

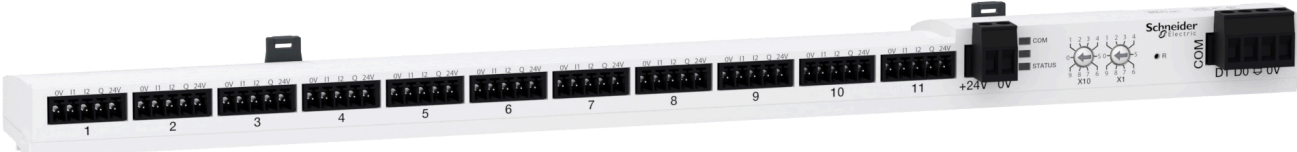


I/O Smart Link

User Guide

EcoStruxure offers IoT-enabled architecture and platform.

DOCA0302EN-03
05/2024



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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 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.

Safety Instructions

⚠ WARNING
UNEXPECTED START OF OPERATION ONLY use I/O Smart Link to control electrical loads that can be safely left unattended. Failure to follow these instructions can result in death, serious injury, or equipment damage.

About the Book

Document Scope

The purpose of this guide is to provide users, installers and maintenance personnel with the technical information necessary to install and use the EcoStruxure™ I/O Smart Link module.

Validity Note

The I/O Smart Link module can be easily integrated into any building management architecture.

It combines command and control, metering and protection functions designed for energy efficiency solutions in any type of environment. Based on the Modbus protocol, the I/O Smart Link module allows switchboard data to be exchanged in real time with a supervision system or a PLC.

The pre-wired connector system increases efficiency and helps to prevent wiring errors during installation.

This guide applies to I/O Smart Link with minimum firmware version 003.003.004. For legacy Acti9 Smartlink product with firmware version 001.003.007 or lower, refer to DOCA0004**, page 8.

Online Information

The information contained in this guide is likely to be updated at any time. Schneider Electric strongly recommends that you have the most recent and up-to-date version available on www.se.com/ww/en/download.

The technical characteristics of the devices described in this guide also appear online. To access the information online, go to the Schneider Electric home page at www.se.com.

Related Documents

Title of documentation	Reference number
I/O Smart Link - Firmware Release Notes	DOCA0303EN DOCA0303DE DOCA0303ES DOCA0303FR DOCA0303IT DOCA0303PT
<i>I/O Smart Link - Instruction Sheet</i>	PKR5509302
<i>iACT24 - Auxiliary on the iCT Contactor - Instruction Sheet</i>	S1B3342101
<i>iATL24 - Auxiliary on the iTL Remote Control Switch - Instruction Sheet</i>	S1B3342201
<i>RCA iC60 - Remote Control Auxiliary - Instruction Sheet</i>	S1A4079001
<i>Reflex iC60 - Integrated Remote Control Circuit Breaker - Instruction Sheet</i>	S1B8674701
<i>RCA iC60 Remote Control for iC60 Circuit Breakers - Reference Manual</i>	A9MA01EN A9MA01DE A9MA01ES A9MA01FR A9MA01IT A9MA01PT
<i>Reflex iC60 Integrated Control Circuit Breaker for iC60 Circuit Breakers - Reference Manual</i>	A9MA03EN A9MA03DE A9MA03ES A9MA03FR A9MA03IT A9MA03PT
<i>Acti9 Smartlink Modbus Communication System - User Manual</i>	DOCA0004EN DOCA0004DE DOCA0004ES DOCA0004FR DOCA0004IT DOCA0004PT

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EcoStruxure Communication System

EcoStruxure Master Range

EcoStruxure is Schneider Electric's IoT-enabled, plug-and-play, open, interoperable architecture and platform, in Homes, Buildings, Data Centers, Infrastructure and Industries. Innovation at Every Level from Connected Products to Edge Control, and Apps, Analytics and Services.

Introduction

EcoStruxure I/O Smart Link is used to connect final distribution boards to any supervision system.

EcoStruxure I/O Smart Link can be connected to:

- iOF+SD24 and OF+SD24 indication auxiliaries
- iACT24 and iATL24 auxiliaries for contactors and impulse relays in the Acti 9 range
- Acti 9 RCA iC60 remote control module with Ti24 interface
- Reflex iC60 integrated control circuit breaker with Ti24 interface
- Pre-wired cables
- iEM2000T pulse output meter

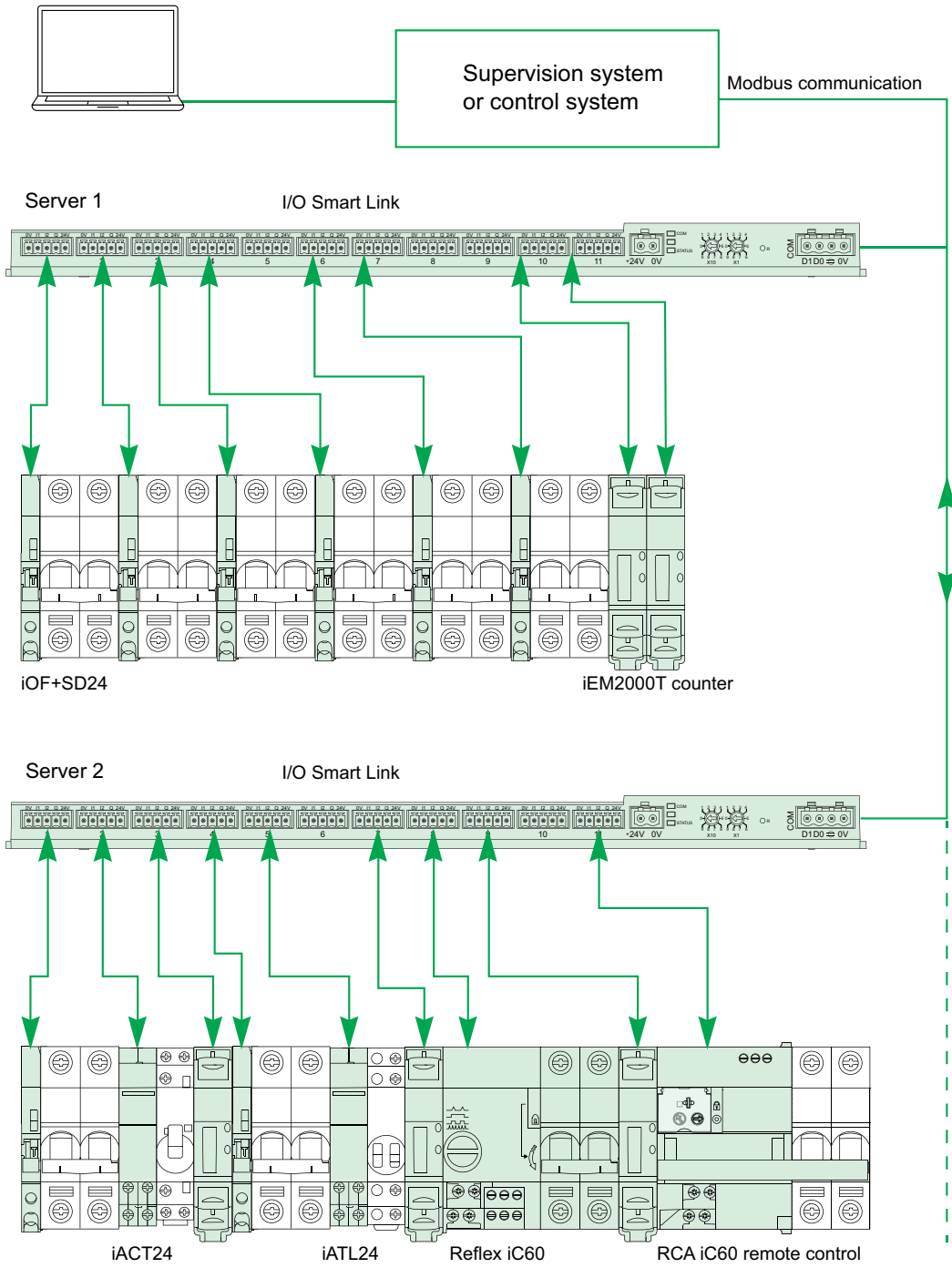
I/O Smart Link offers the advantages and services of an automatic connection to the Modbus network.

I/O Smart Link is an open system:

- I/O Smart Link can be used as a standard I/O distributed module.
- I/O Smart Link is equipped with eleven 24 Vdc channels. Each channel is represented by a Ti24 interface consisting of:
 - Two power supply terminals: 0 V and 24 Vdc
 - Two 24 Vdc digital inputs (I1 and I2)
 - One 24 Vdc digital output (Q)
- Each Ti24 interface is compatible with Miniconnect Phoenix standard connectors (at intervals of 3.81 mm (0.15 in)) or equivalent.
- I/O Smart Link is compatible with any type of counter (pulse output) compliant with standard IEC 62053-21 (minimum pulse 30 ms):
 - The pulse weight must be configured (written in a Modbus register).
- I/O Smart Link is compatible with any type of device equipped with low level inputs and outputs (24 Vdc).

I/O Smart Link is simple to use and maintenance-free. The system pre-wired cables reduce complexity and wiring time by allowing connection on all Acti 9 components and 24 Vdc compatible products.

EcoStruxure Communication System Block Diagram



Integration of I/O Smart Link in Schneider Electric Offers

I/O Smart Link can connect via an RS 485 link to the following offers:

- PLCs
- Building management system:
 - EcoStruxure Building Operation platform, version V1.2 or later
- Supervisors and human machine interfaces (HMIs):
 - EcoStruxure Power Monitoring Expert , ION-E electrical distribution supervisor, version V6.0 or later
 - Control and display of Magelis interfaces
- Controllers dedicated to energy management:
 - Gateways and energy servers : Smartlink SIB, Ecostruxure Panel Server

For installations using other communication systems (for example, LON, KNX, BACnet), compatibility is provided by means of suitable gateways (for example: Modbus/KNX).

Architecture of EcoStruxure Communication System

What's in This Part

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EcoStruxure I/O Smart Link

Introduction

The I/O Smart Link device has 11 channels (24 Vdc) and can be connected to devices in the Acti 9 range equipped with a Ti24 interface. Thanks to the Ti24 link, data can be transmitted from the I/O Smart Link device to a PLC or a supervision system via a Modbus communication network.

The I/O Smart Link channels can also be used to transmit standardized I/O. The I/O Smart Link device can also therefore communicate with devices (not in the Acti 9 range) with or without a Ti24 link.

Devices which can be connected to the I/O Smart Link device include:

- Acti 9 products: control switch for iACT24 contactors and iATL24 impulse relays, iC60 iOF+SD24 indication auxiliary, C60 OF+SD24 indication auxiliary, RCA iC60 remote control with Ti24 interface, Reflex iC60 integrated control circuit breaker with Ti24 interface
- Meters: iEM2000T or other meters (Schneider Electric or other manufacturers) in compliance with IEC 62053-21 (minimum pulse 30 ms).
- Any product (not in the Acti 9 range) that has command and control information: two discrete 24 V outputs and one discrete 24 V inputs.

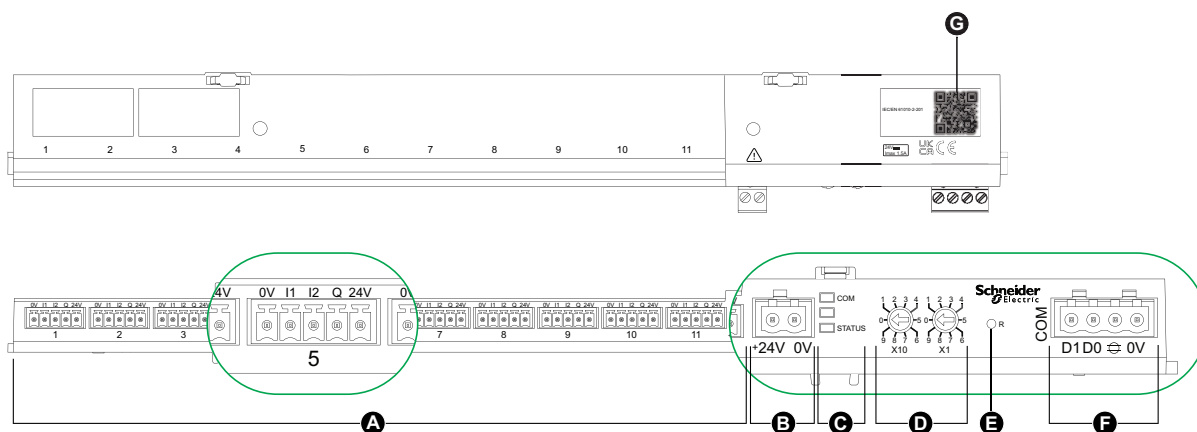
The I/O Smart Link device is an intermediary between the supervisor and various electrical appliances. It can therefore be used to retrieve and process data received from devices and also control them. The functions available depend on the type of connected devices.

The I/O Smart Link functions are described in detail, page 56.

Description

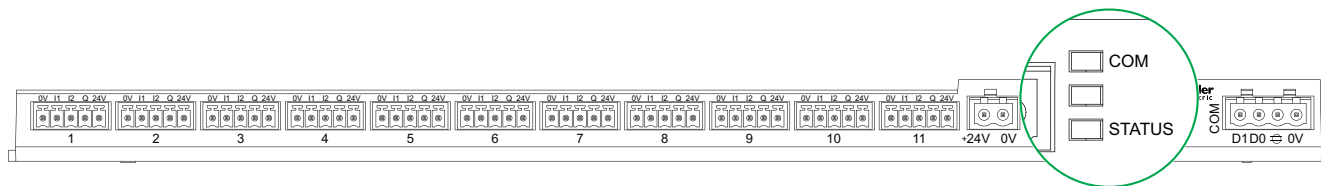
The following figure shows the front and top faces of I/O Smart Link device:

For detailed information regarding installation instructions, refer to [PKR5509302 I/O Smart Link - Instruction Sheet](#).



