

ARA Automatic Recloser iID Residual Current Circuit Breakers Reference Manual

12/2015



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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to observe this information can result in injury or equipment damage.

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Important Information

NOTICE

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 documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of this 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

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by 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 and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

About the Book



At a Glance

Document Scope

This manual is intended for designers and installers of control systems and electrical protection systems.

Validity Note

ARA iID automatic reclosers are designed to automatically reclose iID 2-pole (2P) and iID 4-pole (4P) iID residual current circuit breakers after they have tripped.

Related Documents

Title of Documentation	Reference Number
Instruction Sheet for ARA iID Automatic Reclosers (English, Dutch, French, German, Italian, Portuguese, Spanish, Chinese, Russian)	EAV3943701

You can download these technical publications and other technical information from our website at <http://download.schneider-electric.com>

Chapter 1

Presentation

What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Presentation	10
Description	12
Technical Characteristics	13

Presentation

Introduction

ARA automatic reclosers are designed to automatically reclose the associated protective device after it has tripped.

A number of different models are available for iID 2-pole and 4-pole circuit breakers.

Functions

The ARA iID automatic recloser functions are:

- Remote reclosing of iID residual current circuit breakers
- Remote inhibition of the automatic recloser
- Remote control of the final reclosing attempt
- Local control via the handle
- Padlocking to secure the circuit
- 4 operating programs

Identification/Catalog Numbers

The catalog numbers of the automatic reclosers for iID residual current circuit breakers are as follows:

iID residual current circuit breaker type	ARA iID automatic recloser	
	Number of programs	Catalog number
2P	4	A9C70332
4P	4	A9C70334

The composition rule for catalog numbers A9C7033* for iID residual current circuit breakers is as follows:

Field	A9	C	703	3	• = 2 or 4
Meaning	Acti 9 range	Control	ARA for iID residual current circuit breakers iID	Number of programs: 3 = 4 programs	Number of residual current circuit breaker poles: 2 = 2 poles 4 = 4 poles

Example: Catalog number A9C70334 corresponds to an ARA automatic recloser with 4 programs for iID 4-pole residual current circuit breakers.

Description of Optional Auxiliaries

The unit comprising the ARA automatic recloser and iID residual current circuit breaker can be combined with:

- Tripping auxiliaries
- Indication auxiliaries

Residual current circuit breaker tripping auxiliaries allow the residual current circuit breaker to be electrically tripped externally.

Product designation	Catalog number	Description
iMX	A9A26476 A9A26977 A9A26978	Shunt release
iMX+OF	A9A26946 A9A26947 A9A26948	Shunt release with voltage presence check
iMN	A9A26959 A9A26960 A9A26961	Undervoltage release
iMNs	A9A26963	Undervoltage release for a period exceeding 200 ms
iMNx	A9A26969 A9A26971	Undervoltage release independent of the power supply voltage

Residual current circuit breaker indication auxiliaries indicate the state of the residual current circuit breaker.

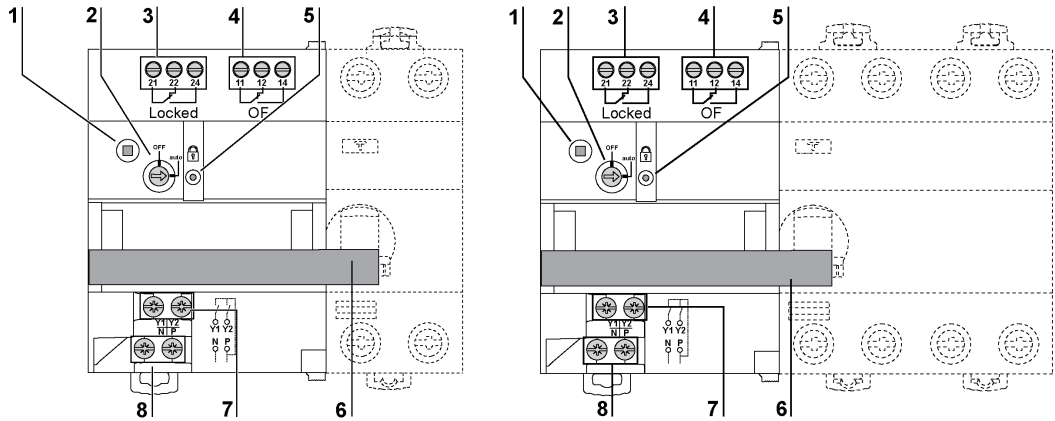
Product designation	Catalog number	Description
iOF	A9A26924 A9A26869	Residual current circuit breaker open/closed state indication contact
iSD	A9A26927 A9A26855	Residual current circuit breaker trip state indication contact
iOF/SD+OF	A9A26929	Residual current circuit breaker open/closed state and residual current circuit breaker trip state indication contact

The iMDU adapter auxiliary allows the ARA automatic recloser to be used with differing control voltages.

