mm)	TE-18	TE-25	TE-35	TE-45	TE-55
PITCH	18	25	35	45	55
LXHXD	28 x 45 x 20	25 x 65 x 32.5	35 x 71 x 32.5	45 x 86 x 32.5	55 x 100 x 32.5
APERTURE W	ø 8.4	13.5 x 13.5	21 x 21	31 x 31	41 x 41
T	-	17.5	17.5	19.5	21.5

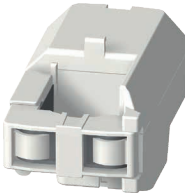


4.2.5. TR split-core current sensors

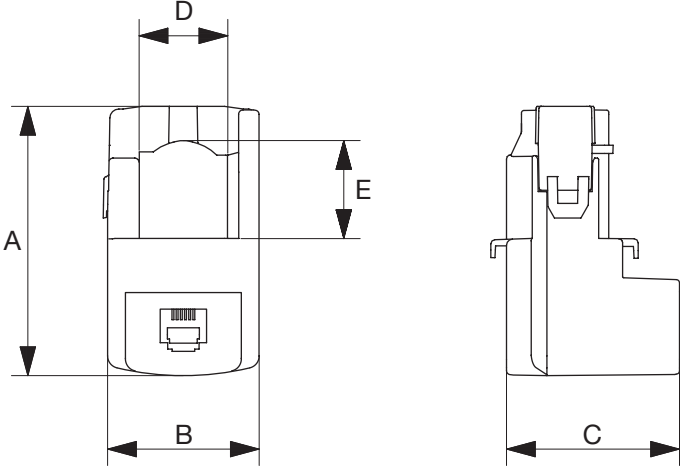
The TR split-core current sensors are used to set up measurement points in a new or existing installation without interfering with its cabling. Thanks to the specific link, they are recognised by the DIRIS Digiware R-60 and a high level of overall accuracy for the measurement chain is guaranteed.

4.2.5.1. Range

Four models are available from 25A to 600A to analyse several types of loads.

				
	TR-10 / iTR-10	TR-14 / iTR-14	TR-21 / iTR-21	TR-32 / iTR-32
APERTURE	Ø 10 mm	Ø 14 mm	Ø 21 mm	Ø 32 mm
NOMINAL CURRENT RANGE I_n	25 - 63 A	40 - 160 A	63 - 250 A	160 - 600 A
RECOMMENDED CABLE SECTION	6 mm ² (iTR-10)	10 mm ² (iTR-14)	50 mm ² (iTR-21)	50 mm ² (iTR-32)
I_{max}	75.6 A	192 A	300 A	720 A
REFERENCE	4829 0555 / 4829 0655	4829 0556 / 4829 0656	4829 0557 / 4829 0657	4829 0558 / 4829 0658

4.2.5.2. Dimensions

				
Dimensions in/mm	TR-10 / iTR-10	TR-14 / iTR-14	TR-21 / iTR-21	TR-32 / iTR-32
A	1.74 44	2.63 67	2.56 65	3.38 86
B	1.02 26	1.14 29	1.45 37	2.08 53
C	1.10 28	1.10 28	1.69 43	1.85 47
D	0.39 10	0.55 14	0.82 21	1.26 32
E	-	0.59 15	0.90 23	1.30 33

4.2.6. TF flexible current sensors

The TF flexible current sensors use the Rogowski principle, covering a wide current range without saturation. Their flexible design and easy opening system enables a quick installation inside electrical panels, making them particularly well suited for adding measuring points in existing electrical installations, especially when space is limited. The secure lock technology prevents non voluntary openings of the Rogowski rope. Thanks to the specific link, they are recognised by the DIRIS Digiware R-60 and a high level of overall accuracy for the measurement chain is guaranteed.

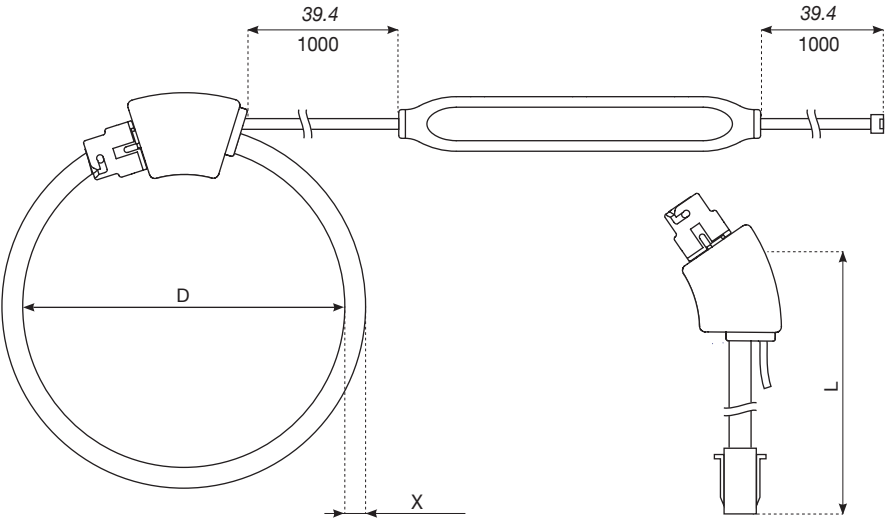
4.2.6.1. Range

Six models are available, covering a large current range up to 6000 A with openings of different shapes and sizes. They include a compact and self-supplied integrator, required to shape the current signal.

	TF-40	TF-80	TF-120	TF-200	TF-300	TF-600
APERTURE	Ø 40 mm	Ø 80 mm	Ø 120 mm	Ø 200 mm	Ø 300 mm	Ø 600 mm
NOMINAL CURRENT RANGE In	100 ... 400A	150 ... 600A	400 ... 2000A	600 ... 4000A	1600 ... 6000A	1600 ... 6000A
PART NUMBER	4829 0573	4829 0574	4829 0575	4829 0576	4829 0577	4829 0578

4.2.6.2. Dimensions

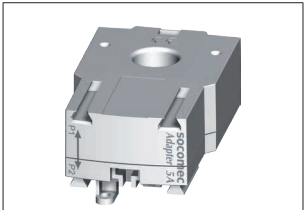
Dimensions in/mm	TF-40	TF-80	TF-120	TF-200	TF-300	TF-600
APERTURE D	1.57 40	3.15 80	4.72 120	7.87 200	11.81 300	23.62 600
PERIMETER L	4.96 126	9.88 251	14.84 377	24.72 628	37.09 942	74.21 1885
SECTION X	0.28 7	0.33 8.4				
INTEGRATOR	8.04 x 0.75 x 0.6 128 x 19 x 15					



4.2.7. Adaptor for 5A or 1A current transformers

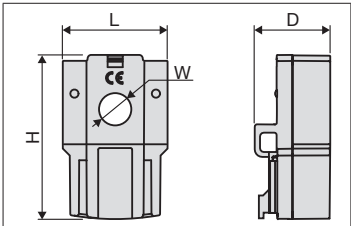
The adaptor allows you to retrofit an existing 1 A or 5 A secondary current transformer and use it with your DIRIS Digiware system. The overall DIRIS Digiware system accuracy is no longer guaranteed, as it depends on the accuracy of the associated CT (see standard "IEC 61557-12 annex F" for more information). The maximum primary current is 10000 A for a 5 A secondary CT and 2000 A for a 1 A secondary CT.

4.2.7.1. Range



	5A ADAPTOR
I nom.	5 A
I max.	6 A
REFERENCE	4829 0599

4.2.7.2. Dimensions



Dimensions (mm)	5A ADAPTOR
LXHXD	28 x 20 x 45
APERTURE W	ø 8.4

5. INSTALLATION

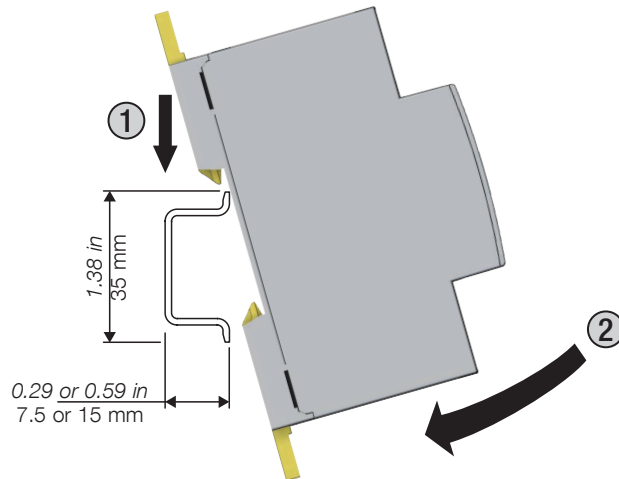
The following paragraphs describe the installation of the DIRIS Digiware RCM system.

5.1. Recommendations and safety

Refer to the safety instructions (section "Hazards and Warnings", page 7)

5.2. Installing DIRIS Digiware modules

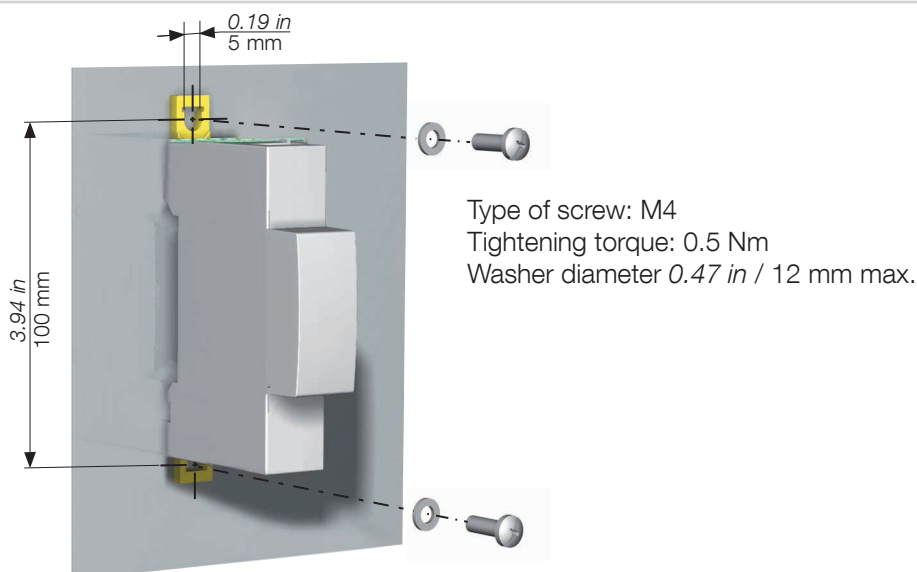
5.2.1. DIRIS Digiware R-60, T-10 – DIN rail mounting



PLEASE NOTE:

- When the DIRIS Digiware T-10 adaptor is mounted on DIN rail, do not fix the Δ IC residual CTs to the T-10.
- Make sure that the DIN rail is earthed.
- Do not install the T-10 adaptor or DIRIS Digiware R-60 close to or touching any live parts, or close to breakers or other equipment carrying dangerous voltage.

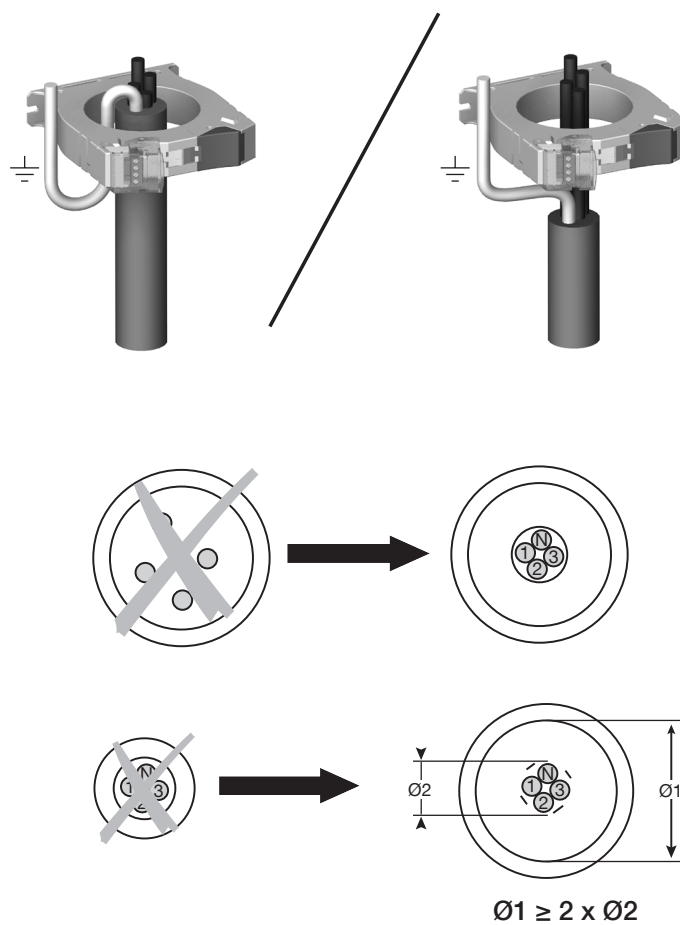
5.2.2. DIRIS Digiware R-60 – back plate mounting



If using a metal bracket, make sure it is earthed.

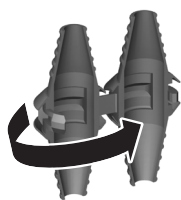
5.3. Installing residual CTs

5.3.1. Recommendations for the installation of residuals CTs around distribution cables

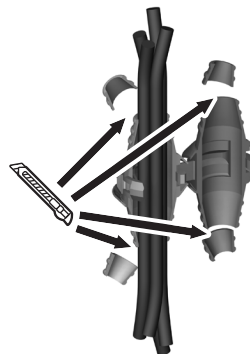


5.3.2. Centering accessory (compatible with Δ IC and Δ IP-R residual CTs Ø 30 – 120 mm)

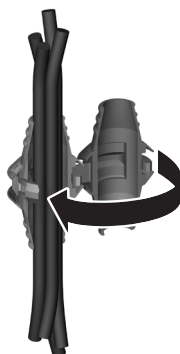
Step 1 : opening the accessory



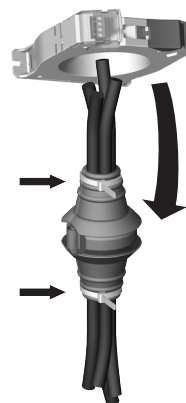
Step 2 : Clamping the wires and adapting the accessory to the wire section



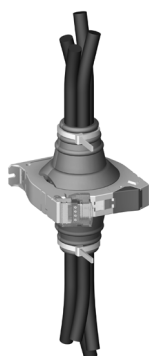
Step 3 : closing the accessory



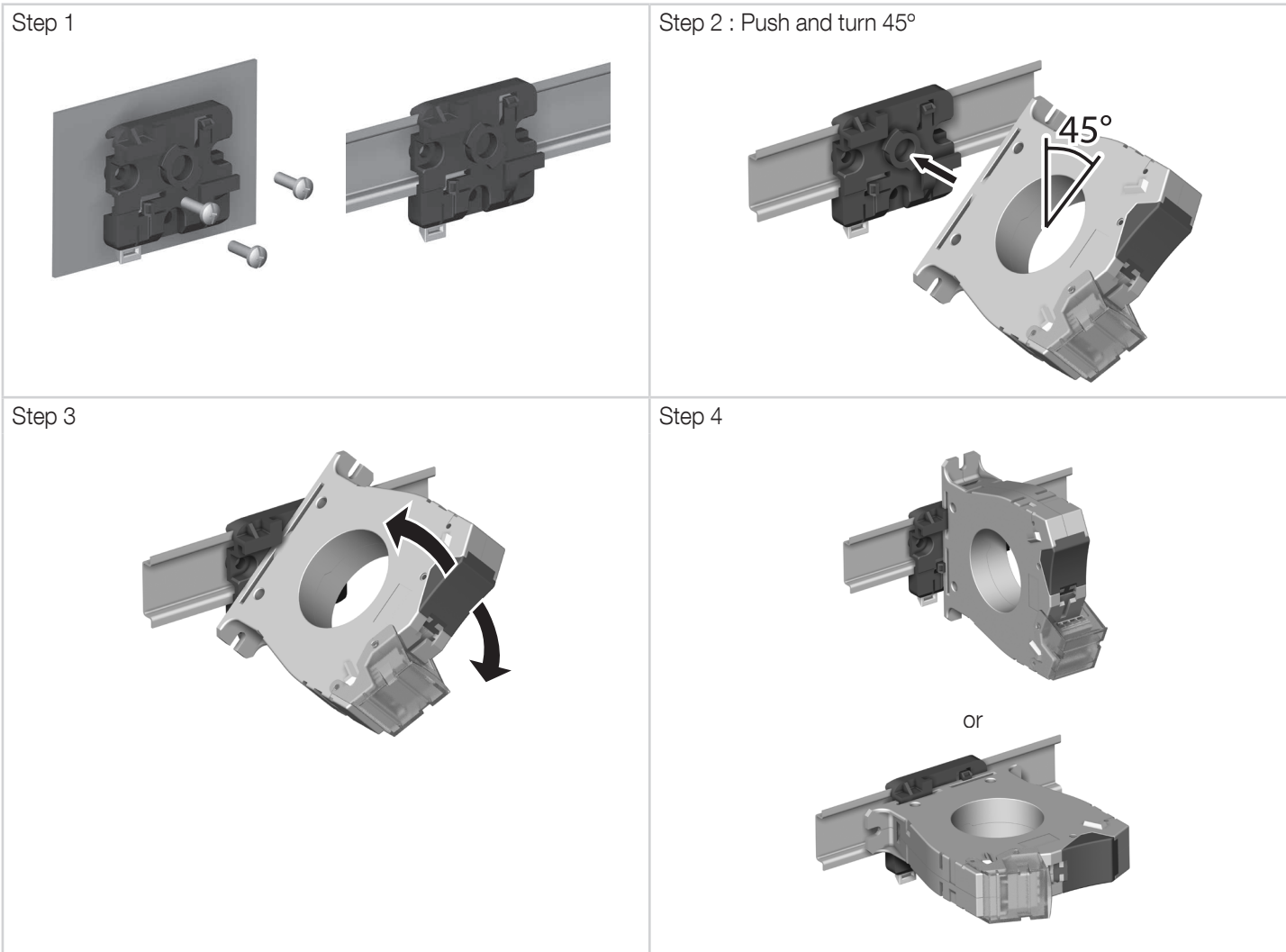
Step 4 : clamping the tightening collars



Step 5 : Integration of the residual CT in the accessory



5.3.3. DIN rail mounting accessory compatible with Δ IC ($\varnothing$ 15 – 120 mm) and Δ IP-R residual CTs



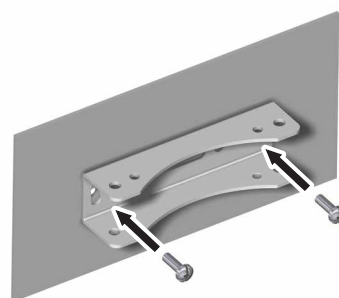
Note: a DIN rail mounting accessory is provided with the Δ IC 8mm residual CT and the Δ IP-R range.

5.3.4. Mounting with metal bracket (only for Δ IC and Δ IP-R)

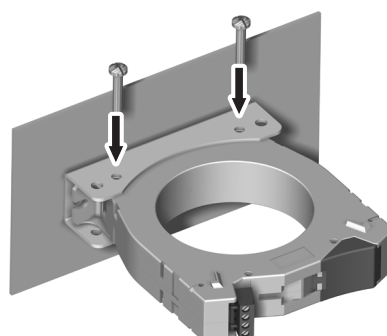
Step 1 : Mounting the accessory on back plate, by Pan Head thread-forming screws, metric thread, cruciform shape Z (Pozidriv).

Maximum torque :

- M5: 5.6 Nm
- M6: 9.6 Nm



Step 2 : mounting of the residual CT in the accessory with screws supplied



5.4. Installing TE solid-core sensors

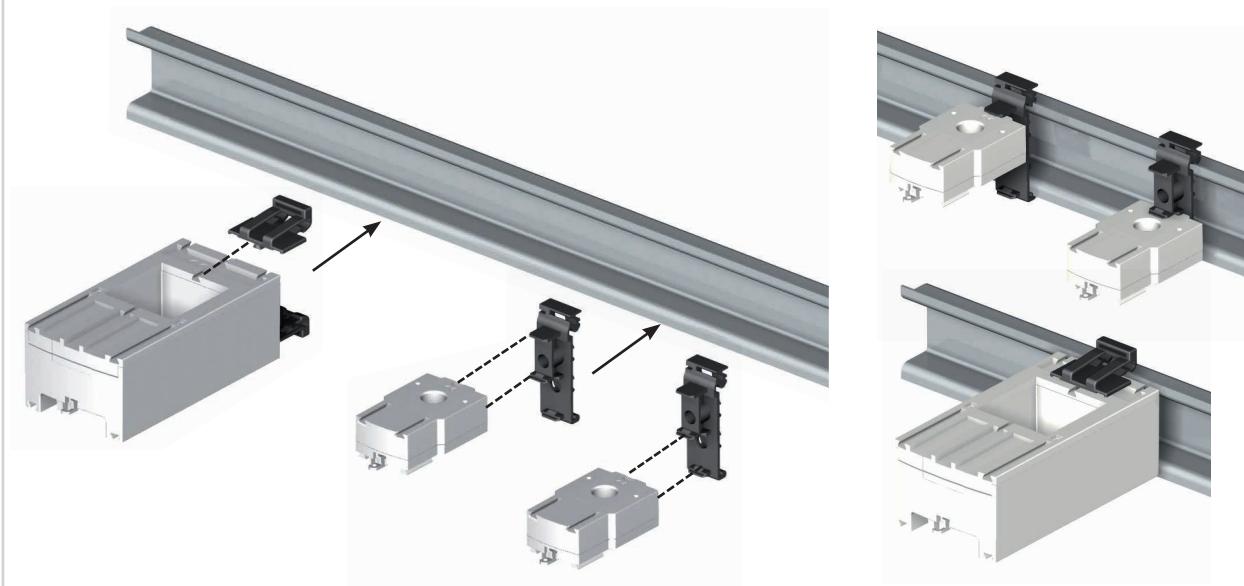
5.4.1. Mounting accessories

The mounting accessories provided with the sensors are listed below:

						
REFERENCE		PITCH	DIN rail and plate mounting	DIN rail mounting	Plate mounting	Busbar mounting
4829 0500 4829 0501	TE-18	18 mm	x 1			
4829 0502	TE-25	25 mm		x2	x4	
4829 0503	TE-35	35 mm		x2	x4	x2
4829 0504	TE-45	45 mm		x2	x4	x2
4829 0505	TE-55	55 mm		x2	x4	x2
4829 0506	TE-90	90 mm	x2		x6	

