VAMP Arc Flash Protection

Testing Manual

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Schneider Electric

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Safety information

Important information

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

Failure to follow these instructions will result in death or serious injury.

⚠ WARNING

Only qualified personnel should install this equipment. Such work should be performed only after reading this entire set of instructions.

Turn off all power supplying this equipment before starting the installation work.

Ensure the protective grounding is connected.

Before performing visual inspections, commissioning, or maintenance on this equipment, disconnect all sources of electric power.

Assume that all circuits are live until they have been completely de-energised, tested and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.

Beware of potential hazards, wear personal protective equipment, carefully inspect the work area for tools and objects that may have been used during commissioning or maintenance.

Neglecting fundamental installation requirements can lead to personal injury as well as damage to electrical equipment or other property.

Handling this equipment requires relevant expertise in the field of protection of electrical networks. Only competent people who have this expertise are allowed to configure and set up this product.

⚠CAUTION

Before performing dielectric (Hi-Pot) testing on any equipment in which the IED is installed, disconnect all input and output wires to the IED. High voltage testing can damage electronic components contained in the unit.

NOTICE

Always use a properly rated voltage sensing device to confirm that all power is off.

The successful operation of this equipment depends upon proper handling, installation, and operation.

User qualification

Electrical equipment should be installed, operated, serviced, and maintained only by trained and qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material. A qualified person is one who has skills and knowledge related to the construction, installation, and operation of electrical equipment and has received safety training to recognize and avoid the hazards involved.

Password protection

Use IED's password protection feature in order to protect untrained person interacting this device.

⚠WARNING

Do not choose lower Personal Protection Equipment while working on energized equipment.
Failure to follow these instructions can result in death or serious injury.

Table of Contents

1. This document

1.1. Purpose

This document contains instructions on the secondary commissioning test procedure of the VAMP arc flash protection systems VAMP 321 and VAMP 221 as well as VAMP 121 and 120 units. This guide also contains troubleshooting information.

The prerequisite for the testing procedure described in this manual is that the system to be tested is installed and configured.

1.2. Related documents

Document	Identification*)
VAMP Mounting and Commissioning Instructions	VARC/xx MC/xxxx
VAMPSET Setting and Configuration Tool User Manual	VVAMPSET/EN M/xxxx
VAMP 120 Arc protection unit user manual	V120/EN M/xxxx
VAMP 121 Arc protection unit user manual	V121/EN M/xxxx
VAMP 221 Arc protection system Operation and configuration instructions/ Technical descriptions	V221/EN M/xxxx

*) xxxx = one document revision index and a three-digit document version number

NOTE! Download the latest documents and software at www.schneider-electric.com or m.vamp.fi.

1.3. Symbols

Symbol	Description
⚠ DANGER	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
⚠ WARNING	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE	Addresses practices not related to personal injury.

2. Preparations for the testing

2.1. Required documentation

During the testing the test results and remarks are documented in a test report. The test report should clearly indicate what tests have been performed and what the respective test results are.

In addition to the test report, the customer may also request other documentation not specified in this manual.

- Risk assessment
- Method statement
- Commissioning program
- List of the equipment to be used during the testing

2.2. Required equipment

Special tools and protective clothing are required during the testing.

- Computer
  - Suitable cable for USB connection with the relay
  - Latest version of VAMPSET setting tool
- Current injection device
  - One phase (for example Sverker 750/760)
  - Three phase with time measurement is recommended (for example Freja 300)
- Powerful light source
  - Flashlight (burning time >5ms, non LED)
  - Flashlight with an output contact for time measurement (burning time >5ms, non LED)
  - Torch (MagLite)
  - Recommended flash device: Nissin Digital, Di622 Mark II / Canon, Speedlite 430EX II or equivalent.
- Insulated screwdriver kit
- Test leads
- Extension cord
- Multimeter
- Relay tester
- Arc flash resistive clothing including helmet, protective goggles and gloves

2.4. System inspection

Before the actual testing begins, the station and the system to be tested should be inspected. The aim is to find out the relevant details of the system to be able to choose a suitable testing procedure. The inspection consists of different procedures.

- Consulting the customer about the details of the system as good communication and mutual understanding is a prerequisite for successful testing.
- Defining the boundaries of the safe and hazardous working areas and checking that they are properly marked.
- Inspecting the devices and wiring visually.
- Checking the application; comparing the actual system to the available system drawings and also checking that the system and application are logical.
- Checking that the used settings correspond to the system plans and further, checking any anomalies in the settings, like a deviation from the planned value, with the customer.
- Based on the details of the system, defining the proper testing procedure.
- Checking device code and location map; comparing the device and location codes with the available system drawings and documenting the deviations in the test report.

2.5. Safety precautions

The required level of safety for the system to be tested should always be defined before the testing can begin. Also, the safety procedures need to be verified with the customer. Note that the safety regulations and procedures vary significantly, for example, depending on the country or the application area but certain points need to be considered.

- What is the level of testing? What part of the station is de-energised?
- Has the system been de-energised if the light sensors are installed near the busbar?
- Should auxiliary power be fed to the protection units?
- What is the level of lightning?

NOTICE Testing the arc flash sensors using a light source can trip the neighboring zones.

