

## How to ensure maintenance of installation

# Routine operating checks of residual current devices: local test and loop test

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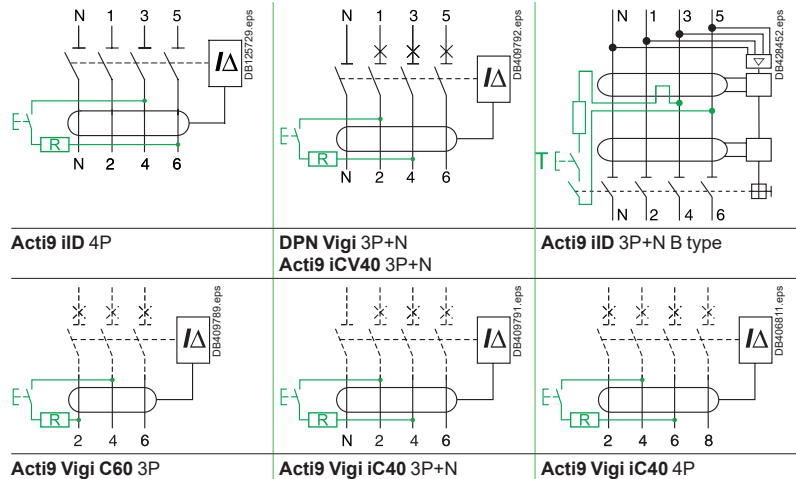
# Routine operating checks of residual current devices: local test and loop test

Residual current devices are designed to protect against hazardous earth fault current. That is why:

- the electrical installation operation and maintenance standards require these protection devices to be tested at regular intervals
- the IEC 61008 and IEC 61009 series of product standards require such devices to be fitted with a test button (marked "T") on the front panel.

The user can therefore check and be certain that the device is working correctly.

The test button allows the user to check if the RCD is able to trip in presence of an earth leakage current. If the device doesn't trip, it must be examined to determine if the device is out of service.



## 1- Test frequency

Residual current devices must be tested as required by local regulations or guidelines on electrical installation inspection and maintenance.

In the absence of any local regulations or guidelines, Schneider Electric recommends that the test is carried out:

### For Voltage independent RCDs:

- after initial connection and any subsequent reconnection
- **every six months**, for devices installed in AF1\* environmental conditions (no dust, corrosion, high humidity, etc.)
- **every month**, for devices installed in AF2\* to AF4\* environmental conditions or highly exposed to voltage surges.

(\*) Refer to tables in page 5 for definition of classes of environmental conditions.

### For Voltage dependent RCDs:

- after initial connection and any subsequent reconnection
- **every month**, whatever the environmental conditions or exposition to voltage surges.

## 2- Procedure

The residual current device is powered on and the loads are connected



Briefly press the test button marked "T" on the front panel

**Note**  
It is recommended to disconnect the loads before testing



The residual current device should trip instantly. If it doesn't trip, the additional checks described next page should be performed



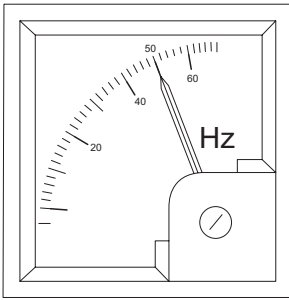
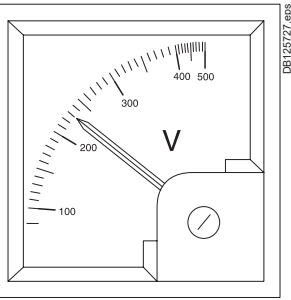
When the test is finished, put the residual current device back into service



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## 3- If the RCD doesn't trip during the test

This event is mainly due to a cause that is external to the residual current device. The table below shows the possible causes, the additional checks and tests to be carried out and the corrective actions to be taken, depending on the results. After a corrective action has been performed, repeat the test.