- 11 digital input/output channels
- One 24 Vdc power supply connector
- LEDs that show the device operating status
- Two Modbus address coding switches
- Reset button
- One 4-pin Modbus connector
- QR code to access product information

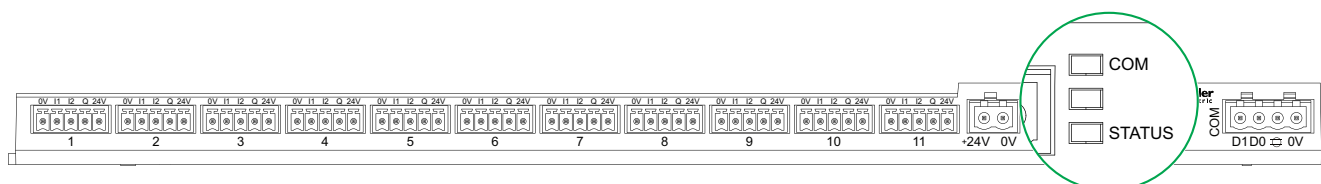
Status LED



The **STATUS** LED indicates the operation mode of I/O Smart Link:

LED indication	Description
<input type="checkbox"/> STATUS	Light off. I/O Smart Link switched off.
<input checked="" type="checkbox"/> STATUS	Green light when the I/O Smart Link device operates normally.
<input type="checkbox"/> STATUS	<ul style="list-style-type: none"> Slow green light blinking (1 blink / s) while pressing reset button between 1 and 10 seconds. Communication settings are reset if pushbutton released before 10 seconds. Fast green light blinking (2 blinks / s) while pressing reset button for more than 10 seconds. Customer settings are reset to factory settings.
<input type="checkbox"/> STATUS	Orange light in case of a degraded mode: <ul style="list-style-type: none"> I/O Smart Link power-up Problem with peripheral device: short-circuit or overload on the 24 Vdc I/O Power supply level less than 13.7 Vdc
<input type="checkbox"/> STATUS	Orange light blinking during reset to factory settings for between 20 and 30 seconds.
<input type="checkbox"/> STATUS	Alternately green and red lights every second during firmware update.
<input type="checkbox"/> STATUS	Red light when a major malfunction is detected in the I/O Smart Link device.

Communication LED



The **COM** LED indicates the Modbus serial communication status of I/O Smart Link:

LED indication	Description
<input type="checkbox"/> COM	Light off. No Modbus communication.
<input type="checkbox"/> COM	Yellow light when Modbus serial communication is booting during I/O Smart Link power-up.
<input type="checkbox"/> COM	Yellow light flashing when Modbus serial communication is active.

Reset Button

There are two levels of reset launched by pressing the Reset button:

- Level 1: Press and hold the Reset button for between 1 and 10 seconds to reset the communication settings of the I/O Smart Link device.

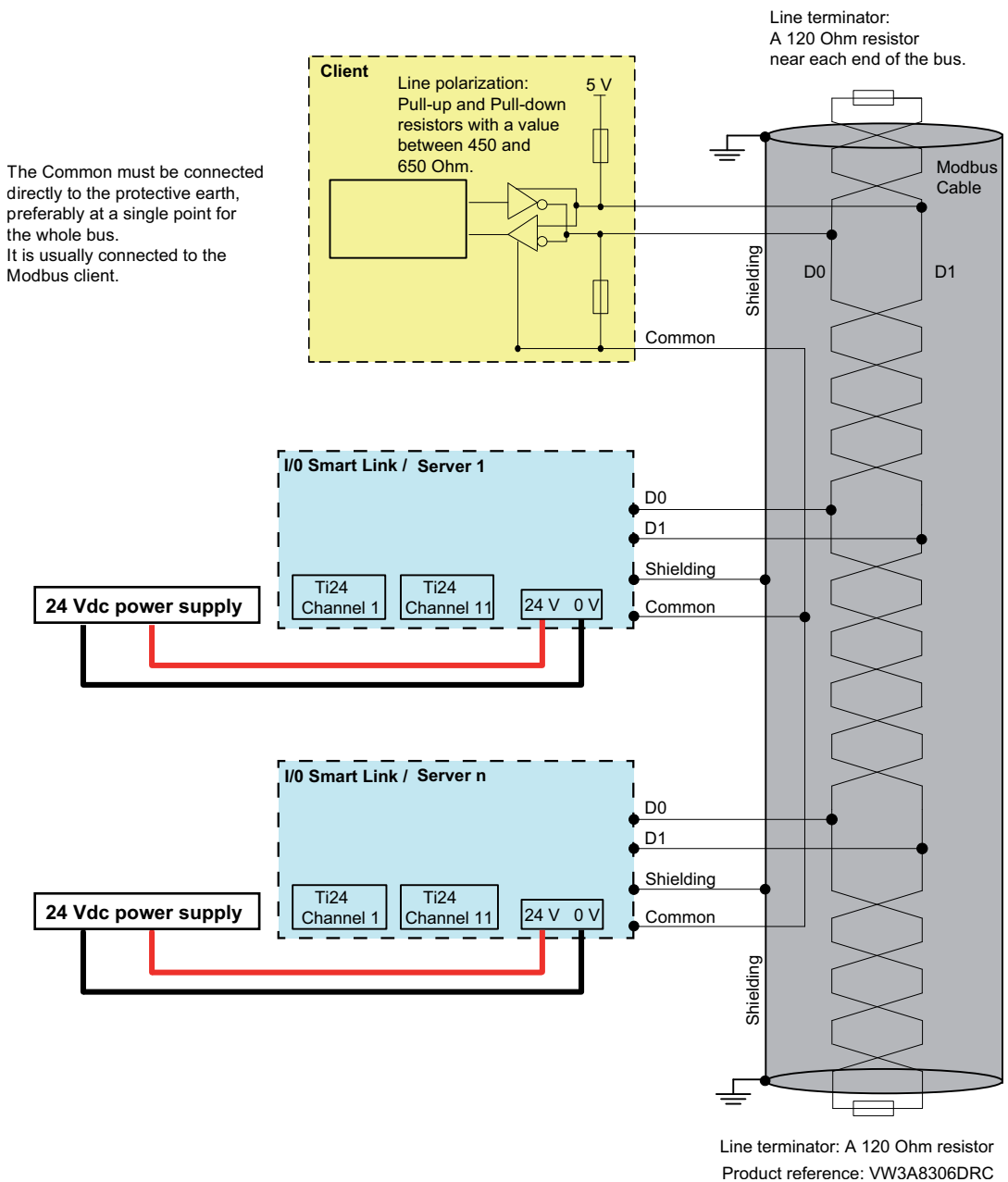
- Level 2: Press and hold the Reset button for more than 10 seconds to reset the I/O Smart Link device to its factory settings. For more information, see [Resetting to Factory Parameters](#), page 55.

Connecting the Modbus Connector

NOTICE
HAZARD OF NON-OPERATION OF MODBUS NETWORK
Comply with the wiring and connection rules described in PKR5509302 <i>I/O Smart Link - Instruction Sheet</i> to create a working Modbus network.
Failure to follow these instructions can result in equipment damage.

The Schneider Electric communication cables to be used are:

Product reference	Description	Length
50965	RS 485 double shielded twisted pair cable for Modbus serial link (supplied without connector)	60 m (196 ft)



NOTE:

- Make sure that line terminator is not already present at client level.
- It is possible to use a common 24 Vdc power supply for several I/O Smart Link devices if installed in the same switchboard.

Checking the Modbus Serial Link

The table gives the characteristics of the RS 485 link that need to be checked during installation:

Designation	Description
Shielding connection	Each Modbus serial link must have shielding connected at one point to an earthed link.
Bus polarization	<ul style="list-style-type: none"> • Pull-up resistor connected to the 5 V: 450–650 Ohm • Pull-down resistor connected to ground (Modbus 0 V): 450–650 Ohm <p>NOTE: This polarization is recommended for the client.</p>
Line terminator	<p>Two Modbus line terminators (120 Ohm + 1 nF), reference VW3A8306DRC.</p> <p>The Modbus cable communication pair has characteristic impedance of 120 Ohm. The Modbus cable must therefore have a Modbus line terminator with 120 Ohm impedance at each end.</p> <p>The Modbus client is at one end of the Modbus cable and usually has a switchable terminal impedance. At the other end of the Modbus cable, a Modbus line terminator with 120 Ohm impedance must be connected.</p> <p>To obtain a high-frequency impedance of 120 Ohm without loading the cable with direct current, the Modbus line terminator is optimized in the form of an RC cell: 120 Ohm in series with a 1 nF capacitor and two 10 cm wires for direct connection to the 5-pin connector of the last Modbus interface module, between D0 and D1.</p>
Ground polarity	The ground circuit (0 V of an optional power supply) must be connected directly to a protected earth, preferably at a single point on the bus. This point is usually placed on the client or its servers.
Trunk cable	A pair of shielded twisted cables and a third conductor at minimum.
Maximum length of bus	1000 m (3280.84 ft) at 19 200 Baud with the Schneider Electric 50965 cable.

Acti 9 Devices with Ti24 Interface

Description

Devices that can be connected to the I/O Smart Link are listed in the following table:

Device	Product Reference	Description
iACT24 auxiliary for iCT contactor	A9C15924	The iACT24 auxiliary: <ul style="list-style-type: none"> allows control and indication of a 230 Vac contactor iCT rated 25 A or higher from the I/O Smart Link by 24 Vdc signals (Y3), allows control by a maintained signal (Y2), is used to find out the contactor status (O/C status).
iATL24 auxiliary for iTL contactor	A9C15424	The iATL24 auxiliary: <ul style="list-style-type: none"> allows control and indication of a 230 Vac impulse relay iTL from the I/O Smart Link by 24 Vdc signals (Y3), allows control by a pulsed signal (Y2), is used to find out the impulse relay status (O/C status).
iOF+SD24 indication auxiliary for iC60, iC40, iDPN, iCV40 and iID, iID40, and iSW-NA	A9A26897	Compatible with downstream comb busbar, the iOF+SD24 indication auxiliary is used to find out the status (OF) and the tripping status upon a fault (\overline{SD}) of iC60, iC40, iDPN, iCV40 and iID, iID40, and iSW-NA.
iOF+SD24 indication auxiliary for iC60, iC40, iDPN, iCV40 and iID, iID40, and iSW-NA	A9A26898	Compatible with upstream comb busbar, the iOF+SD24 indication auxiliary is used to find out the status (OF) and the tripping status upon a fault (\overline{SD}) of iC60, iC40, iDPN, iCV40 and iID, iID40, and iSW-NA.
OF+SD24 indication auxiliary for C60, C120, DPN, DPN Vigi, C60H-DC and ID, SW60-DC, C60PV-DC, C60NA-DC, and C120NA-DC	A9N26899	Compatible with downstream comb busbar, the OF+SD24 indication auxiliary is used to find out the status (OF) and the tripping status upon a fault (\overline{SD}) of the following devices: C60, C120, DPN, DPN Vigi, C60H-DC and ID, SW60-DC, C60PV-DC, C60NA-DC, and C120NA-DC.
iOF/SD24 indication auxiliary for iC60 RCBO	A9A19804	Compatible with downstream comb busbar, the iOF/SD24 indication auxiliary is used to find out the status (OF) or the tripping status upon a fault (\overline{SD}) of the iC60 RCBO.
Acti 9 RCA iC60 remote control with Ti24 interface	A9C7012•	The Acti 9 RCA iC60 remote control: <ul style="list-style-type: none"> Should have a Ti24 interface (with product references A9C70122 and A9C70124). Can be used to control an iC60 circuit breaker via input Y1/Y2 local control depending on the selected mode and Y3 of its Ti24 interface. Input Y3 (24 Vdc) can be controlled by one of the I/O Smart Link channels. Can be used to find out the OF and \overline{SD} status of the circuit breaker associated with the RCA iC60 remote control.
Acti 9 Reflex iC60 integrated control circuit breaker with Ti24 interface	A9C6••••	The Acti 9 Reflex iC60 integrated control circuit breaker: <ul style="list-style-type: none"> Should have a Ti24 interface (with product references A9C6••••). Can allow the device to be controlled via input Y3 of its Ti24 interface. The Y3 (24 Vdc) input can be controlled by one of the I/O Smart Link channels. Can be used to indicate the state of the control circuit (O/C) and circuit breaker state (auto/OFF).

NOTE: All the devices in the preceding table can be connected to channel N ($1 \leq N \leq 11$) of a I/O Smart Link device with A9XCAS06 pre-wired cable (or A9XCAM06 or A9XCAH06).

Acti 9 Devices without Ti24 Interface

Description

Devices that can be connected to the I/O Smart Link are listed in the following table:

Designation	Product Reference	Description
iEM2000T	A9MEM2000T	Single-phase energy meter without display
iEM3110	A9MEM3110	Three-phase energy meter with display
iEM3155	A9MEM3155	Three-phase energy meter with display
iEM3210	A9MEM3210	Three-phase energy meter with display
iEM3255	A9MEM3255	Three-phase energy meter with display
iPRD (Type 2)	A9L****1	Withdrawable surge arresters with remote indication contact iPRD65r/iPRD40r/iPRD20r/iPRD8r
iPRD 40r PV (Type 2)	A9L40271 A9L40281	Withdrawable surge arresters with remote indication contact
iPRF1 12.5r (Type 1 + Type 2; Type B+C)	A9L16632 A9L16633 A9L16634	Monobloc surge arresters with remote indication contact
PRD1 25r (Type 1 + Type 2)	16329 16330 16331 16332	Withdrawable surge arresters with remote indication contact
PRD1 Master (Type 1)	16360 16361 16362 16363	Withdrawable surge arresters with remote indication contact
iQuick PRD (Type 2)	A9L16292 A9L16293 A9L16294 A9L16295 A9L16296 A9L16297 A9L16298 A9L16299 A9L16300	Withdrawable surge arresters with integrated backup MCB and remote indication contact

NOTE:

- The connection of these devices can be done with an A9XCAU06 or A9XCAC01 pre-wired cable: molded connector (at Smart Link end), and with five wires (at device end).
- When connecting OF/SD indication contacts to I/O Smart Link, use only OF/SD indication contacts with low level.

The table describes the products that need a low level interface relay to connect to I/O Smart Link:

Designation	Description
IH, IHP	Timer switches with RBN type low level relays or equivalent
IC	Light sensitive switches with RBN type low level relays or equivalent
TH, THP	Thermostats with RBN type low level relays or equivalent

For more information, refer to technical information from www.se.com.

Other Devices

Description

Devices that can be connected to the I/O Smart Link are:

- Meter with a pulse output and compliant with standard IEC 62053-31
- Volt-free low level indication contact
- Volt-free standard indication contact
- Contactor and relay
- Indication device or PLC input can be directly connected to the output (Q) of I/O Smart Link channel.

The connected device should have the following characteristics:

- To be powered with 24 Vdc
- The consumption must be less than 100 mA
- Any device (for example, motor) that needs a command circuit of more than 100 mA can be controlled by the output (Q) of a channel of I/O Smart Link. The electrical diagram must be indirect between I/O Smart Link and this device: a low level relay must be installed between the command of this device and I/O Smart Link.

NOTE: The connection of these devices can be done with an A9XCAU06 or A9XCAC01 pre-wired cable: molded connector (at Smart Link end), and with five wires (at device end).