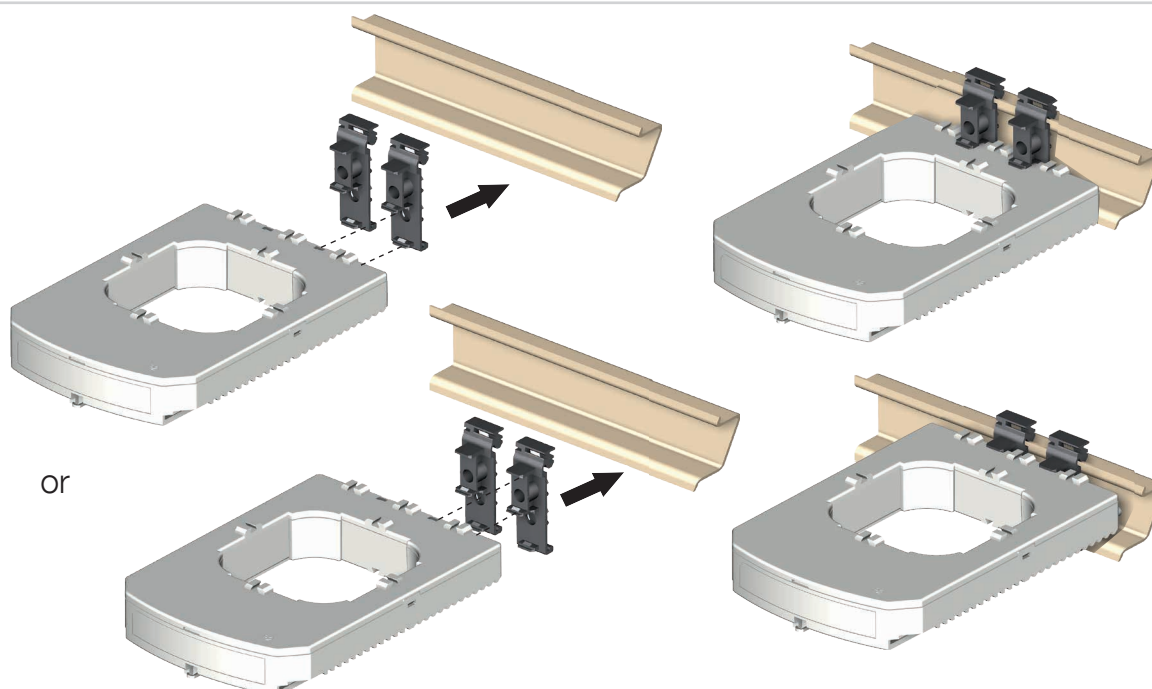
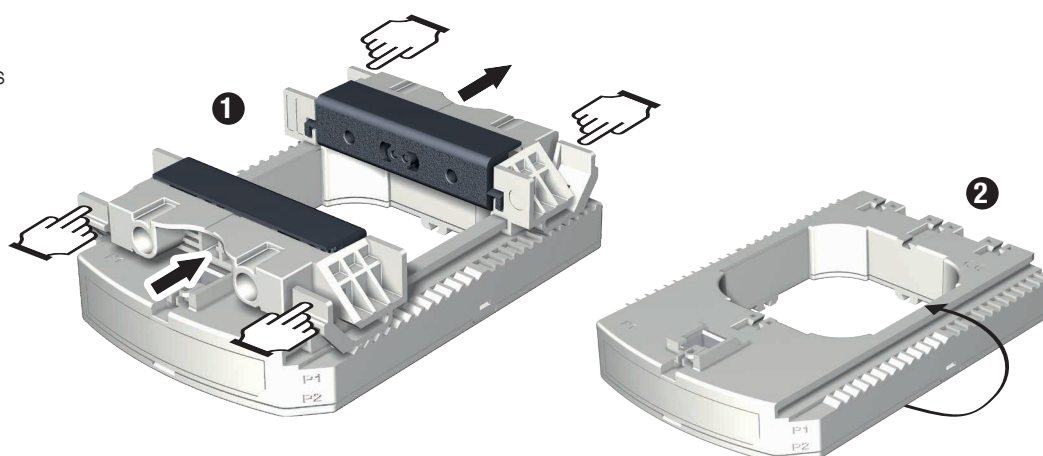
5.4.2. DIN rail mounted

TE-18 -> TE-55



TE-90

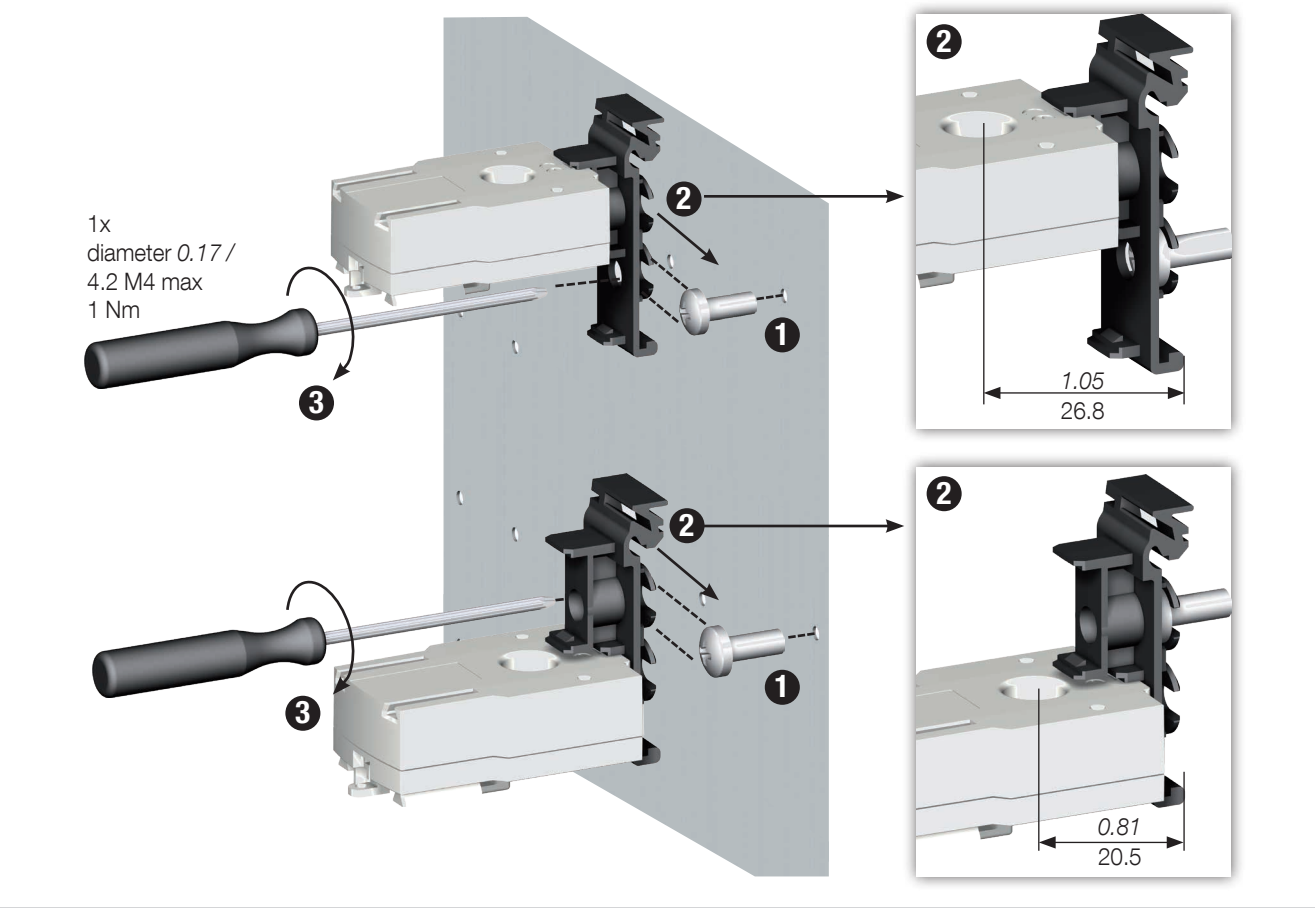
Removing clamps



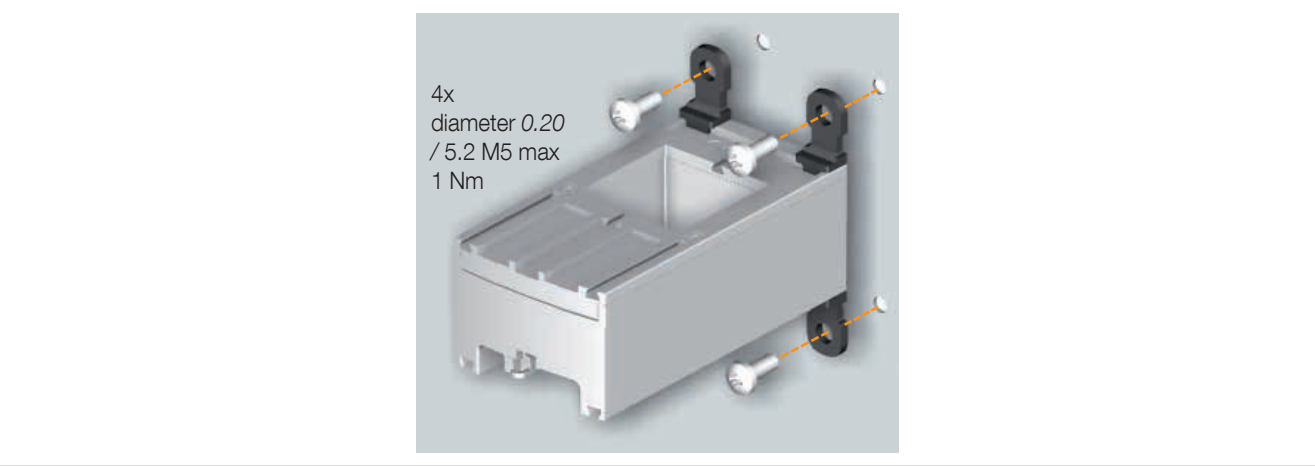
Fix sensor TE-90 to the DIN rail to make it easier to install. This is a temporary installation. Use the clamps to install the TE-90 sensors on the DIN rail.

5.4.3. Back plate mounting

TE-18

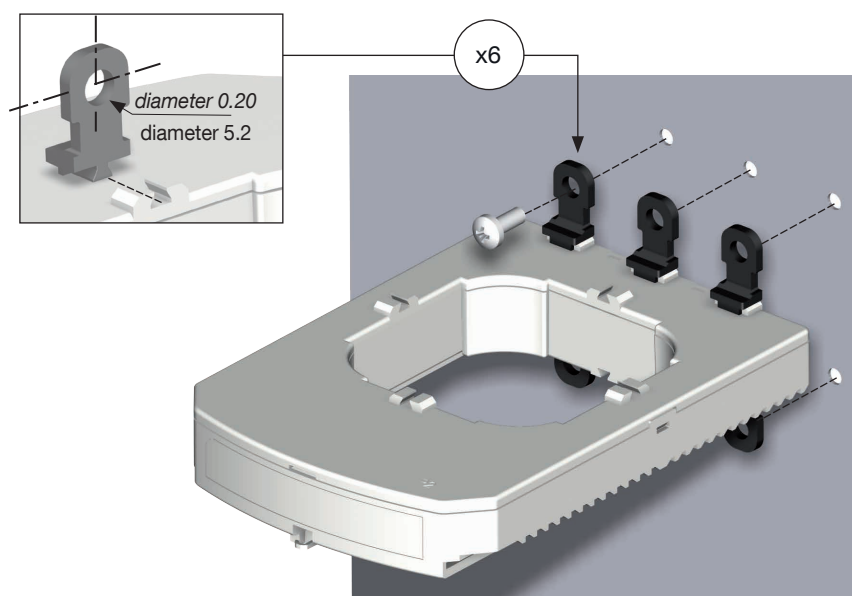
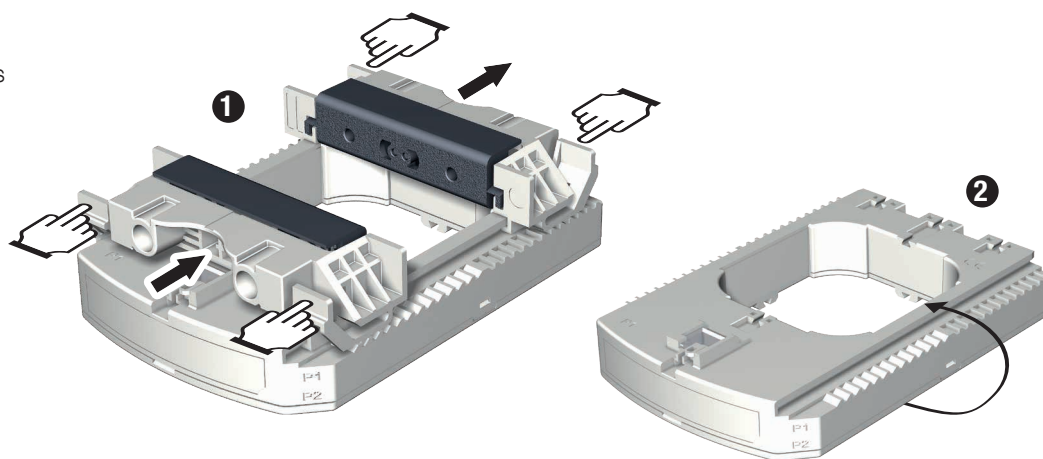


TE-25 -> TE-55



TE-90

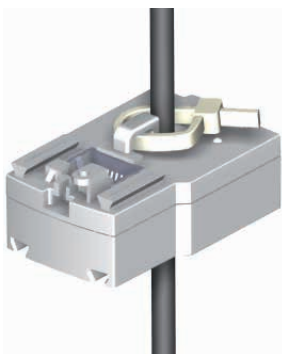
Removing clamps



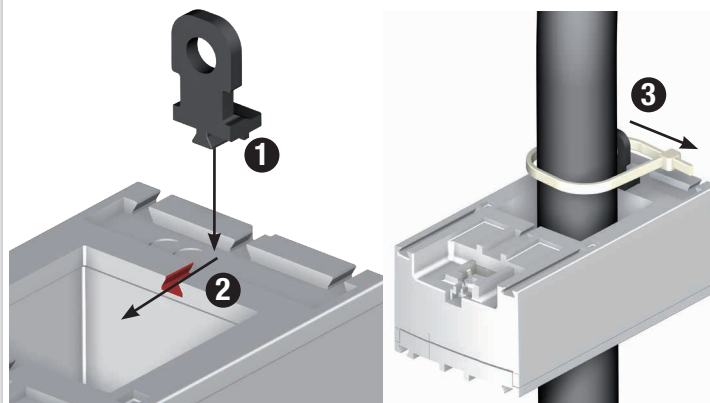
Use the clamps to install the TE-90 sensors on the board.

5.4.4. Installing on a cable with clamping collar

TE-18

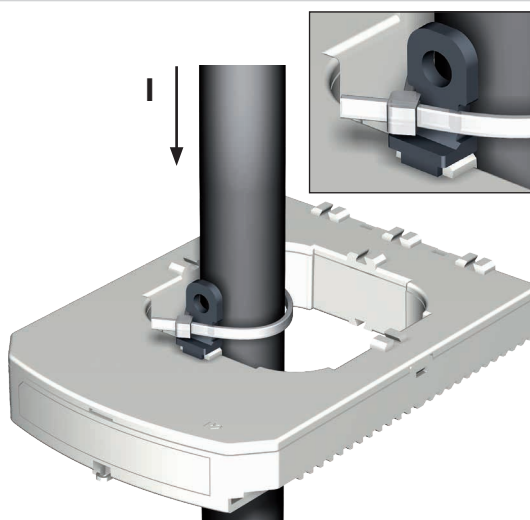
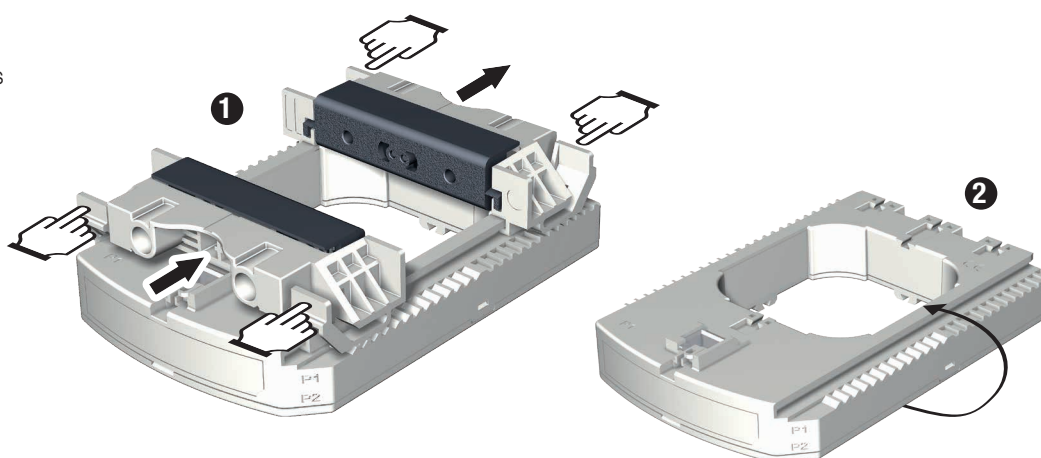


TE-25 - > TE-55



TE-90

Removing clamps



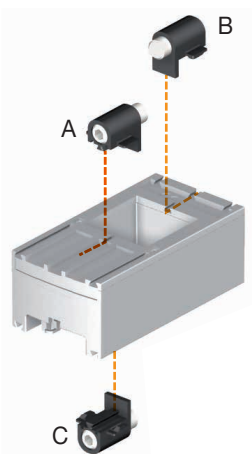
Use the clamps to install the TE-90 sensors on a cable with clamping collar.



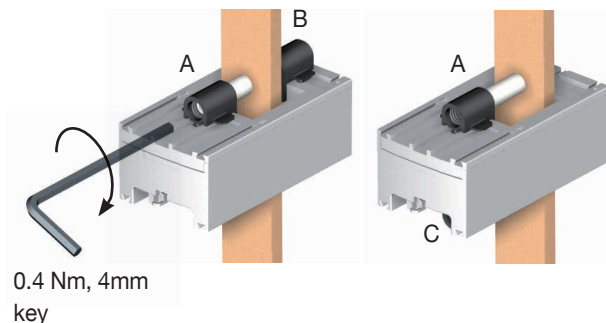
Do NOT clamp or pull out NON-INSULATED conductors carrying DANGEROUS VOLTAGE which could cause an electric shock, burn or arc flash. Ref. IEC 61010-2-032

5.4.5. Bar mounting

TE-35 - > TE-55



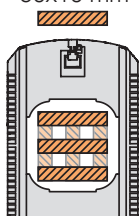
Installation options:
A+B, A+C



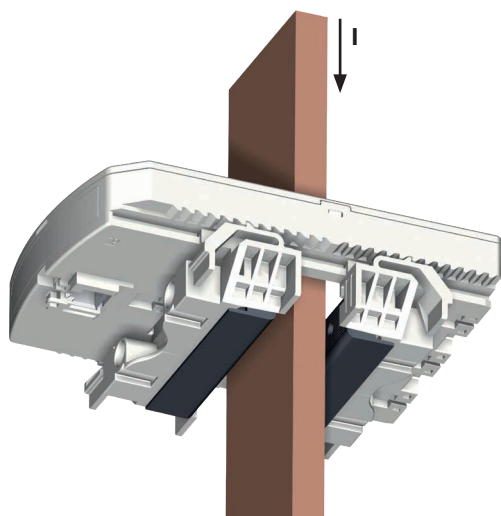
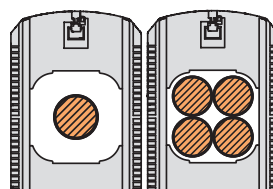
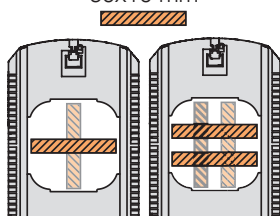
0.4 Nm, 4mm
key

TE-90

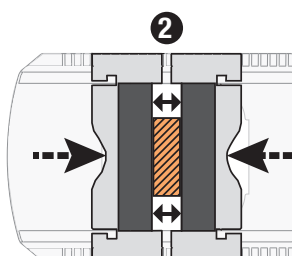
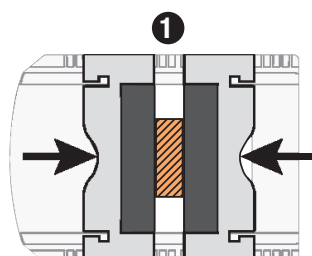
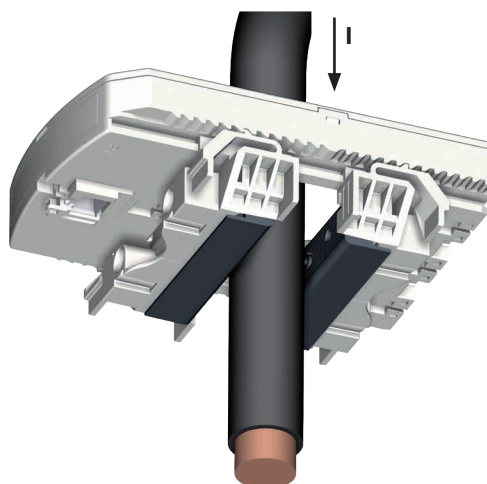
50x10 mm



60x10 mm



or



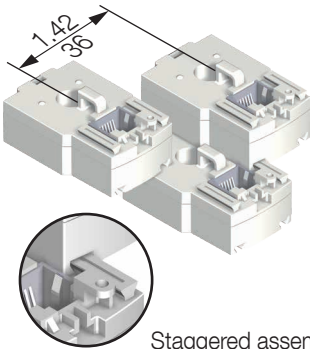
Tighten the jaws on both
sides of the cable by
applying pressure.
The jaws must be
perpendicular to the holding
notches.



Do NOT clamp or pull out NON-INSULATED conductors carrying DANGEROUS VOLTAGE which could cause an electric shock, burn or arc flash. Ref. IEC 61010-2-032

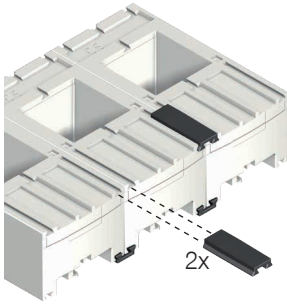
5.4.6. Sensors assembly

TE-18



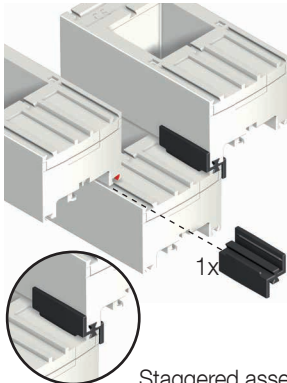
Staggered assembly

TE-25 - > TE-55



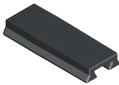
Linear mounting

TE-35 - > TE-55



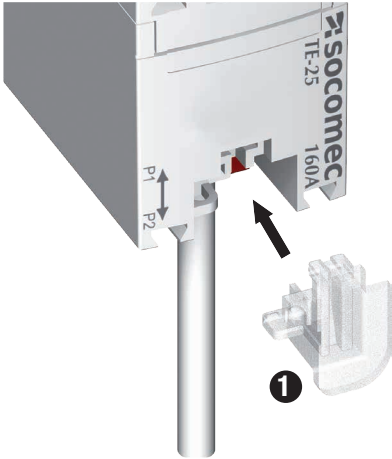
Staggered assembly

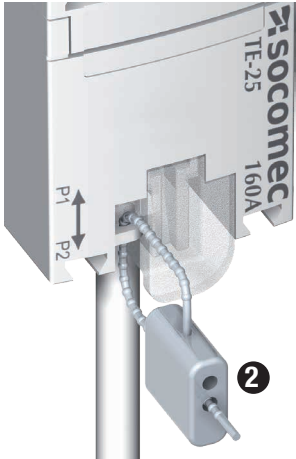
Mounting accessories for combining sensors:

		
REFERENCE	Linear assembly	Staggered assembly
4829 0598	x30	

These accessories must be ordered separately.