| Cause of non tripping                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Network frequency                                                                                  | Network voltage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Connection (three-pole or four-pole device)                                                                                                                                                                                                                                                                                                                                               | Load leakage currents                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Additional action                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Check that the network frequency is the same as the frequency read on the device or in the catalog | Check that the main voltage is the same as that indicated on the front face of the device                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Measure the voltage between terminals:<br>■ 3 and 6 for Acti9 iID 4P<br>■ 2 and 4 for Acti9 Vigi C60 3P<br>■ at the middle for Acti9 Vigi iC40 or DPN Vigi 3P+N or 4P<br>This voltage must be between 85% and 110% of the voltage indicated on the device                                                                                                                                 | Disconnect the loads and press the test button again                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Result after additional action                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| If the network frequency is different, the test button test is not significant                     | <ul style="list-style-type: none"> <li>■ If the voltage measured is less than 85% of that indicated on the device, the test button may not work, although the protection device will continue to function</li> <li>■ If the voltage measured is more than 110% of the voltage indicated on the device, there is a risk to damage the device.</li> </ul>                                                                                                                                                                                                                                           | <ul style="list-style-type: none"> <li>■ The incorrect voltage may be due to a connection error (e.g. line/neutral inversion, missing phase, etc.)</li> <li>■ Acti9 three-pole and four-pole residual current devices cannot be used on single-phase circuits</li> <li>■ Acti9 four-pole residual current devices can be used normally on three-phase circuits without neutral</li> </ul> | If the device trips, the earth fault protection is not working correctly in the presence of the loads                                                                                                                                                                                                                                                                                                                                                                                                       |
| Corrective actions                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| The device must be checked by a RCD tester (IEC/EN 61557-6)                                        | <p><b>If the voltage measured is different from the rated network voltage, look for the problem on the power supply or on the downstream circuits (lines, loads).</b></p> <p><b>Otherwise:</b></p> <ul style="list-style-type: none"> <li>■ if the rated network voltage is lower than that indicated on the device, the device must be replaced by one with a suitable rated voltage, the next time it is shut down</li> <li>■ if the rated network voltage is higher than that indicated on the device, the device must immediately be replaced by one with a suitable rated voltage</li> </ul> | Modify the connection to obtain the rated voltage (line-line) between terminals                                                                                                                                                                                                                                                                                                           | <p><b>Measure the permanent leakage current of each load</b></p> <ul style="list-style-type: none"> <li>■ In the event of abnormal load leakage, correct the insulation fault</li> <li>■ Separate the circuits to reduce the permanent leakage currents seen by each residual current device</li> <li>■ Consider the replacement of the device by a different type of RCD adapted to the permanent leakage current</li> </ul> <p><b>Note</b><br/>Disconnect the loads in the event of a resistance leak</p> |

If the RCD doesn't trip after all the additional actions, it must be tested with an external RCD tester.

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Some tertiary and industrial installation maintenance regulations require residual current devices to be checked with a specific device.



### 4- Checking with a RCD tester

If the RCD doesn't trip after all the additional actions, it must be tested with an external RCD tester. If it is confirmed that it is out of service, it must be replaced immediately.

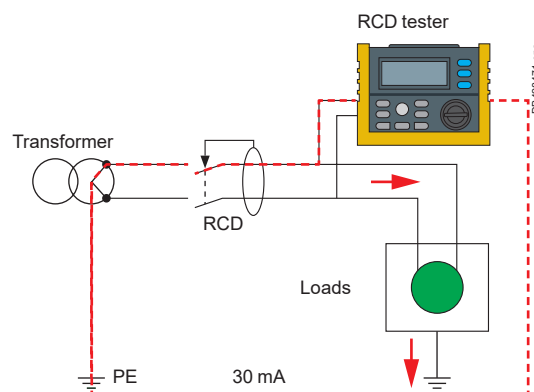
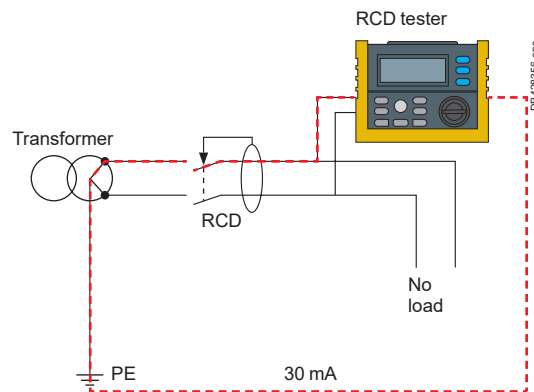
For the tests performed to be valid, these devices must comply with IEC/EN 61557-6.

These devices are used to check:

- the operating voltage
- the tripping threshold (according to the sensitivity  $I_{\Delta n}$ ) of the residual current device
- the tripping times ( $I_{\Delta n}$ ,  $2 \times I_{\Delta n}$ ,  $5 \times I_{\Delta n}$ , etc.).