Technical Characteristics

General Characteristics

Characteristic		Value
Product marking		CE, UKCA
Temperature	Operation (horizontal)	-25 °C to +60 °C (-13 °F to +140 °F)
	Operation (vertical)	-25 °C to +50 °C (-13 °F to +122 °F)
	Storage	-40 °C to +85 °C (-40 °F to +185 °F)
Tropicalization		Execution 2 (relative humidity of 93% at 40 °C (104 °F))
Resistance to voltage dips		10 ms, class 3 according to IEC/EN 61000-4-29
Degree of protection		IP20
Pollution degree		3
Overvoltage category		OVC II
Conforming to SELV specifications		Yes
Altitude	Operation	0–2,000 m (0–6561.68 ft)
IK degree of protection	IEC 62262	IK06 (1J)
Immunity to electrostatic discharge	IEC/EN 61000-4-2	Class B - Air: 8 kV
		Class B - Contact: 4 kV
Immunity to radiated magnetic interference	IEC/EN 61000-4-3	Class A - 80 MHz to 1 GHz 10 V/m
		Class A - 1.4 GHz to 6 GHz 3 V/m
Immunity to fast transients	IEC/EN 61000-4-4	Class B - 1 kV for the I/O and Modbus communication
		Class B - 2 kV for the 24 Vdc - 5 kHz - 100 kHz power supply
Surge	IEC/EN 61000-4-5	Class B - 1 kV DM coupling 42 Ω; 2 kV CM coupling 42 Ω power supply
		Class B - 1 kV CM coupling 2 Ω Modbus communication
Immunity to conducted magnetic fields	IEC/EN 61000-4-6	Class A - 3 V from 0.15 MHz to 80 MHz
Conducted emissions	IEC 61326–1, CISPR11	Class B - 0.15 MHz to 30 MHz
Radiated emissions	IEC 61326–1, CISPR11	Class B - 30 MHz to 6000 MHz
Mechanical impact resistance for product casing	IEC 62262	1J (IK06)
Environment		Conforms to the RoHS directive and REACH regulations
Installation position		Horizontal or vertical
Mean Time To Failure (MTTF)		More than 1 million hours

Power Supply

Characteristic		Value
Power supply	Nominal	Non-isolated 24 Vdc with protection against negative voltages up to -28.8 Vdc
	Voltage limits	19.2–28.8 Vdc with ripple
	Current consumption, no-load	10 mA
	Maximum input intensity	1.5 A
	Maximum current inrush	7 A

Mechanical Characteristics

Characteristic		Value
Dimensions	Length	359 mm (14.13 in)
	Height	22.5 mm (0.88 in)
	Depth	42 mm (1.65 in)
Weight		188 g (6.63 oz)

Communication Module

Characteristic		Value
Type of interface module		Modbus RTU, RS485 serial connection
Transmission	Transfer rate	<ul style="list-style-type: none"> • 4 800 Baud • 9 600 Baud • 19 200 Baud • 38 400 Baud
	Medium	Double shielded twisted pair
	Modbus line terminator	Impedance 120 Ω
Structure	Type	Modbus
	Method	Client/Server
Device type		Server
Response time		10 ms (approximately)
Maximum length of Modbus line		1,000 m (3280.84 ft)
Type of bus connector		4-pin connector
Isolation	Between the Modbus serial connection and 24 Vdc Ti24 I/O interfaces	2,500 V RMS for 1 minute
Number of digital I/O channels		11

Inputs

Characteristic		Value
Number of digital inputs		22 (two per channel)
Rated input voltage		24 Vdc
Input type		Current sink, type 1 (IEC 61131-2)
Weight (0 V)		1 for two inputs (one per channel)
Input voltage limits		19.2–28.8 Vdc
Rated input current		3 mA
Maximum input current		5 mA
Filtering time		2 ms
Acquisition time		10 ms
Isolation		No isolation between the Ti24 interfaces
Negative voltage protection		Yes
Maximum length of cables and cord sets		500 m (1640.42 ft) (conductor cross-sectional area of at least 0.5 mm ² (20 AWG))
Pulse counter	Maximum frequency	16.667 Hz, IEC 62053-31
	Non-volatile memory	10 years

Outputs

Characteristic		Value
Number of digital outputs		11 (one per channel)
Digital output		Current source, 24 Vdc 0.1 A (IEC 61131-2)
Rated output voltage	Voltage	24 Vdc
	Maximum current	100 mA
Filtering time		1 ms
Voltage drop (voltage at state 1)		1 V maximum
Maximum current inrush		500 mA
Leakage current		0.1 mA
Overvoltage protection		33 Vdc
Short-circuit protection		Yes
Overload protection		Yes
Current limiting		Yes
Maximum length of cables and cord sets		500 m (1640.42 ft) (conductor cross-sectional area of at least 0.5 mm ² (20 AWG))

iACT24 / iATL24

Characteristic		Value
Control voltage (Ue)		230 Vac, +10 %, -15 % (Y2) 24 Vdc, ± 20 % (Y3)
Control voltage frequency		50/60 Hz
Insulation voltage (Ui)		250 Vac
Rated impulse withstand voltage (Uimp)		8 kV (OVC IV)
Level of pollution		3
Degree of protection		IP20B device only IP40 device in modular enclosure
Width in 9 mm (0.35 in) modules		2
Auxiliary contact (O/C) Ti24		24 Vdc protected output, minimum 2 mA, maximum 100 mA
Contact		1 O/C operating category AC 14
Temperature	Operation	-25 to +60 °C (-13 °F to +140 °F)
	Storage	-40 to +80 °C (-40 °F to +176 °F)
Consumption		< 1 W
Standard		IEC/EN 60947-5-1

Sizing the 24 Vdc Power Supply

What's in This Part

Definition of the 24 Vdc Power Supply.....	28
Electromagnetic Compatibility (EMC) Recommendations	30

Definition of the 24 Vdc Power Supply

Insulation of Power Terminals

Isolate the I/O Smart Link power terminals from the power terminals connected to the Modbus network line.

Example: The 0 V and 24 V of a 24 Vdc power supply connected to the IFM Modbus-SL interface with reference LV434000 must be isolated from the **0 V** or **+24 V** terminals of the 24 Vdc power supply for the I/O Smart Link device.

I/O Smart Link Consumption

Status	Consumption
Device with no load	10 mA
Device under load	1.5 A maximum

Products in the Acti 9 Range

If products connected to the channels (Ti24 interfaces) of a I/O Smart Link device are in the Acti 9 range, the maximum consumption of a channel related to this device state is 16 mA.

Example: The consumption of a I/O Smart Link device is as follows:

No-load consumption + Number of channels x Maximum current consumption per channel = 10 mA + 11 x (16 mA) = 186 mA

Products that can be Controlled by a Channel

If products connected to the channels (Ti24 interfaces) of a I/O Smart Link device are in a different range, the maximum consumption of a device channel is 110 mA. The output for each channel supplies 100 mA and the inputs can consume up to 5 mA each.

Example: Assuming that the consumption of one channel is 110 mA, the consumption of one I/O Smart Link device is as follows:

No-load consumption + number of outputs x consumption per channel = 10 mA + 11 x (110 mA) = 1.22 A

Selection of the I/O Smart Link 24 Vdc Power Supply

Follow these recommendations when selecting the 24 Vdc power supply:

- Install the 24 Vdc power supply inside the electrical cabinet.
- Use a different power supply from the Modbus network 24 Vdc power supply so as to maintain galvanic isolation between the Modbus network (common to several electrical cabinets) and the 24 Vdc I/O.
- Use a Safety Extra Low Voltage (SELV) type.
- Ensure that galvanic isolation between the power supply input (AC voltage) and the power supply output (DC voltage) is at least 4 kVac at 50 Hz.

- This power supply can be used to supply other products inside the electrical cabinet provided that these products are double insulated or with reinforced insulation so as to preserve the power supply SELV quality.

It is recommended that the power supply complies with OVC III category.

Overvoltage Protection on the I/O Smart Link Device 24 Vdc Input

In case of overvoltage on the 24 Vdc input on the I/O Smart Link power supply, fuse protection is provided to reduce the hazard of fire.

NOTICE

HAZARD OF FIRE

If the I/O Smart Link device has a fuse blown, replace the device.

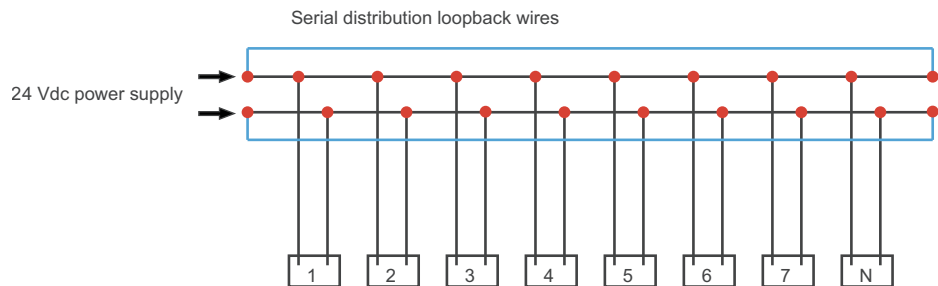
Failure to follow these instructions can result in equipment damage.

Electromagnetic Compatibility (EMC) Recommendations

Electromagnetic Compatibility (EMC) Recommendations

A star 24 Vdc distribution is preferable to a serial 24 Vdc distribution because star 24 Vdc distribution can minimize the wiring impedance.

If serial distribution is used, it is advisable to wire two serial loopback wires (see the two blue wires in the following drawing) in order to minimize impedance.



In a poor-quality electrical distribution network, it is advisable to use a power supply compliant with OVC II and which can withstand up to 500 Vac incoming and also offers galvanic insulation between the power supply AC input and the power supply DC output of 4 kVac at 50 Hz.

It is advisable to comply with the segregation rules between low level signals (24 Vdc) and power conductors, see:

- www.electrical-installation.org see the *ElectroMagnetic Compatibility (EMC)* part, *Wiring recommendations* section (information only available in English).
- EIGED306001EN *Electrical Installation Guide*

Connection of Input/Output Channels

What's in This Part

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Generating Summary Data Using iOF+SD24 or OF+SD24	43

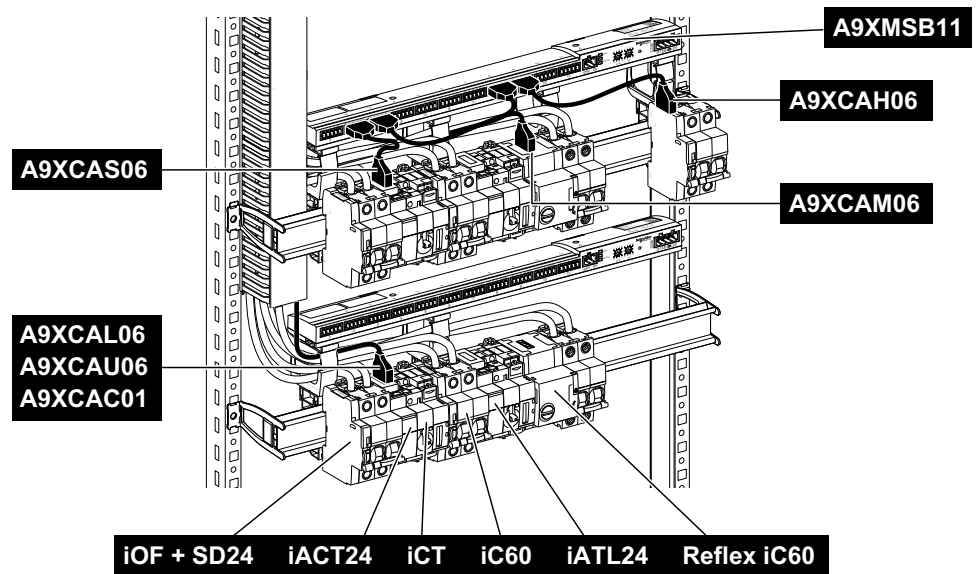
Acti 9 Devices with Ti24 Interface

Overview

Devices (iACT24, iATL24, iOF+SD24, OF+SD24, RCA iC60, Reflex iC60) can be connected to the I/O Smart Link with EcoStruxure communication system pre-assembled cables.

Wiring

The following figure shows the connection of devices to the I/O Smart Link using pre-assembled cables:



NOTE: A9XCAU06 or A9XCAC01 cable could be used to link Acti 9 devices with Ti24 interface to I/O Smart Link.

In this case, for the connection of iACT24 and iATL24, input I2 must be connected to both ends of A9XCAU06 or A9XCAC01 cable.

For detailed information regarding installation instructions, refer to PKR5509302 *I/O Smart Link - Instruction Sheet*.

Meters

Overview

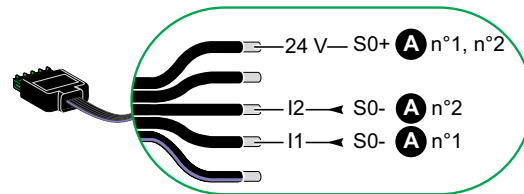
The iEM2000T, iEM3110, iEM3155, iEM3210, iEM3255, and iEM3355 products are kilowatt-hour meters from the Schneider Electric range.

Meters not in the Acti 9 range can be controlled by a I/O Smart Link channel. These meters must have the following characteristics:

- One pulse output
- Compatibility with standard CEI 62053-31

Wiring

iEM2000T, iEM3110, iEM3155, iEM3210, iEM3255, and iEM3355 kilowatt-hour meters can be connected to channel N ($1 \leq N \leq 11$) of a I/O Smart Link device with an A9XCAU06 or A9XCAC01 pre-wired cable: molded connector (at I/O Smart Link end), and with five wires (at iEM2000T end).



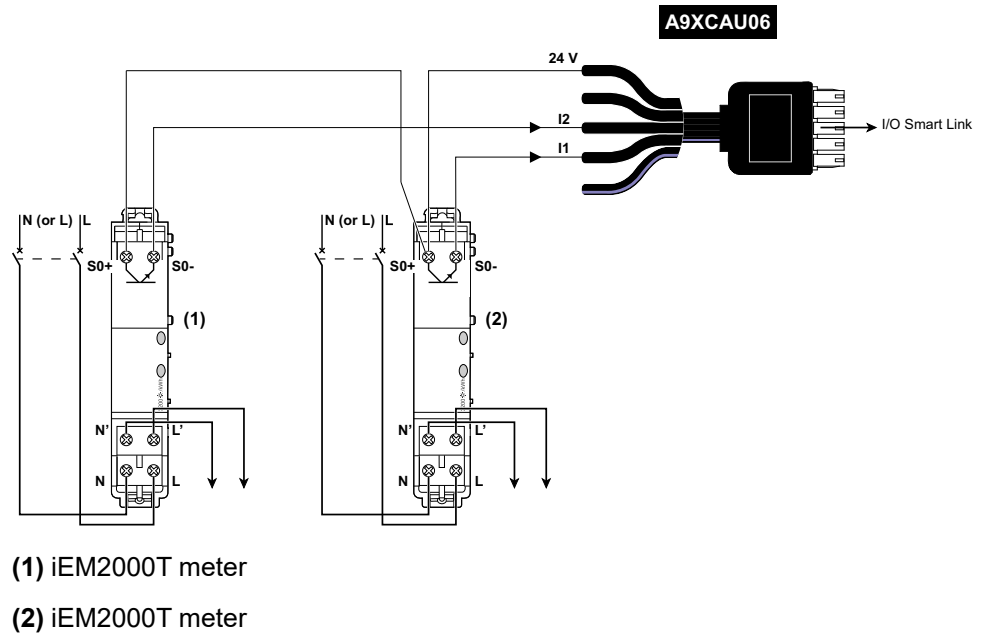
A. Meter

NOTE: A single I/O Smart Link channel can take account of two meters, one meter on input I1 and 1 meter on input I2.