5.4.7. Sealing accessories for sensors



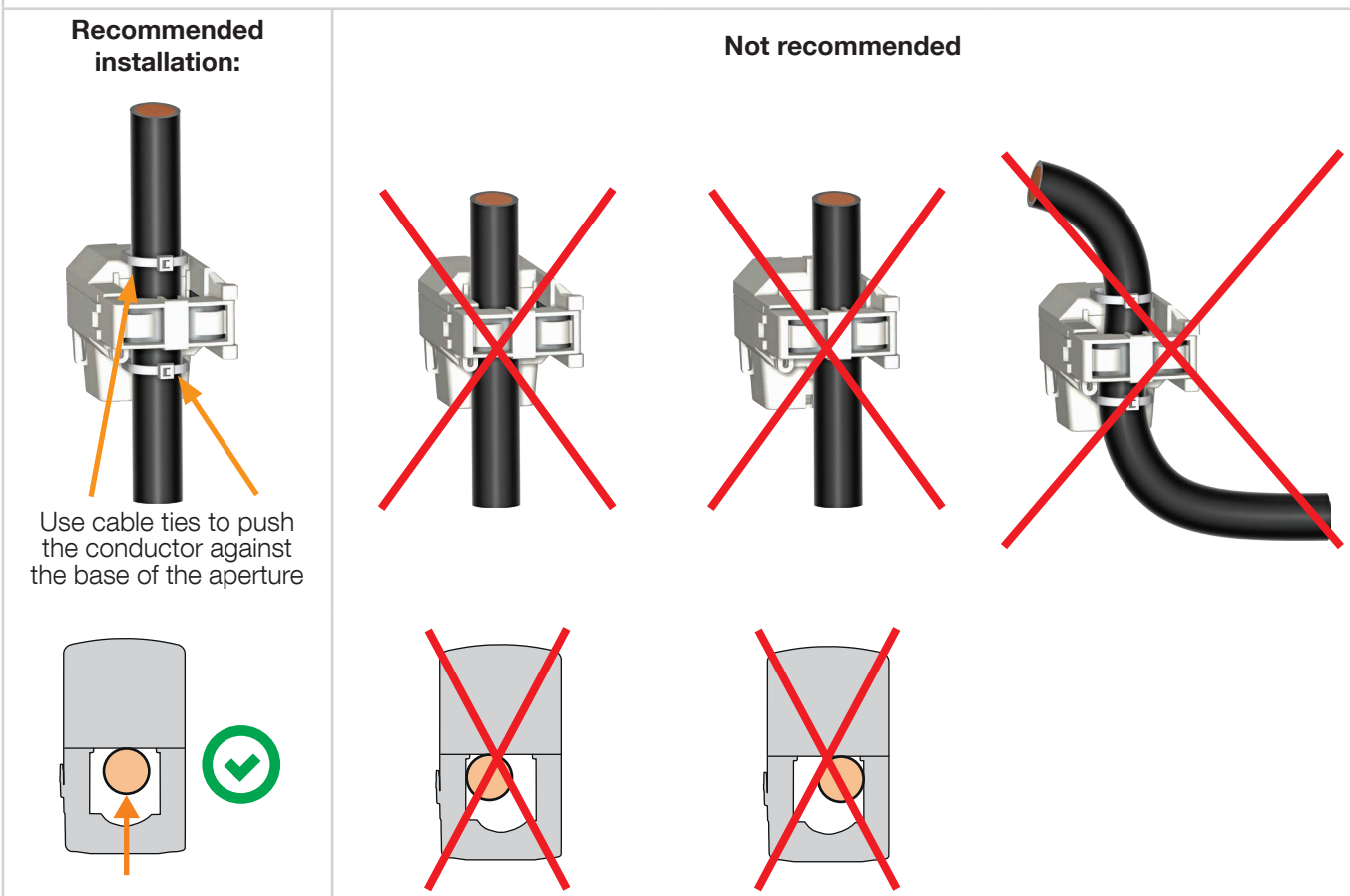
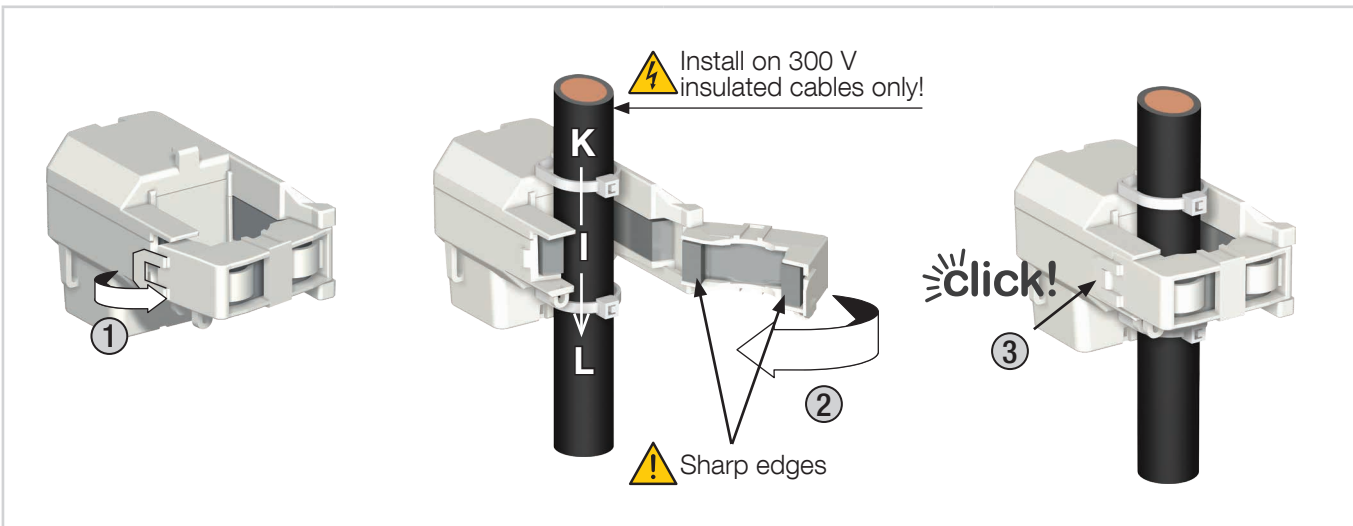


REFERENCE	Sealing case for terminal
4829 0600	x20

These accessories must be ordered separately.

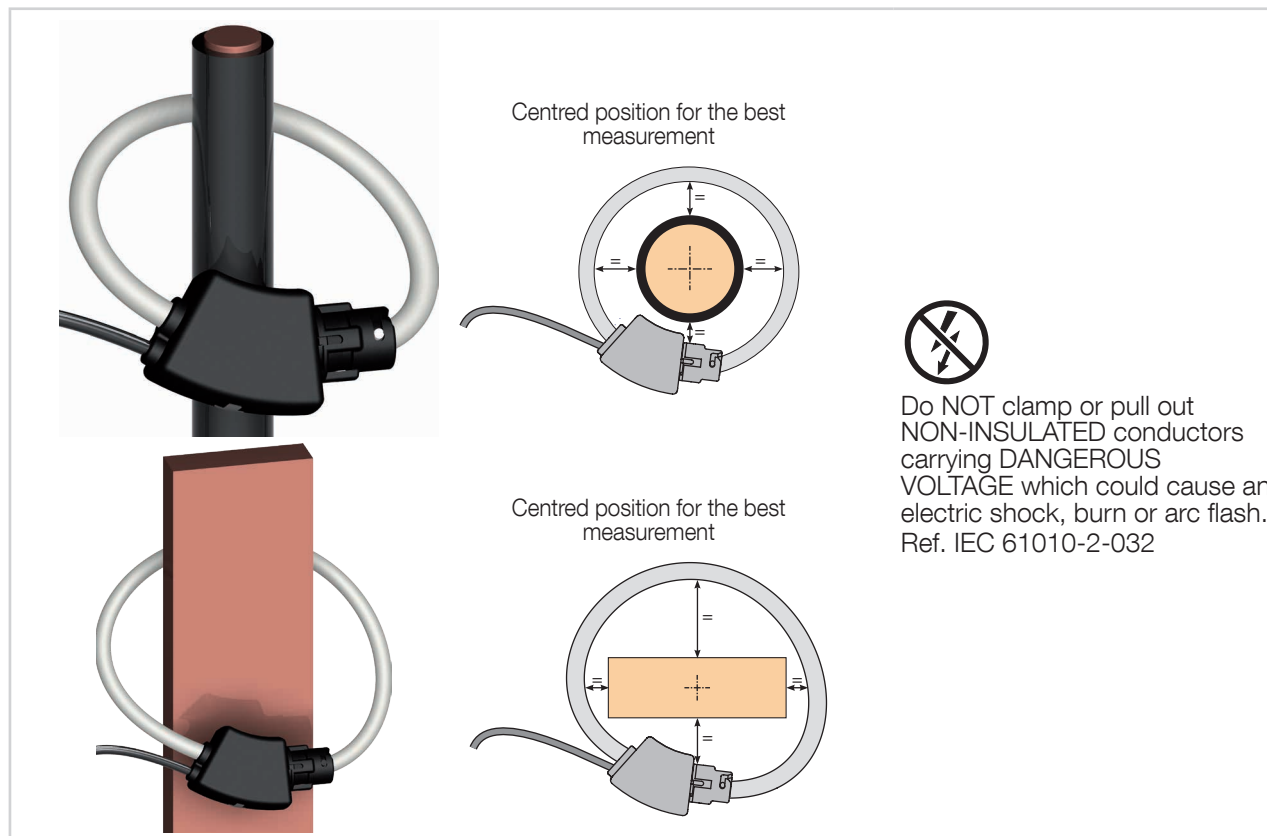
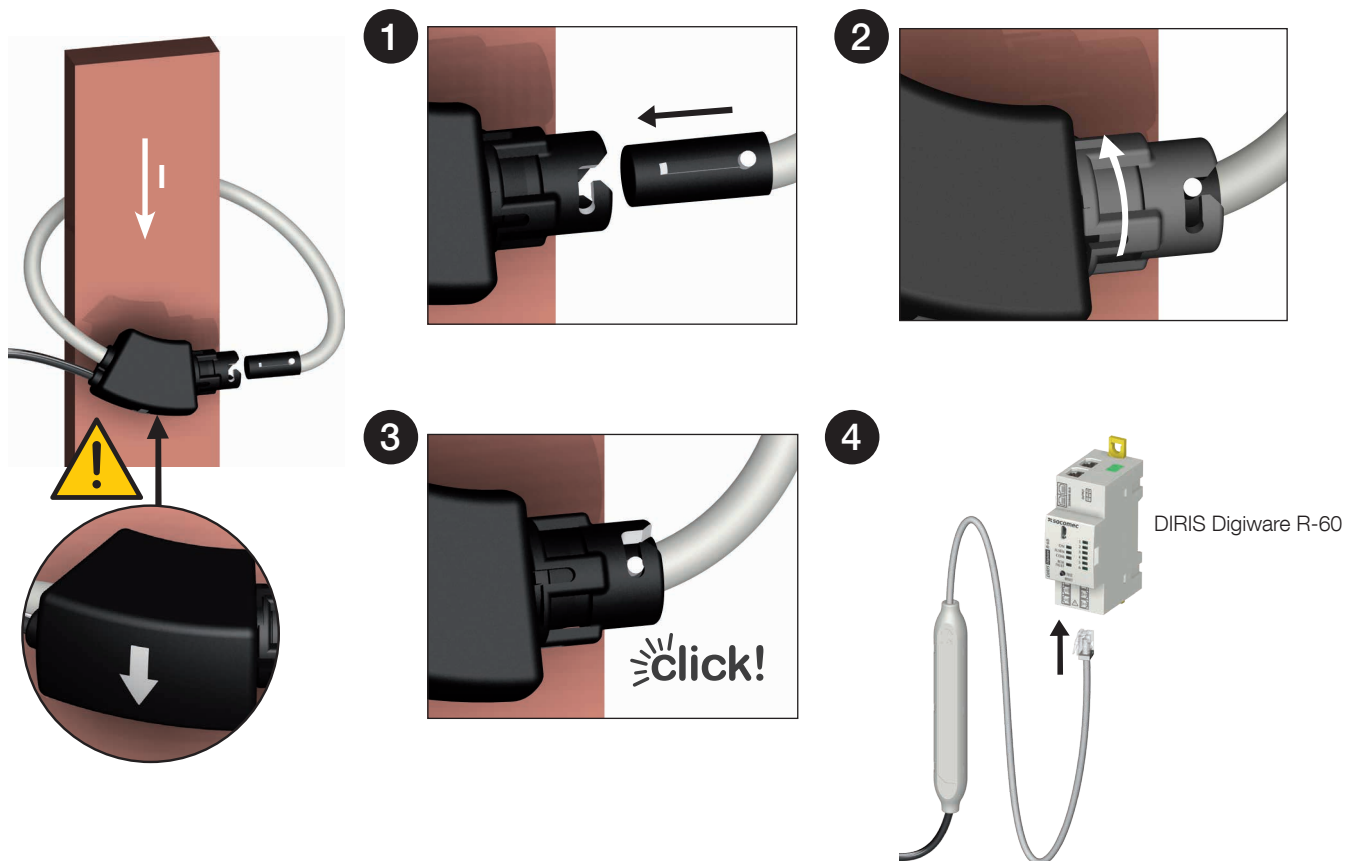
5.5. Installing TR/iTR split-core sensors

5.5.1. Cable mounting

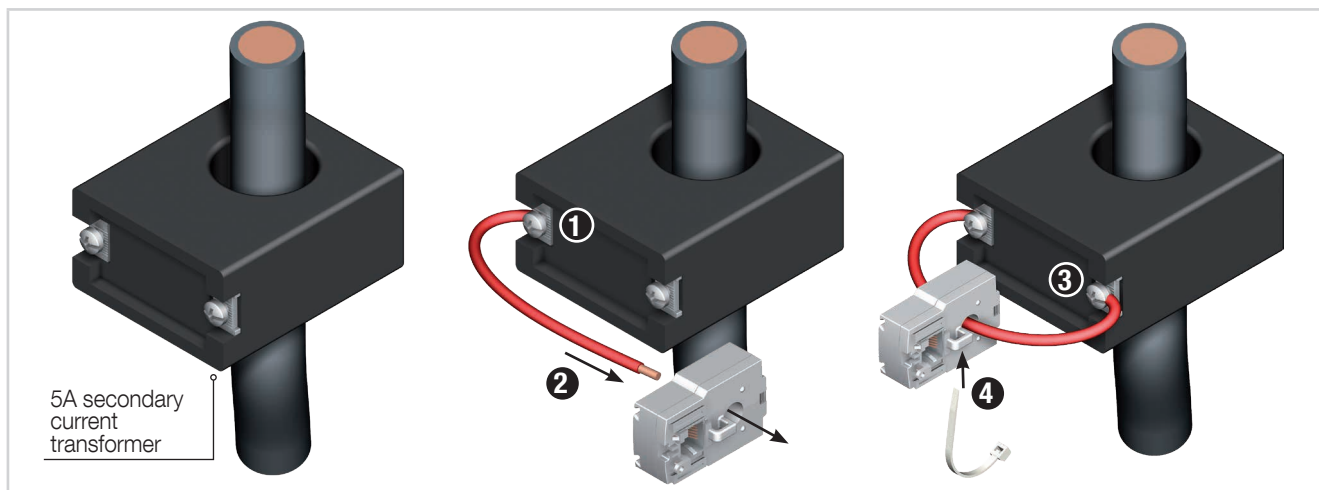


5.6. Installing TF flexible current sensors

5.6.1. Cable or bus bar-mounting



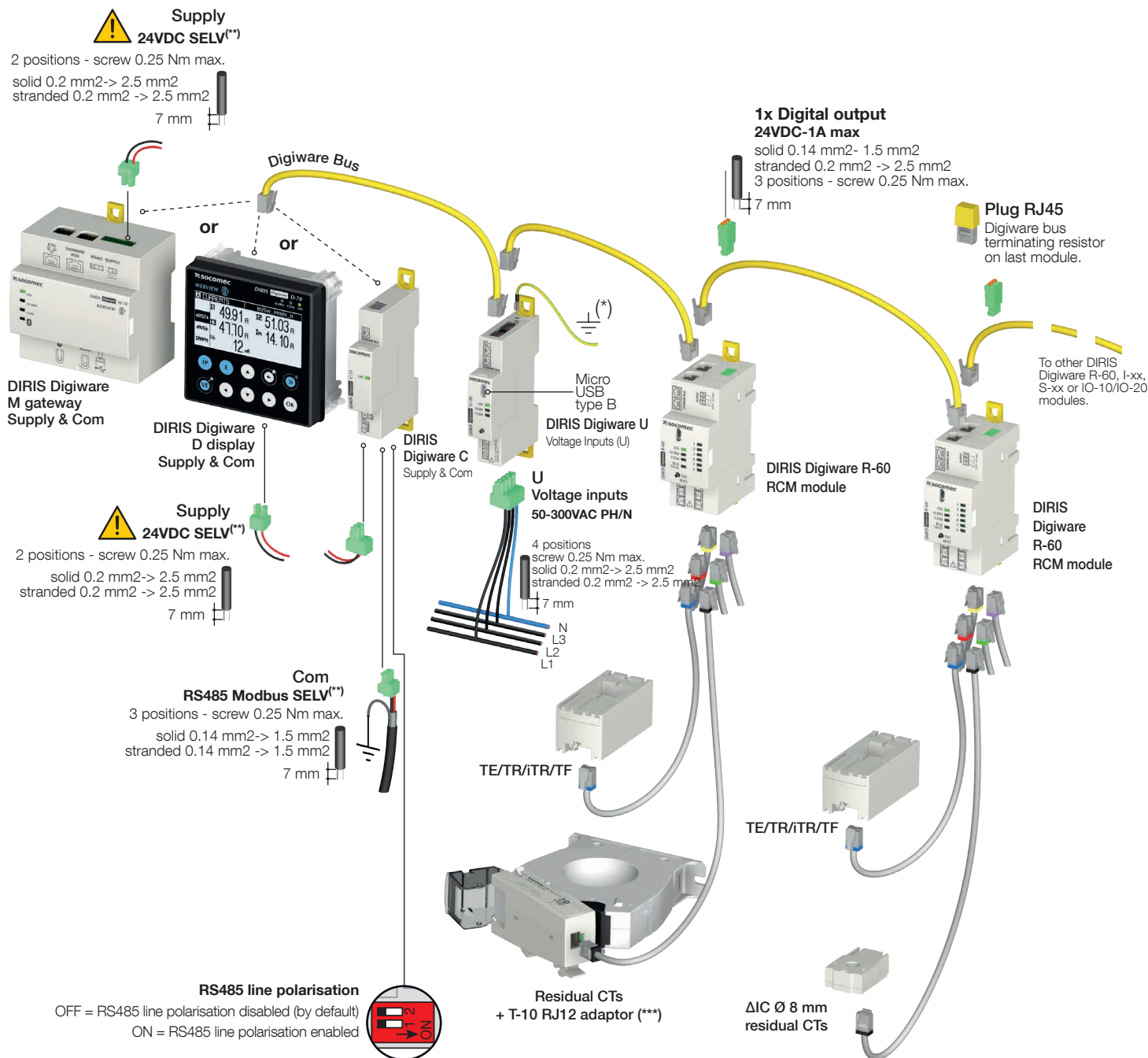
5.7. Installing the 5A adaptor



Do NOT clamp or pull out NON-INSULATED conductors carrying DANGEROUS VOLTAGE which could cause an electric shock, burn or arc flash. Ref. IEC 61010-2-032

6. CONNECTION

6.1. Connecting DIRIS Digiware RCM



(*) Do not forget to connect earth to the DIRIS Digiware U module

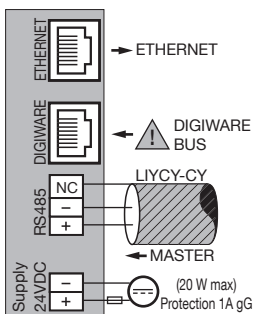
(**) Safety Extra Low Voltage

(***) T-10 adaptor only needed for ΔIC Ø 15mm - 200mm, ΔIP-R, WR and TFR residual CTs

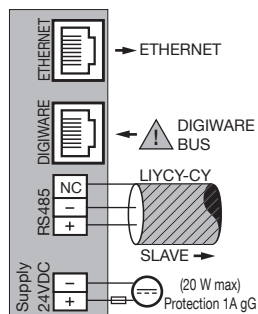
6.2. Description of the terminals

DIRIS Digiware D-50/D-70 display and M-50/M-70 gateway

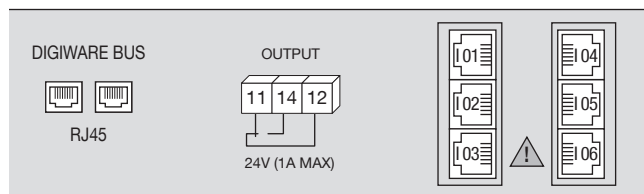
• RS485 master mode



• RS485 slave mode



DIRIS Digiware R-60



Digiware bus: Digiware bus connection with other Digiware devices

11 - 14 - 12: alarm relay output (fuse 1A gG)

I01 - I02 - I03 - I04 - I05 - I06: connection to T-10 adaptor (for residual CTs) or TE/TR/iTR/TF current sensors

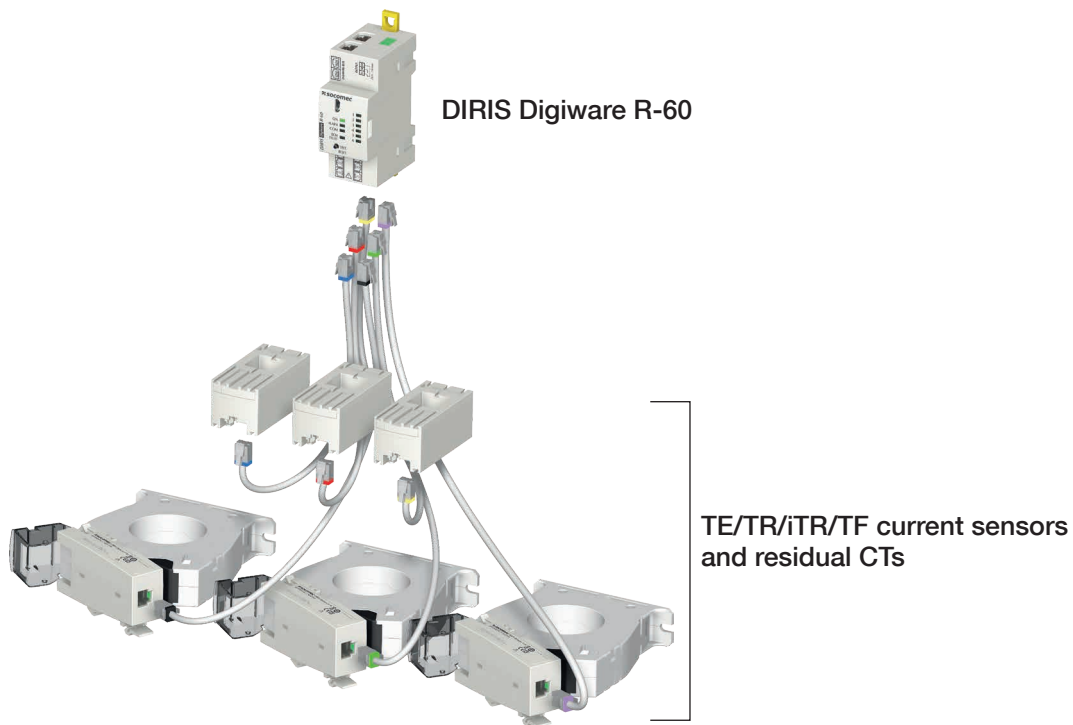


IMPORTANT:

- Always observe the auxiliary power supply voltage shown on the device: 24 VDC $\pm$ 15%.
- Use a P15 24 VDC power supply, available as 15 W (ref. 4829 0120), or protect the device with a 1A gG 24 VDC fuse.
- Provide a 2A gG fuse on main voltage inputs.