⚠WARNING Working near live components is dangerous. Be careful when testing in the vicinity of live circuits.

3. Commissioning testing

3.1. Commissioning testing sequence

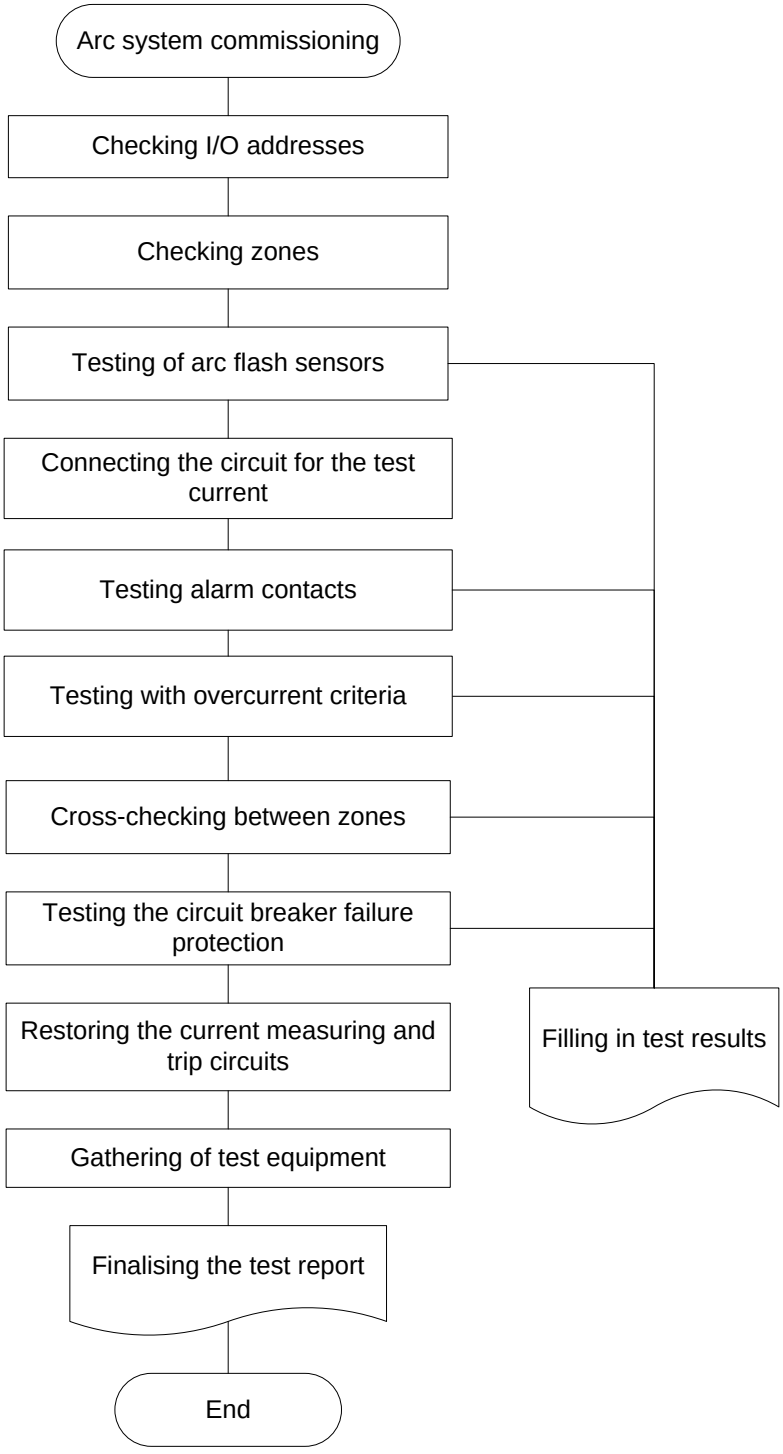

Figure 3.1-1 Test sequence

3.3. Checking I/O unit addresses

1. Check the settings of the main unit and verify how many I/O units and sensors are configured.
2. Compare the settings with the actual number of installed I/O units and sensors in the system.
3. Compare the settings with the drawings.

NOTE! See the user manual for information on how to check the settings.

3.4. Checking zones

1. Check the protected zones and compare them against the drawings.
2. Study the system and find out if a part of the system needs to be disconnected before the test.
3. Consult the customer if the configuration does not match with the drawings.

3.5. Disconnecting trip circuits

Disconnect the trip signals to the circuit breakers that may disturb other parts of the system during the test. Disconnect also trip signals routed to other parts of the system, such as the CBFP backup trip to upstream breakers and the transfer trip signals.

Test the disconnected trip signals with a multimeter.

3.6. Testing of arc flash sensors

Testing the arc flash sensors with the light only criteria operates the trip outputs of the main unit or I/O units for the protected zone. Testing the arc flash sensors with the light and current criteria, without an injected current, only generates an indication on the unit that protects the zone. The indication of the fault is registered by the possible main unit and I/O unit.

NOTE! For more information on viewing indications, see the user manual.

Three different arc flash sensors are available to be used with the VAMP arc flash protection systems.