NOTE:

- A maximum of one wire can be connected in each Ti24 connector terminal (A9XC2412).
- Do not connect a wire with cable end in each of the Ti24 connector terminals.

Example of Connection of iEM2000T Meters



Volt-Free Low Level Indication Contact

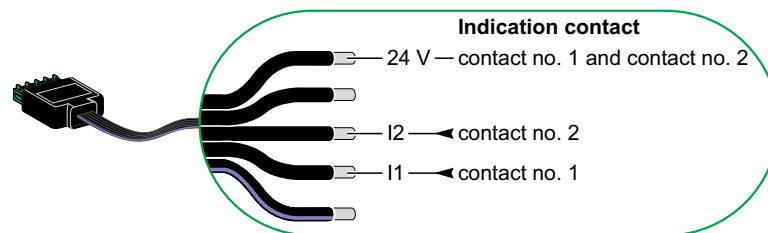
Overview

A low level type indication contact (NO or NC) can be connected to input I1 or I2 of an I/O Smart Link channel.

NOTE: A single I/O Smart Link channel can take account of two indication contacts, one contact on input I1 and one contact on input I2.

Wiring

An indication contact can be connected with an A9XCAU06 or A9XCAC01 pre-wired cable: molded connector (at I/O Smart Link end), and with the five wires (indication contact end).

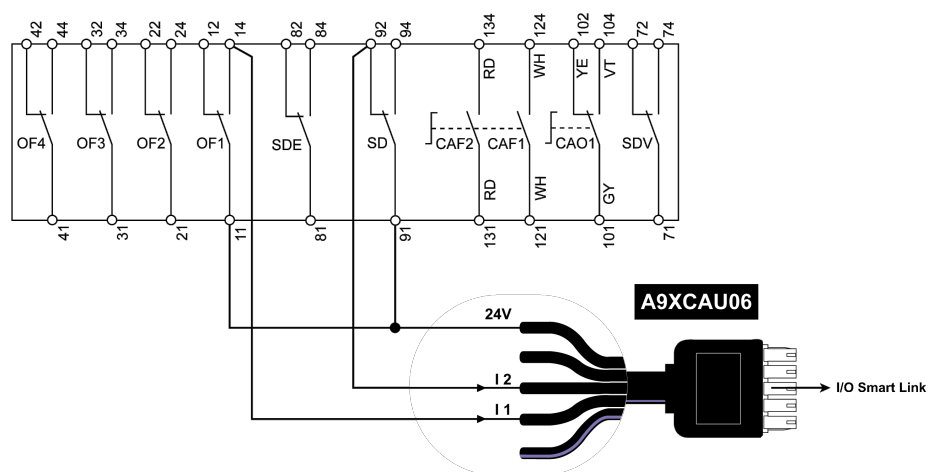


NOTE:

- A maximum of one wire can be connected in each Ti24 connector terminal (A9XC2412).
- Do not connect a wire with cable end in each of the Ti24 connector terminals.

Example of Connection

The OF and SD contacts of a NSX circuit breaker could be directly connected to I/O Smart Link.



Volt-Free Standard Indication Contact

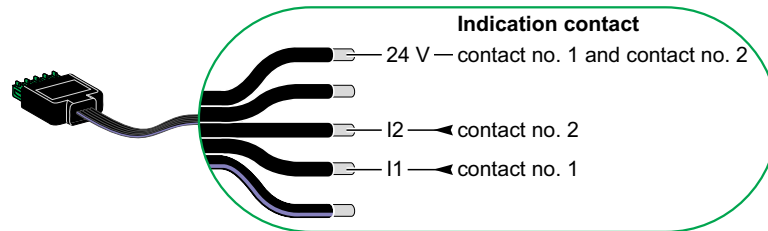
Overview

A standard indication contact (NO or NC) can be connected to input I1 or I2 of a I/O Smart Link channel.

NOTE: A single I/O Smart Link channel can take account of two indication contacts, one contact on input I1 and one contact on input I2. The electrical diagram must be indirect between I/O Smart Link and this device: a low level relay must be installed between the contact of this device and I/O Smart Link.

Wiring

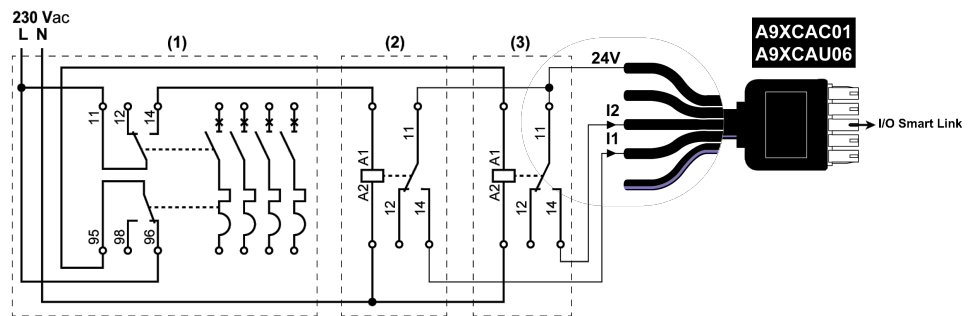
An indication contact can be connected with an A9XCAU06 or A9XCAC01 pre-wired cable: molded connector (at I/O Smart Link end), and with the five wires (indication contact end).



NOTE:

- A maximum of one wire can be connected in each Ti24 connector terminal (A9XC2412).
- Do not connect a wire with cable end in each of the Ti24 connector terminals.

Example of Connection



(1) NG125 circuit breaker: OF+SD auxiliary contacts with a minimum current of 100 mA

(2) iRBN relay for OF signal

(3) iRBN relay for SD signal

Surge Arresters

Overview

Acti 9 surge arresters can be connected to I/O Smart Link:

- The remote transfer contact (indication contact: NO) of an Acti 9 surge arrester can be connected to input I1 or I2 of an I/O Smart Link channel.
- The SD fault-trip indication contact (indication contact: NC) of the circuit breaker associated to an Acti 9 surge arrester can be connected to input I1 or I2 of an I/O Smart Link channel.

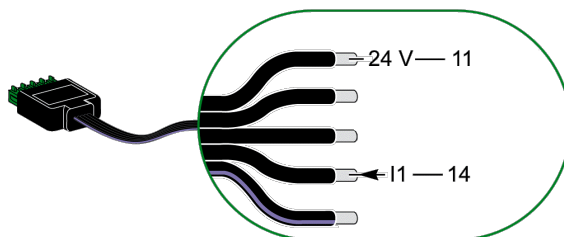
NOTE: A single I/O Smart Link channel can take account of two indication contacts, one contact on input I1 and one contact on input I2.

Wiring

An indication contact can be connected with an A9XCAU06 or A9XCAC01 pre-wired cable: molded connector (at I/O Smart Link end), and with the five wires (indication contact end).

The following wiring is dedicated to surge arresters:

- iPRD (with a commercial reference ending by 1)
- iPRD DC
- iQuick PRD
- iQuick PF (with remote auxiliary)
- iPRF1 12.5r
- PRD1 25r and PRD1 35r
- PRD1 Master

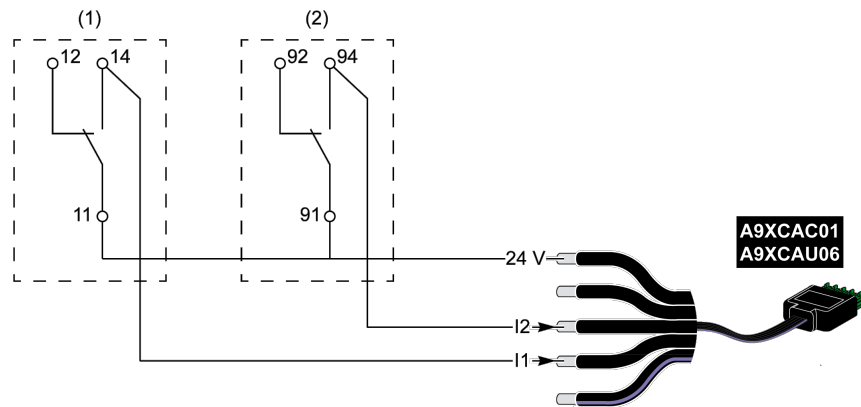


NOTE:

- A maximum of one wire can be connected in each Ti24 connector terminal (A9XC2412).
- Do not connect a wire with cable end in each of the Ti24 connector terminals.

Examples of Connection

Example: Electrical diagram dedicated to iPRD surge arrester.

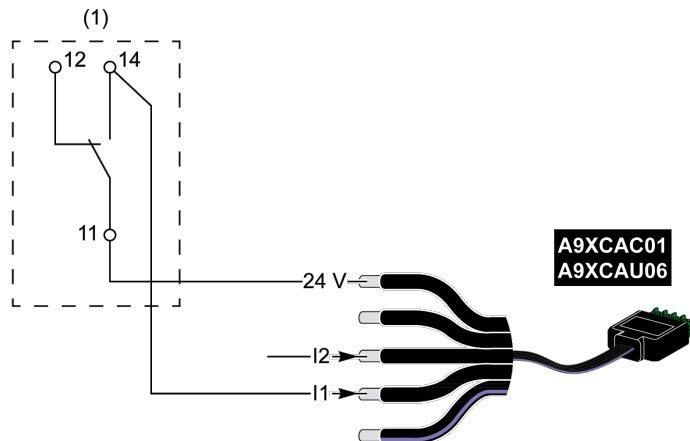


(1) Remote transfer contact of iPRD surge arrester: cartridges status

(2) iSD fault-trip indication contact of iC60 or NG125 circuit breaker associated to iPRD surge arrester

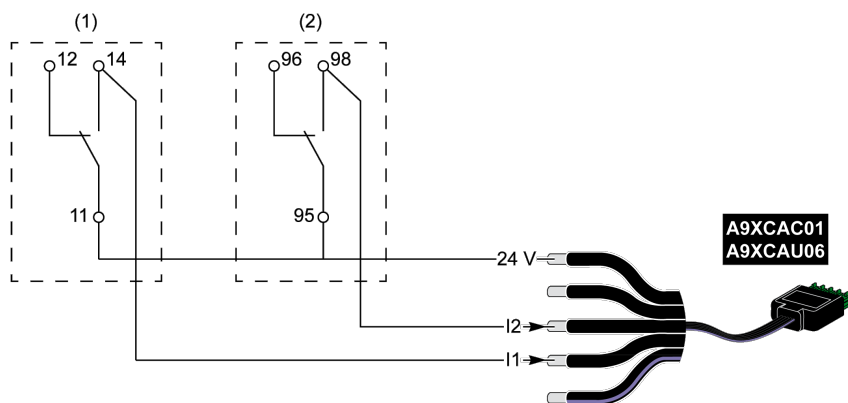
Example: Electrical diagram dedicated to the following surge arresters:

- iQuick PRD
- iQuick PF (with remote auxiliary)



(1) Remote transfer contact of surge arrester: cartridges status

Example: Electrical diagram dedicated to iPRF1 12.5r surge arresters:

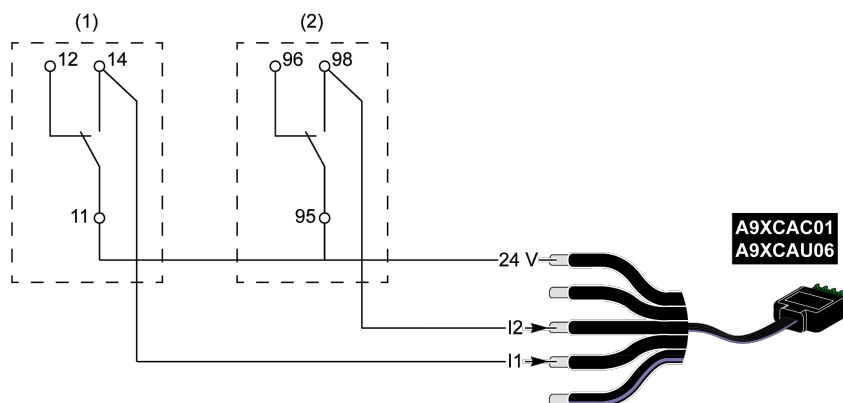


(1) Remote transfer contact of iPRF1 12.5r surge arrester: surge arrester status

(2) iSD fault-trip indication contact of NG125 circuit breaker associated to iPRF1 12.5r surge arrester

Example: Electrical diagram dedicated to the following surge arresters:

- PRD1 25r and PRD1 35r
- PRD1 Master



(1) Remote transfer contact of PRD1 25r and PRD1 35r or PRD1 Master surge arrester: cartridges status

(2) iSD fault-trip indication contact of ComPacT NSXm circuit breaker associated to PRD1 25r and PRD1 35r or PRD1 Master surge arrester

Contactor and Relay (Not in the Acti 9 Range)

Overview

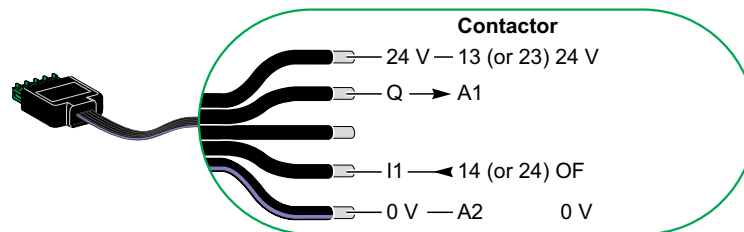
A contactor or relay powered with 24 Vdc can be connected to I/O Smart Link. This should have the following characteristics:

- The contactor or relay coil must not draw more than 100 mA
- The indication contact must be low level type

Only contactors in the Acti 9 range can be connected to I/O Smart Link using the iACT24 auxiliary.