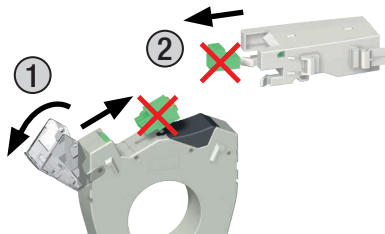
6.3. Connecting the residual CTs and current sensors

6.3.1. Connection concept

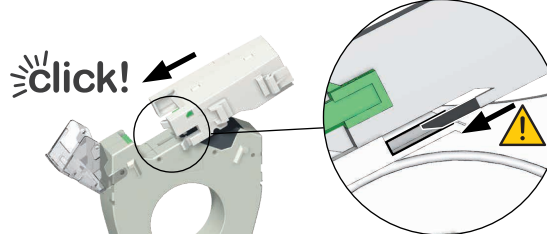


Mounting onto Δ IC (*)

STEP 1



STEP 2



(*) Direct mounting onto residual CT is only possible for Δ IC $\varnothing$ 30mm and above.

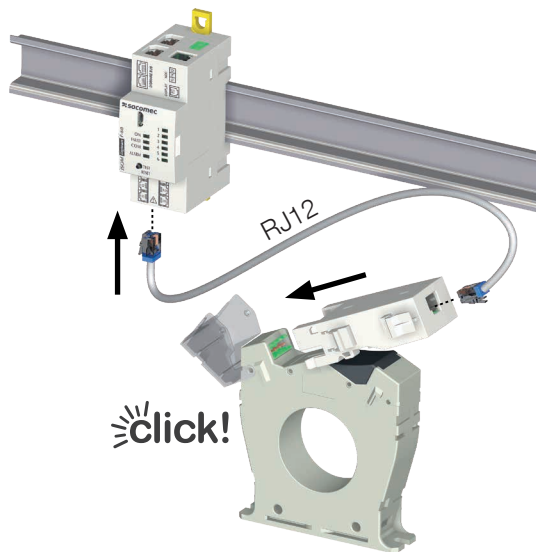
Important:

- To connect the current sensors or residual CTs, use SOCOMEC cables or equivalent only, RJ12 straight cables, twisted pair, unshielded, 600 V -10°C / +70°C in accordance with IEC 61010-1 version 3.0.
- We recommend that current sensors are installed in the same direction.
- Always connect input I01 first.

6.3.2. Details of the RJ12 connections for each current sensor

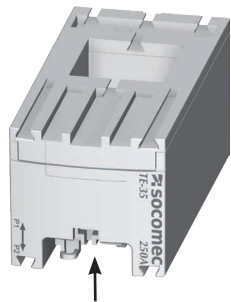
Δ IC/ Δ IP-R

Mounting the DIRIS Digiware T-10 adaptor on Δ IC residual CTs.
(Do not mount the T-10 adaptor on a busbar !)

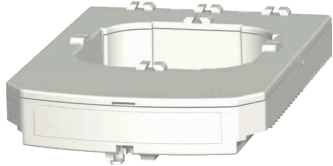


TE

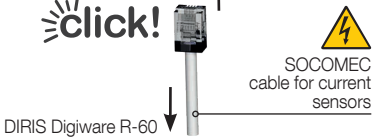
TE-18 to TE-55



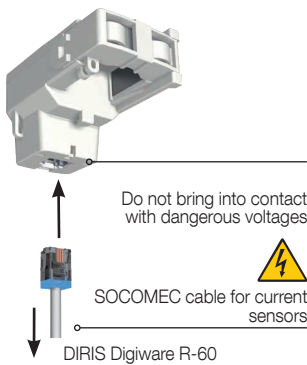
TE-90



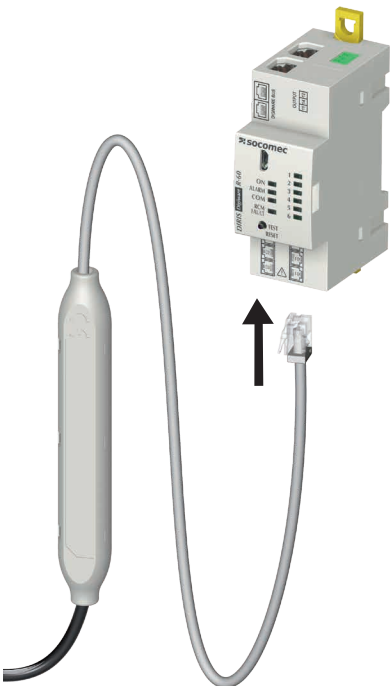
click!



TR



TF



6.4. Connecting to the electrical network and circuits

The DIRIS Digiware RCM residual current monitoring system is suitable for single-phase, two-phase, three-phase electrical systems.

The DIRIS Digiware R-60 residual current monitoring module monitors the leakage current for TN-S and TT earthing systems. Thanks to the DIRIS Digiware U voltage measurement module, the system also ensures power monitoring functions according to the IEC 61557-12 standard.

Each DIRIS Digiware R-60 RCM module can combine residual current monitoring with energy and power monitoring for multiple circuits altogether.

Several types of residual CTs and current sensors can be used (solid core, split core, flexible) making the system compatible with new, existing or high-current installation.

Each DIRIS Digiware R-60 module is connected to its associated residual CTs and current sensors via specific RJ12 cables. The R-60 module automatically detects the connected sensors.

This makes the installation quick, without cabling errors, and in complete safety.

Furthermore, DIRIS Digiware RCM is compatible with the majority of load types: single-phase, three-phase with or without neutral, balanced or unbalanced, using 1, 2, 3 or 4 current sensors.

6.4.1. Configurable loads based on the network type

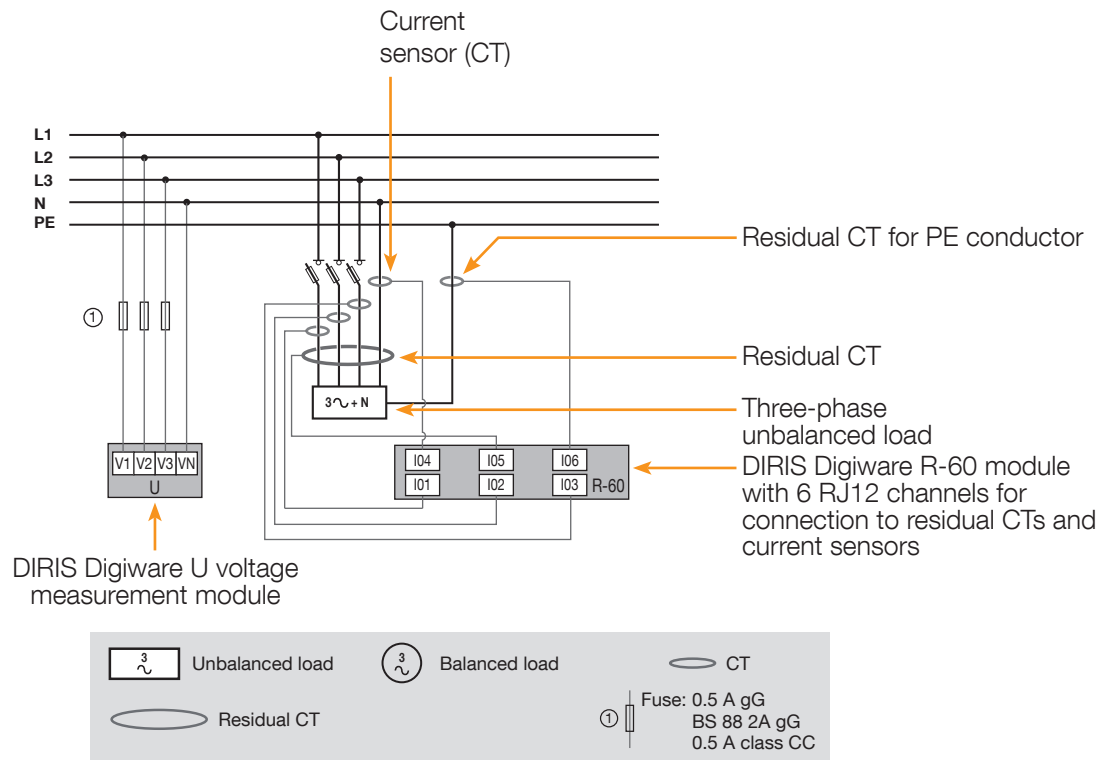
The following table summarises the loads which can be configured based on the system's network type

NETWORK TYPE	Configurable load
1P+N	1P+N – 1CT
2P	2P – 1CT
2P+N	2P+N – 2CT / 2P – 1CT / 1P+N – 1CT
3P*	3P – 3CT / 3P – 2CT / 3P – 1CT / 2P – 1CT
3P+N	3P+N – 4CT / 3P+N – 3CT / 3P+N – 1CT / 3P – 3CT / 3P – 2CT / 3P – 1CT / 1P+N – 1CT / 2P – 1CT / 2P+N – 2CT

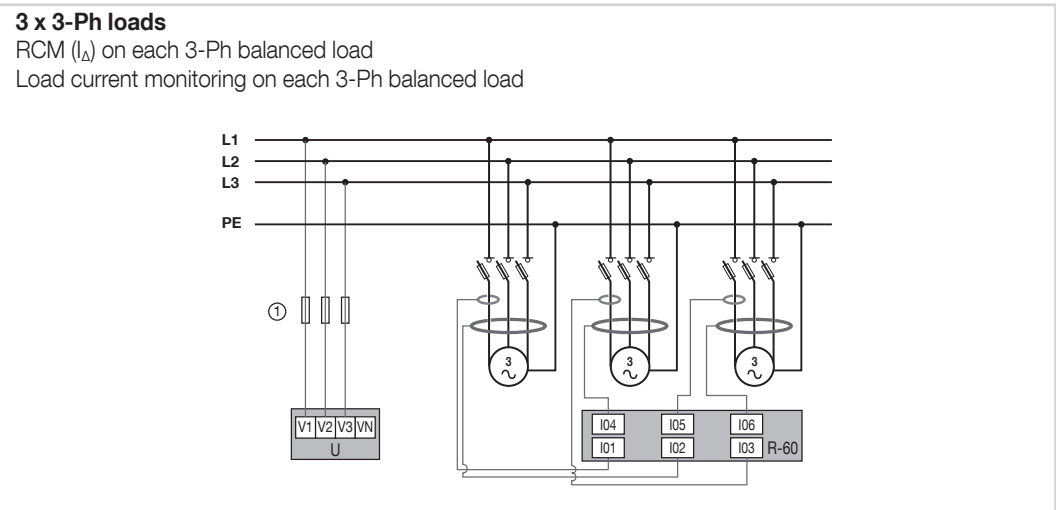
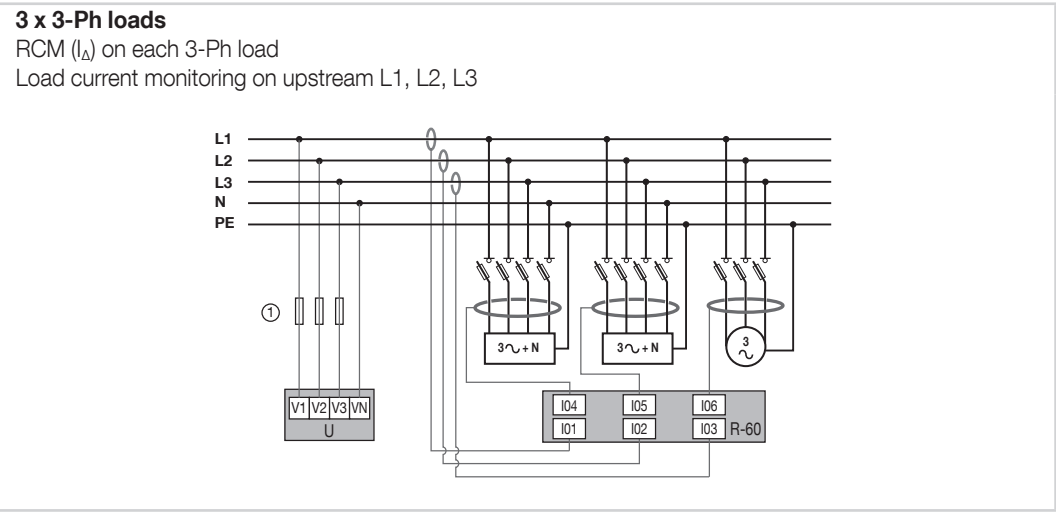
(*) Note: Single-phase loads cannot exist on a 3P network without neutral.

6.4.2. Description of the main network and circuit combinations

Legend:

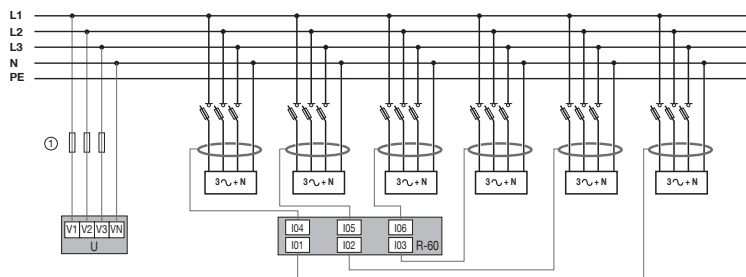


Each current input is individual; see below for some connection examples:



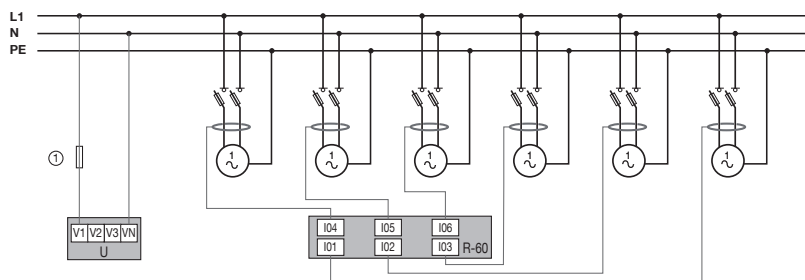
6 x 3-Ph loads

RCM (I_{Δ}) on each 3-Ph load



6 x 1-Ph loads

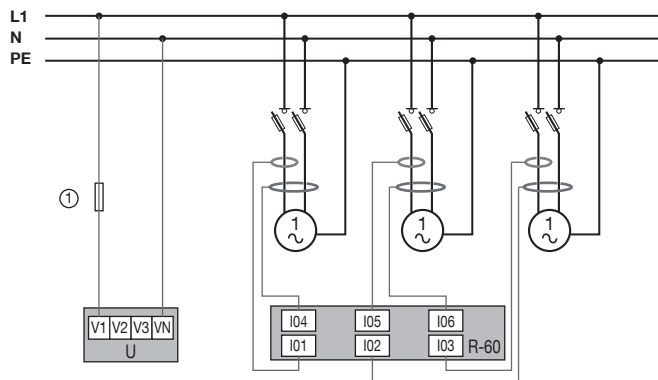
RCM (I_{Δ}) on each 1-Ph load



3 x 1-Ph loads

RCM (I_{Δ}) on each 1-Ph load

Load current monitoring on each 1-Ph load



When combining load current monitoring with Residual Current Monitoring for the same circuit, always use the first available IOx current inputs of the DIRIS Digiware R-60 to connect TE, TR/ITR and TF current sensors directly followed by residual CTs.

Example for 1 load: 3P+N – 3 CT

- I01 → Load current monitoring (I1)
- I02 → Load current monitoring (I2)
- I03 → Load current monitoring (I3)
- I04 → Residual Current Monitoring (I_{Δ})
- I05 → Residual Current Monitoring (IPE)

Example for 3 loads: 1P+N – 1 CT

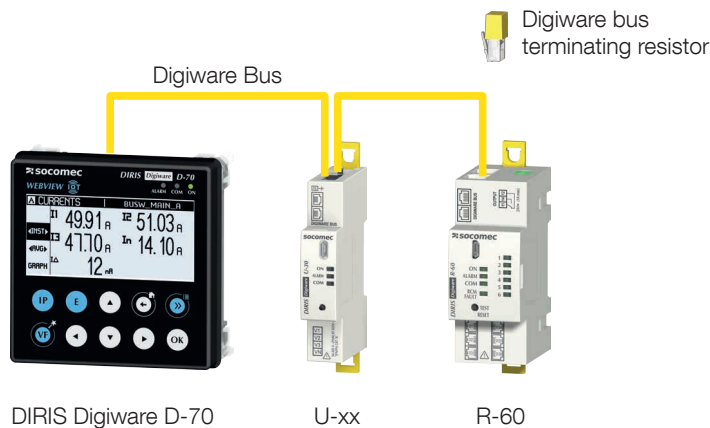
- I01 → Load 1 current monitoring (I1)
- I02 → Residual Current Monitoring (I_{Δ})
- I03 → Load 2 current monitoring (I1)
- I04 → Residual Current Monitoring (I_{Δ})
- I05 → Load 3 current monitoring (I1)
- I06 → Residual Current Monitoring (I_{Δ})



Numerous configuration variants of electrical networks and loads can be configured from the Easy Config System software.

7. DIGIWARE BUS

7.1. Principle



- DIRIS Digiware RCM is a system which must comprise the following elements:
- A system display DIRIS Digiware D (or gateway DIRIS Digiware M)
 - A DIRIS Digiware U voltage measurement module
 - One or multiple DIRIS Digiware R-60 RCM modules to measure residual currents and load currents
 - A Digiware bus terminating resistor (ref. 4829 0180). It is provided with the DIRIS Digiware D display, DIRIS Digiware M gateway and the DIRIS Digiware C-31 system interface.
- The DIRIS Digiware RCM system can also include other modules from the DIRIS Digiware range:
- DIRIS Digiware I or S modules for additional power monitoring or power quality functions
 - DIRIS Digiware IO for digital or analogue input/output management

7.1.1. Digiware bus connection cable

LENGTH (m)	QUANTITY	REFERENCE
0.06	1	4829 0189
0.1	1	4829 0181
0.2	1	4829 0188
0.5	1	4829 0182
1	1	4829 0183
2	1	4829 0184
3	1	4829 0190
5	1	4829 0186
10	1	4829 0187
50 m reel + 100 connectors		4829 0185

Use the shortest possible length of cable to optimise the electromagnetic emissions.
The total maximum length must not exceed 100 metres.



Use only SOCOMEC RJ45 cables for the Digiware bus.

7.1.2. Digiware Bus Termination

	QUANTITY	REFERENCE
	1	4829 0180

The DIRIS Digiware bus terminating resistor is provided with every DIRIS Digiware system interface (C-31, M-50/M-70, D-50/D-70).

7.2. Sizing of the power supply

DIRIS Digiware modules are powered by a single 24 VDC port on the DIRIS Digiware system interface (D, M or C-31).

2 power supply units are available:

- The P15 24 VDC power unit is available as a 15 W version (ref. 4829 0120):
 - o 230 VAC / 24 VDC – 0.63 A - 15 W
 - o Modular format
 - o Dimensions (H x W): 90 x 36 mm
- The P30 24 VDC power unit is available as a 30 W version (ref. 4729 0603):
 - o 230 VAC / 24 VDC – 1.75 A - 30 W
 - o Modular format
 - o Dimensions (H x W): 90 x 54 mm

7.2.1. Device consumption

DEVICE	POWER SUPPLIED (W)	POWER CONSUMED (W)
POWER SUPPLY		
P15 230V / 24V	15	
P30 230V / 24V	30 (*)	
CABLES		
25 metre package		0.75
SYSTEM INTERFACE		
DIRIS Digiware C-31		
DIRIS Digiware M-50/M-70		2.5
DIRIS Digiware D-50/D-70		2.5
VOLTAGE MODULE		
DIRIS Digiware U-xx		0.72
RCM MODULE		
DIRIS Digiware R-60		0.53
DIRIS Digiware T-10		0.07
REPEATER		
DIRIS Digiware C-32		1.5

(*) Max 20 W for use by the Digiware system

7.2.2. Calculation rules for the max. number of products on the Digiware bus

The total power consumed by the equipment connected to the Digiware bus must not exceed the power from the 24 VDC power supply.

Size with P15 power supply (ref. 4829 0120) delivering 15 W

You can use the following, for example:

- 1 DIRIS Digiware D-70 (2.5 W) display
- 1 DIRIS Digiware voltage module U-xx (0.72 W)
- 25 metres of cable (0.75 W)

and

- 11 DIRIS Digiware R-60 ($11 \times 0.53 = 5.83$ W) modules
 - 66 T-10 adaptors ($66 \times 0.07 = 4.62$ W)
- Total power = 14.42 W

Dimensioning with a P30 power supply (ref. 4729 0603) delivering a maximum usable power of 20 W by the Digiware system

You can use the following, for example

- 1 DIRIS Digiware D-70 (2.5 W) display
- 1 DIRIS Digiware voltage module U-xx (0.72 W)
- 25 metres of cable (0.75 W)

and

- 16 DIRIS Digiware R-60 ($16 \times 0.53 = 10$ W) modules
 - 96 T-10 adaptors ($96 \times 0.07 = 6.72$ W)
- Total power = 19.17 W

7.2.3. Digiware bus repeater

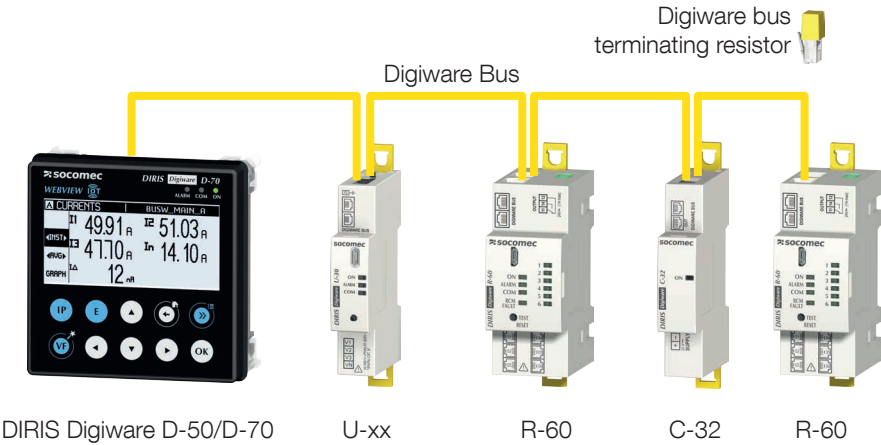
Whenever the power consumption is higher than 15 or 20 W (depending on the type of power supply used) or the distance is greater than 100 m, a DIRIS Digiware C-32 repeater is required. Within a DIRIS Digiware system, a maximum of 2 repeaters can be used.