Sensor	Type
Arc point sensors	VA1DA-x VA1EH-x
Arc fibre sensor	Arc-SLmx
Arc portable sensors	VA1DP-5 VA1DP-5D

3.6.1. Testing point or fibre sensors

4) Testing the point sensor

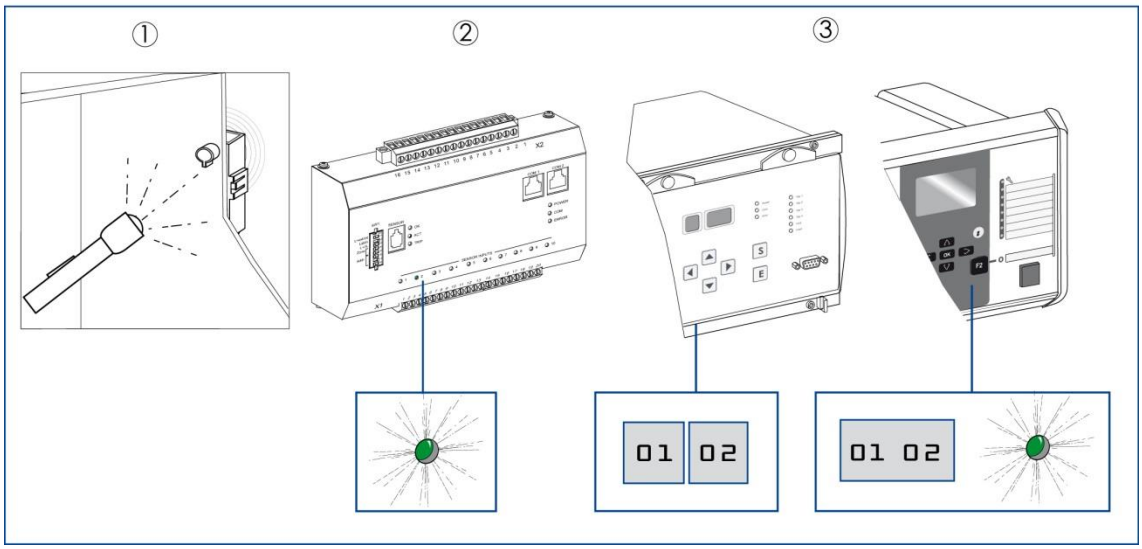

Figure 3.6.1-1 Testing point sensors

5) Testing the fibre sensor

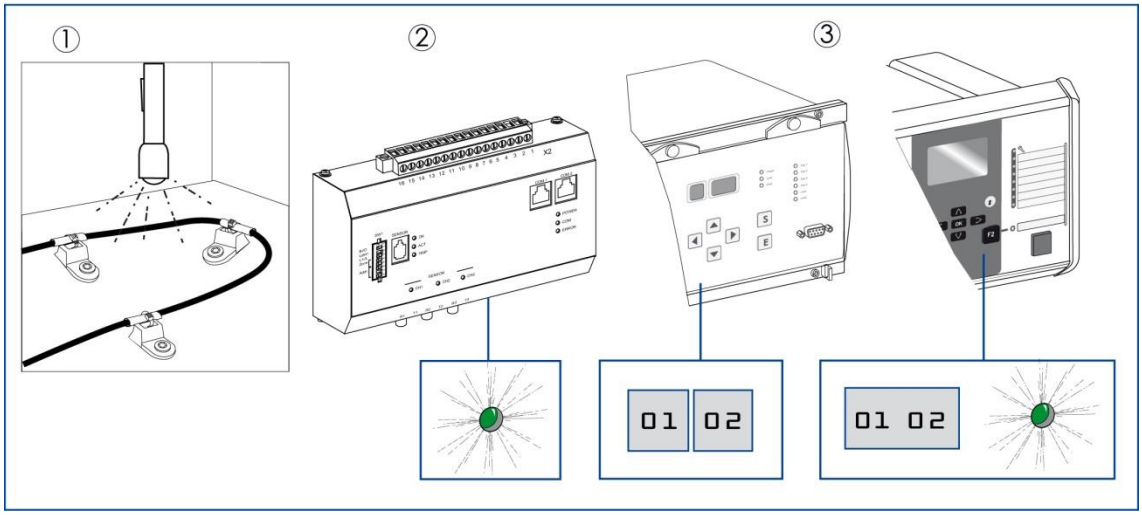

Figure 3.6.1-2 Testing fibre sensors

NOTICE Reset the main unit before the test.

1. Point light to each arc flash sensor, one at a time, until activated with a powerful light source such as a flashlight or torch.
2. Check the light sensor indication from the unit.
3. Check the light sensor address from the main unit.

In case of stand alone units VAMP 120 and VAMP 121, check the light sensor address from the channel number beside the sensor indication LED.

4. Compare the light sensor address information from the main unit with the sensor location map.
5. Fill in the test result in the test report.
6. Reset the main unit.
7. Repeat the procedure with the next point or fibre sensor.

NOTICE For more information on viewing and resetting indications, see the user manual.

NOTICE Due to their placement, some sensors may not be tested without dismantling parts of the system. Either dismantle the necessary parts of the system to run the test or pass the test. Document the choice in the test report.