Wiring

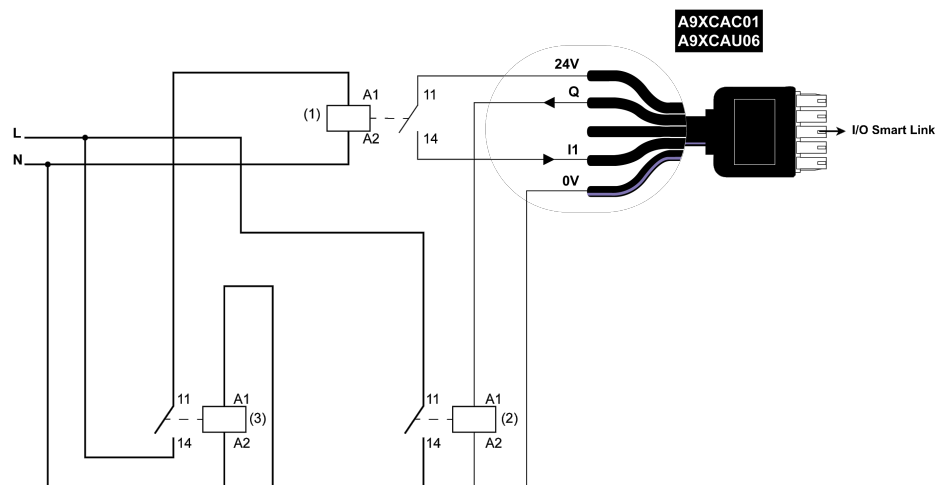
A contactor can be connected with an A9XCAU06 or A9XCAC01 pre-wired cable: molded connector (at I/O Smart Link end), and with five wires (at contactor end).



NOTE:

- A maximum of one wire can be connected in each Ti24 connector terminal (A9XC2412).
- Do not connect a wire with cable end in each of the Ti24 connector terminals.

Example of Connection



- (1) Low level relay (for example, iRBN)
- (2) 24 Vdc relay
- (3) Power contactor (for example, TeSys Deca LC1D••••)

Direct Output Connection

Overview

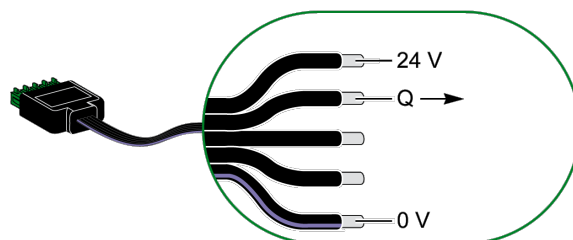
An indication device or a PLC input can be directly connected to the output (Q) of I/O Smart Link channel.

The connected device should have the following characteristics:

- To be powered with 24 Vdc
- The consumption must be less than 100 mA

Wiring

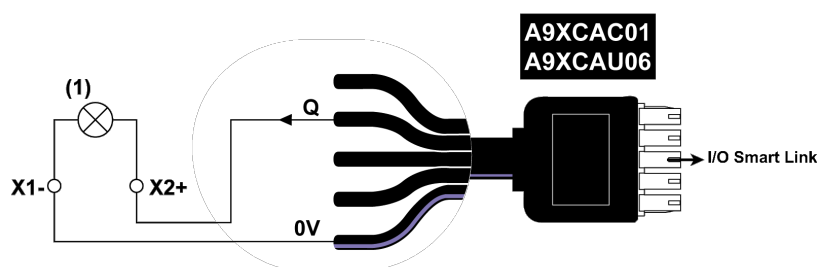
The wiring can be done with an A9XCAU06 or A9XCAC01 pre-wired cable: molded connector (at I/O Smart Link end), and with five wires (at contactor end).



NOTE:

- A maximum of one wire can be connected in each Ti24 connector terminal (A9XC2412).
- Do not connect a wire with cable end in each of the Ti24 connector terminals.

Example of Connection



(1) Indication light 24 Vdc

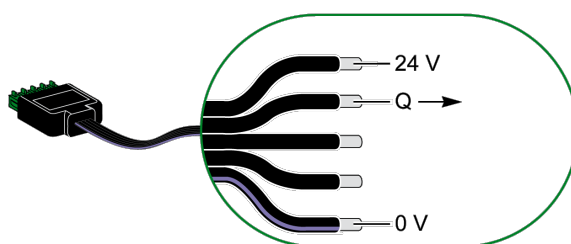
Indirect Output Connection

Overview

Any device (for example, a motor) that needs a command circuit of more than 100 mA can be controlled by the output (Q) of a channel of I/O Smart Link. The electrical diagram must be indirect between I/O Smart Link and this device: a low level relay must be installed between the command of this device and I/O Smart Link.

Wiring

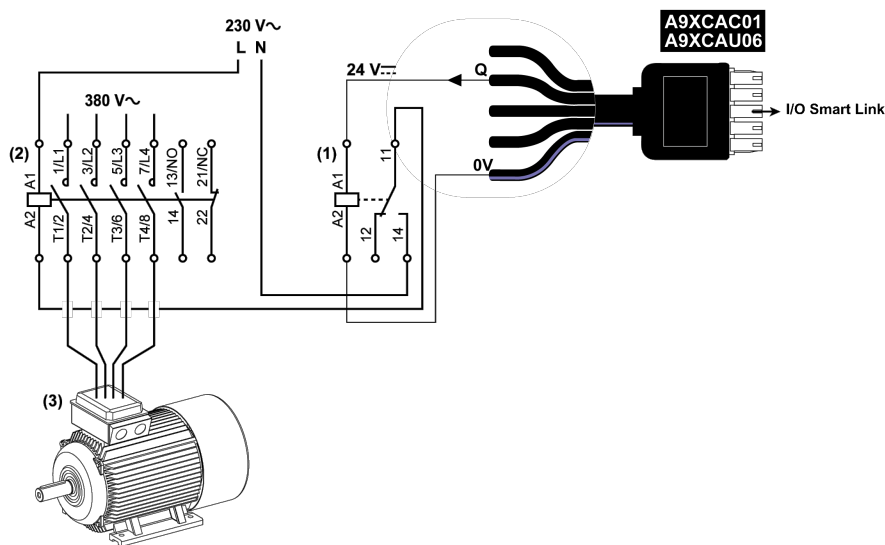
The wiring can be done with an A9XCAU06 or A9XCAC01 pre-wired cable: molded connector (at I/O Smart Link end), and with five wires (at contactor end).



NOTE:

- A maximum of one wire can be connected in each Ti24 connector terminal (A9XC2412).
- Do not connect a wire with cable end in each of the Ti24 connector terminals.

Example of Connection



- (1) Relay iRTBT
- (2) Contactor Tesys D LC1D•25 with an 230 Vac coil
- (3) Motor 10 kW (13.41 hp) with power supply 3-phases 380 Vac

Generating Summary Data Using iOF+SD24 or OF+SD24

Overview

The electrical summary of the SD contacts or summary of the OF contacts can be generated with iOF+SD24 and/or OF+SD24 auxiliaries.

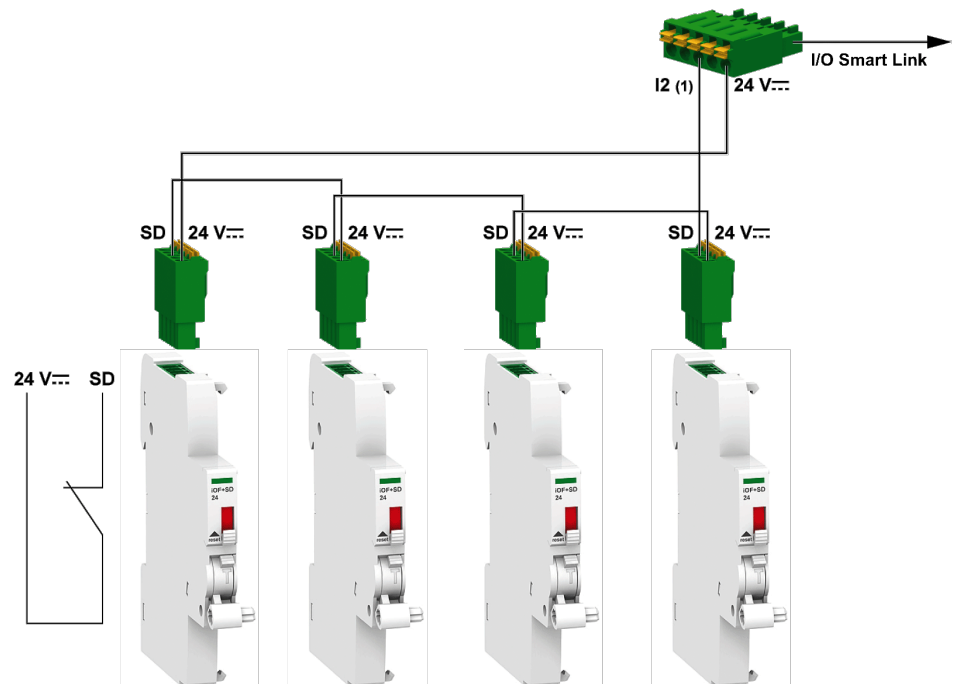
The electrical summary of the OF signals can be done by cabling in series of all OF signals and by connecting this circuit to the I1 input of a channel of I/O Smart Link.

The electrical summary of the SD signals can be done by cabling in series of all SD signals and by connecting this circuit to the I2 input of another channel of I/O Smart Link.

The OF connections (on I1 input) and the SD connections (on I2 input) cannot be connected to the same channel of I/O Smart Link, as the summary information dedicated to the OF signals cannot be separated from the summary information dedicated to the SD signals in I/O Smart Link.

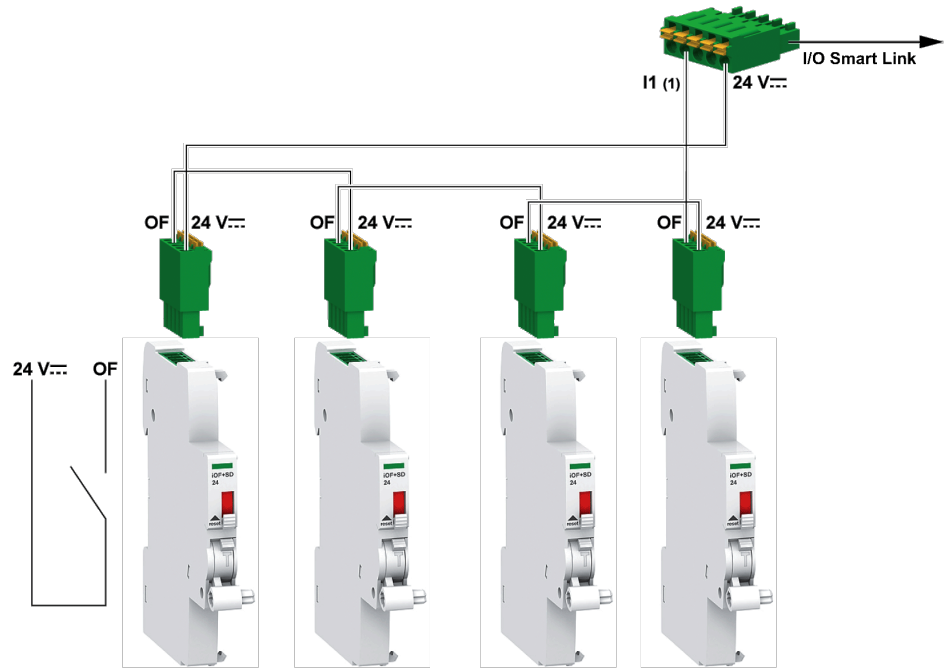
The summary of OF (or SD) signals can be wired in series using the A9XC2412 15-pin connector (spring cage). A maximum of 10 OF (or SD) signals can be wired in the same summary.

Wiring SD Contacts on iOF+SD24 or OF+SD24 in Series



(1) Input I2 (of a channel) on I/O Smart Link or PLC input

Wiring OF Contacts on iOF+SD24 or OF+SD24 in Series



(1) Input I1 (of a channel) on I/O Smart Link or PLC input

Commissioning

What's in This Part

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EcoStruxure Power Commission Software

Overview

EcoStruxure Power Commission is an all-in-one software tool used to configure, test, and provide reporting for smart devices in your electrical equipment.

EcoStruxure Power Commission software offers a quick test process based on a very intuitive Graphical User Interface.

This software has the ability to deal with multiple I/O Smart Link devices at the same time. They can be chained and multiple Acti 9 devices can be connected to the computer using Smart Link Modbus and Panel Server network. The maximum number of I/O Smart Link devices that can be connected for Modbus network is 10. The maximum number of I/O Smart Link server devices that can be connected for Panel Server network is eight. The server devices can include I/O Smart Link.

EcoStruxure Power Commission software is used to update the I/O Smart Link firmware. For more information, see *EcoStruxure Power Commission Online Help*.

The I/O Smart Link can only be updated through IFE Ethernet interface or Panel Server.

When I/O Smart Link firmware upgrade is initiated, the I/O Smart Link device should be in an isolated network along with the gateway. No other Modbus client should be polling any other Modbus device connected in the same network.

Main Functions

EcoStruxure Power Commission software has four main functions:

- Testing the installation
- Generating test reports
- Upgrading the firmware version of I/O Smart Link
- Configuring the Acti 9 devices connected to I/O Smart Link and recovering the configuration of I/O Smart Link channels

In order to test the installation, the software:

- Tests the communication network (Modbus SL/Modbus TCP/IP).
- Tests the connection and the status of the electrical devices connected to I/O Smart Link.

Also, the software provides the following reports:

- List of tested devices (.pdf and .xlsx files)
- I/O Smart Link channels assignment (.dxf file)

Downloading and Installing EcoStruxure Power Commission Software

To download and install EcoStruxure Power Commission software, refer to DOCA0134EN *EcoStruxure Power Commission Installation Guide*.

Commissioning with EcoStruxure Power Commission Software

To commission I/O Smart Link, refer to the *EcoStruxure Power Commission Online Help*.

Setting Up Modbus Communication

What's in This Part

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Modbus Functions	59
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Modbus Client/Server Principle

Overview

The Modbus protocol exchanges data using a request/response mechanism between a client and a server. The client/server principle is a type of communication protocol in which a device (the client) controls one or more devices (the servers). A standard Modbus network consists of one client and up to 31 servers.

NOTE: For more information, a detailed description of the Modbus protocol is available on www.modbus.org.

Characteristics of the Client/Server Principle

The client/server principle has the following characteristics:

- Only one client at a time is connected to the network.
- Only the client can launch communication and send requests to servers.
- The client can address each server individually using its dedicated address or all servers simultaneously using address 0.
- The servers can only send responses to the client.
- Servers cannot launch communication with either the client, or the other servers.