#### Procedure

- Disconnect the fixed and portable loads (if the residual current device protects the power outlets).
- Connect the test device to the downstream terminals of the residual current device or to a downstream power outlet.
- the residual current device (RCD) should trip.



→ Earth leakage current

In case of TN method of earthing with RCD short-circuit current,  $I_k$  calculated by some testers can be wrong if the measurement is done downstream of the RCD, especially if RCD is 30 mA.

Measurement shall be done upstream RCD to obtain correct values of  $I_k$ . The protection provided by the RCD is independent from the value of  $I_k$ .

# Routine operating checks of residual current devices: local test and loop test

Table 1: classification for external influences in the presence of corrosive or polluting substances and required protective measures (IEC 60364-5-51)

| Class as per IEC 60364-5-51 | External influence         | Characteristics                                                | Applications and examples                                                                                                                                                                                                                                                            | Recommendations for equipment characteristics and protective measures                                                                                                                                                                                                                                                          |
|-----------------------------|----------------------------|----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AF1                         | Negligible                 | Negligible quantity or nature of corrosive or polluting agents | -                                                                                                                                                                                                                                                                                    | Normal                                                                                                                                                                                                                                                                                                                         |
| AF2                         | Atmospheric                | Presence of corrosive or polluting atmospheric agents          | Installations situated by the sea or near industrial zones producing serious atmospheric pollution, such as chemical works, cement works; this type of pollution arises especially in the production of abrasive, insulating or conductive dusts                                     | According to the nature of the substances (compliance to salt mist test according to NF C 20-702: test Ka)                                                                                                                                                                                                                     |
| AF3                         | Intermittent or accidental | Intermittent or accidental action of certain common chemicals  | Locations where some chemical products are handled in small quantities and where these products may come only accidentally into contact with electrical equipment; such conditions are found in factory laboratories, other laboratories or in locations where hydrocarbons are used | <ul style="list-style-type: none"> <li>■ Protection against corrosion according to equipment specification</li> <li>■ Cabinet made of unprotected ferrous materials or natural rubber are unsuitable</li> <li>■ Plastic cabinets are generally suitable</li> </ul>                                                             |
| AF4                         | Continuous                 | Permanent action of corrosive or polluting chemicals           | <ul style="list-style-type: none"> <li>■ Chemical works</li> <li>■ Farms (piggery or dairies)</li> <li>■ Technical room of swimming pool</li> </ul>                                                                                                                                  | Equipment specifically designed according to the nature of substances. It is necessary to specify the nature of the chemical agent to allow the manufacturer to define the type of protection of the equipment. Protection is provided by special paints, appropriate coatings or surface treatments or by choice of material. |

Example: a technical local of swimming pool must be considered as AF4, because it is subject to the permanent presence of corrosive chlorinated derivatives. The materials must be specially studied according to the nature of the agents: reinforced A-SI type of Acti9 offer and cabinet in overpressure.

Table 2: choice of residual current device

| Product function | Product range                                              | Class as per IEC 60364-5-51 |                                      |                                               |                                                                           |
|------------------|------------------------------------------------------------|-----------------------------|--------------------------------------|-----------------------------------------------|---------------------------------------------------------------------------|
|                  |                                                            | AF1                         | AF2                                  | AF3                                           | AF4                                                                       |
| RCCB             | Acti9 iID, Acti9 iID K, Acti9 iID bico, RCCB-ID A-SI 125 A | ■                           | A-SI                                 | A-SI and sealed cabinet, class IP65 or higher | A-SI and IP65 electrical cabinet + ventilated room with clean outdoor air |
|                  | RCCB-ID 125 A, REDs, REDtest                               |                             | Sealed cabinet, class IP65 or higher | Sealed cabinet, class IP65 or higher          | IP65 electrical cabinet + ventilated room with clean outdoor air          |
| RCD Vigi add-on  | Vigi iC40, Vigi iC60, Vigi C120, Vigi NG125                |                             | A-SI                                 | A-SI and sealed cabinet, class IP65 or higher | A-SI and IP65 electrical cabinet + ventilated room with clean outdoor air |
| RCBO             | iDPN Vigi, iCV40, DPN Vigi, iSPN Vigi, Acti9 iC60 RCBO     |                             |                                      |                                               |                                                                           |