3.6.2. Testing portable sensors

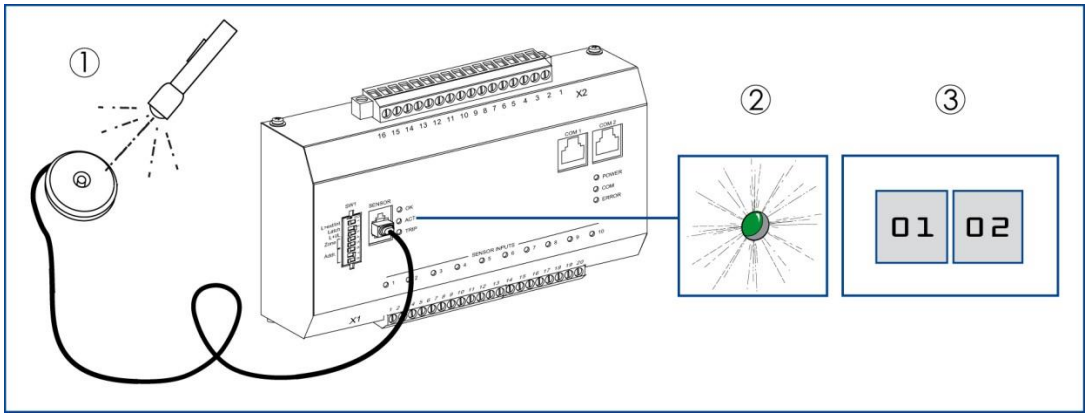

Figure 3.6.2-1 Testing portable sensors

NOTE! Reset the main unit before the test.

1. Connect the portable arc flash sensor to the I/O unit and test it. Provide light to the sensor with a powerful light source such as a flashlight or torch.

Be sure to connect to an I/O unit that is protecting the area where the work is ongoing. Some units may only trip the circuit breaker of the outgoing feeder.

2. Check the light sensor indication from the unit.
3. Check the light sensor address from the main unit.
4. Fill in the test result in the test report.
5. Reset the main unit.
6. Repeat the procedure with the next I/O unit.

NOTICE For more information on viewing and resetting indications, see the user manual.

NOTICE To avoid false activations, disconnect the portable sensor from the unit immediately after use.

3.6.3. Testing of the supervision of arc flash sensors

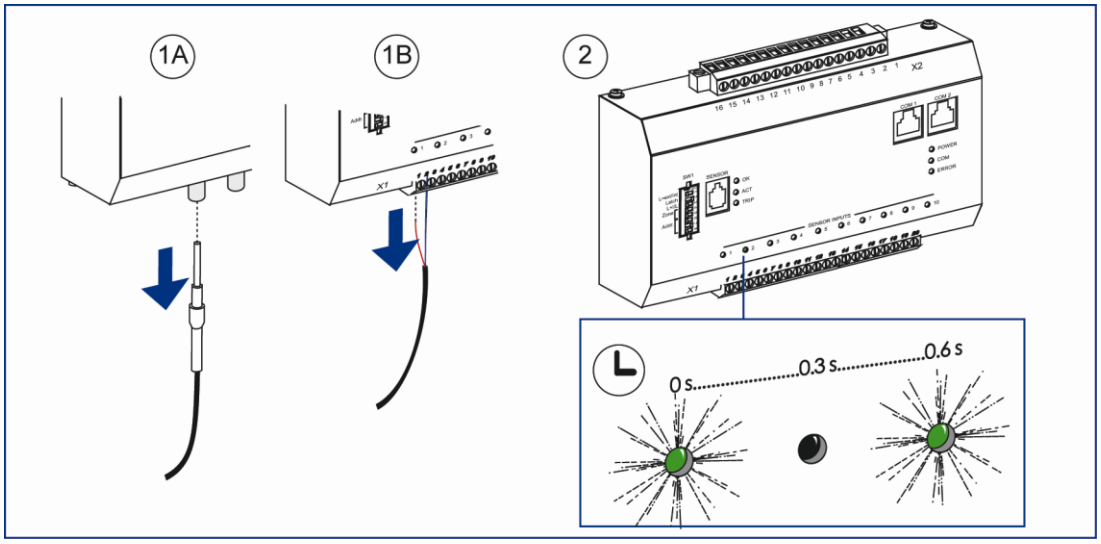

Figure 3.6.3-1 Testing the self-supervision of sensors

Testing the supervision of point sensors

1. Disconnect one wire from one point sensor, one for each unit, to see that the self-supervision system recognises the fault in the sensor.
2. Wait until the fault indication appears.

Depending on the device this can take several minutes.

3. Check that the internal fault relay operates and that the self-supervision information travels to the possible external systems.
4. Fill in the test results in the test report.
5. Reconnect the wire and reset the system.
6. Repeat the procedure with the any other units.

Testing the supervision of fibre sensors

1. Disconnect one end of the fibre sensor, one for each unit, to see that the self-supervision system recognises the fault in the sensor.
2. Wait until the fault indication appears.

Depending on the device this can take several minutes.

3. Check that the internal fault relay operates and that self-supervision information travels to the possible external systems.
4. Fill in the test results in the test report.
5. Reconnect the arc fibre sensor and reset the system.
6. Repeat the procedure with the any other I/O units.