Product designation	Catalog number	Description
iMDU	A9C18195	24 or 48 Vac/dc – 230 Vac adapter module

Description

Automatic Recloser for iID Residual Current Circuit Breakers (1 Program) with 2P or 4P Residual Current Circuit Breaker



- 1 Operating state LED
- 2 Automatic recloser inhibitor switch
- 3 Automatic recloser state terminal block
- 4 Residual current circuit breaker state terminal block (open or closed)
- 5 Padlocking device (ARA automatic recloser padlocking)
- 6 Opening/closing handle for ARA automatic recloser
- 7 Y1/Y2 control input terminal block
- 8 230 Vac power supply terminal block

Automatic Recloser Inhibitor Switch

Position	Description
	Automatic recloser inhibited
	Automatic recloser operational

Control Inputs

Input	Description
Y1	Remote inhibit of automatic reset Y1 = 0 iID inhibition Y1 = 1 iID activation
Y2	Remote control of intermediate or final reset Y2 = 1 attempt to an intermediate control or a final reclosing

Automatic Recloser State LED

State	Description
	Automatic recloser operational
	Reclosing cycle in progress
	Automatic recloser locked at end of reclosing cycle: residual current circuit breaker tripped (open)
	ARA automatic recloser not operational

Technical Characteristics

General Characteristics

Characteristics		Value
Degree of protection (IEC 60529)	Device alone	IP20
	Device in a modular enclosure	IP40 (insulation class II)
Degree of protection (IEC 62262:2002)		IK05
Degree of pollution (IEC 60947)		3
Rail mounting		DIN 35 mm
Installation position		Any
Supply voltage U_e		230 Vac, 50–60 Hz
Insulation voltage U_i		phase-neutral: 250 V
Rated impulse withstand voltage U_{imp}		<ul style="list-style-type: none"> ● 4 kV (OVC III class 1) ● 6 kV (OVC III class 2) on the front panel
Operating temperature		-25°C to +60°C
Storage temperature		-40°C to +85°C
Tropicalization		Execution 2 (93% relative humidity at +40°C)
Weight		470 g
Mechanical durability (NC/NO)		5000 cycles
Resistance to voltage dips		IEC 61 000-4-11 class III
Immunity to power supply frequency variation		IEC 61 000-4-28 and IACS E10
Harmonic resistance		IEC 61 000-4-13 class 2
Immunity to electrostatic discharge	air	8 kV, IEC 61 000-4-2
	contacts	4 kV, IEC 61 000-4-2
Immunity to radiated magnetic fields		12 V/m up to 3 GHz, IEC 61 000-4-3
Immunity to fast transients		4 kV from 5 to 100 kHz, IEC 61 000-4-4
Surge immunity		IEC 61 000-4-5
Immunity to conducted magnetic fields		10 V from 150 kHz to 80 MHz, IEC 61 000-4-6
Immunity to magnetic fields at line frequency		level 4 30 A/m according to IEC 61 000-4-8 and IEC 61 000-4-9
Fire resistance (glow wire)	for live parts	at 960°C 30 s/30 s according to IEC 60 695-2-10 and IEC 60 695-2-11
	for other parts	at 650°C 30 s/30 s according to IEC 60 695-2-10 and IEC 60 695-2-11
	for handle	at 750°C 30 s/30 s according to IEC 60 695-2-10 and IEC 60 695-2-11
Conducted emissions		CISPR 11/22
Radiated emissions		CISPR 11/22
Resistance to corrosive atmospheres (4-gas test)		IEC 60721-3-3 category 3C2
Salt mist		Severity 2 according to IEC 60068-2-52
Environment		Conforms to RoHS directives, halogen free

Control Circuit

Characteristics	Value
Control voltage U_c of inputs Y1, Y2	230 Vac (according to IEC 61131)
Duration of command pulse for input Y2	200 ms
Maximum response time of input Y2	500 ms
Consumption	≤ 1 W
Inrush consumption	< 1000 VA
Length of control wires for inputs Y1 and Y2 under 230 Vac	<ul style="list-style-type: none"> ● cable: 100 m ● wires in a cable sheath: 500 m

Remote Indication/Control

Characteristics	Value	
Consumption of OF changeover contact output	Minimum	10 mA (24 Vac/dc)
	Maximum	1 A (230 Vac)
Consumption of inputs Y1/Y2	230 Vac type 1 according to IEC 61131-2	

NOTE: The **OF** and **Locked** contacts may change state for less than 10 ms. These brief changes of state (bounce) must not be taken into account and must be filtered by a device external to ARA.

Chapter 2

Installation

What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Assembly	16
Connection	20

Assembly

Introduction

The ARA iID automatic recloser is used in conjunction with an iID residual current circuit breaker. It is possible to add optional auxiliaries to the iID + ARA unit.

Rules for Combination

The table below shows the rules for combining ARA automatic reclosers with iID residual current circuit breakers, based on the number of poles on each unit.

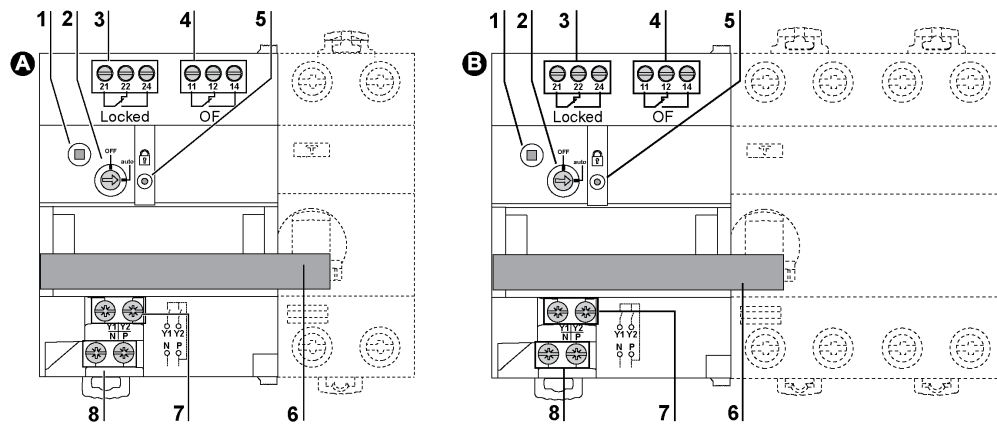
	iID 2P	iID 4P
ARA iID 2P	√	–
ARA iID 4P	–	√

NOTICE

HAZARD OF IMPROPER OPERATION

Do not use an ARA 2P automatic recloser with an iID 4P residual current circuit breaker.