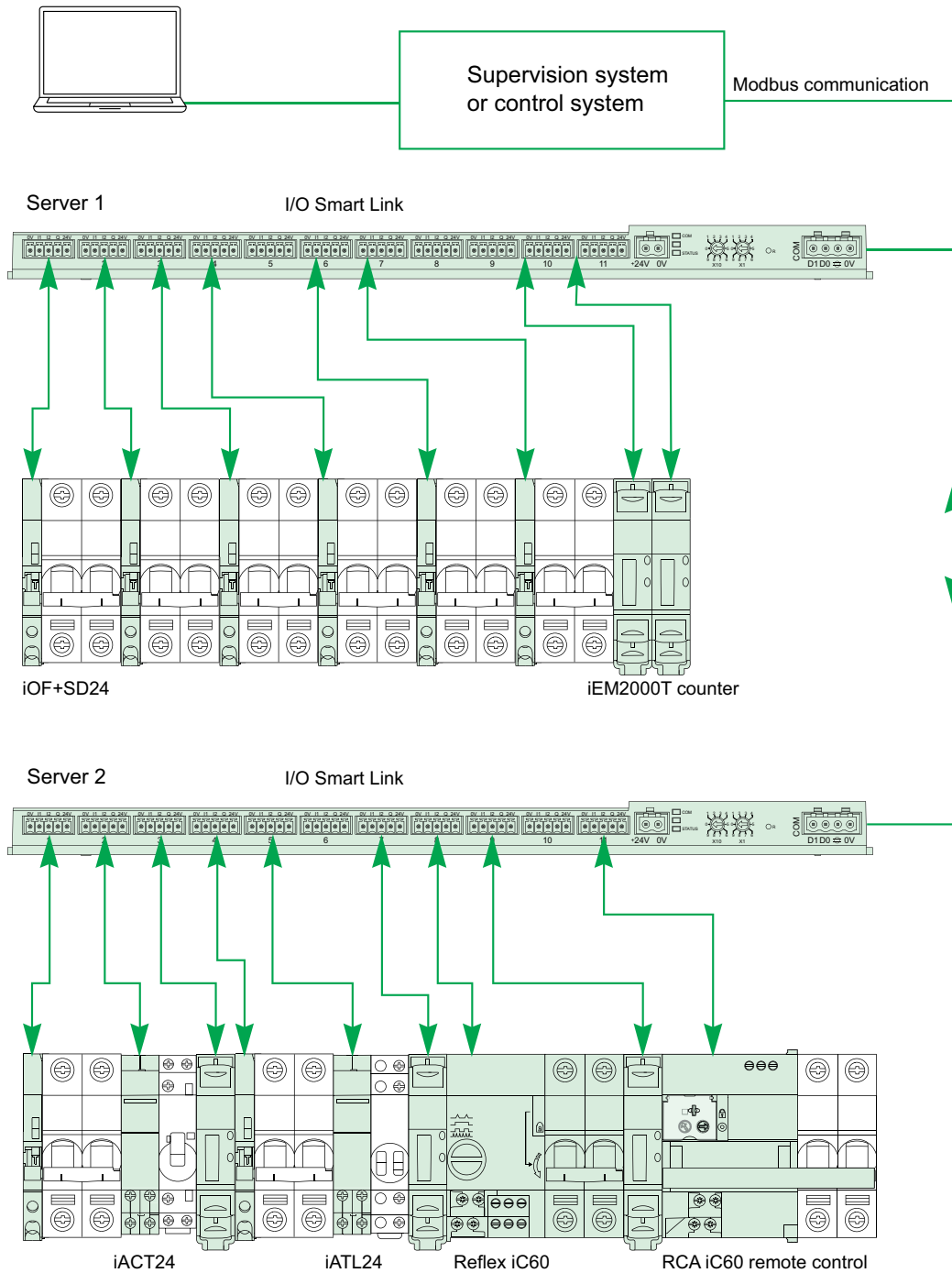
Client/Server Communication Modes

The Modbus protocol can exchange data using two communication modes:

- Request/response mode
- Broadcast mode

Each I/O Smart Link has a Modbus address (1 to 99), and concentrates data from connected devices on its 11 channels (Ti24 interface).

The states and orders for each device connected to I/O Smart Link are accessible in registers whose address depends on the channel (1 to 11) on which the device is connected.



Request/Response Mode

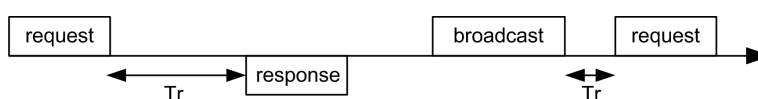
In request/response mode, the client addresses 1 server using the server dedicated address. The server processes the request, then responds to the client.

Broadcast Mode

In broadcast mode, the client addresses all the servers using address 0. Servers do not respond to broadcast messages.

Turnaround Time

The turnaround time T_r is the time between the end of receipt of a request and sending the response.



The typical value of the turnaround time T_r is less than 10 ms with the Modbus protocol.

Data Exchange

The Modbus protocol uses two data types:

- Bits
- 16-bit words called registers

Each register has a register number. Each data type (bit or register) has a 16-bit address.

Messages exchanged with the Modbus protocol contain the address of the data to be processed.

Frames

All frames exchanged with the Modbus protocol are 256 bytes maximum and consist of four fields:

Field	Definition	Size	Description
1	Server number	1 byte	Destination of the request <ul style="list-style-type: none"> • 0: broadcast (all servers are affected) • 1–247: unique destination
2	Function code	1 byte	Modbus function, page 59
3	<ul style="list-style-type: none"> • Data • Sub-function code 	n bytes	<ul style="list-style-type: none"> • Request or response data • Sub-function code
4	Check	2 bytes	CRC16 (to check transmission errors)

Data Format

The data format is configured as shown in the following table according to Modbus RTU format:

Start	Data	Parity	Stop
1 bit	8 bits	1 bit	1 bit

NOTE: The Modbus RTU data format is composed of 11 bits.

Even parity is required, other modes (odd parity, no parity) may be also used.

If no parity is implemented in the Modbus Client, an additional stop bit must be transmitted by the Modbus Client to fill out the character frame to a full 11 bit asynchronous character.

NOTE: For more information, a detailed description of the Modbus protocol is available on www.modbus.org.

Setup

Initialization

The table describes the two initialization phases for the I/O Smart Link device:

Phase	Description
1	<ul style="list-style-type: none"> I/O Smart Link must be connected to a Modbus client. When the 24 Vdc power supply is activated, the Modbus communication for the I/O Smart Link device is initialized and addressing is taken into account.
2	After receiving a maximum of 25 frames from the client, I/O Smart Link automatically adapts its communication parameters to those of the client (speed, parity and number of stop bits).

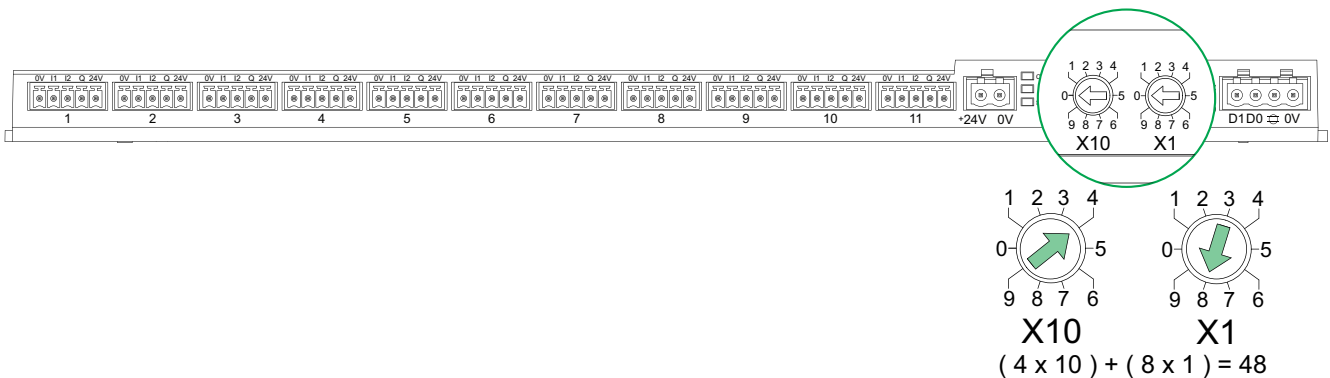
NOTE: The Modbus network communication speed is the same for all serial connections for the Modbus devices used. It is imposed by the lowest communication speed of a server device.

NOTE: Automatic adaptation to the communication parameters only occurs on powering up the I/O Smart Link.

Setting the Modbus Address Parameters

The I/O Smart Link device addressing is performed using two coding switches:

- The left-hand coding switch sets the tens.
- The right-hand coding switch sets the units.



NOTE:

- The I/O Smart Link address must be between 01 and 99.
- A standard Modbus network consists of up to 31 servers.
- In run mode, the user can change the Modbus server address without having to de-energize the I/O Smart Link.

To reset the I/O Smart Link to factory settings by using the coding switches, proceed as follows:

- De-energize Smart Link Modbus.
- Set the Modbus address to value 00.
- Re-energize the I/O Smart Link.
- Set the selected address.

For more information, see [Resetting to Factory Parameters](#), page 55.

Communication Parameters

The communication parameter values are as follows:

Settings	Authorized values	Default value
Data rate (in Baud)	4 800 9 600 19 200 38 400	19 200
Parity	<ul style="list-style-type: none">• Even and one stop bit• Odd and one stop bit• No parity (parity bit eliminated), two stop bits are needed.	Even (with one stop bit)

NOTE: The Modbus network communication speed is the same for all serial connections for the Modbus devices used. It is imposed by the lowest communication speed of a server device.

Resetting to Factory Parameters

Description

To reset the I/O Smart Link device to factory settings, press and hold the reset button (R) on the front face of the I/O Smart Link for more than 10 seconds.

NOTE: After performing the factory reset, the device takes 20-30 seconds to resume normal operation.

The reset data is as follows:

- The communication parameters become: 19 200 Baud, even parity, one stop bit.
- The operation counters are set to 0.
- The running hours counters are set to 0.
- The counter modification dates are set to the value "1 January 2000".
- The counter pulse weights are set to 10.

I/O Smart Link Device Functions

Acti 9 Device Command and Control Functions

The products concerned are:

- iOF+SD24
- OF+SD24
- iACT24
- iATL24
- Reflex iC60
- RCA iC60

Input state acquisition function:

- Open/closed state (input I1 of the Ti24 interface)
- Trip signal (input I2 of the Ti24 interface) for the protection devices

Open and close order function:

Each I/O Smart Link channel offers an output (Q):

- Output Q is set to 1 by forcing the bit of the channel concerned to 1 in the activation register (ON). The Modbus command register bit is automatically set to 0 by I/O Smart Link as soon as the order has been sent to output Q.
- Output Q is set to 0 by forcing the bit of the channel concerned to 1 in the deactivation register (OFF). The Modbus command register bit is automatically set to 0 by I/O Smart Link as soon as the order has been sent to output Q.

Installation life management function:

- I/O Smart Link stores the number of changes of state (or number of operations) for the control and protection devices, which allows the wear on these devices to be estimated. To do this, I/O Smart Link counts the changes of state of input I1 (on falling edge) for each channel.
- I/O Smart Link stores the number of protection device trips, thus highlighting detected faults in the electrical installation. To do this, I/O Smart Link counts the changes of state of input I2 (on falling edge) for each channel.
- I/O Smart Link stores the total time when control products are closed, which allows the wear on controlled loads to be estimated. To do this, I/O Smart Link counts the changes of state of input I1 (OF status) for each channel.
- This data (number of changes of state, running hours) can be reset to 0, and the initialization date can be stored.

Command and Control Functions of Devices Not in the Acti 9 Range

Input state acquisition function:

All other types of device offering low level I/O (24 Vdc) can be connected to the 22 inputs and 11 outputs offered by I/O Smart Link. Each I/O Smart Link channel offers two inputs (I1 and I2).

Command function:

Each I/O Smart Link channel offers an output (Q).

- Output Q is set to 1 by forcing the bit of the channel concerned to 1 in the activation register (ON). The Modbus command register bit is automatically set to 0 by I/O Smart Link as soon as the order has been sent to output Q.

- Output Q is set to 0 by forcing the bit of the channel concerned to 1 in the deactivation register (OFF). The Modbus command register bit is automatically set to 0 by I/O Smart Link as soon as the order has been sent to output Q.

Counting Functions

Schneider Electric energy meters with pulse output:

- iEM2000T (the pulse weight equals 10)
- iEM3110 (the pulse weight can be configured)
- iEM3155 (the pulse weight can be configured)
- iEM3210 (the pulse weight can be configured)
- iEM3255 (the pulse weight can be configured)

I/O Smart Link calculates the energy consumption and the average power between two pulses.

Energy consumption = Number of pulses counted × pulse weight

Average power between two pulses = $(3600 \times \text{Pulse weight})/t$; the result is expressed for one hour.

With t, the time in seconds between the last two pulses received.

Other types of meter with pulse output:

- Water, gas meters, for example.
- Any type of meter whose pulse output complies with standard IEC 62053-21 (minimum pulse 30 ms).

The pulse weight can be configured.

I/O Smart Link calculates the consumption and the average flow between two pulses.

Consumption = Number of pulses counted × pulse weight

Average flow = $(3600 \times \text{pulse weight})/t$; the result is expressed for one hour.

With t, the time in seconds between the last two pulses received.

The average power data (or average flow) between two pulses is reset to 0:

- After a duration $d = 3 \times t$; if $3 \times t$ is less than 5 seconds, the duration d equals five seconds

With t, the time in seconds between the last two pulses received.

- After 24 hours without a pulse
- After loss of the 24 Vdc input/output voltage

Every 10 minutes, the meter values are saved in the EEPROM memory.

Each time it changes, the value of each pulse is saved instantly in the EEPROM memory.

The meter parameter setting dates are saved instantly in the EEPROM memory.

System Behavior in the Event of Loss of the 24 Vdc Power Supply

Up to a duration of 10 ms, I/O Smart Link is unaffected by voltage dips. If the voltage is below 19.2 Vdc (24 Vdc - 20%) for more than 10 ms, I/O Smart Link changes to degraded mode:

- All the outputs are set to zero. However the Acti 9 control auxiliaries (iACT24, iATL24, Reflex iC60, RCA iC60) distinguish this loss of voltage event in actual order. They do not therefore change state.
- The time between two write operations in the EEPROM memory is 10 minutes. Data previously written to this memory is not modified on loss of voltage. Saved values therefore date back a maximum of 10 minutes.
- Calculated power (or flow) values are not saved. They are set to zero.

System Behavior at the Time the 24 Vdc Power Supply is Energized or Returns

NOTE: The I/O Smart Link power supply must be between 19.2 Vdc (24 Vdc - 20%) and 28.8 Vdc (24 Vdc + 20%).

- The outputs remain at zero.
- The Acti 9 control auxiliaries (iACT24, iATL24, Reflex iC60, RCA iC60) do not change status since they operate according to rising or falling edge.
- Data stored in the EEPROM memory is written to the corresponding registers (pulse weights, event counters, impulse counters, running hours counters, counter reset dates). The values in the registers are therefore those of the last save to the EEPROM memory. These values may differ from the last values read in the registers before the power failure.

NOTE: If the I/O Smart Link coding switches are set to zero during the loss of voltage, I/O Smart Link is reset when the power returns. For more information, see [Setting the Modbus Address Parameters](#).