DIRIS Digiware
C-32 repeater

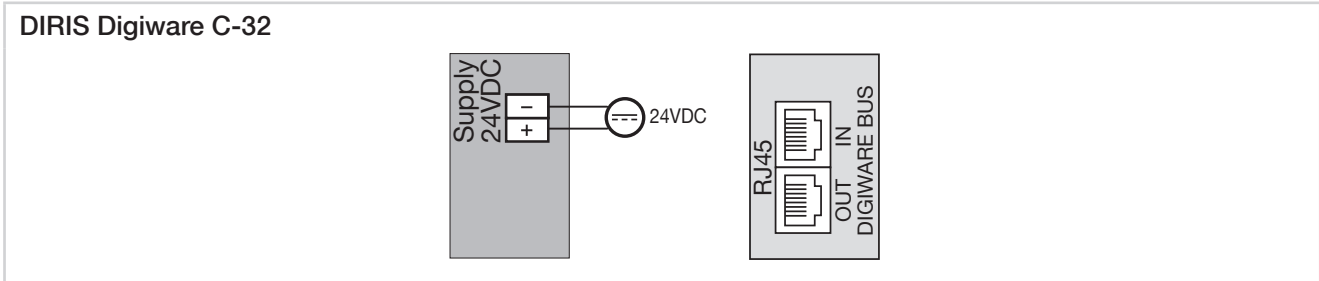
REFERENCE	4829 0103
-----------	-----------

Configuration example:



 The DIRIS Digiware U voltage module must be located upstream of the repeater.

The repeater requires a 24VDC power supply.



8. COMMUNICATION

8.1. General information

The DIRIS Digiware system communicates via RS485 or Ethernet from the DIRIS Digiware M-50/M-70 gateway or D-50/D-70 display, both acting as the unique point of access to measurements.

The M-50/M-70 and D-50/D-70 can communicate via multiple communication protocols: Modbus RTU, Modbus TCP, BACnet IP, SNMP v1, v2, v3.

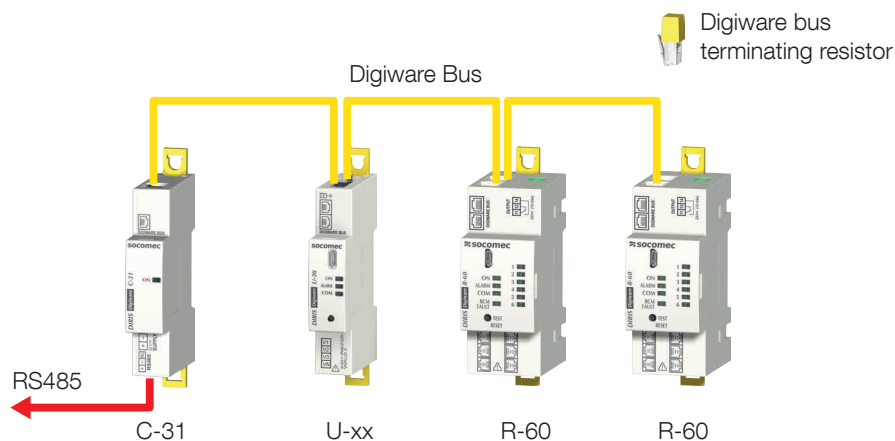
Maximum 32 devices can be visualised on the D-50/D-70 display or on WEBVIEW-M, the webserver embedded in the M-70 gateway and D-70 display.

8.2. RS485 communication

The DIRIS Digiware C-31 module, DIRIS Digiware D-50/D-70/M-50/M-70 can communicate over RS485 (2- or 3-wire) using the Modbus RTU protocol.

The Modbus protocol requires a dialogue with a master/slave structure. The mode of communication is the RTU (Remote Terminal Unit). In a standard setup, an RS485 link enables the interconnection of 32 RS485 devices to a PC (with DIRIS Digiware C-31 or DIRIS Digiware D-50/D-70 counting as one device), or a PLC over a distance of 1,200 metres.

Example of architecture using a C-31 module* :



* RS485 communication is also possible with M-50/M-70 gateways and D-50/D-70 displays



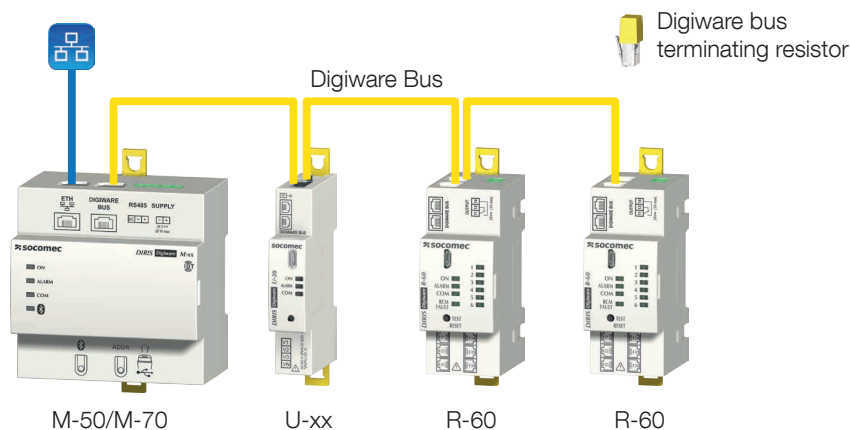
The following rules must be observed:

- A 120 Ω resistor must be added at the start of the RS485 link
- A 120 Ω resistor must be added at the end of the RS485 link
- A terminating resistor must be added at the end of the Digiware bus.

8.3. Ethernet communication

The DIRIS Digiware M-50/M-70 gateway and DIRIS Digiware D-50/D-70 display can communicate over Ethernet using multiple communication protocols (Modbus TCP, BACnet IP, SNMP v1, v2, v3 & Traps).

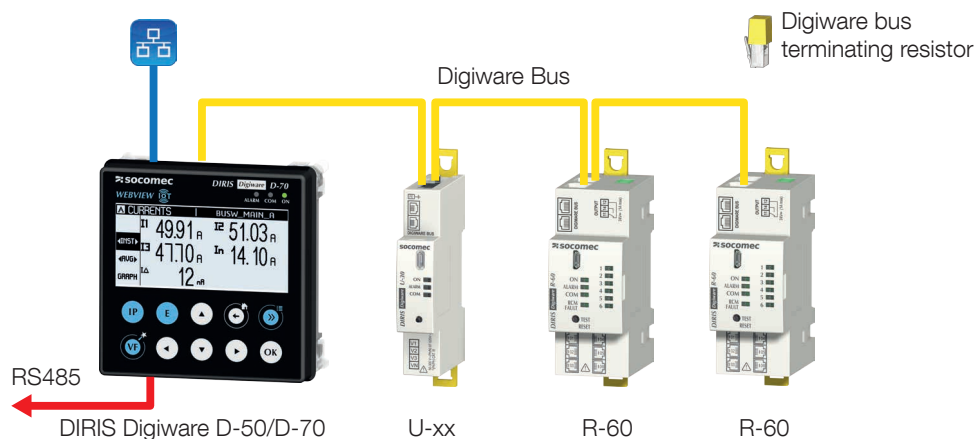
Example of architecture using an M-50/M-70 gateway:



8.4. Ethernet and RS485 communication

In the event that the system needs to communicate to a second PLC via RS485, you can configure M-50/M-70 gateways and D-50/D-70 displays as RS485 slave to communicate via the RS485 bus in addition to the Ethernet bus.

Example of architecture using a D-50 or D-70 display:



The following rules must be observed:

- A 120 Ω resistor must be added at the start of the RS485 link
- A 120 Ω resistor must be added at the end of the RS485 link
- An end of line resistor must be added at the end of the Digiware bus.

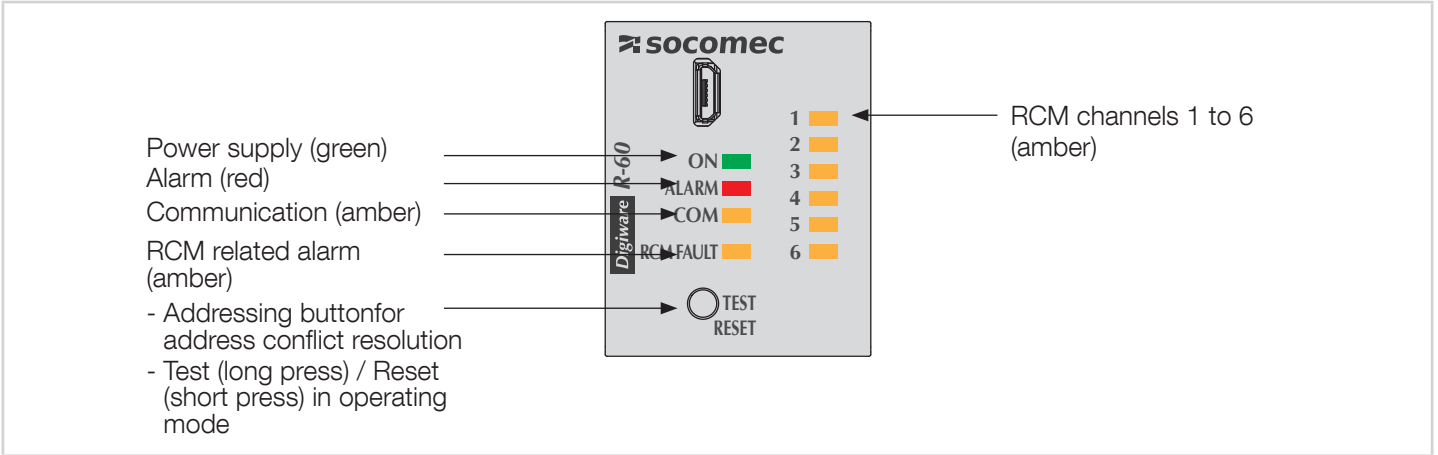
8.5. Communication tables

The communication tables and associated explanations can be found on the documentations page for DIRIS Digiware on the SOCOMEC website: www.socomec.com/operating-instructions_en.html

9. STATUS LEDS, BUTTONS AND AUTOTEST

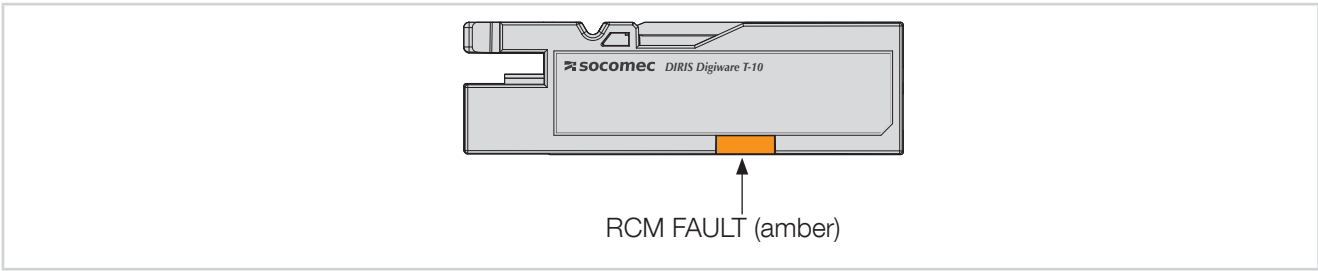
These LEDs indicate the status of the product at any time.

9.1. R-60



LED STATE	FIXED	BLINKING	PULSE
ON	In operation	Ongoing navigation from D-xx display.	1 second during start-up
ALARM	A protection alarm is active (does not have priority over system alarms)	At least one system alarm is active (current sensor or residual CT disconnected, incorrect V/I association , bad CT primary)	1 second during start-up
COM	Addressing conflict after auto-discovery process	Device is communicating	1 second during start-up and when a frame received is processed
RCM FAULT	Presence of an RCM alarm and / or a comparison alarm on at least one of the 6 channels	Autotest in progress	-
RCM CHANNELS 1-6	Presence of an RCM alarm and/or a Comparison alarm on the circuit monitored by the residual CT	• Presence of a Residual CT disconnected system alarm indicating that the residual CT is not properly connected to the DIRIS Digiware R-60. and/or • Autotest in progress	-

9.2. T-10



LED STATE	FIXED	BLINKING	PULSE
ALARM	Presence of an RCM alarm on the circuit monitored by the residual CT	Presence of a Residual CT disconnected system alarm indicating that the residual CT is not properly connected to the DIRIS Digiware R-60.	-

9.3. Autotest

An AUTOTEST function can be launched by pressing the push button on the front face of the DIRIS Digiware R-60 module for 5 seconds.

To launch the AUTOTEST, press on the TEST button for 5 seconds. During the AUTOTEST, the RCM fault LED and the channel LEDs connected to a residual CT are blinking.

The AUTOTEST simulates the activation of an RCM alarm on each residual CT to verify the proper functioning of the DIRIS Digiware R-60 module in the event that a high leakage current is detected and triggers an alarm.

After approximately 10 seconds, the AUTOTEST is finished and LEDs return to their normal state.

10. VIRTUALMONITOR TECHNOLOGY

MONITORING OF PROTECTIVE DEVICES (ONLY AVAILABLE WITH iTR SENSORS)

iTR split-core current sensors embed the VirtualMonitor technology when they are connected to DIRIS Digiware R-60 modules. The technology offers an advanced real-time monitoring of protective devices without using auxiliary contacts:

- Position (open/closed)
- Trip information
- Operation counters and trip counters
- Alarms:
 - On the opening or the trip of protective devices
 - On the defect of protective devices

The protective device can be:

- a circuit breaker
- An RCCB (Residual Current Circuit Breaker)
- An RCBO (Residual Current Breaker with Overcurrent protection)
- a switch
- a fusible switch
- a fuse

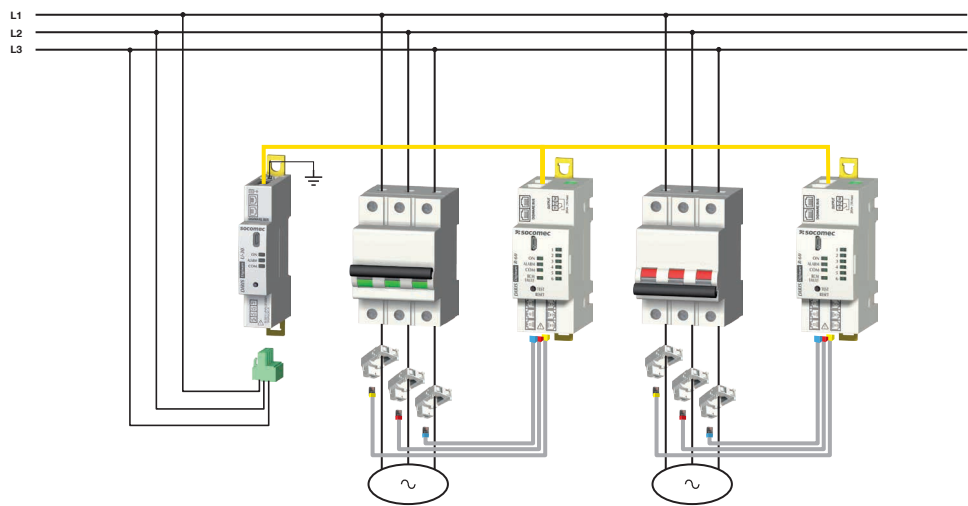
Visualisation is available from the DIRIS Digiware D-50/D-70 displays or WEBVIEW, embedded in the DIRIS Digiware M-70/D-70 and DATALOG H80/H81.

You must configure the type of protective device from the Easy Config System software in the “Protection” menu for the VirtualMonitor function to be used:

The screenshot displays the 'Easy Config System' software interface. The top bar shows 'EASY CONFIG SYSTEM 1.1' and 'English'. The left sidebar contains a menu with 'ORGANISATION' (Products by Gateway, Search, R-60 - 293FD5) and 'PARAMETERS' (Settings, Communication, Measurements, Monitoring, Trends, Load curves, Protection, Alarms, Digital I/O, Multi tariff, Commands). The main area is titled 'Protection' and contains a table with columns 'Description', 'Value', 'R-60', and 'Unit'. The table lists configuration parameters for 'Protection 1' under the 'Protective device' section, including 'Type' (RCBO), 'Trip info' (Virtual Monitor (iTR)), and 'Threshold' (No load threshold, High load threshold, Trip threshold, Differential Trip threshold). The 'Read' and 'Program' buttons are visible on the right.

Description	Value	R-60	Unit
Protection 1			
Protective device			
Type	RCBO	RCBO	-
Sources			
Trip info	Virtual Monitor (iTR)	Virtual Monitor (iTR)	-
Threshold			
No load threshold	5	5	%
High load threshold	100	100	%
Trip threshold	120	120	%
Differential Trip threshold	70	70	%

VirtualMonitor can only be used if the DIRIS Digiware U module is connected upstream of the protective device, and the iTR sensors downstream. This is illustrated in the architecture below:



The position of MCBs detected by iTR sensors is given in the following table:

	MCB 1	MCB 2
Voltage measured by U module	Yes, 230 V L-N measured for instance	
Voltage detected by iTR	Yes	No
Position of MCB	Closed	Open

 DIRIS Digiware R-60 and iTR are able to detect several successive openings of a protective device if the interval between 2 openings is greater than or equal to 200 ms.

10.1. Trips

If the protective device is a circuit breaker, or a residual current device (RCCB or RCBO), the VirtualMonitor technology enables to detect and count trips.

- When a circuit breaker is used, a trip is detected if the 2 following conditions are met:
 - the iTR records an opening of the protective device
 - the iTR detects an overcurrent (when the current measured by iTR exceeds the "Overcurrent Trip threshold", by default 120% I_n) (*)
- When an RCCB (Residual Current Circuit Breaker) is used, a trip is detected if a high residual current I_{Δ} is measured, exceeding the user preset " I_{Δ} Trip threshold" (by default $I_{\Delta n} / 2$) configured in Easy Config System.
- When an RCBO (Residual-current Circuit Breaker with Overcurrent protection) is used, the technology determines if the trip is due to a high leakage current or due to an overload.
 - > The cause of the trip is a high leakage current if:
 - o the iTR record an opening of the RCBO
 - o the I_{Δ} measured exceeds the user preset " I_{Δ} Trip threshold" (by default $I_{\Delta n} / 2$) configured in Easy Config System.
 - > The cause of the trip is an overcurrent if:
 - o the iTR record an opening of the RCBO
 - o the iTR detects an overcurrent (when the current measured by iTR exceeds the "Overcurrent Trip threshold", by default 120% I_n) (*)

 (*) It is important to configure the nominal current correctly in the "Loads" configuration menu for the VirtualMonitor technology to work correctly.

10.2. Protection counters

Several protection counters are also accessible thanks to the VirtualMonitor technology:

PROTECTION COUNTER TYPE	DESCRIPTION
Total operation counter	Number of times the protective device was opened
Low-load operation counter	Number of times the protective device was opened when load current was $\leq 5\% I_{nom}$
On-load operation counter	Number of times the protective device was opened when load current was $[5\% I_{nom} - 100\% I_{nom})$
Overload operation counter	Number of times the protective device was opened when load current was $\geq 100\% I_{nom}$
Trip Counter	Number of times the protective device has tripped. Only available if the protective device is a circuit breaker or an RCD (RCCB or RCBO.)

10.3. Defective protective device

When a Residual Current Device is used (RCCB or RCBO), a “Defective RCD” alarm is triggered if the measured I_{Δ} exceeds the user preset rated residual current $I_{\Delta n}$ threshold without tripping the RCD.

You can configure the $I_{\Delta n}$ threshold from the Easy Config System software, in the “Load” menu of the DIRIS Digiware R-60.

The screenshot shows the 'Easy Config System' software interface for the 'DIRIS Digiware R-60'. The main window is titled 'PRODUCT CONFIGURATION' and 'EASY CONFIG SYSTEM 1.1'. The left sidebar has a search bar and a list of products, with 'R-60 - 293FD5' selected. Below this, the 'PARAMETERS' section is expanded, showing a tree view with 'Settings', 'Communication', 'Measurements', 'Load' (selected), 'Current sensors', 'Calculations', 'Monitoring', 'Alarms', 'Digital I/O', 'Multi tariff', and 'Commands'. The 'Load' configuration page for 'Load 1' is displayed, showing various settings for 'Activate', 'Type', 'Nominal Current', 'Phase association to current input', 'Miscellaneous', and 'Residual Currents (RCM)'. The 'Residual Currents (RCM)' section shows 'IΔ' set to 'Input I05', 'Ipe' set to 'Input I06', and 'IΔn' set to '300 mA'. Buttons for 'Read' and 'Program' are visible on the right side of the configuration table.

10.4. Summary

The following table summarises all protection events covered by the VirtualMonitor technology depending on the protective device type:

		PROTECTION EVENT				
		OPENING	TRIP ON HIGH RESIDUAL CURRENT	TRIP ON OVERCURRENT	DEFECTIVE PROTECTIVE DEVICE	DEFECTIVE RCD
PROTECTIVE DEVICE	Switch	X			X	
	Fusible switch	X			X	
	Fuse	X				
	Circuit breaker	X		X	X	
	RCCB	X	X		X	X
	RCBO	X	X	X	X	X



Make sure Earth is connected on the DIRIS Digiware U module to use the VirtualMonitor technology.



For the voltage detection (and therefore the VirtualMonitor technology) to work properly, please observe the following recommendations:

- Make sure the section of live conductors are above the minimal sections given in the table below:

ITR TYPE	ITR-10	ITR-14	ITR-21	ITR-32
MIN CABLE SECTION (mm ²)	6	10	50	50

- Do not install multiple iTR current sensors side by side.
- For multiple single-phase circuits, iTR sensors must not be mounted staggered together.
- The cable should pass through the iTR sensor in a straight line as much as possible.
- Use tightening clamps to hold the conductor against the inside of the iTR sensor.

11. ALARMS

For more details on how to configure alarms on the DIRIS Digiware RCM system, refer to paragraph 13.2. “Configuration via Easy Config System”.

11.1. RCM alarms

The DIRIS Digiware R-60 module includes 6 RCM alarms alerting the user of a high leakage current on one or multiple circuits. RCM alarms can be configured for I_{Δ} or I_{PE} currents.

For the same RCM alarm, you can choose up to 6 thresholds, dynamic to the load current level (I_{sys}).

A patented Automatic learning function records the leakage current and load current for a chosen duration (up to 1 week) and automatically chooses the 6 best RCM alarm thresholds.

This is useful if you do not know what the acceptable leakage current is under normal conditions for each circuit

Easy Config System

PRODUCT CONFIGURATION

ORGANISATION

Products by Gateway

Q Search...