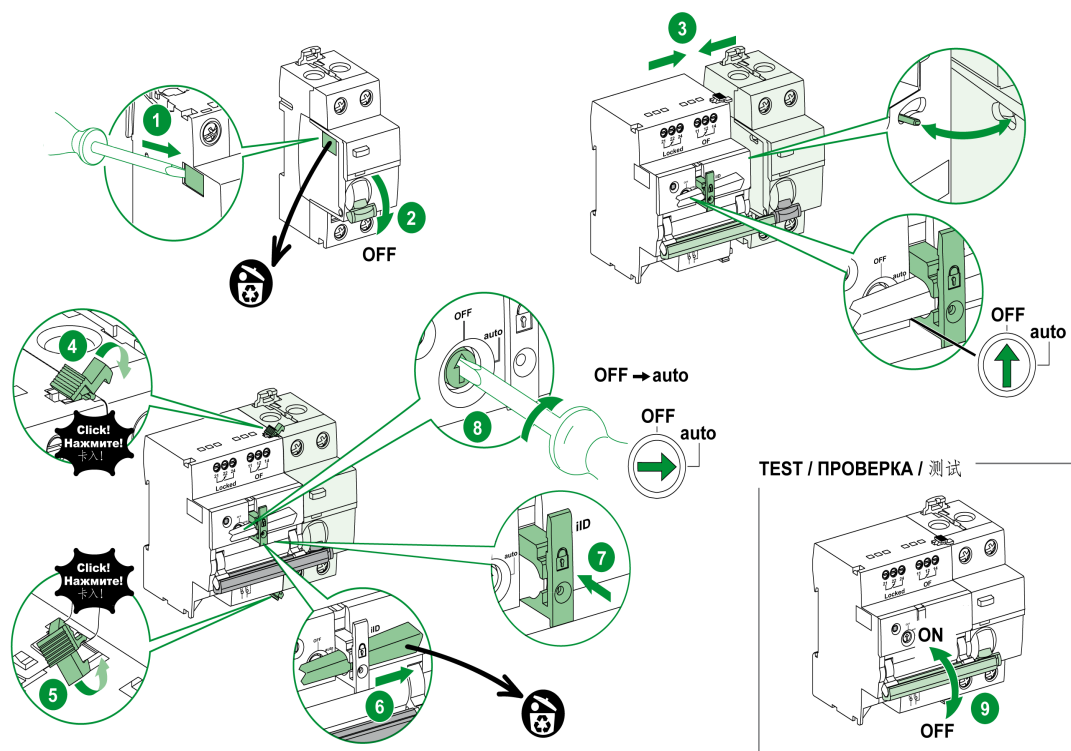
Failure to follow these instructions can result in equipment damage.



A - ARA iID 2P
B - ARA iID 4P

Assembly Procedure with the iID Residual Current Circuit Breaker

Step	Action
1	Remove the blanking plate on the left-hand side of the iID residual current circuit breaker using a screwdriver.
2	Move the ARA automatic recloser handle to the open position (OFF).
3	Move the iID residual current circuit breaker handle to the open position (OFF).
4	Check that the remote control inhibitor switch is on OFF position to unlock the padlocking device.
5	Check that the padlocking device on the ARA automatic recloser is open (device pulled out).
6	Connect the ARA automatic recloser to the iID residual current circuit breaker, ensuring that the release rod is inserted correctly.
7	Close the locking tab located on top of the ARA automatic recloser.
8	Close the locking tab located underneath the ARA automatic recloser.
9	On a new product remove the piece of card holding the padlocking device in the open position.
10	Push back the padlocking device.
11	Check that the unit has been assembled correctly by moving the handle of ARA from the ON to the OFF position and back again.



Assembly with Optional Auxiliaries

Once the ARA automatic recloser has been assembled with an iID 2P residual current circuit breaker, a maximum of 2 indication/tripping auxiliaries can be added.

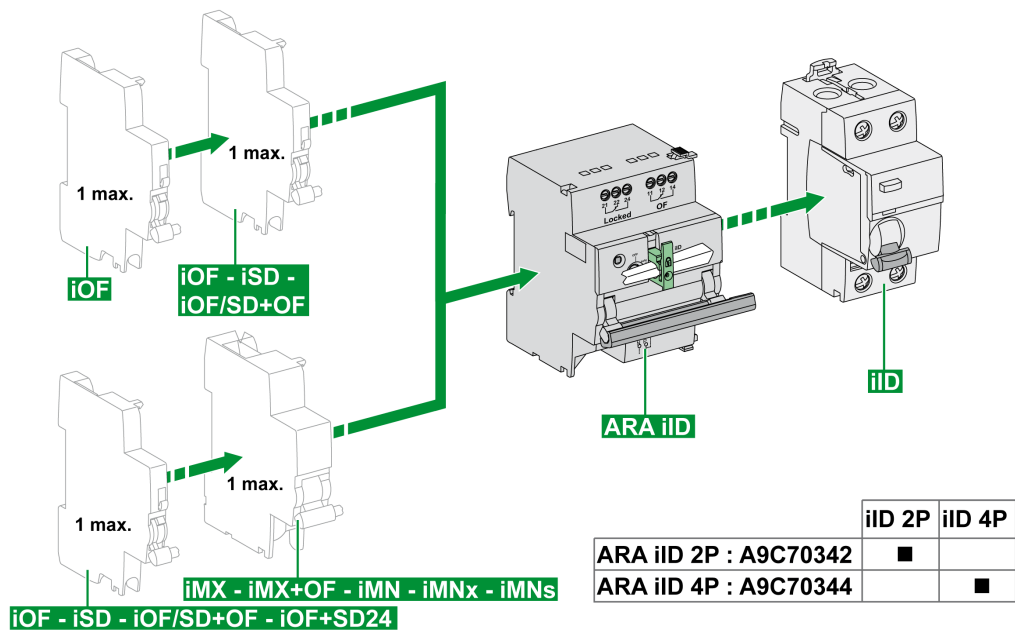
The following table shows the possible combinations of indication or tripping auxiliaries in position 2 depending on the auxiliary in position 1. The auxiliary in position 1 is located closest to the automatic recloser.