Modbus Functions

General Description

The Modbus protocol offers functions for reading or writing data on the Modbus network. This protocol also offers diagnostic and network management functions.

Only Modbus functions managed by the I/O Smart Link device are described here.

Table of Modbus Functions

The following table describes in detail the functions supported by I/O Smart Link devices:

Function code	Sub-Function code	Function Name
01	–	Read n output or internal bits
02	–	Read n input bits
03	–	Read n output or internal words
05	–	Write 1 bit
06	–	Write 1 word
08	(1)	Modbus diagnostics
15	–	Write n bits
16	–	Write n words
43	14 ⁽²⁾	Read identification
	15 ⁽³⁾	Read the date and time
	16 ⁽⁴⁾	Write the date and time
100	4 ⁽⁵⁾	Read n non-adjacent words where $n \leq 100$. NOTE: Thanks to the read distributed holding register function, the user can: <ul style="list-style-type: none"> • Avoid reading a large block of adjacent words when only a few words are needed. • Avoid multiple use of function 3 in order to read non-adjacent words.
<p>(1) For more details, see the appendix describing function 8, page 97</p> <p>(2) For more details, see the appendix describing function 43–14, page 98</p> <p>(3) For more details, see the appendix describing function 43-15, page 100</p> <p>(4) For more details, see the appendix describing function 43-16, page 101</p> <p>(5) For more details, see the appendix describing function 100-4, page 102</p>		

NOTE: For more information, a detailed description of the Modbus protocol is available on www.modbus.org.

Modbus Exception Codes

Exception Responses

Exception responses issued by the client or a server can be the result of data processing errors. One of the following events can occur after a request from the client:

- If the server receives the request from the client without a communication error and manages the request correctly, it sends back a normal response.
- If the server does not receive the request from the client due to a communication error, it does not send back a response. The client program ends by applying a time delay condition to the request.
- If the server receives the request from the client but detects a communication error, it does not send back a response. The client program ends by applying a time delay condition to the request.
- If the server receives the request from the client without a communication error but cannot manage it (for example, the request consists of reading a register that does not exist), the server sends back an exception response to inform the client of the nature of the error.

Exception Frame

The server sends an exception frame to the client to indicate an exception response. An exception response consists of four fields:

Field	Definition	Size
1	Server number	1 byte
2	Exception function code	1 byte
3	Exception code	n bytes
4	Check	2 bytes

Managing Modbus Exceptions

The exception response frame consists of two fields that distinguish it from a normal response frame:

- The exception response's exception function code is the same as the original request function code plus 128 (0x80).
- The exception code depends on the communication error detected by the server.

The table describes the exception codes managed by the I/O Smart Link device:

Exception code	Name	Description
01	Illegal function	The function code received in the request is not a permitted action for the server. It is possible that the server is in an unsuitable state to process a specific request.
02	Illegal data address	The data address received by the server is not a permitted address for the server.
03	Illegal data value	The value of the request data field is not a permitted value for the server.
04	Server device failure	The server is unable to perform a required action due to an unrecoverable error.
06	Server device busy	The server is busy processing another command. The client should send the request once the server is free.

NOTE: For more information, a detailed description of the Modbus protocol is available on www.modbus.org.

Access to Variables

A Modbus variable can have the following attributes:

- Read-only
- Read/write
- Write-only

NOTE: An attempt to write to a read-only variable generates an exception response.

Tables of Modbus Registers

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General Description of Modbus Tables

What's in This Chapter

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Overview

Overview

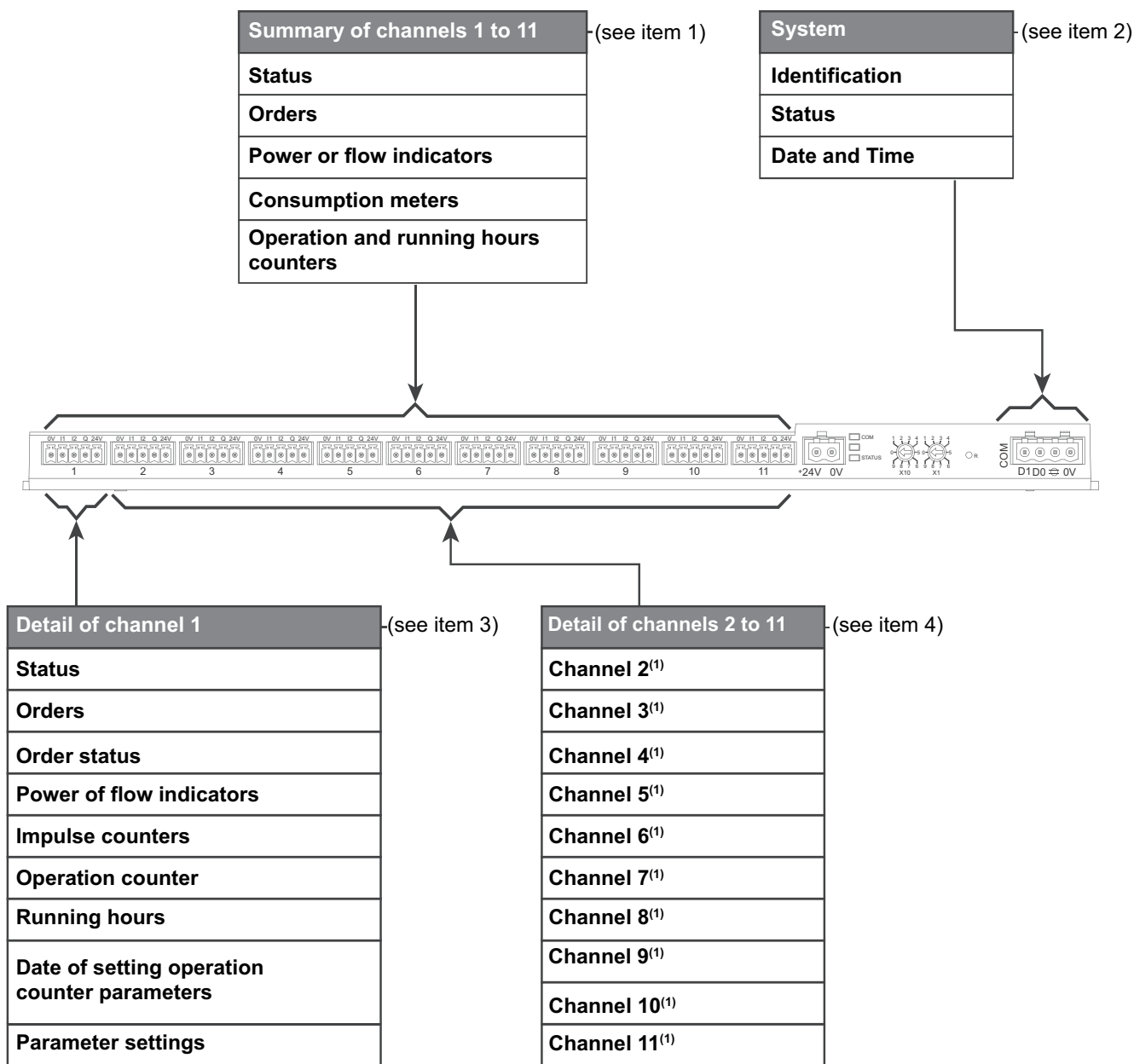
All the Modbus tables in the I/O Smart Link device have been designed to minimize the number of Modbus requests that the client system needs to send in order to collect the data prepared by I/O Smart Link.

The Modbus tables in the I/O Smart Link device are compact and are summaries of all the data collected on the 11 channels of the I/O Smart Link device.

The Modbus tables in the I/O Smart Link device are described in:

- The section presenting:
 - The overall list of I/O Smart Link device address zones, page 70
 - The summary of channel 1 to 11 address zones, page 80
- The section presenting the address zones for each type of device that can be connected to I/O Smart Link: iOF+SD24, OF+SD24, iACT24, iATL24, RCA iC60, Reflex iC60, iEM2000T, meter, contactor and impulse relay, page 86
- The section presenting the address zones for each type of data (status, orders, measurements and parameter settings) with a description of the summary zones and a description of the detailed data zones for each channel.

General Organization of Modbus Tables in I/O Smart Link Devices



Item	Description	See
1	Channel summary data	Status
2	System data independent of the channel	Identification
3	Data for channel 1 Devices that can be connected to channel 1	Channels 1 to 11 Modbus Tables for connected products, page 86
4	Data for channel 2 to 11 Devices that can be connected to channel 2 to 11	Channels 1 to 11 Modbus Tables for connected products, page 86

Modbus Table Format and Data Types

Table Formats

Register tables have the following columns:

Address	Register	No.	RW	X	Unit	Type	Range	Default value	Svd	Function code	Description
Designation	Description										
Address	16-bit register address in hexadecimal. The address is the data used in the Modbus frame.										
Register	16-bit register number in decimal. Register = Address + 1										
No.	Number of 16-bit registers that need to be read/written to access the complete information.										
RW	Whether the register is read only (R) or read-write (RW).										
X	Scale factor: <ul style="list-style-type: none"> Scale X1 means that the value of the register is the right one with the unit indicated. A scale of 10 means that the register contains the value multiplied by 10. The actual value is therefore the value of the register divided by 10. A scale of 0.1 means that the register contains the value multiplied by 0.1. The actual value is therefore the value of the register multiplied by 10. 										
Unit	Information unit of measurement: <ul style="list-style-type: none"> –: no unit corresponding to the value expressed. h: hours. D: the unit depends on the connected device. 										
Type	Coding data type (see <i>Data types table</i> , page 67).										
Range	Range of permitted values for the variable, usually a subset of what the format allows. For BITMAP type data, the content of this domain is "-".										
Default value	Default value for the variable.										
Svd	Saving the value in the event of a power failure: <ul style="list-style-type: none"> Y: the value of the register is saved in the event of a power failure. N: the value is lost in the event of a power failure. NOTE: On start-up or reset, the available values are retrieved.										
Function code	Code of functions that can be used in the register.										
Description	Information about the register and the restrictions that apply.										

Data Types

The following data types appear in the tables of Modbus registers:

Name	Description	Range
UINT	16-bit unsigned integer (1 word)	0 to 65535
INT	16-bit signed integer (1 word)	-32768 to +32767
UINT32	32-bit unsigned integer (2 words)	0 to 4 294 967 295
INT32	32-bit signed integer (2 words)	-2 147 483 648 to +2 147 483 647
Float32	32-bit value (2 words)	-3.4028E+38 to +3.4028E+38
ASCII	8-bit alphanumeric character	Table of ASCII Characters
BITMAP	16-bit field (1 word)	–
DATE	See Date table, page 68	–

NOTE:

Float32 type data: Single precision float with sign bit, 8 bits exponent, 23 bits mantissa (positive and negative normalized real)

For ASCII type data, the order of transmission of characters in words (16-bit registers) is as follows:

- Character n as least significant
- Character n + 1 as most significant

All registers (16-bit or 2 bytes) are transmitted with Big Endian coding:

- The most significant byte is transmitted first
- The least significant byte is transmitted second

32-bit variables saved on two 16-bit words (for example, consumption meters) are in Big Endian format:

- The most significant word is transmitted first, then the least significant.

64-bit variables saved on four 16-bit words (for example, dates) are in Big Endian format:

- The most significant word is transmitted first, and so on.

DATETIME

DATETIME is a data type used to code date and time defined by the IEC 60870-5 standard.

Register	Type	Bit	Range	Description
1	INT16U	0–6	0x00–0x7F	Year: 0x00 (00) to 0x7F (127) correspond to years 2000 to 2127 For example, 0x17 (23) corresponds to year 2023.
		7–15	–	Reserved
2	INT16U	0–4	0x01–0x1F	Day
		5–7	–	Reserved
		8–11	0x00–0x0C	Month
		12–15	–	Reserved
3	INT16U	0–5	0x00–0x3B	Minutes
		6–7	–	Reserved
		8–12	0x00–0x17	Hours
		13–15	–	Reserved
4	INT16U	0–15	0x0000–0xEA5F	Milliseconds

Direct Bit Addressing

Addressing is permitted for BITMAP type zones with functions 1, 2, 5 and 15.

The address of the first bit is constructed as follows: (register address x 16) + bit number.

This addressing mode is specific to Schneider Electric.

Example: For functions 1, 2, 5 and 15, bit 3 of register 0x0078 should be addressed; the bit address is therefore 0x0783.

NOTE: The register whose bit needs to be addressed should have an address $\leq 0x0FFF$.

Example of Modbus Frames

Request

Definition	Number of Bytes	Value	Comment
Server number	1 byte	0x05	I/O Smart Link Modbus address
Function code	1 byte	0x03	Reads n output or internal words
Address	2 bytes	0x36E2	Address of a consumption meter whose address is 14050 in decimal notation.
Number of words	2 bytes	0x002C	Reads 44 16-bit registers.
CRC	2 bytes	xxxx	Value of CRC16.

Response

Definition	Number of Bytes	Value	Comment
Server number	1 byte	0x05	I/O Smart Link Modbus address
Function code	1 byte	0x03	Reads n output or internal words
Number of Bytes	2 bytes	0x0058	Number of bytes read
Value of words read	88 bytes	–	Reads 44 16-bit registers
CRC	2 bytes	xxxx	Value of CRC16.

Modbus Address

The list of Modbus addresses, defined by the Modbus protocol, starts at 0.

The address of register number n is n-1.

The detailed tables in subsequent chapters of this guide provide both register numbers (in decimal format) and corresponding addresses (in hexadecimal format). Example of address: address of register number 3000 is 0x0BB7 (2999).

Global Modbus Address Table

Presentation

Address Groups	Description	Address	Register	No. of Words	Type	RW
System	Serial number	0x0064	101	6	ASCII	R
	Status	0x0070	113	2	BITMAP	R
	Date and Time	0x0073	116	4	DATE	RW
	Hardware and firmware versions	0x0086	135	18	ASCII	R
	Identification	0x01F4	501	109	ASCII	R
Summary of channels 1 to 11	Status	0x0078	121	2	BITMAP	R
	Orders	0x0082	131	4	BITMAP	RW
	Power or flow indicators	0x36B0	14001	44	Float32	R
	Consumption meters	0x36E2	14051	44	UINT32	R
	Operation counters	0x3714	14101	44	UINT32	RW
	Running hour counters	0x3740	14145	22	UINT32	RW
Detail of channel 1	Status	0x3778	14201	1	BITMAP	R
	Orders	0x3779	14202	2	BITMAP	RW
	Output status	0x377B	14204	1	BITMAP	R
	Power or flow indicators	0x377C	14205	4	Float32	R
	Consumption meters	0x3780	14209	4	UINT32	R
	Operation counters	0x3784	14213	4	UINT32	RW
	Running hour counters	0x3788	14217	2	UINT32	RW
	Setting date of operation counters	0x378A	14219	12	DATE	R
	Pulse weight settings (meters)	0x3796	14231	2	UNIT	RW
Detail of channels 2 to 11	Channel 2 ⁽¹⁾	0x37a0	14241	40	–	–
	Channel 3 ⁽¹⁾	0x37c8	14281	40	–	–
	Channel 4 ⁽¹⁾	0x37f0	14321	40	–	–
	Channel 5 ⁽¹⁾	0x3818	14361	40	–	–
	Channel 6 ⁽¹⁾	0x3840	14401	40	–	–
	Channel 7 ⁽¹⁾	0x3868	14441	40	–	–
	Channel 8 ⁽¹⁾	0x3890	14481	40	–	–
	Channel 9 ⁽¹⁾	0x38b8	14521	40	–	–
	Channel 10 ⁽¹⁾	0x38e0	14561	40	–	–
	Channel 11 ⁽¹⁾	0x3908	14601	40	–	–
	(1) The detailed information for channels 2 to 11 has the same structure as the detailed information for channel 1. To address the channel N (1 ≤ N ≤ 11) registers, add 40 × (N – 1) to the channel 1 registers.					