3.6.4. Testing the supervision of I/O units

3) Testing the selfsupervision of the units

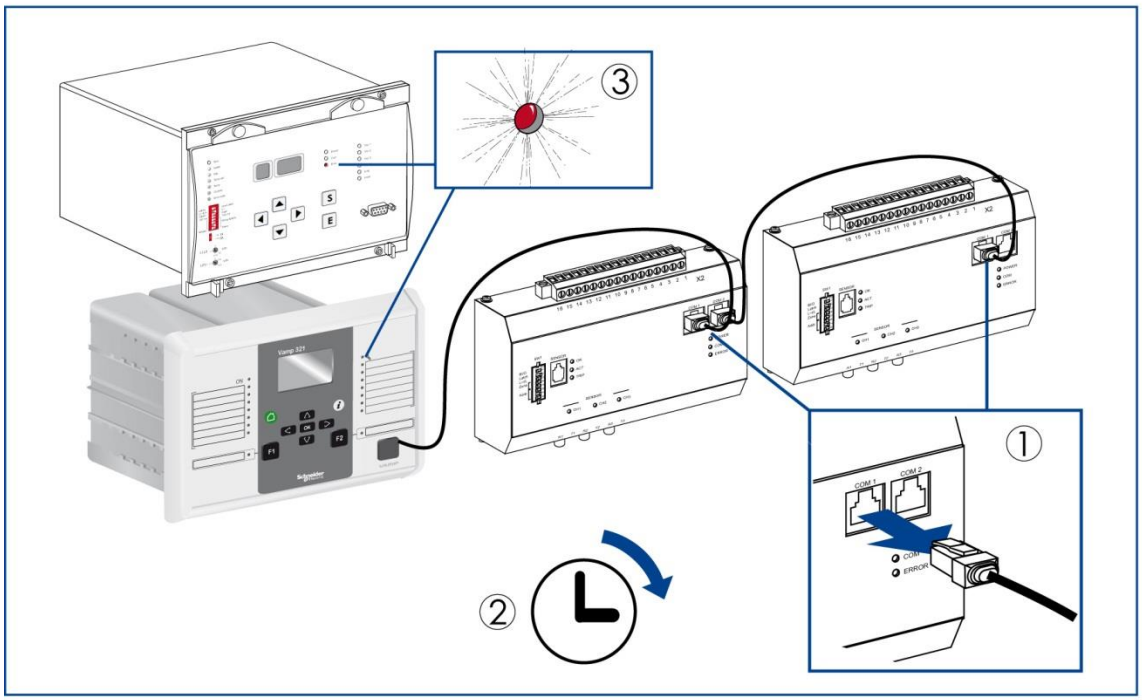

Figure 3.6.4-1 Testing of the I/O units self-supervision

1. Disconnect the modular cable from one I/O unit.
2. Wait until the fault indication appears on the main unit. Depending on the device this can take several minutes.
3. Check that the internal fault relay in the main unit operates and that the self-supervision information travels to the possible external systems.
4. Fill in the test results in the test report.
5. Reconnect the modular cable.

NOTICE For the VAMP 321 unit the self-supervision has to be configured.

NOTICE For more information on self-supervision, see the user manual.

3.7. Connections for testing devices

The current measuring circuit always has to remain intact.

⚠WARNING Do not open a loaded current measuring circuit before the secondary circuit of the current transformer is reliably short-circuited. An open secondary circuit in the current transformer may destroy the current transformer.

3.7.1. Connecting a current injection device without the time measurement

1. Short circuit the secondary circuit of the current transformer and disconnect the main unit or I/O unit from the measuring circuit.
2. Connect a current injection device, one phase at a time, to the main or current measuring I/O units current measuring circuit.