Position	1°	iOF	iSD	iOF/SD+OF	iMX	iMX+OF	iMN	iMNs	iMNx
	2°								
iOF		√	√	√	√	√	√	√	√
iSD		-	-	-	√	√	√	√	√
iOF/SD+OF		-	-	-	√	√	√	√	√
iOF+SD24		-	-	-	√	√	√	√	√
iMX		-	-	-	-	-	-	-	-
iMX+OF		-	-	-	-	-	-	-	-
iMN		-	-	-	-	-	-	-	-
iMNs		-	-	-	-	-	-	-	-
iMNx		-	-	-	-	-	-	-	-

The auxiliaries:

- must be mounted to the left of the ARA automatic recloser
- must not be mounted between the ARA automatic recloser and the iID residual current circuit breaker.

The diagram below shows the possible combinations of an ARA iID automatic recloser and optional auxiliaries.

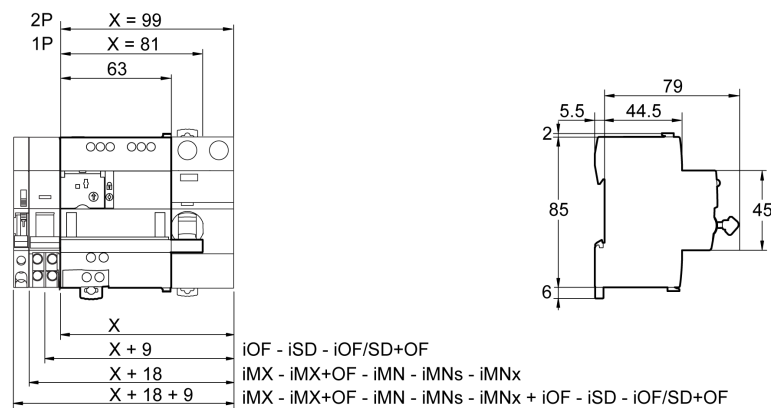


Assembly Procedure with Auxiliaries

Step	Action
1	Remove the blanking plate on the left-hand side of the ARA iID automatic recloser using a screwdriver.
2	Move the ARA automatic recloser handle to the open position (OFF).
3	Check that the remote control inhibitor switch is on OFF position to unlock the padlocking device.
4	Check that the padlocking device on the ARA automatic recloser is open (device pulled out).
5	Connect the auxiliary to the ARA automatic recloser, ensuring that the release rod is inserted correctly.
6	On a new product remove the piece of card holding the padlocking device in the open position.
7	Push back the padlocking device.
8	Check that the unit has been assembled correctly by moving the handle of ARA from the ON to the OFF position and back again.

Dimensions

The dimensions of the ARA iID automatic recloser assembled with an iID residual current circuit breaker and, optionally, with an indication/tripping auxiliary are as follows:



The widths of the indication/tripping auxiliaries are as follows:

Auxiliary	Type	Width
Indication	iOF - iSD - iOF/SD+OF - iOF+SD24	9 mm
Tripping	iMX - iMX+OF - iMN - iMNx - iMNx	18 mm
Indication + tripping	iOF - iSD - iOF/SD+OF - iOF+SD24 + iMX - iMX+OF - iMN - iMNx - iMNx	27 mm

Connection

Safety Instructions

⚡ ⚠ **DANGER**

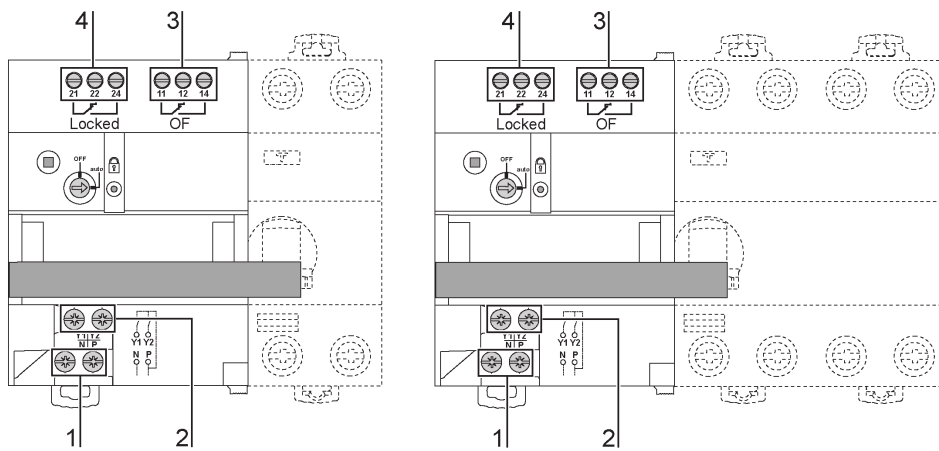
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Wear appropriate personal protective equipment and follow the standard electrical safety precautions.
- Only qualified electricians who have read the relevant instructions are authorized to install this equipment.
- NEVER work alone.
- Disconnect all current and voltage sources before carrying out visual inspections, testing or maintenance work on this equipment. Always assume that all circuits are live until they have been de-energized, tested and labeled. Pay particular attention to the design of the power supply circuit. Take account of all power supply sources, including in particular feedback possibilities.
- Before closing the covers and doors, carefully inspect the working area to ensure that no tools or other items have been left inside the equipment.
- Take care when removing or replacing panels. In particular, make sure that they do not touch live busbars. To minimize the risk of injury, avoid handling panels.
- If this equipment is to remain in good working order it must be handled, installed and operated correctly. Failure to comply with basic installation instructions may lead to injury and may damage the electrical equipment or other property.
- NEVER shunt an external fuse/circuit breaker.
- This equipment must be installed inside a suitable electrical cabinet.