R-60 - 293FD5

PARAMETERS

Settings

Communication

Measurements

Monitoring

Alarms

RCM alarm

Protection alarm

RCM comparison alarm

System alarm

Digital I/O

Multi tariff

Commands

RCM alarm

Description	Value	R-60	Unit
RCM alarm 1			
Common			
Alarm activation	Enabled	Enabled	-
Name	TOB-A_003_Pre	TOB-A_003_Pre	-
Type			
Based on	I_{Δ}	I_{Δ}	-
Load	Load 1	Load 1	-
Information			
Acknowledgement			
RCM Thresholds			
Hysteresis	5	5	%
Number of points on the curve	1	1	-
Threshold 1 : leakage current	140	140	mA
Delays			
Startup delay	0	0	x0.5 s
Dropout delay	0	0	x0.5 s
Startup delay of relay	0	0	x0.5 s
Auto-learning			
Auto-learning duration	12 hours	12 hours	-
RCM alarm 2			

Back to devices list

Read

Program

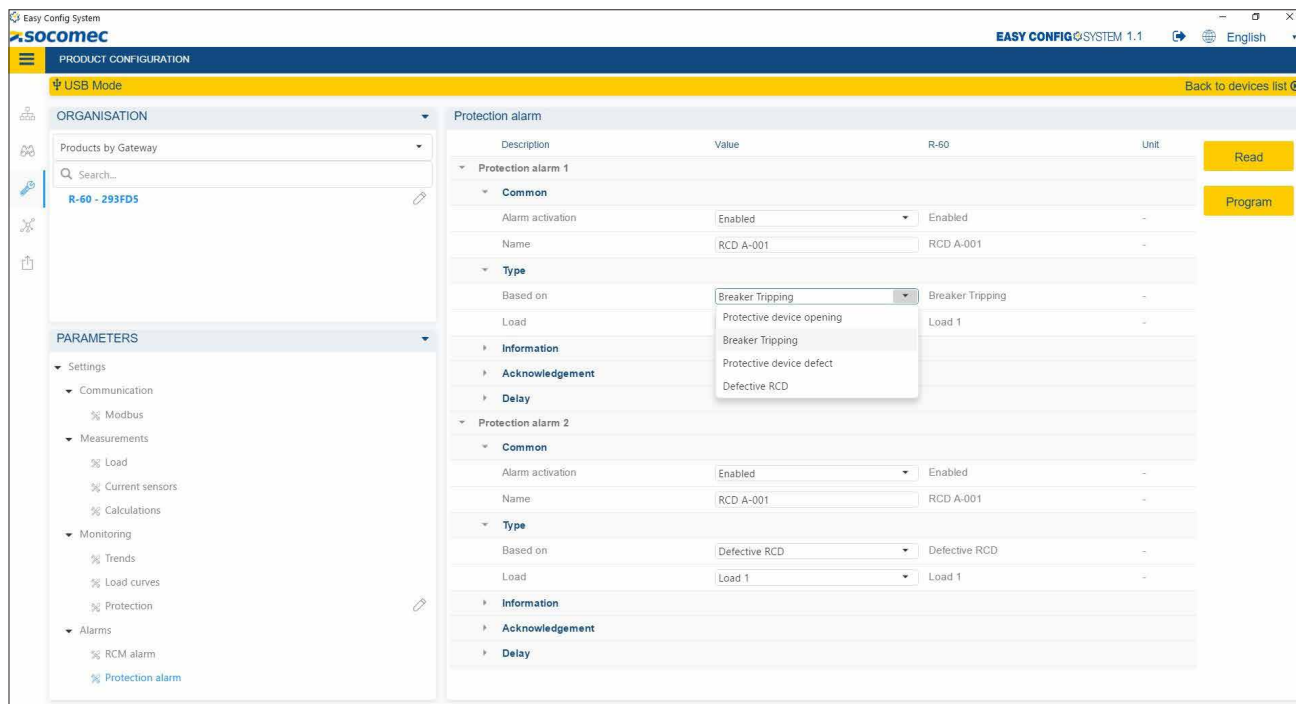
11.2. Protection alarms

The DIRIS Digiware R-60 module includes 6 protection alarms alerting the user of an event on a protective device.

Make sure you have configured the protective device type used in the “Protection” menu in order to use the Protection alarms.

Protection alarms can be configured in case of:

- an **opening** of the protective device.
- a **trip** of the protective device (only available for circuit breakers, RCCBs and RCBOs).
- a **defect** of the protective device:
 - o One pole in a different position from the other poles (abnormal for a multi-phase protective device).
 - o For RCDs (RCCBs and RCBOs), a $I_{\Delta n}$ residual current exceeding $I_{\Delta n}$ (the rated residual current of the RCD).



11.3. System alarms

The DIRIS Digiware R-60 module includes 4 System alarms:

- V/I association: Triggered if the voltage/current association of at least one phase is inconsistent. This can indicate a phase inversion of a current sensor.
- CT disconnected: Triggered when a current sensor or a residual CT gets disconnected.
- Bad CT primary: Triggered if there is an inconsistency between the detected rating and what is configured.
- Corrupted product: If alarm is active, the product should be returned to Socomec.

The screenshot shows the 'Easy Config System' interface for a Socomec device. The left sidebar contains a navigation menu with 'ORGANISATION' and 'PARAMETERS' sections. The 'PARAMETERS' section is expanded, showing 'Settings', 'Communication', 'Measurements', 'Monitoring', 'Alarms', 'Digital I/O', 'Multi tariff', and 'Commands'. The 'Alarms' section is further expanded, showing 'RCM alarm', 'Protection alarm', 'RCM comparison alarm', and 'System alarm'. The 'System alarm' section is selected, and the main area displays the configuration for three system alarms.

Description	Value	R-60	Unit
System alarm 1			
Common			
Alarm activation	Enabled	Enabled	-
Alarm type	V/I association	V/I association	-
Information			
Acknowledgement			
Delay			
System alarm 2			
Common			
Alarm activation	Enabled	Enabled	-
Alarm type	CT disconnected	CT disconnected	-
Information			
Acknowledgement			
Delay			
System alarm 3			
Common			
Alarm activation	Enabled	Enabled	-
Alarm type	Bad CT Primary	Bad CT Primary	-
Information			
Acknowledgement			

On the right side of the main area, there are two buttons: 'Read' and 'Program'.

11.4. Comparison alarms

The DIRIS Digiware R-60 includes 3 comparison alarms allowing to compare 2 or several parameters:

- Comparison of the neutral current to an analogue value to avoid overloaded neutral conductors.
- Comparison of the residual current I_{Δ} to another I_{Δ} from a different channel of the R-60.
- Comparison of the residual current I_{Δ} to protective earth current IPE.
- Comparison of the residual current I_{Δ} or protective earth current IPE to an analogue value.

An offset value can be added for each comparison.

The comparison alarm can be set on a single value or on a boolean combination of multiple values.

The comparison can be based on an equality, an inequality or if one value is higher/lower than the other one.

The screenshot shows the 'Easy Config System' interface for a Socomec R-60 device. The left sidebar contains a navigation menu with 'ORGANISATION' and 'PARAMETERS'. Under 'PARAMETERS', the 'Alarms' section is expanded, showing 'RCM alarm', 'Protection alarm', 'RCM comparison alarm' (selected), and 'System alarm'. The main area displays the 'RCM comparison alarm' configuration for 'RCM comparison alarm 1'. The configuration is organized into sections: 'Common', 'Reference', 'Information', 'Acknowledgement', 'Type', and 'Delays'. The 'Type' section is currently expanded, showing settings for 'Reference value compared to' (A single value), '1st comparison value' (Ipe), 'Load of 1st value' (Load 1), 'Add an offset' (0), 'Trigger in case of' (Higher than), and 'Hysteresis' (20%). The 'Delays' section shows 'RCM comparison alarm 2' and 'RCM comparison alarm 3'. On the right side of the configuration area, there are 'Read' and 'Program' buttons.

Description	Value	R-60	Unit
RCM comparison alarm 1			
Common			
Alarm activation	Enabled	Enabled	-
Name	Comparison Alarm 1	Comparison Alarm 1	-
Reference			
Parameter	I_{Δ}	I_{Δ}	-
Load	Load 1	Load 1	-
Information			
Acknowledgement			
Type			
Reference value compared to	A single value	A single value	-
1st comparison value	Ipe	Ipe	-
Load of 1st value	Load 1	Load 1	-
Add an offset	0	0	A
Trigger in case of	Higher than	Higher than	-
Hysteresis	20	20	%
Delays			
RCM comparison alarm 2			
RCM comparison alarm 3			

12. AUTO-DISCOVERY PROCESS

Once the system is fully wired and powered on, you must launch the auto-discovery process.

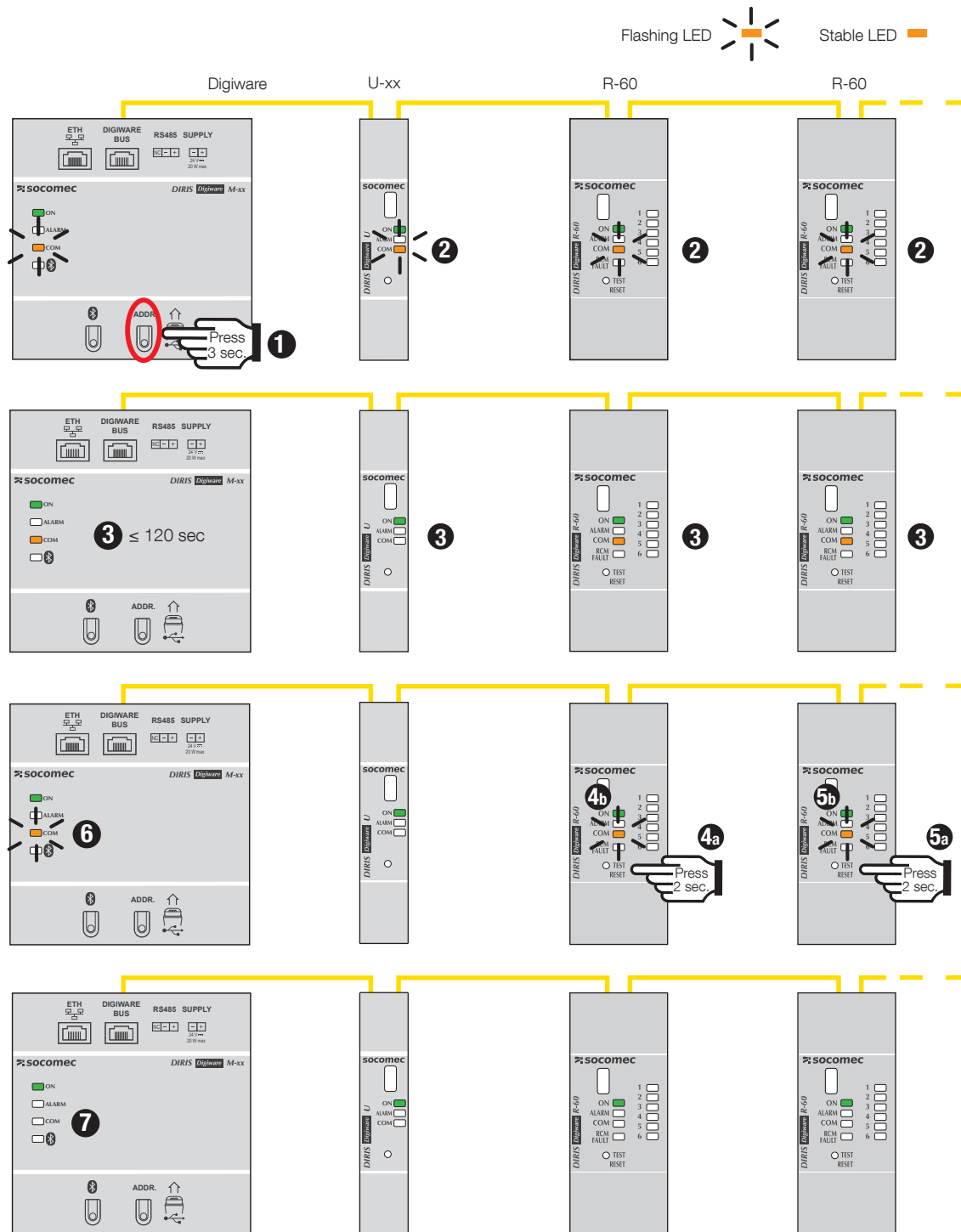
The auto-discovery process scans all slave devices connected on the Digiware and RS485 bus of the display/gateway and assigns them with a unique Modbus address.

Two auto-discovery modes can be used:

- FAST (default mode): this mode will only detect DIRIS Digiware modules on the Digiware bus and RS485 bus, DIRIS B and DIRIS A-40 on the RS485 bus.
- FULL: this mode will also detect other Socomec PMDs (DIRIS A) and meters (COUNTIS E) connected on the RS485 bus.

You can launch the auto-discovery using the push button of the DIRIS Digiware M-50/M-70 gateway, using the DIRIS Digiware D-50/D-70 display, or from the Easy Config System software.

12.1. Auto-discovery via the M-xx gateway



1. Start the auto-discovery of all devices connected to the Digiware or RS485 buses, by pressing the “ADDR.” button under the M-50/M-70.
2. “COM” LEDs of all devices will start blinking synchronously during the process. If com LEDs are not blinking, there could be a configuration issue (inconsistent baud rate between the M-xx gateway and slave devices).
3. After approximately 1 minute, the COM LED of the M-xx gateway as well as R-60 modules are lit and stable. This is perfectly normal; it simply indicates that address conflicts have been detected since multiple devices have the same Modbus address (same factory default settings).
- 4a/5a. Press the front button on each slave device that has a fixed COM LED, for at least 2 seconds to resolve address conflicts.
- 4b/5b. COM LEDs of the modules start blinking again.
6. COM LED of the M-xx gateway starts blinking again, and slave devices can now communicate with the M-xx gateway.
7. The auto-discovery process is finished, the COM LEDs blink when communication is on-going between the M-xx gateway and downstream modules.

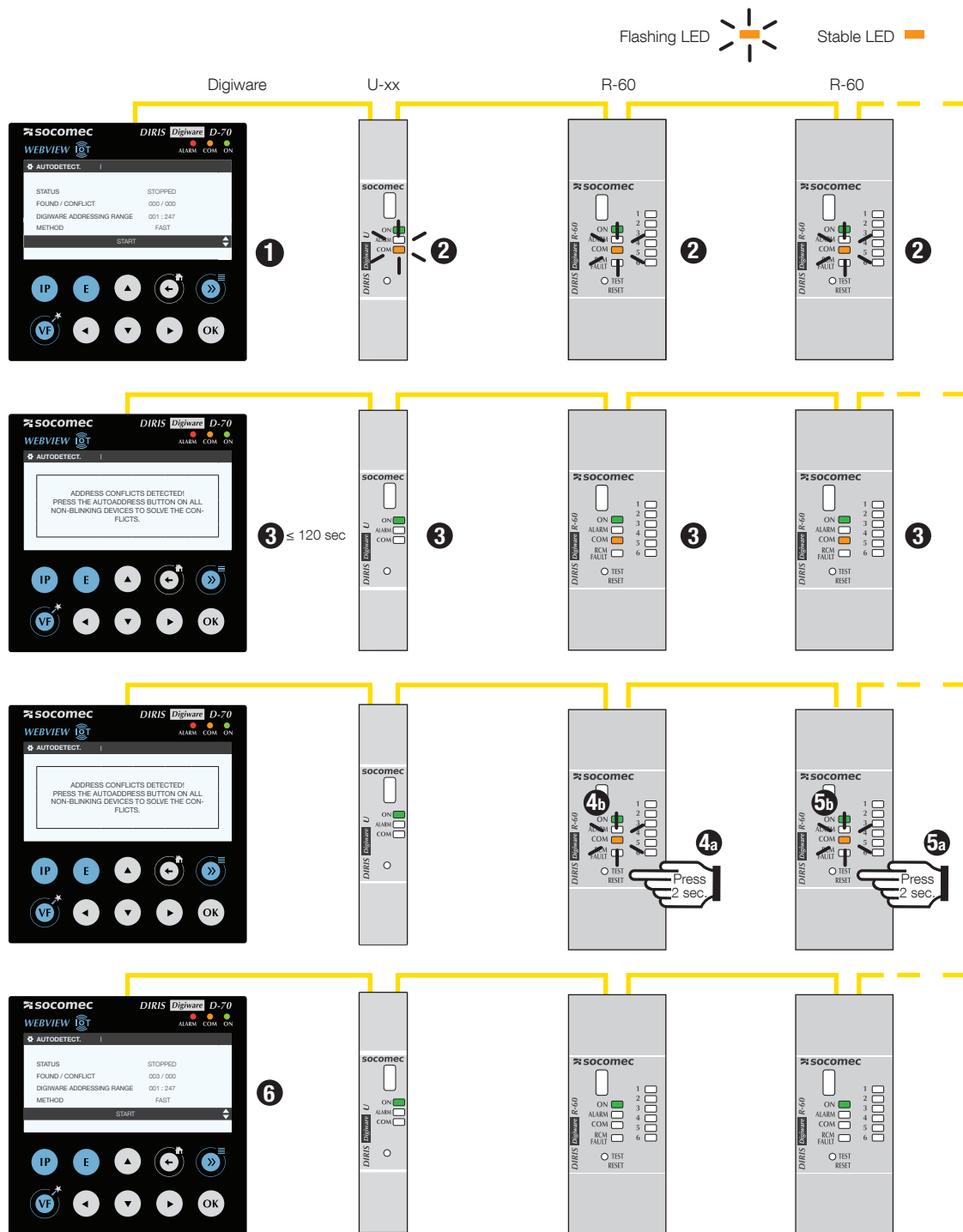
Notes:

- The Easy Config System software must be used if you wish to change the auto-discovery process mode to FULL.
- The order used when pressing the push buttons on the modules also determines the order for the Modbus addressing of those modules.
- The auto-discovery process can also be launched from the Easy Config System software where you can choose an automatic resolution of conflicts, instead of having to press the front button on the modules.



If you would like to assign specific Modbus addresses to the devices connected to the M-50/M-70 gateway, launch the auto-discovery from the Easy Config System software, and change the Modbus addresses of slave devices directly from the dashboard of the M-50/M-70 display (see 13.2).

12.2. Auto-discovery via D-xx display



1. Go to PARAMETERS (password is 100), then AUTODETECT SERIAL DEVICES. Click on START, then OK to start the auto-discovery process.
2. "COM" LEDs of all devices will start blinking synchronously during the process. If com LEDs are not blinking, there could be a configuration issue (inconsistent baud rate between D-xx display and slave device etc.).
3. After approximately 1 minute, a pop-up message on the D-xx display indicates that address conflicts have been detected, and the COM LED of slave devices in conflict are lit and stable. This is perfectly normal; it simply indicates that address conflicts have been detected since multiple devices have the same Modbus address (same factory default settings).
- 4a/5a. Press the front button on each slave device that has a fixed COM LED, for at least 2 seconds.
- 4b/5b. COM LEDs of the modules start blinking again.
6. The auto-discovery process is finished, the D-xx display shows the number of discovered devices (3 in our example). The COM LEDs blink when communication is on-going between the D-xx display and downstream modules.

Notes:

- The order used when pressing the push buttons on the modules also determines the order for the Modbus addressing of those modules.
- Before launching the auto-discovery process, you can change the method to resolve address conflicts and set it to AUTOMATIC. In this case, steps 3-5 are avoided



If you would like to assign specific Modbus addresses to the devices connected to the D-50/D-70 display, launch the auto-discovery from the Easy Config System software, and change the Modbus addresses of slave devices directly from the dashboard of the D-50/D-70 display (see 13.2).

12.3. Auto-discovery via the Easy Config System software

Refer to paragraph 13.2.1 "Auto-discovery of slaves connected to the DIRIS Digiware M gateway / D display" page 71.

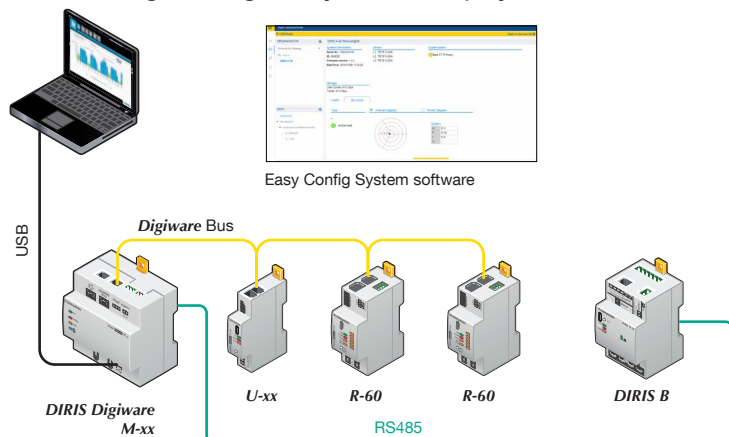
13. CONFIGURATION

Configuration can be carried out using the **Easy Config System** configuration software or directly from the **DIRIS Digiware D-xx** remote display.

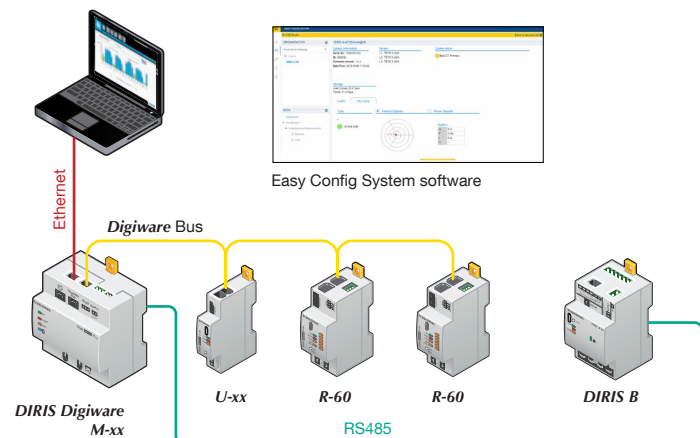
The Easy Config System software is used to configure DIRIS Digiware RCM directly via Ethernet or USB. Easy Config System must be installed before using the USB connection.

13.1. Connection modes

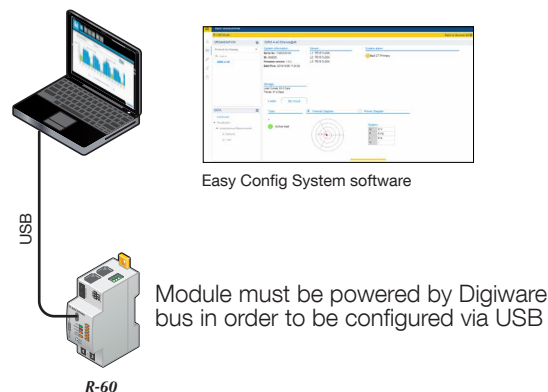
> USB through M-xx gateway or D-xx display



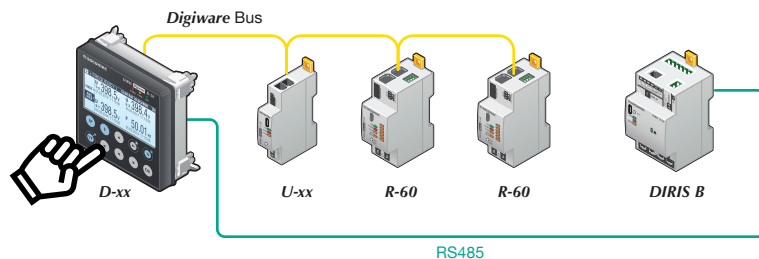
> Ethernet through M-xx gateway or D-xx display



> Direct USB to R-60 module



> Manual via D-xx display



Connect the power supply before configuring the products.