3.7.2. Connecting a current injection device for the time measurement

6) Time measurement

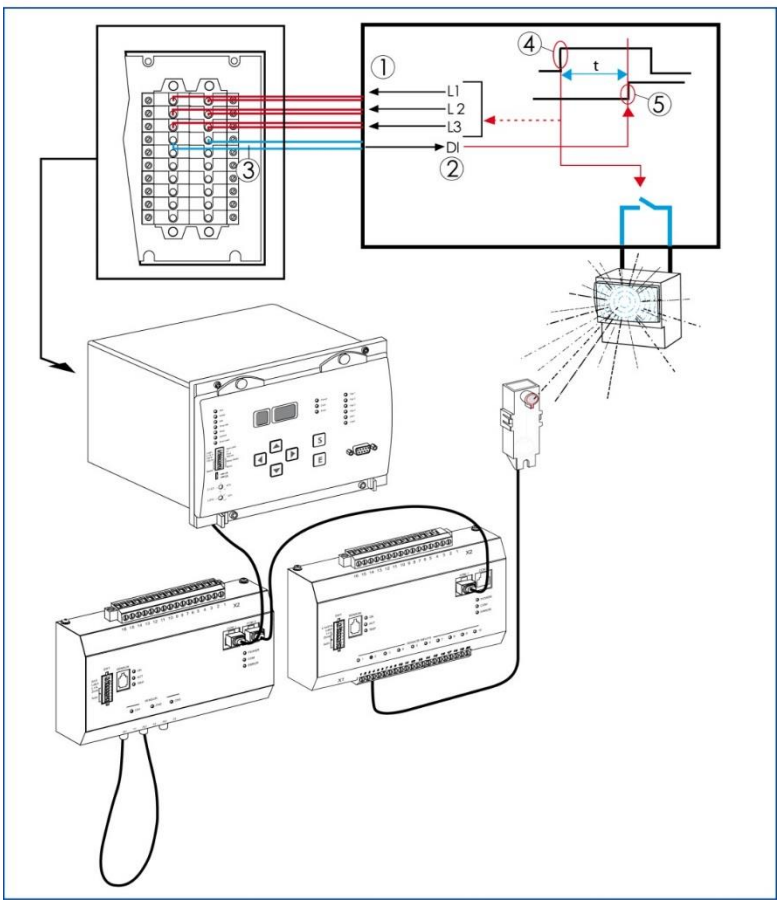

Figure 3.7.2-1 Connecting injection device for the time measurement

1. Short circuit the secondary circuit of the current transformer and disconnect the main unit or I/O unit from the measuring circuit.
2. Connect a three-phase current injection device with time measurement to the main or current measuring I/O units of the current measuring circuit.

Connect the injection device either to inject the current continuously or to be triggered by the time measuring circuit.

3. Use the digital input of the current injection device for the stop trigger in the time measurement circuit.
4. Connect the trip output of the tested unit to the digital input of the current injection device for the stop trigger. For measuring the total operating time, use the circuit breaker's NO contact, which indicates that status of circuit breaker is open, for the stop trigger.
5. Connect the time measuring start signal output to the flashlight. Configure the time measuring start signal to either trigger only the flashlight or both the flashlight and the current injection.

Preferably, the current injection should be triggered before the flashlight.

6. Measure the operate time between the start trigger and stop trigger.

3.8. Testing the BI/O channel

BI/O signals such as light and overcurrent information are transmitted between units via a BI/O bus.

1. Activate the signal outputs in the BI/O bus for the sending unit by generating arc fault light signal, overcurrent pickup or both.
2. Check the sent signal from the receiving unit to verify that the function operates according to the configuration.
3. Fill in the test result in the test report.
4. Reset the main unit.

3.9. Testing alarm contacts

Alarm signals generated by the arc protection system (trip and self-supervision alarms) can be forwarded to higher-level switchgear supervision and control systems through the output contacts.

1. Activate an alarm by generating an arc fault trip or self-supervision alarm.
2. Check the alarm contact operation from the higher-lever system. For VAMP 321, alarm signals can also be sent via communication.
3. Fill in the test result in the test report.
4. Reset the main unit.
5. Repeat the procedure with the next alarm contact.

3.10. Testing the arc flash protection with the overcurrent condition

3.10.1. Testing the pickup value

1. Check the pickup value settings of the current criteria by injecting a current to the main or I/O unit.
2. Increase the current until the overcurrent criterion picks up.
3. Fill in the test results in the test report.
4. Reset the main unit.
5. Compare the current settings with the drawings.
6. If needed, connect the current injection device to another unit in the protected zone and repeat the test.

NOTICE For more information on viewing and resetting indications, see the user manual.

3.10.2. Testing without the time measurement

1. Inject a current, two times greater than the set current level, to the unit that protects the zone. Inject a current in each phase, one phase at a time, for every current measuring main unit or I/O unit.

Check that the technical characteristics of the channels are not exceeded.

2. While injecting the current, point light with a flashlight to at least one of the arc flash sensors, one at a time.
3. Check that the function operates.
4. Generate at least one trip with current per I/O unit.
5. Fill in the test result in the test report.
6. Reset the main unit.

7. If needed, connect the current injection device to another unit in the system and repeat the test.

NOTICE For more information on viewing and resetting indications, see the user manual.

3.10.3. Testing with the time measurement

1. Inject current, two times greater than the set current level, to the unit that protects the zone. Inject current to all three phases for every current measuring main unit or I/O unit. The current can be injected in two ways.

- Continuous injection
- Injection triggered by the time measurement start

Check that the technical characteristics of the channels are not exceeded.

2. Point the flashlight and start the time measurement to trigger it. Point light to at least one of the arc flash sensors, one at a time.
3. Check that the function operates.
4. Check the operate time from the time measuring device.
5. Generate at least one trip with current per I/O unit.
6. Fill in the test result in the test report.
7. Reset the main unit.
8. If needed, connect the current injection device to another unit in the system and repeat the test.

NOTICE For more information on viewing and resetting indications, see the user manual.

3.10.4. Testing protection zones

Checking the operation within the same zone

1. Test the protection zones, one at a time, by applying signals to operate the arc flash protection within the zone according to the plans.
2. Check that the function operates.
3. Compare the result with the plans.
4. Fill in the test result in the test report.
5. Repeat the procedure with the other zones.

NOTICE Minimise the need to move the test equipment by cross-checking the operation between different zones in parallel with this test.

Cross-checking the operation between different zones

1. Test the protection zones, one at a time, by applying signals to operate the arc flash protection in other protection zones according to the plans.
2. Check that the other protection zones do not cause unwanted operations in the zone being tested.
3. Check that the function operates according to the plans.
4. Fill in the test result in the test report.
5. Repeat the procedure with the other zones.