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

Connection Blocks

The figure below shows the 4 connection blocks for an ARA automatic recloser.



- 1 230 Vac power supply terminal block
- 2 Y1/Y2 control input terminal block
- 3 Residual current circuit breaker state indication contact terminal block (OF)
- 4 Automatic recloser state terminal block

Description of Terminals

230 Vac power supply terminal block

Terminals	Function
N	Neutral
P	Phase

Y1/Y2 control input terminal block

Terminals	Function
Y1	Remote inhibition of automatic recloser
Y2	Remote control of intermediate and final reclosing















Residual current circuit breaker state indication contact terminal block (OF)

Terminals	Contact	Function
11-12	NC (normally closed)	Residual current circuit breaker state: closed
11-14	NO (normally open)	Residual current circuit breaker state: open

Automatic recloser state terminal block (Locked)

Terminals	Contact	Function
21-22	NC (normally closed)	Automatic recloser state: locked
21-24	NO (normally open)	Automatic recloser state: not locked

Connection Characteristics

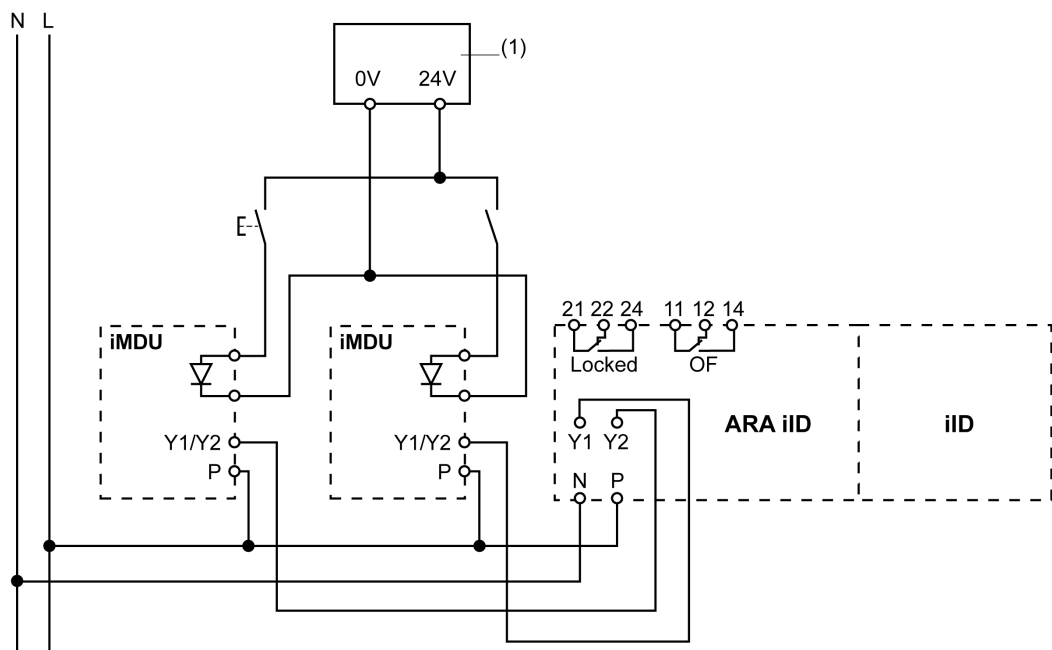
																																																																																																																																																																																																																																														
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Power Supply to Control Inputs via an iMDU Auxiliary



The Y1/Y2 control inputs of ARA automatic reclosers operate with a voltage of 230 Vac. An iMDU auxiliary allows an ARA automatic recloser to be controlled by means of a 24/48 Vac/dc output.

The diagram below shows the connection of the control inputs of the ARA automatic recloser by means of iMDU auxiliaries.



The catalog number for the iMDU auxiliary can be found in the corresponding section ([see page 10](#)).

Chapter 3

Usage

What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Safety Instruction	24
Operation	25
Usage	30

Safety Instruction

Safety Message

<i>NOTICE</i>
RISK OF DAMAGING THE ARA IID SWITCHGEAR When the switch is OFF, position the padlocking device in retracted position before moving the lever. Failure to follow these instructions can result in equipment damage.

Operation

Introduction

The ARA iID automatic recloser performs a maximum of 15 reclosing operations.