13.2. Configuration via Easy Config System

Easy Config System is the software used to configure the DIRIS Digiware system easily and quickly.

It can be downloaded at the following link: https://www.socomec.com/easy-config-system_en.html

The DIRIS Digiware system should be configured in the following sequence:

- Configuration of the DIRIS Digiware D display / M gateway
- Configuration of the DIRIS Digiware U voltage module
- Configuration of DIRIS Digiware R-60 modules

13.2.1. Auto-discovery of slave devices connected to the DIRIS Digiware M gateway / D display

Connect your laptop to the DIRIS Digiware D display / M gateway using one of the connection modes detailed in paragraph 13.1.

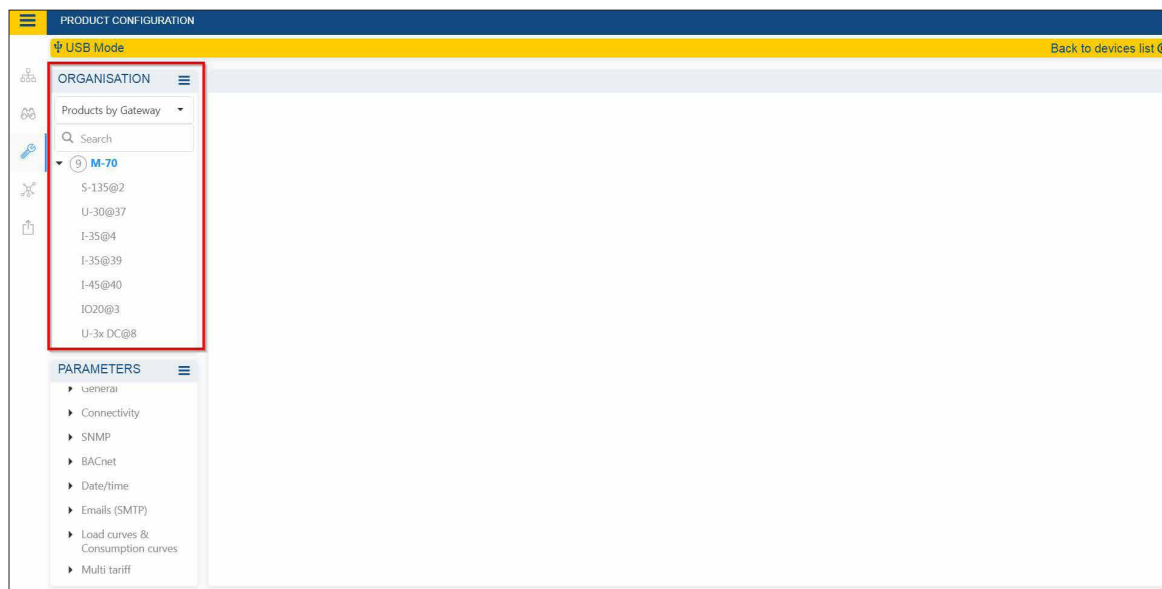
- > Open the Easy Config System software and connect as Admin (default password is "Admin").
- > Click on "New Configuration", then enter a name and icon.
- > Click on the newly created configuration.
- > Click on "USB mode" on the right top corner to connect to the M-50/M-70 gateway or D-50/D-70 display via a USB cable.
- > Click on the "Binocular" icon on the left side bar.
- > Under the "Organisation" part, select the M-70/M-50 gateway or D-50/D-70 display.
- > Click on "Dashboard" to visualise general information about the M-50/M-70 gateway or D-50/D-70 display.
- > Click on "Auto-discovery" (1):

The screenshot shows the Easy Config System software interface. The 'Organisation' section on the left lists various products. The 'Data' section on the left shows the 'Dashboard' view. The main area displays 'System information', 'IP configuration', 'Storage', 'Devices connected', and 'Protocols'. A red box highlights the 'Auto-discovery' button in the 'Devices connected' section. Another red box highlights the 'Dashboard' table at the bottom, which lists discovered devices with their Modbus addresses, versions, and statuses.

Bus	Type	Name	ID	Modbus address	Version	Date/Time	Com status
Digiware	DIRIS Digiware S-135	S-135@2	115B1F	2	1.1.2	08/10/2019 11:27:42	Good
RS485	DIRIS Digiware IO-20	IO20@3	A76D5A	3	1.0.3	08/10/2019 11:27:48	Good
Digiware	DIRIS Digiware I-35	I-35@4	0454A9	4	1.9.1	08/10/2019 11:27:44	Good
RS485	DIRIS Digiware I-35dc	___@5	FDFE94	5	1.0.4	08/10/2019 11:27:49	Good
Digiware	DIRIS Digiware I-35	I-35@39	DCB5E9	6	1.9.1	08/10/2019 11:27:45	Good
Digiware	DIRIS Digiware U-30	U-30@37	D503BA	7	1.9.0	08/10/2019 11:27:43	Good

- > Once the auto-discovery process is finished, slave devices will be displayed in the lower part of the dashboard (2). You can change their Modbus address, and use the unique ID or the Blink button to locate modules inside electrical panels.

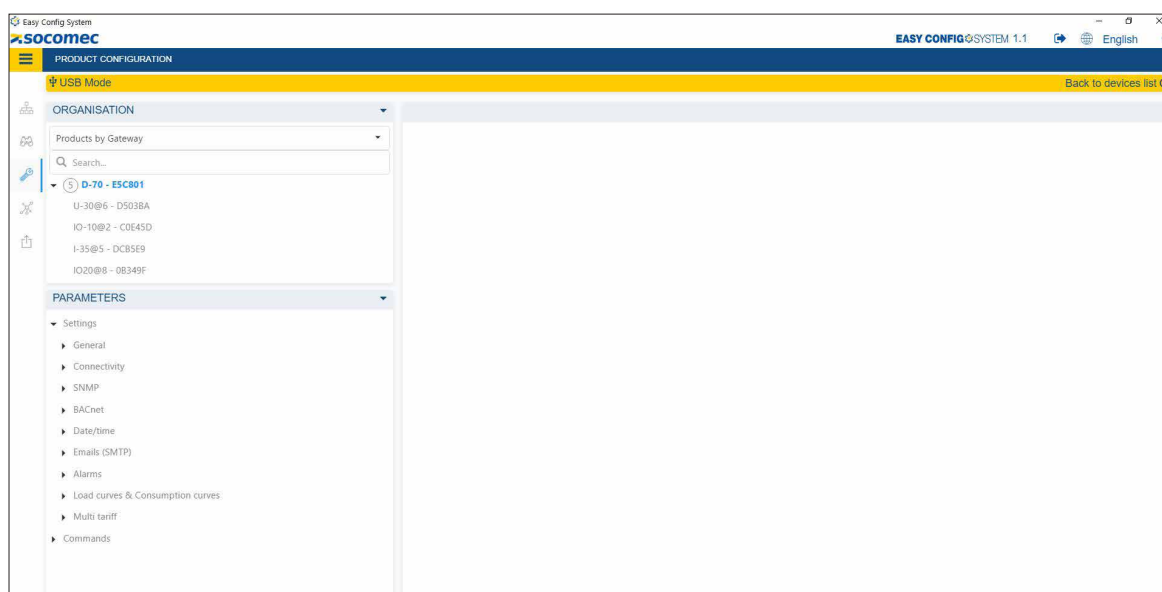
> Configuration of slave devices can be done directly without unplugging the USB cable, by clicking on the Wrench icon on the left side bar:



The configuration of the DIRIS Digiware system is explained in paragraphs 13.2.2 through 13.2.4

13.2.2. Configuration of the DIRIS Digiware M gateway/D display

Go to the “PARAMETERS” part to configure the different menus:



- General

- Display settings (only for DIRIS Digiware D displays): you can change display settings such as the language, the backlight intensity and timeout.
- Auto-discovery settings: you can change the auto-discovery method (FAST or FULL), the addressing range and the conflict resolution method (AUTO or Push-Button).

- Connectivity

- IP configuration: configure the IP address of the gateway/display, its subnet mask, activate or disable DHCP, host name etc.
- RS485: you can change the RS485 Modbus settings of the gateway/display
 - o Modbus address
 - o RS485 Mode: slave to communicate via RS485 to external PLCs or software, master (by default) to act as a RS485 to Ethernet gateway for slaves connected on the RS485 bus.
- Digiware: allows to modify the communication settings of the Digiware bus. Please contact Socomec before modifying any of the Digiware bus settings.

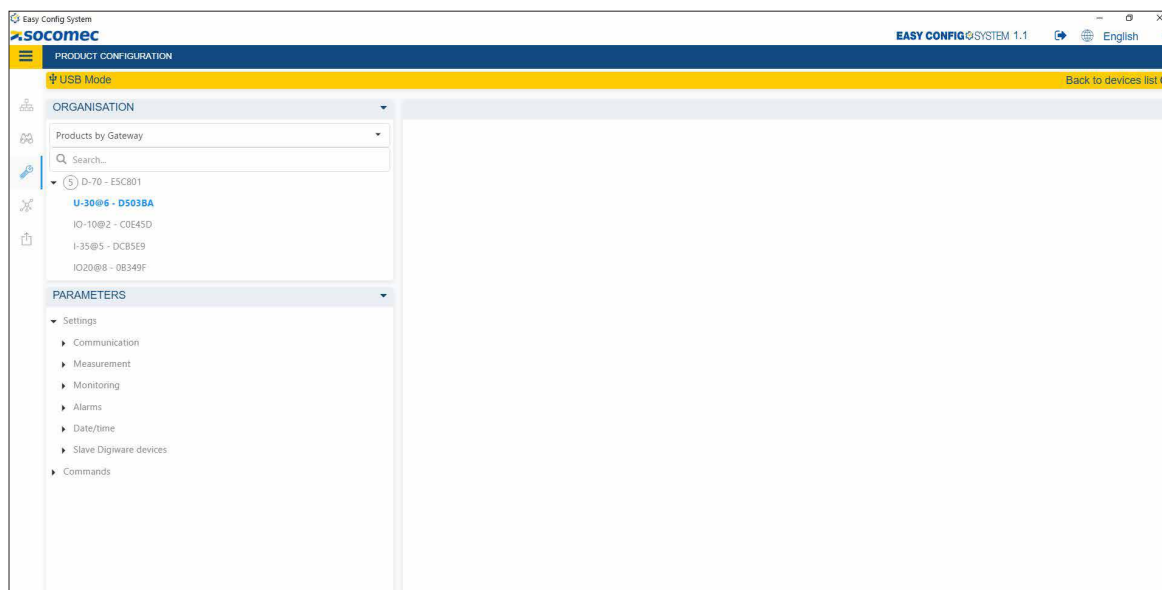
- **SNMP:** to configure SNMP communication (refer to the DIRIS Digiware M-50/M-70 or D-50/D-70 instruction manual for more information).
- **BACnet:** to configure BACnet communication (refer to the DIRIS Digiware M-50/M-70 or D-50/D-70 instruction manual for more information).
- **Date/time**
 - Date/time: to manually synchronise the date/time of the gateway/display with your computer
 - SNTP server: you can configure an SNTP server if you wish to synchronise the date/time of the gateway/display automatically with a remote SNTP server.
- **Emails (SMTP)**
 - SMTP settings: to configure email notifications in case of alarms on any device connected to the DIRIS Digiware M-50/M-70 gateway or D-50/D-70 display.
 - Send test email: sends a test email to verify that the SMTP server is correctly configured.
- **Alarms**
 - System alarms: to enable or disable system alarms on the M-50/M-70 gateway or D-50/D-70 display. There are 8 system alarms such as email transmission error, SNTP synchronisation error, Modbus slave timeout etc.
- **Load curves & Consumption curves**
 - Synch & integration period:
 - o Load curves synchronisation source: to synchronise the beginning and end of the load curves' integration using an external communication command or via the M-50/M-70 gateway or D-50/D-70 display's internal clock.
 - o Consumption curves synchronisation source: to synchronise the beginning and end of the consumption curves' integration using an external communication command or via the M-50/M-70 gateway or D-50/D-70 display's internal clock.
 - o Consumption curves integration period: enter the integration period for consumption curves (60 minutes by default).

Note: The integration period of load curves is configured directly from the DIRIS Digiware U-30 module.

- **Multi tariff:** to configure multiple tariff rates (up to 8) based on an external communication order or on a time schedule.
- **Commands**
 - Reset: to reboot the gateway/display, reset logs or restore the gateway/display to factory default settings.

13.2.3. Configuration of the DIRIS Digiware U module

Go to the “PARAMETERS” part to configure the different menus of the DIRIS Digiware U module:



- Communication

- Modbus: to change the Modbus address of the DIRIS Digiware U module



If you change the Modbus address of a slave device, you will need to launch the auto-discovery process again.

- Measurement

- Electrical network: configure the electrical network type (three-phase, with or without neutral, etc.), the nominal voltage and frequency, and the phase rotation.
- Calculations: enter the integration period of instantaneous values and Trends of average values.

- Monitoring (only available for DIRIS Digiware U-30 module)

- Trends: select the electrical parameters you want to log over time for the DIRIS Digiware U-30 module. You can select a maximum of 9 parameters.
- EN 50160 events: here you can change the thresholds for power quality events (dips, swells and interruptions).

- Alarms

- Measurement alarm: you can configure up to 8 measurement alarms each based on high and low thresholds.
- Combination alarm: you can configure up to 4 combination alarms. Combination alarms are based on Boolean combinations (AND/OR) of 2 alarms.
Example: a new combination alarm triggered if both V1 and THD V1 alarms are triggered.
- EN 50160 alarm: this menu is used to activate the EN 50160 alarms (dips, swells and interruptions)
- System alarm: a network rotation alarm is triggered if the detected phase rotation is not consistent with the DIRIS Digiware U module's configuration.

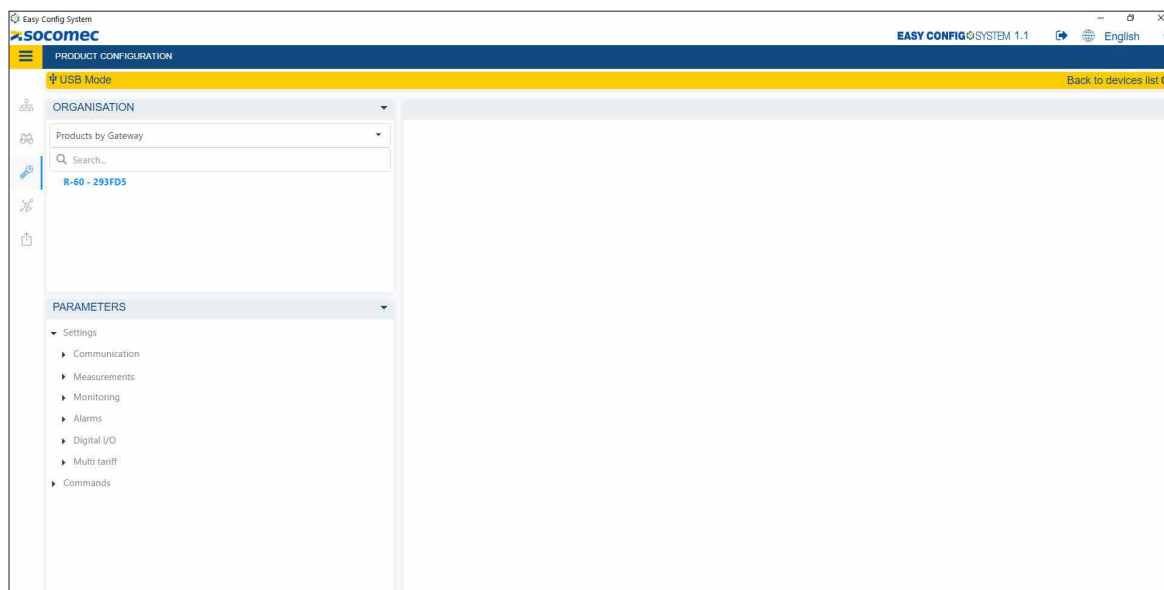
- Date/time

- Date/time: to manually synchronise the date/time of the DIRIS Digiware U module with the computer's. The DIRIS Digiware U module will then automatically synchronise the date/time of all downstream modules.

- Digiware slaves: these submenus are for the configuration of downstream R-60 modules
 - Trends: from this menu, you can select the electrical parameters you want to log over time for all downstream modules. You can select a maximum of 18 parameters per module. If you want all DIRIS Digiware R-60 modules to log the same parameters, it is easier to configure Trends from the DIRIS Digiware U module. Trends can also be configured on each R-60 module individually.
 - Load curves
 - o Integration period: configure the integration period of load curves for all R-60 modules.
 - o Metrological LED: choose the energy type and the load associated to the metrological pulse LED on the front of all R-60 modules. This can also be configured from each R-60 modules individually.
 - o Load curves point 1-18: select the powers (P+, P-, Q+, Q- or S) you want to log over time for each load of all R-60 modules. You can also configure Load curves on each R-60 module individually.
- Commands
 - Reset: to reboot the DIRIS Digiware U module, reset logs (alarms, trends, load curves), reset Min/Max values, reset partial meters or restore the device to factory default settings.

13.2.4. Configuration of the DIRIS Digiware R-60 module

Go to the “PARAMETERS” part to configure the different menus of the DIRIS Digiware R-60 module:



- Communication

- Modbus: to change the Modbus address of the DIRIS Digiware R-60 module



If you change the Modbus address of a slave device, you will need to launch the auto-discovery process again.

- Measurement

- Load:
 - o Activate: activate a load and name it.
 - o Type: enter the load type (single-phase, three-phase with or without neutral etc.), and the nominal current.
 - o Phase association to current inputs: indication only, shows the association of RJ12 current inputs to phase conductors.
 - o Info: select the utility type and a usage.
 - o RCM currents: select which RJ12 current inputs are used to measure residual currents (I_{Δ} and I_{PE})
- Current sensors: for each current input (I01 - I06), you can configure the following fields:
 - o Rating: the rating of current sensors and residual CTs is automatically detected



Note: for the Δ IC8 residual CT, the rating displayed is "3A". For all other residual CTs connected to the R-60 via a T-10 adaptor, the rating displayed is "10A".

- o CT way (for current sensors only): positive (P1 - > P2) or negative (P2 -> P1).
- o Associated voltage (current sensors only): voltage associated to the current measurement.

- Calculations: integration periods of instantaneous and average values (configured from DIRIS Digiware U module).

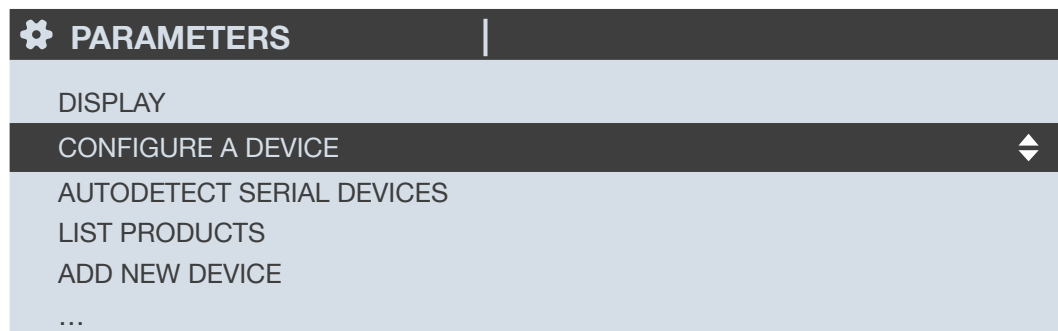
- Monitoring

- Trends
 - o Common: choose the Trends configuration mode (either automatically imported from the U-30 module, or manually configured on each R-60 module).
 - o Trend 1 – 6: select the parameters (I_{Δ} or I_{PE}) you want to log over time and the load associated.
- Load curves
 - o Integration period: integration period for load curves (configured from DIRIS Digiware U module).
 - o Load curves synch. Source: to synchronise the beginning and end of the load curves' integration period using an external communication command or the R-60 module's internal clock.
 - o Configuration mode: choose the Load curves' configuration mode (either automatically imported from the U-30 module, or manually configured on each R-60 module).
 - o Load curves point 1-18: select the powers (P+, P-, Q+, Q- or S) you want to log over time and the load associated. You can select a maximum of 18 parameters. This part is grayed out if the configuration mode is set to "Automatic – Imported from U-30 module".

- Protection
 - o Protective device: select the protective device type (RCBO, RCCB, breaker, fusible switch, switch, fuse)
 - o Sources: select the source for the position and trip information. When iTR sensors are used, the VirtualMonitor technology is used.
 - o Thresholds: used to differentiate between no-load, on-load and overload manual openings, trips on overcurrents and trips on residual currents.
- Alarms
 - RCM alarms: you can configure up to 6 RCM alarms, on I_{Δ} or I_{PE} residual currents.
 - o Common: activate an RCM alarm and name it. By default, RCM alarms are disabled
 - o Type: choose the load and the parameter (I_{Δ} or I_{PE}) for the RCM alarm
 - o Acknowledgement: choose the acknowledgement method for the RCM alarm (choose from "Auto" for an automatic acknowledgement or "COM" to acknowledge the alarm either via an external communication command, or via the D-50/D-70 display, or via WEBVIEW-M or via a short press on the R-60 push button directly).
 - o Thresholds: enter the threshold in mA for the RCM alarm. You can enter up to 6 thresholds, adapted to various load levels (based on Isys).
 - o Auto-learning: an automatic mode records the residual current and load current for a chosen duration and automatically fills in the 6 RCM alarm thresholds.
 - Protection alarms: you can configure up to 6 protection alarms alerting the user of an event on a protective device.
 - o Common: activate a Protection alarm and name it. By default, Protection alarms are disabled.
 - o Type: choose the type of protection alarm (opening, trip, defective protective device or defective RCD), and the load associated to this protection alarm.
 - o Criticality: choose the criticality level of the alarm, between information, not critical and critical. When you configure an SMTP server, you can choose which alarm criticality level will be used for email notifications.
 - o Acknowledgement: choose the acknowledgement method for the RCM alarm (choose from "Auto" for an automatic acknowledgement or "COM" to acknowledge the alarm either via an external communication command, or via the D-50/D-70 display, or via WEBVIEW-M or via a short press on the R-60 push button directly).
 - RCM comparison alarms
 - o Common: activate a comparison alarm and name it. By default, Comparison alarms are disabled.
 - o Reference value: choose the parameter and the load associated that will be used as a reference
 - o Criticality: choose the criticality level of the alarm, between information, not critical and critical. When you configure an SMTP server, you can choose which alarm criticality level will be used for email notifications
 - o Acknowledgement: choose the acknowledgement method for the RCM alarm (choose from "Auto" for an automatic acknowledgement or "COM" to acknowledge the alarm either via an external communication command, or via the D-50/D-70 display, or via WEBVIEW-M or via a short press on the R-60 push button directly).
 - o Type: select the type of comparison (one value, several values, AND/OR Boolean comparisons).
 - System alarms:
 - o Common: activate a System alarm.
 - o Criticality: choose the criticality level of the alarm, between information, not critical and critical. When you configure an SMTP server, you can choose which alarm criticality level will be used for email notifications.
 - o Acknowledgement: choose the acknowledgement method for the system alarm (choose from "Auto" for an automatic acknowledgement or "COM" to acknowledge the alarm either via an external communication command, or via the D-50/D-70 display, or via WEBVIEW-M or via a short press on the R-60 push button directly).
- Digital I/O
 - Digital output
 - o Relay name: choose a name for the relay output
 - o Type: choose the default relay state (Normally opened or Normally closed).
- Commands
 - Reset: to reboot the DIRIS Digiware R-60 module, reset logs or restore the device to factory default settings

13.3. Configuration from the D-50/D-70 display

The main functions of the DIRIS Digiware RCM system can be configured directly from the DIRIS Digiware D-50/D-70 display. Go to " PARAMETERS " (default password is 100), then " CONFIGURE A DEVICE " .