3.10.5. Testing the circuit-breaker failure protection

1. Inject a current above the overcurrent setting value to the main unit or to one of the current measuring I/O units.
2. Point light to one of the light sensors in the protected zone with a bright torch.

The light pulse has to be longer than the CBFP time setting. Thus, the light pulse from a flashlight is too short.

3. Check that the CBFP function operates.
4. Fill in the test result in the test report.
5. Reset the main unit.
6. If needed connect the current injection device to another unit in the protected zone and repeat the test.

NOTICE For more information on viewing and resetting indications, see the user manual.

NOTICE Use a torch to test the CBFP, because the light pulse from a flashlight is too short.

NOTICE Ensure that the light pulse is not too long. If the light pulse is longer than 3 seconds, the daylight blocking function generates an alarm.

3.11. Testing the selectivity of the arc flash protection

1. Test the selectivity of the protection zones, one at a time, by pointing light to an arc flash sensor in a protection zone.
2. Compare the operation against the plans.
3. Inject current to the tested zone.
4. Compare the operation against the plans.
5. Inject current and at the same time point light to one arc flash sensor in the tested zone.
6. Compare the operation against the plans.
7. Fill in the test result in the test report.
8. Repeat the procedure with the other zones.

3.12. Restoring the system

1. Disconnect the current injection device from the current circuit and restore the wiring for the current measuring circuit to the pre-test conditions.
2. Open the short circuit for the current measurement transformer.
3. Reconnect the opened trip circuits.
4. Ensure that there are no active warnings or errors on the units.
5. Reset the system to clear the events from the tests.
6. Gather all the test equipment and devices.

NOTICE Ensure that no equipment used during the test is left behind.

4. Test report

4.1. Filling in the test report

Download the test report template from the Schneider Electric Web site. Fill in all the required information about the system, the tested arc flash units and the test results.

See the example test report with the VAMP 221 arc protection system.

4.2. Test report example

Client _____ **Main unit test repor**

Project _____ Page / pages

Device code - K40
Location: SS05-J12
Type: VAMP221
Serial number: _____

Uaux:	☑ Ac	☐ Dc

CT ratio:	Primary	Secondary	
		☑ 1 A	☐ 5 A

Does the unit receive BI/O - message from other unit:

Current		Light	
☑ Yes	☐ No	☑ Yes	☐ No

RELAY SETTINGS

IL1, IL3 I> (x In): _____

IL2/Io I> (x In): _____

Switch group settings

	Off	On
1	☐ Latch	☑ No latch
2	☑ I> & I>	☑ I>
3	☑ CBFP	☐ Fast
4	☐ 100 ms	☐ 150 ms
5	☐ Matrix	☑ Matrix
6	☑ Matrix	☑ Matrix
7	☑ Matrix	☑ Matrix
8	☐ Master	☑ Slave

TEST VALUES

Pick-up current IL1: _____

Pick-up current IL2/Io: _____

Pick-up current IL3: _____

OPERATING TIME

Injected current: _____
(2x I>, in all three phases)

Measured time: _____

FUNCTIONAL TEST

DONE:	☑ Trips	☑ Alarms	☐ Indication	☐ BI/O	☐ Self-supervision
OK:	☑ Trips	☑ Alarms	☐ Indication	☐ BI/O	☐ Self-supervision

Remarks

Test equipment

Type: _____ S/N: _____ Calibration date: _____

Tested by: _____ Date: _____
Your name dd.mm.yyyy

Figure 4.2-1 Test report example page 1

Client _____ **Point/fibre sensor I/O unit test repo**
Project _____ Page / pages 2 / x

Device code: K42
Location: SS05-J07
Type: VAM 10L
Serial number: _____

Uaux:	Modular cable	Terminal X2:1-2
	☑	☐

I/O unit address: 1 Zone: _____

Is the zone shift in use?	☑ Yes	☐ No
Zone shift tested	☑ Yes	☑ No

Mobile point sensor tested ? ☐ Yes ☑ No

Switch group settings

SW1	Off	On
1	☑ I> ext	☐ I> int
2	☐ No latch	☑ Latch
3	☐ I> & I>	☐ I>
4	☑ Addr 16	☐ Addr 16
5	☐ Addr 8	☑ Addr 8
6	☑ Addr 4	☑ Addr 4
7	☑ Addr 2	☑ Addr 2
8	☑ Addr 1	☑ Addr 1

Sensor channel	Sensor channel activation checked		Tripping checked	
1	☑ Yes	☐ No	☑ Yes	☐ No
2	☑ Yes	☐ No	☐ Yes	☑ No
3	☑ Yes	☐ No	☐ Yes	☑ No
4	☑ Yes	☐ No	☐ Yes	☑ No
5	☑ Yes	☐ No	☐ Yes	☑ No
6	☑ Yes	☐ No	☐ Yes	☑ No
7	☑ Yes	☐ No	☐ Yes	☑ No
8	☑ Yes	☐ No	☐ Yes	☑ No
9	☑ Yes	☐ No	☐ Yes	☑ No
10	☐ Yes	☑ No	☐ Yes	☑ No

=fibre sensor channels

FUNCTIONAL TEST

DONE:	☑ Trips	☑ Alarms	☐ Indication	☐ BI/O	☐ Self-supervision
OK:	☑ Trips	☑ Alarms	☐ Indication	☐ BI/O	☐ Self-supervision