The program includes the following settings:

- A time delay before reclosing (TA)
- A check time (TB)

2 types of fault can occur on a line:

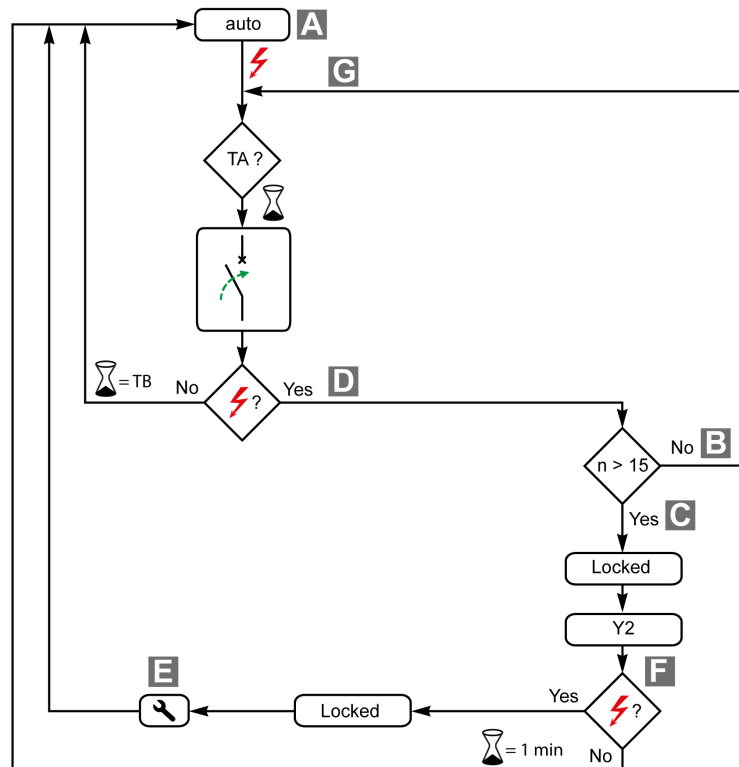
- Transient: The fault occurs but does not reappear
- Permanent: The fault is continuously present

ARA iID automatic recloser provides a means of dealing with these various fault types.

Operating Principle of the Automatic Recloser

When a fault occurs, the system trips and reclosing takes place at the end of time TA. After reclosing, if a new fault occurs during time TB the fault counter is incremented or else the counter is reset to 0. If the fault counter exceeds 15 reclosing operations, ARA iID locks itself out.

ARA iID automatic recloser then has to be reinitialized either manually or remotely by means of input Y2.



Key	Description
TA	Time delay before reset
	Reclosing
TB	Check time after reset
	Fault
n	Number of reclosing attempts
N	Maximum authorized number of reclosing attempts (15)
Y2	Final reclosing attempt
	Locked state: intervention needed

Each response by the ARA automatic recloser is detailed in a timing diagram:

Timing diagram	Description
A	Activation (Y1 = 1) / inhibition (Y1 = 0) (see page 26)
B	n transient faults (n ≤ 15) (see page 27)
C	n transient faults (n > 15) (see page 27)
D	Permanent fault (see page 27)
E	Reset via auto/OFF switch or manual reclosing (see page 28)
F	Final reclosing (see page 28)
G	Intermediate control (see page 29)

Reclosing Programs

The reclosing program parameters are shown in the following table:

Number of reclosing operations	Time delay before reclosing TA	Check time TB	Final reclosing attempt Y2
15	10 s	30 min	Once per cycle
	20 s	30 min	
	40 s	30 min	
	3 min	30 min	
	3 min	30 min	
	3 min	30 min	
	3 min	30 min	
	3 min	30 min	
	3 min	30 min	
	3 min	30 min	
	3 min	30 min	
	3 min	30 min	
	3 min	30 min	
	3 min	30 min	
	3 min	30 min	

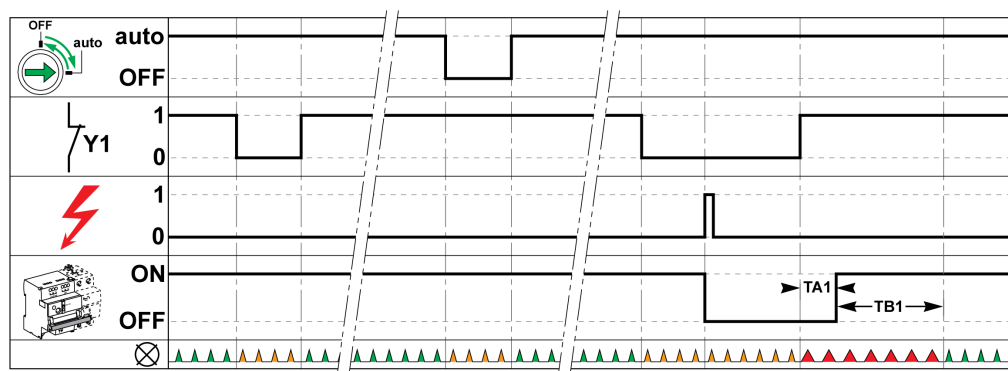
Timing Diagram A: Activation and Inhibition

The automatic recloser can be activated or inhibited in 2 ways:

- Remotely, by means of input Y1
 - Remote inhibit of automatic reset
Y1 = 0 iID inhibition
 - Y1 = 1 iID activation
- Locally, by moving the OFF/auto switch to the OFF position.

When the automatic recloser is inhibited, the state LED flashes orange and reclosing is impossible.

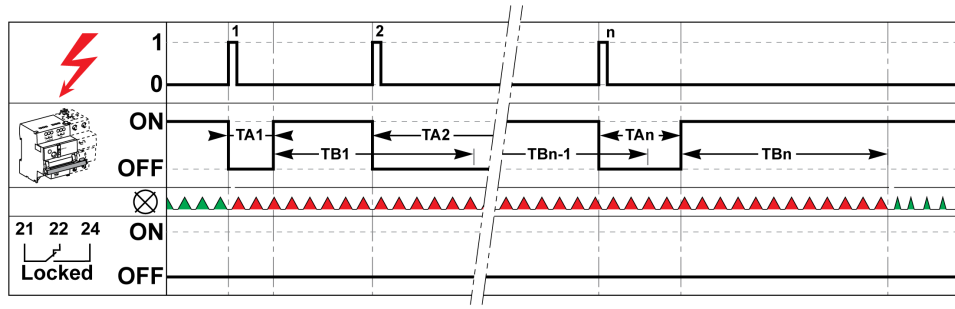
The following timing diagram illustrates operation of the ARA iID automatic recloser:



Timing Diagram B: Transient Faults ($n \leq 15$)

Several short-lived faults occur in succession: the fault counter is incremented consecutively but the maximum authorized number of reclosing operations is not reached. The automatic recloser protects the installation while also maintaining its availability.