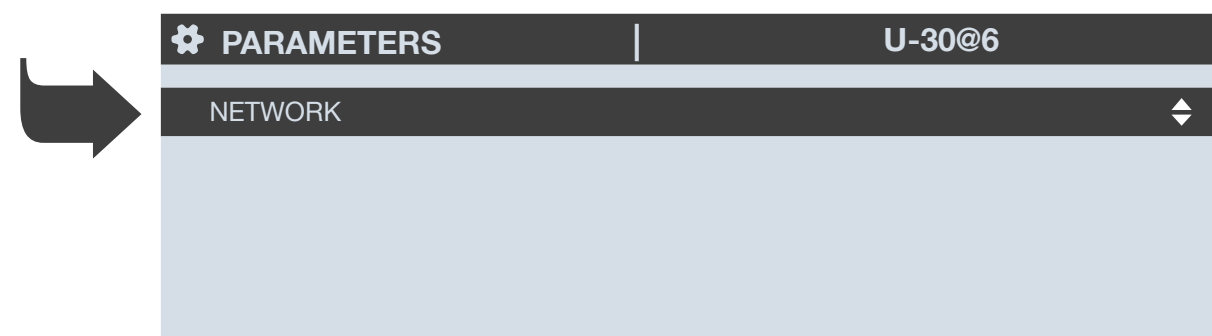
There are two main steps to configure your DIRIS Digiware RCM system:

- **Electrical network:** configuring the type of electrical network (single phase 1P+N, two-phase 2P, three-phase without neutral 3P, three-phase with neutral 3P+N etc.)
- **Load:** configuring the loads/circuits measured. You can, for example, measure three-phase and single-phase loads connected to a three-phase electrical network

The electrical network is configured from the DIRIS Digiware U module and the loads are configured from the DIRIS Digiware R-60 modules.

13.3.1. Electrical network configuration

Select the DIRIS Digiware U module to configure its electrical network



In the Network menu, you can configure the different electrical network parameters:

- Network type: single phase (1P+N), two-phase without neutral (2P), two-phase with neutral (2P+N), three-phase without neutral (3P), three-phase with neutral (3P+N).
- Nominal voltage: typically 400 V for IEC three-phase electrical networks or 230 V for single-phase electrical networks
- Nominal frequency: 50 Hz or 60 Hz depending on the country
- Phase rotation: V1-V2-V3 (Direct) or V1-V3-V2 (reverse)

⚙️ NET. SETTINGS		U-30@6
NETWORK TYPE		3P + N
NOMINAL VOLTAGE (V)		00400
NOMINAL FREQUENCY		50HZ
PHASE ROTATION		V1-V2-V3
PRESS OK TO ENTER SETTINGS		⬆️

13.3.2. Loads configuration

Select the DIRIS Digiware R-60 module to configure the loads and the type of measurement needed.

⚙️ SELECT PROD..

U-30@6 ID:546434 @006

R-60@7 ID:5A6766 @007

⚙️ SELECT PROD.

R-60@7 ID:5A6766

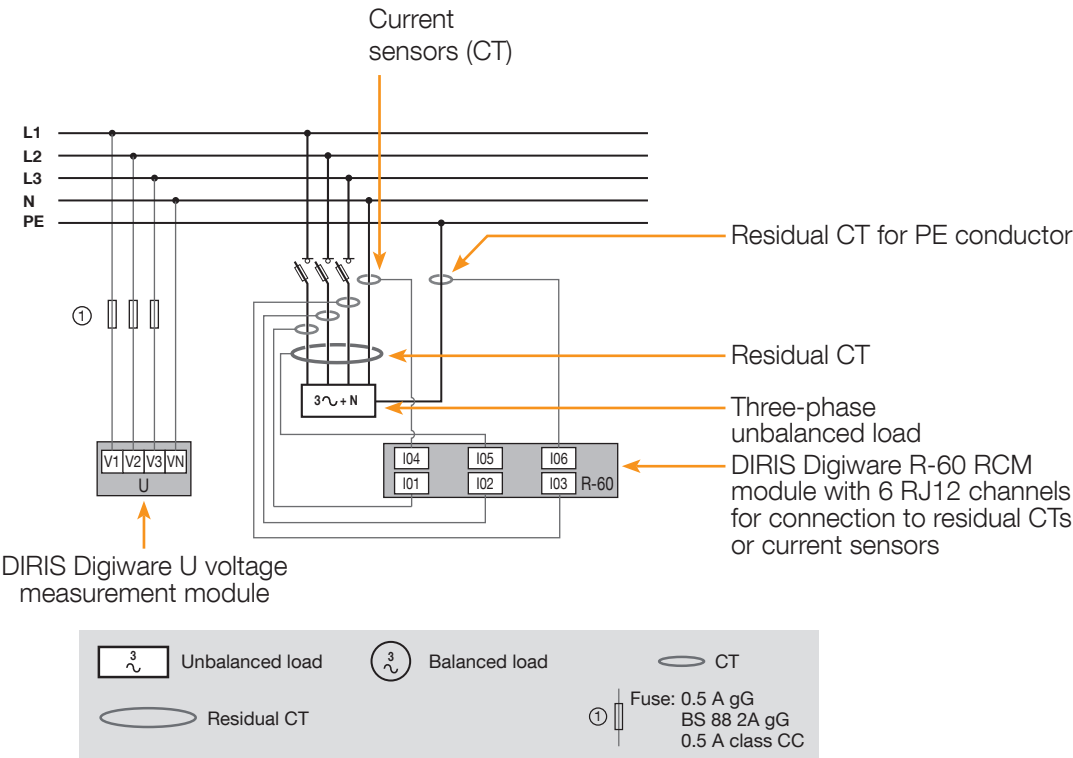
LOADS SETTINGS

AUTOCORRECT

PROTECTIVE DEVICE

RCM SELF-LEARNING

This example below shows a DIRIS Digiware R-60 module measuring a three-phase load + neutral with Residual Current monitoring using 4 current sensors, 1 residual CT to measure the I_{Δ} and 1 residual CT to measure the I_{PE} .



The "LOADS" menu summarises the load configurations of the DIRIS Digiware R-60 module:

⚙️ LOAD		R-60 @ 7				
INPUT	I01	I02	I03	I04	I05	I06
CT	250 A	250 A	250 A	250 A	RCM-3A	RCM-3A
WAY	+/DIRECT	+/DIRECT	+/DIRECT	+/DIRECT	-	-
V LINE	V1	V2	V3	Vn	-	-
LOAD	L1	L1	L1	L1	L1	L1
TYPE	3P+N_4CT	3P+N_4CT	3P+N_4CT	3P+N_4CT	3P+N_4CT	3P+N_4CT
PRESS OK TO ENTER SETTINGS						

The "CT" row indicates the current rating and type of CT connected, In this case 250 A current sensors for all 3 phases and neutral and residual CTs for I05 and I06 Inputs.

The "WAY" row indicates the CT orientation (+/DIRECT = P1 -> P2 or backwards -/INV = P2 -> P1).T

The "LINE V" row indicates the phase to which each CT is connected.

In this example:

- The current sensor connected to the I01 current input measures the current of phase 1 (V1)
- The current sensor connected to the I02 current input measures the current of phase 2 (V2)
- The current sensor connected to the I03 current input measures the current of phase 3 (V3)
- The current sensor connected to the I04 current input measures the current of the neutral (Vn)
- The residual CT connected to the I05 current input measures the residual current of the load
- The residual CT connected to the I06 current Input measures the protective earth current

The "LOAD" row indicates that all current Inputs are used for one unique Load (L1), and the "TYPE" row shows It is a three-phase load with neutral.

Press "OK" to change the settings and click on "MANUAL CONFIG OF LOADS".

You can change each parameter to configure each load (the values in bold are the ones used for this example).

- LOAD -> configure load 1: **L1** - load 2: L2 - load 3: L3
- NAME -> name of the load: **LOAD 1** (edit with max. 16 characters)
- TYPE -> type of load: single-phase (1P+N), two-phase (2P), three-phase (3P), **three-phase+neutral (3P+N_4CT)**
- NOMINAL I (A) -> set the nominal current of the load: **250A** (caution: the nominal current of the load may differ from the rating of the current sensor (CT1) used: a 63A current sensor can be used to monitor a 20A circuit breaker.
- IΔn -> set the nominal residual current (for example the RCD's operating residual current): **30 mA**
- CT1 -> current measured by the current sensor connected to input: **I01**, I02, I03, I04, I05, I06.

⚙️ LOAD		R-60 @ 7	
LOAD	◀ L1 ▶		⬆
NAME	LOAD 1		
TYPE	3P+N_4CT		
NOMINAL I (A)	00250		
IΔn	30 mA		
CT1	I01		
...			

Go to "CT SETTINGS" to perform the configuration of current sensors.

⚙️ LOAD	R-60 @ 7
...	
NAME	LOAD 1
TYPE	3P+N_4CT
NOMINAL I (A)	00250
IΔn	30 mA
CT1	I01
CT SETTINGS	
...	

Configure:

- WAY -> Direction of the current sensor **+/DIRECT**, **-/INV**.
- V Line -> V1, V2, **V3** (position of the current sensor on phase 1, phase 2 or phase 3).
- CT -> Indicates the rating of the current sensor used. Click on "DETECT" to automatically detect the rating. After 2 seconds, the rating is displayed.

⚙️ LINE SETTINGS	R-60 @ 7
WAY	+/DIRECT
V LINE	V3
CT	0250
DETECT	
OK	

Complete the process by clicking on "OK".

In our example, the load is configured as 3P+N-4CT which means you must configure 4 current sensors.

⚙️ LOAD	R-60 @ 7
...	
	CT SETTINGS
CT2	I02
	CT SETTINGS
CT3	I03
CT SETTINGS	
...	

We are also using 1 residual CT to measure the I_{Δ} and 1 residual CT to measure the I_{PE} :

LOAD		R-60 @ 7
...		
CT I_{Δ}	I05	⬆️⬆️
	CT SETTINGS	
CT I_{PE}	I06	
	CT SETTINGS	
SEND SETTINGS		
...		

When you are done configuring the entire load (L1) (type of load, name, nominal current, current sensors), you can scroll right from the "LOAD" line to configure loads 2 and 3 (L2, L3) if there are multiple loads measured by the same DIRIS Digiware R-60 module:

LOAD		R-60 @ 7
LOAD	◀ L1 ▶	⬆️⬆️
NAME	LOAD 1	
TYPE	3P+N_4CT	
NOMINAL I (A)	00250	
$I_{\Delta n}$	30 mA	
CT1	I01	
...		

When all the loads are configured, apply your settings by clicking on "SEND SETTINGS":

LOAD		R-60 @ 7
...		
CT I_{Δ}	I05	
	CT SETTINGS	
CT I_{PE}	I06	
	CT SETTINGS	
SEND SETTINGS		

 If your DIRIS Digiware system contains multiple R-60 modules, go back to the device list, select the 2nd R-60 module and repeat the same configuration steps.

14. TECHNICAL CHARACTERISTICS

14.1. DIRIS Digiware C-31, R-60 & T-10 characteristics

14.1.1. Mechanical characteristics

Casing type	R-60: DIN-rail or back plate mounting C-31: DIN-rail or back plate mounting T-10: Mounted directly on the residual current transformer, on DIN rail or back plate with Rilsan®
Casing protection index	IP20
Front panel protection index	IP40 on the nose in modular assembly
Material and flammability class of housing	Polycarbonate UL94-V0
Weights DIRIS Digiware C-3x / R-60 / T-10	65 g / 103 g / 47 g

14.1.2. Electrical characteristics

DIRIS DIGIWARE C-31	
P15 power supply	Specifications 230 VAC / 24 VDC – 0.63A – 15W
Modular format – Dimensions (H x W): 90 x 25 mm	Removable screw terminal block, 2 positions, stranded or solid 0.2 - 2.5 mm ² cable

14.1.3. Measurement characteristics

MEASUREMENT STANDARDS	
IEC 62020 -1 - Residual Current Monitors (RCM)	Operating characteristics Type A.
IEC 60755 - Residual Current Devices (RCD)	Operating characteristics Type A.
IEC 61557-12 - Power metering and monitoring devices (PMD)	Overall performance class 0.5 for active power (with TE/iTR/TF)
DIRIS DIGIWARE R-60	
Number of channels	6
Associated sensors	- ΔIC, ΔIP-R, WR and TFR residual CTs - TE solid core, TR/iTR split core and TF flexible current sensors
Residual current range	3 mA - 3A with ΔIC, ΔIP-R, WR and TFR residual CTs
Accuracy of active energy and active power	Class 0.2 DIRIS Digiware R-60 alone Class 0.5 with TE, iTR or TF sensors Class 1 with TR sensors
Accuracy of reactive energy	Class 2 with TE, TR/iTR or TF sensors
Connection	Specific Socomec RJ12 cables

14.1.4. Communication characteristics

DIGIWARE BUS	
Function	Connection between DIRIS Digiware modules
Cable type	Specific SOCOMEC RJ45 cables
USB	
Protocol	Modbus RTU on USB
Function	Configuration of the DIRIS Digiware system
Location	On each DIRIS Digiware module
Connection	Type B micro USB connector

14.1.5. Environmental characteristics

STANDARD MODEL	
Ambient operating temperature	-10 to +55°C (IEC 60068-2-1 / IEC 60068-2-2)
Storage temperature	-40 to +70°C (IEC 60068-2-1 / IEC 60068-2-2)
Operating humidity	+25°C / 97% RH & +55°C / 93 % RH (IEC 60068-2-30)
Operating altitude	< 2000 m
Vibration	2 Hz to 13.2 Hz – amplitude ± 1 mm (IEC 60068-2-6) 13.2 Hz to 100 Hz – acceleration $\pm 0.7g$ (IEC 60068-2-6)
Impact resistance	IK08 (5J) front panel IK06 (1J) other panels 10 g / 11 ms, 3 pulses (IEC 60068-2-27)

14.1.6. Electromagnetic characteristics (Directive 2014/30/EU)

Immunity to electrostatic discharges	IEC 61000-4-2 - LEVEL III - CLASS A
Immunity to radiated radio-frequency fields	IEC 61000-4-3 - LEVEL III - CLASS A
Immunity to electrical fast transients/bursts	IEC 61000-4-4 - LEVEL III - CLASS B
Immunity to impulse waves	IEC 61000-4-5 - LEVEL III - CLASS B
Immunity to radio interference	IEC 61000-4-6 - LEVEL III
Immunity to power frequency magnetic fields	IEC 61000-4-8 - 400A/m LEVEL IV - CLASS A
Conducted emissions	CISPR11 Gr:1 - CLASS B
Radiated emissions	CISPR11 Gr:1 - CLASS B

14.1.7. Standards and safety

PRODUCT	R-60: Compliance with Type A operating characteristics of IEC 62020-1 & IEC 60755 Compliance with PMD IEC 61557-12
EMC	Compliance with IEC 61326-6 Compliance with Electromagnetic Compatibility Directive 2014/30/EU of 26th February 2014
SAFETY	Compliance with IEC 61010-1:2010 and IEC 61010-2-030 Compliance with Low Voltage Directive 2014/35/EU of 26 February 2014
INSULATION COORDINATION	Overvoltage category III – degree of pollution 2

14.1.8. Longevity

MTTF (mean time to failure)	> 100 years
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14.2. DIRIS Digiware D-50/D-70 & M-50/M-70 characteristics

14.2.1. Mechanical characteristics

Display type (D-50/D-70)	Capacitive touchscreen technology, 10 keys, 4 LEDs
Display resolution (D-50/D-70)	350 x 160 pixels
Front panel protection index (D-50/D-70)	IP65*
Material and flammability class of housing (D-50/D-70)	Polycarbonate UL94-V0
Weight	210 g (M-50/M-70) 210 g (D-50/D-70)

* Front face only. The use of a silicone seal may be required to ensure sufficient sealing of the junction between D-50/D-70 display and panel door.

14.2.2. Electrical characteristics

POWER SUPPLIES	
Power supply	24 VDC $\pm 10\%$
Power consumption	D-50/D-70/M-50/M-70: 2.5 VA

14.2.3. Communication characteristics

Type of display	Multipoint remote display
Ethernet RJ45 10/100 Mbs	Gateway function: - Modbus TCP, BACnet IP, SNMP v1, v2, v3 & Traps - Embedded web server WEBVIEW-M (M-70/D-70 only)
SNTP protocol	Synchronises the date/time of the M-50/M-70 or D-50/D-70 with an SNTP server. The M-50/M-70 or D-50/D-70 then synchronises the connected devices.
SMTP(S) protocol	Sends email notifications in case of alarms.
FTP(S) protocol	Automatically exports data via standard or secure FTP server (energy index, load curves, measurement logs)
RJ45 Digiware	Control and power supply interface function
RS485 2-3 wires	RS485 2-3 wire master or slave communication function
USB	Firmware upgrade and configuration via type B micro USB connector

14.2.4. Environmental characteristics

STANDARD MODEL	
Operating temperature	-10 ... +55°C (IEC 60068-2-1 / IEC 60068-2-2)
Storage temperature	-40 ... +70°C (IEC 60068-2-1 / IEC 60068-2-2)
Humidity	97% RH at +55°C
Installation category, Degree of pollution	Device powered by SELV, 2

15. PERFORMANCE CLASSES

Performance classes are drawn up in compliance with IEC 61557-12

DIRIS Digiware classification	DD in combination with dedicated sensors (TE, TR/iTR, TF)
Temperature	K55
Overall operating performance class for active power or active energy	0.5 in combination with TE, iTR, TF current sensors 1 in combination with TR current sensors

15.1. Specification of the characteristics

SYMBOL	FUNCTION	OVERALL OPERATING PERFORMANCE CLASS OF DIRIS DIGIWARE + DEDICATED SENSORS * (TE, TR /iTR, TF) + ONE MODULE U COMPLIANT WITH IEC 61557-12	MEASUREMENT RANGE
Pa	Total active power	0.2 DIRIS Digiware only 0.5 with TE, iTR or TF sensors 1 with TR sensors	10% - 120% In 2% - 120% In 2% - 120% In
Q _a , Q _v	Total reactive power (arithmetic, vectorial)	1 with TE, iTR or TF sensors 2 with TR sensors	5% - 120% In
S _a , S _v	Total apparent power (arithmetic, vectorial)	0.5 with TE, iTR or TF sensors 1 with TR sensors	10% - 120% In
Ea	Total active energy	0.2 DIRIS Digiware only 0.5 with TE, iTR or TF sensors 1 with TR sensors	10% - 120% In 2% - 120% In 2% - 120% In
Er _A , Er _v	Total reactive energy (arithmetic, vectorial)	2 with TE, TR/iTR or TF sensors	5% - 120% In
Eap _A , Eap _v	Total apparent energy (arithmetic, vectorial)	0.5 with TE/iTR or TF sensors 1 with TR sensors	10% - 120% In
f	Frequency	0.02	45 - 65 Hz
I, IN	Phase current, measured neutral current	0.2 DIRIS Digiware only 0.5 with TE, iTR or TF sensors 1 with TR sensors	5% - 120% In 10% - 120% In 10% - 120% In
INc	Calculated neutral current	1 with TE, iTR or TF sensors 2 with TR sensors	10% - 120% In
U	Voltage (Lp-Lg or Lp-N)	0.2	50 - 300 VAC Ph/N
PF _A , PF _v	Power factor (arithmetic, vectorial)	0.5 with TE/iTR or TF sensors 1 with TR sensors	0.5 inductive to 0.8 capacitive
Pst, Plt	Flicker (short, long)	-	-
Udip	Voltage dip (Lp-Lg or Lp-N)	0.5	-
Uswl	Temporary overvoltages (Lp-Lg or Lp-N)	0.5	-
Uint	Voltage outage (Lp-Lg or Lp-N)	0.2	-
Unba	Voltage amplitude imbalance (Lp-N)	0.5	-
Unb	Voltage phase and amplitude imbalance (Lp-Lg or Lp-N)	0.2	-
THDu, THD-Ru	Total harmonic distortion rate of the voltage (relative to the fundamental, relative to the efficient value)	1	Orders 1 to 63
Uh	Voltage harmonics	1	-
THDi, THD-Ri	Total harmonic distortion rate of the current (relative to the fundamental, relative to the efficient value)	1 with sensors TE, TR/iTR or TF	Orders 1 to 63
Ih	Current harmonics	1 with sensors TE, TR/iTR or TF	-
Msv	Centralised remote control signals	-	-

*With SOCOMEC RJ12 connection cables.

15.2. Evaluation of the power supply quality

SYMBOL	FUNCTION	OVERALL OPERATING PERFORMANCE CLASS DIRIS DIGIWARE + DEDICATED SENSORS (TE, TR / ITR, TF) IN COMPLIANCE WITH IEC 61557-12	MEASUREMENT RANGE
f	Frequency	0.02	45 - 65 Hz
I, I _N	Phase current, measured neutral current	0.2 DIRIS Digiware only 0.5 with TE/ITR or TF sensors 1 with TR sensors	5% - 120% I _n 10% - 120% I _n 10% - 120% I _n
I _{Nc}	Calculated neutral current	1 with solid-core TE or TF sensors 2 with TR sensors	10% - 120% I _n
U	Voltage (Lp-Lg or Lp-N)	0.2	50 - 300 VAC Ph/N
Pst, PIt	Flicker (short, long)	-	-
Udip	Voltage dip (Lp-Lg or Lp-N)	0.5	-
Uswl	Temporary overvoltages (Lp-Lg or Lp-N)	0.5	-
Uint	Voltage outage (Lp-Lg or Lp-N)	0.2	-
Unba	Voltage amplitude imbalance (Lp-N)	0.5	-
Unb	Voltage phase and amplitude imbalance (Lp-Lg or Lp-N)	0.2	-
Uh	Voltage harmonics	1	-
Ih	Current harmonics	1 with TE, TR/ITR or TF sensors	-
Msv	Centralised remote control signals	-	-

15.3. RCM performance

Function	Overall operating characteristics (in compliance with IEC 62020-1 & IEC 60755) DIRIS Digiware R-60 + T-10 adapter + dedicated residual CT	Measurement Range
Operating characteristic in presence of residual currents	RCM Type A with: - T-10 adaptor and $\Delta I_C \geq \varnothing 15$ mm or ΔI_P -R residual CTs - $\Delta I_C \varnothing 8$ mm residual CT	3 mA to 3 A 3 mA to 2 A
Residual current ($I_{\Delta n}$, I_{PE})	$\pm 2\%$ with ΔI_C , ΔI_P -R residual CTs	3 mA to 3 A
Maximum actuating time (T_{max})	8.5 s	
Minimum non-actuating time (T_{min})	1.5 s	

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