Remarks

Tested by: _____ (Your name) Date: _____ (dd.mm.yyyy)

Figure 4.2-2 Test report example page 2

Client _____ **Current I/O unit test repor**
Project _____ Page/pages 1 / x

Device code: K41
Location: SS05-J02
Type: VAM 4C
Serial number: _____

Uaux:	Modular cable	Terminal X2:1-2
	☑	☐

CT ratio:	Primary	Secondary	
		☐ 1 A	☑ 5 A

I/O unit address: 32 Zone: _____

CURRENT PICK-UP SETTINGS

IL1, IL3 I> (x In): _____

IL2/Io I> (x In): _____

Switch group settings

SW1	Off	On
1	☐ Zone 1 L>	☑ Zone 1 L>
2	☐ Zone 2 L>	☑ Zone 2 L>
3	☐ Zone 3 L>	☐ Zone 3 L>
4	☑ Zone 4 L>	☐ Zone 4 L>
5	☐ Addr 8	☑ Addr 8
6	☑ Addr 4	☑ Addr 4
7	☑ Addr 2	☑ Addr 2
8	☑ Addr 1	☑ Addr 1

Note ! Actual address is "32" + switch 5-8 coefficient value

SW2		
1	☑ No latch	☐ Latch
2	☐ 1A	☑ 5A
3	☑ No I> out	☐ I> out
4	☑ No ext I>	☐ Ext I> in

TEST VALUES

Pick-up current IL1: _____

Pick-up current IL2 / Io: _____

Pick-up current IL3: _____

OPERATING TIME

Injected current: _____
(2x I>, in all three phases)

Measured time: _____

FUNCTIONAL TEST

DONE:	☑ Trips	☑ Alarms	☑ Indication	☐ BI/O	☐ Self-supervision
OK:	☑ Trips	☑ Alarms	☑ Indication	☐ BI/O	☐ Self-supervision

Remarks

Tested by: _____ (Your name) Date: _____ (dd.mm.yyyy)

Figure 4.2-3 Test report example page 3

5. Troubleshooting

5.1. Checking the wiring

Check that the wiring of the trip circuit is not faulty if the trip signal does not reach the circuit breaker.

5.2. Checking the trip condition

Check the configuration if the protection does not trip even when a sufficient light signal is provided. The protection may be configured to require both the light and current condition to trip. In that case, inject also the current.

5.3. Checking the I/O unit and arc flash sensor installation

1. Check the sensor wiring if the self-supervision detects a faulty sensor. The sensor wire may have loosened in the terminal blocks.
2. Check the distance between each end in the communication chain if errors occur in the communication. The total distance between the ends of the communication bus must be less than 100 meters. Lengths exceeding 100 meters can cause interruptions and faults in the communication.
3. Check the number of the I/O units if errors occur in the communication. In systems with more than 5 I/O units, it is recommended to have a separate auxiliary power installed for the I/O units. Pay particular attention to the polarity of the cable connections.

NOTICE For more information on the I/O units, see the user manual.

5.4. Checking the suitability of the light source

Check that the light source is powerful enough and gives a long enough pulse. Inadequate light in case of fibre sensors can result in a situation where the main unit registers the arc flash event but does not trip.

5.6. Checking the daylight blocking mode

Check that the light pulse to the arc flash sensor is not too long. If light is supplied to the arc flash sensor for over three seconds the self-supervision function activates and switches the light sensor channel to daylight blocking mode, the sensor channel is blocked. The sensor channel indication activates and an error message appears on the main unit. Remove the light in order reset the blocked channel..

6. Maintenance

The VAMP arc products and its extension units require maintenance in order to work according to specification. Keep record of the maintenance actions performed for the system. The maintenance can include, but is not limited the following actions.

6.1. Preventative maintenance

The VAMP arc products and its extension units, sensor and cabling shall be visually checked when the switchgear is de-energized. During such inspection pay attention to

- possible dirty arc sensors
- loose wire connections
- damaged wiring
- indicator lights (see section LED test sequence) and
- other mechanical connections.

Visual inspection shall be made minimum every three (3) years.

6.2. Periodical testing

The IED and its extension units, cabling and sensors must periodically be tested according to the end-user's safety instructions, national safety instructions or law. Manufacturer recommend functional testing being carried minimum every five (5) years.

Recommended periodic testing method is secondary injection principle with light sensor functionality validation.

6.3. Cleaning of hardware

Special attention must be paid that the IED, it's extension units and sensors do not become dirty. In case cleaning is required, wipe out dirt from the units.

6.4. Sensor condition and positioning check

After commissioning, sensor replacement, modification procedure, cleaning and periodical testing always check that the sensor positioning remains as it was originally designed.

7. Glossary

Term	Description
BI/O	Binary input/output
CBFP	Circuit-breaker failure protection
CT	Current transformer
HMI	Human-machine interface
IED	Intelligent electronic device
LED	Light emitting diode
Local HMI	IED front panel with display and push-buttons
NO	Normally open contact
U_{AUX}	Auxiliary voltage
VAMPSET	Configuration tool for VAMP protection devices

Customers Care Center

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