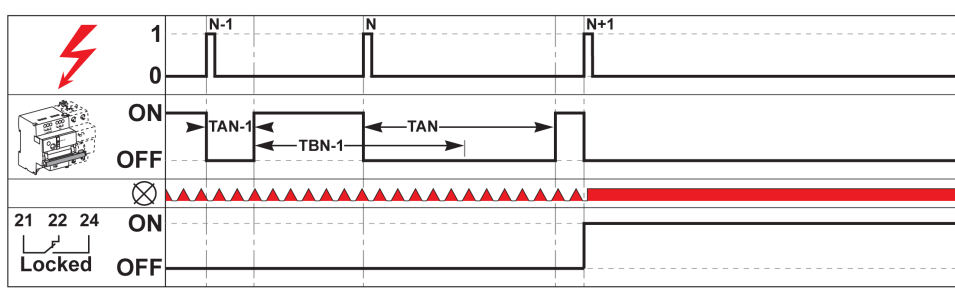
The following timing diagram illustrates operation of the ARA IID automatic recloser:



Timing Diagram C: Transient Faults ($n > 15$)

Several short-lived faults occur on the line and their number exceeds the maximum authorized number of faults to ensure the safety of the installation. The automatic recloser locks and the installation is not powered up again: the automatic recloser maintains the safety of the installation.

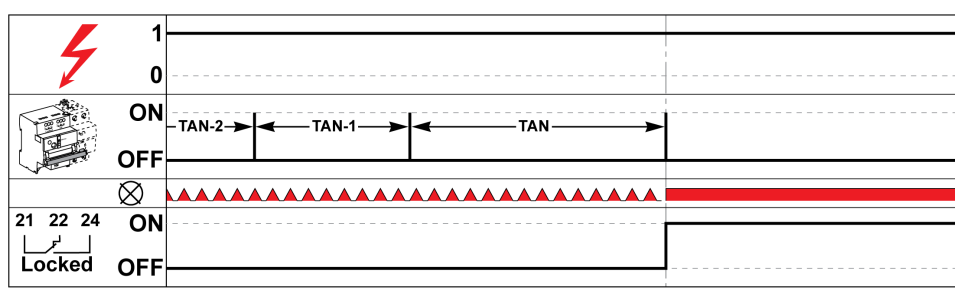
The following timing diagram illustrates operation of the ARA IID automatic recloser:



Timing Diagram D: Permanent Fault

If a permanent fault occurs on the installation, the automatic recloser locks after the maximum authorized number of reclosing operations has been reached. The installation cannot be powered up again automatically. Human intervention is needed to clear the fault. The safety of the installation is maintained.

The following timing diagram illustrates operation of the ARA IID automatic recloser:

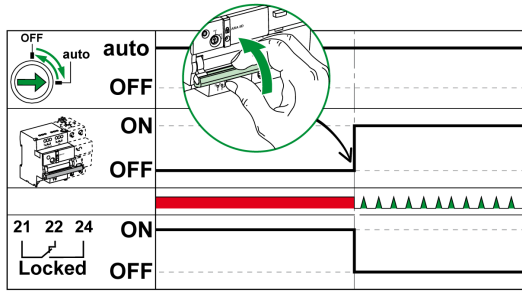


Timing Diagram E: Reinitialization

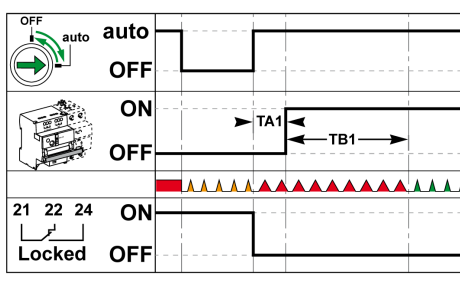
If the automatic recloser is locked (owing to too high a number of reclosing attempts), it can be reinitialized in 2 ways:

- By reclosing the residual current circuit breaker manually using the handle. In this case reclosing is immediate.
- By moving the auto/OFF switch to the OFF position and then to the auto position. In this case reclosing occurs at the end of time TA.

The following timing diagram illustrates operation of the ARA iID automatic recloser when the residual current circuit breaker is reinitialized by manual reclosing:



The following timing diagram illustrates operation of the ARA iID automatic recloser when the residual current circuit breaker is reinitialized by means of the auto/OFF switch:

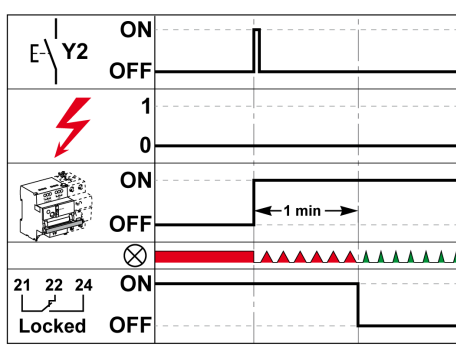


Timing Diagram F: Final Reclosing

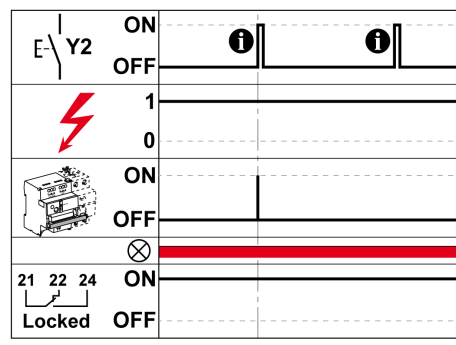
If the automatic recloser is locked, a pulse at input Y2 can be used to reclose it remotely. Only one reclosing attempt is permissible.

The following timing diagram illustrates operation of the ARA iID automatic recloser:

Without default



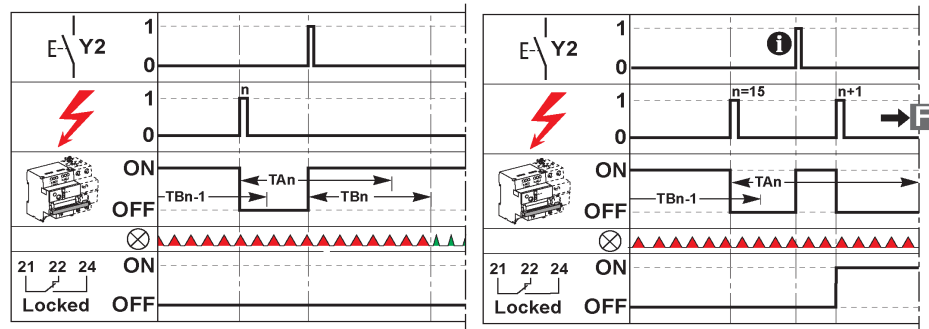
With permanent default



i: Only one Y2 command can be attempted in order to reclose the locked ARA iID automatic recloser.

Timing Diagram G: Intermediate Control

A pulse at input Y2 when reclosing is in progress allows the ARA iID automatic recloser to be reclosed before the end of time TA. Only one intermediate command is permissible during time TA.

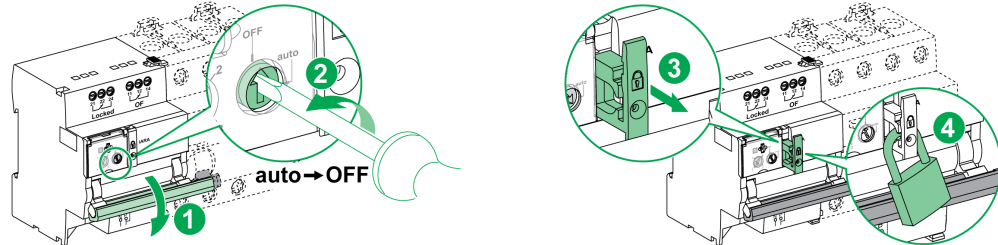


i: Only one Y2 command can be attempted in order to reclose the locked ARA iID automatic recloser.

Usage

Padlocking

This procedure shows how to padlock the ARA automatic recloser and the residual current circuit breaker before starting electrical work. It is impossible to reclose the automatic recloser and residual current circuit breaker either remotely or locally without removing the padlock and pushing in the padlocking device.



Step	Action
1	Open the residual current circuit breaker by moving the handle down.
2	Set the remote control inhibitor switch to the OFF position.
3	Pull out the padlocking device of the ARA automatic recloser.
4	Attach the padlock (diameter 3 to 6 mm) to the padlocking device. The automatic recloser and the residual current circuit breaker are electrically padlocked.

Chapter 4

Application Example

Application Example for ARA Automatic Recloser

Introduction

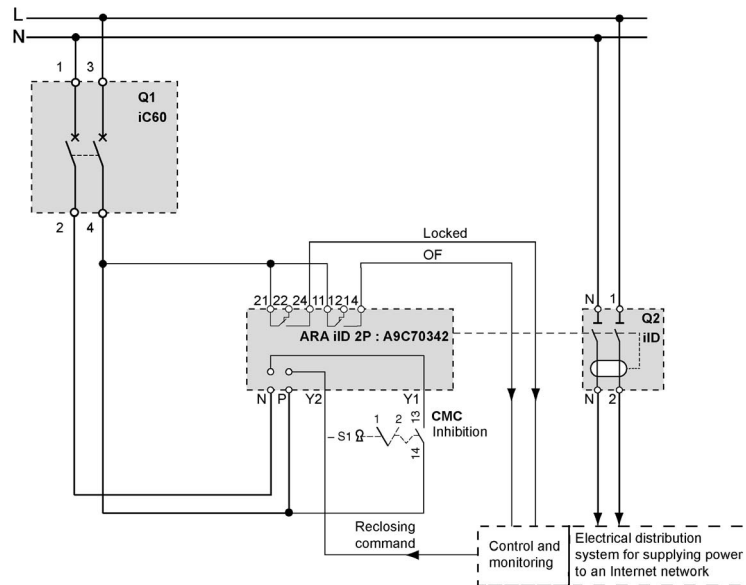
The ARA automatic recloser can be used to carry out the following operations:

- Automatically reclose an iID residual current circuit breaker
- Select a predefined reclosing program to ensure the safety and availability of installations, depending on the type of installation
- Padlock the automatic recloser

The ARA automatic recloser increases the availability of installations which are unmonitored, isolated, difficult to access or demand high availability (mobile telephony systems, roads, pumping stations, airports, railways, meteorological stations, service stations, automated teller machines, public lighting, tunnels, etc.). In the case of transient faults (atmospheric disturbance, industrial overvoltages, etc.), availability can be maintained without the need for operator intervention.

Application Example of the Power Supply to an Internet Distribution Box

The diagram below shows the use of an ARA automatic recloser with an iID residual current circuit breaker to control an electrical distribution system for supplying power to an Internet network.





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