Summary and Detailed Modbus Tables

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System

Serial Number

Address	Register	No.	RW	Type	Default value	Svd	Function code	Description
0x0064	101	6	R	ASCII	N/A	Y	03, 100-4	<p>Serial number on 12 ASCII characters; 11 alphanumeric digits maximum [SN] or [S/N]; PP YY WW [D[nnnn]]</p> <ul style="list-style-type: none"> • PP: SAP Bridge plant number • YY: Year in decimal notation [05–99] • WW: Week in decimal notation [1–53] • D: Day of the week in decimal notation [1–7] • nnnn: Sequence of numbers [0001 to 10.000–1]

Status

Address	Register	No.	RW	Type	Default value	Svd	Function code	Description
0x0070	113	1	R	BITMAP	0x0000	N	03, 100-4	Status and diagnostic register Bit 0 = 1: start-up phase Bit 1 = 1: operating phase Bit 2 = 1: degraded mode ⁽¹⁾ Bit 3 = 1: internal error mode ⁽²⁾ Bit 4: not used Bit 5: not used Bit 6 = 1: invalid data Bit 7 = 1: invalid 24 V I/O Bit 8: not used Bit 9: not used Bit 10: not used Bit 11: not used Bit 12: not used Bit 13: E2PROM error Bit 14: not used Bit 15: EXT FLASH error NOTE: Bits 0 to 3 are exclusive: only one mode is used at any given time.
0x0071	114	1	R	BITMAP	0xA0CF	Y	03, 100-4	Validity of the status and diagnostic bit (0 = Invalid / 1 = Valid) – refer to register 113 For example: Address 0 x 0100 — 16 bits register for bit validity of the following register. <ul style="list-style-type: none"> • If Bit 0 = 1, then Bit 0 of the following register (Addr 0 x 0101) is valid. • Address 0 x 0101 — 16 bits register for bits corresponding to Boolean status data.

(1) Degraded mode comes into effect:

- When the power supply is cut or less than 13.7 Vdc.
- In the event of overcurrent (overload or short-circuit) on the Ti24 I/O.

If a short-circuit on an output has caused a change to degraded mode, at the end of the short-circuit, the output is reset to 0 by the electronics: the Modbus client system sends a Modbus message to reset the output to 1 if it was at 1, before the short-circuit.

(2) Internal error mode if an EXT FLASH and/or E2PROM error is detected.

The data is invalid in the start-up phase, degraded and internal error modes. Invalid data include inputs 1 and 2, the power or flow indicator, the operation and running hours counter.

- The E2PROM error bit is activated during the operating phase when a checksum error is detected in an E2PROM page.
- The FLASH error bit is activated during the start-up phase when a checksum error is detected on the FLASH memory.

Date and Time

Address	Register	No.	RW	Type	Range	Default value	Svd	Function code	Description
0x0073	116	4	RW	DATE	(1)	N/A	N	03, 16, 100-4	Indicates the year, month, day, hour, minute and millisecond on the I/O Smart Link device.
(1) See description of the DATETIME type, page 68.									

Hardware and Firmware Versions

Address	Register	No.	RW	Type	Default value	Svd	Function code	Description
0x0086	135	6	R	ASCII	N/A	Y	03, 100-4	Hardware version on 11 ASCII characters. Example: 002.000.000
0x008C	141	6	R	ASCII	N/A	Y	03, 100-4, 43-14	Firmware version on 11 ASCII characters. Example: 003.002.001
0x0092	147	6	R	ASCII	N/A	Y	03, 100-4	Boot firmware version on 11 ASCII characters. Example: 001.032.000

Identification

Address	Register	No.	RW	Type	Default value	Svd	Function code	Description
0x01F4	501	8	R	ASCII	EcoStruxure	N/A	03, 100-4, 43-14	Product range
0x01FC	509	8	R	ASCII	I/O Device	N/A	03, 100-4,	Product family
0x0204	517	32	R	ASCII	https://www.se.com/	N/A	03, 100-4, 43-14	Vendor URL
0x0224	549	8	R	ASCII	I/O Smart Link	N/A	03, 100-4, 43-14	Product model
0x022C	557	1	R	UINT16	9100	N/A	03, 100-4,	Product identifier
0x022D	558	16	R	ASCII	Schneider Electric	N/A	03, 100-4, 43-14	Vendor name
0x023D	574	10	RW	ASCII	I/O Smart Link	Y	03, 100-4, 43-14	User application name
0x0247	584	16	R	ASCII	A9XMSB11	N/A	03, 100-4, 43-14	Commercial reference
0x0257	600	10	R	ASCII	I/O	N/A	03, 100-4,	Product capability

Summary of Channels 1 to 11

Status

Address	Register	No.	RW	Type	Default value	Svd	Function code	Description
0x0078	121	1	R	BITMAP	0x0000	N	01, 02, 03, 100-4	Electrical status on input 1 of all channels ⁽¹⁾ .
0x0079	122	1	R	BITMAP	0x0000	N	01, 02, 03, 100-4	Electrical status on input 2 of all channels ⁽¹⁾ .

(1) With bit assignment:

- Bit 0 to 10: channel 1 to 11
- Bits 11 to 15: not used

Each bit gives the electrical level of input 1 and 2:

- 0 = no current
- 1 = input current

Orders

Address	Register	No.	RW	Type	Default value	Svd	Function code	Description
0x0082	131	1	RW	BITMAP	0x0000	N	01, 02, 03, 05, 06, 15, 16, 100-4	Open order for Acti 9 product ⁽¹⁾ .
0x0083	132	1	RW	BITMAP	0x0000	N	01, 02, 03, 05, 06, 15, 16, 100-4	Close order for Acti 9 product ⁽¹⁾ .
0x0084	133	1	RW	BITMAP	0x0000	N	01, 02, 03, 05, 06, 15, 16, 100-4	Deactivation order for product not in the Acti 9 range ⁽¹⁾ .
0x0085	134	1	RW	BITMAP	0x0000	N	01, 02, 03, 05, 06, 15, 16, 100-4	Activation order for product not in the Acti 9 range ⁽¹⁾ .

(1) With bit assignment:

- Bit 0 to 10: channel 1 to 11
- Bits 11 to 15: not used

NOTE:

- Each bit corresponds to either an open or a closed order relative to the register feature (activated when the bit is at 1).
- Several channels can be controlled at the same time.
- The I/O Smart Link device resets the bit to state 0 when the order is taken into account (unless no product is connected to the channel).
- If bits 0 and 1 are set to 1, there is no effect on the system.

Power or Flow Indicators

	Channels										
	1	2	3	4	5	6	7	8	9	10	11
Input I1	14001	14003	14005	14007	14009	14011	14013	14015	14017	14019	14021
Input I2	14023	14025	14027	14029	14031	14033	14035	14037	14039	14041	14043

Address	Register	No.	RW	X	Unit	Type	Default value	Svd	Function code	Description
0x36B0	14001	2	R	X1	D	Float32	0	N	03, 100-4	Power or flow indicator for channel 1/input 1.

The characteristics of the power or flow indicators register are as follows:

- When the impulse counter (the unit depends on the connected device: energy, gas, water, for example) is connected to input 1 or 2 of channel 1, the register contains the flow value. This is calculated as follows:
 - $(3600 \times \text{pulse weight})/t$, t representing the time in seconds between two pulses. The result is expressed for one hour.
- The pulse weight is 10 by default and can be configured by the Modbus command.

Example: This register indicates the active power between the last two pulses if an iEM2000T device is connected to the channel 1/input 1 (Pulse weight = 10 Wh).

This register is reset to 0:

- After a duration $d = 3 \times t$ (t being the time in seconds between the last two pulses), if $3 \times t$ is less than 5 seconds, the duration d equals 5 seconds
- After 24 hours without a pulse
- After loss of the 24 Vdc input/output voltage

The accuracy of the power or flow indication is:

- 5% if the pulse frequency is 5 Hertz or less
- 17% if the pulse frequency equals the maximum frequency of 17 Hertz

Consumption Meters

The consumption meters in this Modbus table indicate the consumption from meters connected to each I/O Smart Link channel (1 to 11).

The consumption value (associated with a channel) is obtained by multiplying the number of pulses (received by inputs I1 and I2 of this channel) by the pulse weight.

	Channels										
	1	2	3	4	5	6	7	8	9	10	11
Input I1	14051	14053	14055	14057	14059	14061	14063	14065	14067	14069	14071
Input I2	14073	14075	14077	14079	14081	14083	14085	14087	14089	14091	14093

Address	Register	No.	RW	X	Type	Default value	Svd	Function code	Description
0x36E2	14051	2	R	X1	UINT32	0	Y	03, 100-4	Consumption meter on channel 1/input I1.

NOTE:

- The number of pulses from inputs I1 and I2 of each channel (1 to 11) are available in registers 14212 (channel 1) to 14614 (channel 11). The number of pulses can be preset by writing to the impulse counter register. For more information, see [Operation Counters](#), page 78.
- The pulse weights of inputs I1 and I2 of each channel (1 to 11) are available and can be set in registers 14230 (channel 1) to 14631 (channel 11). The pulse weight is 10 by default. For more information, see [Pulse Weight Settings \(Meters\)](#), page 84.

Operation Counters

	Channels										
	1	2	3	4	5	6	7	8	9	10	11
Input I1	14101	14103	14105	14107	14109	14111	14113	14115	14117	14119	14121
Input I2	14123	14125	14127	14129	14131	14133	14135	14137	14139	14141	14143

Address	Register	No.	RW	X	Type	Default value	Svd	Function code	Description
0x3714	14101	2	RW	X1	UINT32	0	Y	03, 16, 100-4	Operation counter for channel 1/input 1: changes from state 1 to state 0.

Running Hour Counters

	Channels										
	1	2	3	4	5	6	7	8	9	10	11
Input I1	14145	14147	14149	14151	14153	14155	14157	14159	14161	14163	14165

Address	Register	No.	RW	X	Unit	Type	Default value	Svd	Function code	Description
0x3740	14145	2	RW	X1	h	UINT32	0	Y	03, 16, 100-4	Running hours counter for channel 1/input 1. Counting starts when the input is activated.

Details of Channels 1 to 11

Channels 1 to 11 Overview

	Channels										
	1	2	3	4	5	6	7	8	9	10	11
Status											
Input I1 (bit 0)	14201	14241	14281	14321	14361	14401	14441	14481	14521	14561	14601
Input I2 (bit 1)	14201	14241	14281	14321	14361	14401	14441	14481	14521	14561	14601
Orders											
Commands output Q (bit 0 and bit 1): Acti 9 product	14202	14242	14282	14322	14362	14402	14442	14482	14522	14562	14602
Commands output Q (bit 0 and bit 1): non-Acti 9 product	14203	14243	14283	14323	14363	14403	14443	14483	14523	14563	14603
State of output Q (bit 0)	14204	14244	14284	14324	14364	14404	14444	14484	14524	14564	14604
Counters											
Input I1 power or flow indicator ⁽²⁾	14205	14245	14285	14325	14365	14405	14445	14485	14525	14565	14605
Input I2 power or flow indicator ⁽²⁾	14207	14247	14287	14327	14367	14407	14447	14487	14527	14567	14607
Input I1 consumption meter ⁽¹⁾⁽²⁾	14209	14249	14289	14328	14369	14409	14449	14489	14529	14569	14609
Input I2 consumption meter ⁽¹⁾⁽²⁾	14211	14251	14291	14331	14371	14411	14451	14491	14531	14571	14611
Operation and Running Hours Counters											
I1 operation counter ⁽¹⁾	14213	14253	14293	14333	14373	14413	14453	14493	14533	14573	14613
I2 operation counter ⁽¹⁾	14215	14255	14295	14335	14375	14415	14455	14495	14535	14575	14615
I1 input running hours ⁽¹⁾	14217	14257	14297	14337	14377	14417	14457	14497	14537	14577	14617
Setting Date of Operation Counters											
Input I1 date	14219	14259	14299	14339	14379	14419	14459	14499	14539	14579	14619
Input I2 date	14223	14263	14303	14343	14383	14423	14463	14503	14543	14583	14623
Running hours parameter setting date on input I1	14227	14267	14307	14347	14387	14427	14467	14507	14547	14587	14627
Pulse Weight Settings (Meters)											
Pulse weight for input I1 ⁽²⁾	14231	14271	14311	14351	14391	14431	14471	14511	14551	14591	14631
Pulse weight for input I2 ⁽²⁾	14232	14272	14312	14352	14392	14432	14472	14512	14552	14592	14632
(1) Data type: UINT32											
(2) Information specific to Meter type devices											

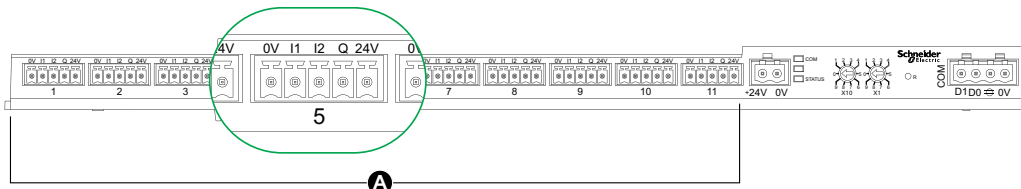
Modbus Address

The list of Modbus addresses, defined by the Modbus protocol, starts at 0.

The address of register number n is n-1.

The detailed tables in subsequent chapters of this guide provide both register numbers (in decimal format) and corresponding addresses (in hexadecimal format). Example of address: address of register number 3000 is 0x0BB7 (2999).

The following figure shows the terminals for each channel.



A

A. Channels from 1 to 11

Description of terminals for each channel (Ti24 interface):

Terminal	Description
24 V	24 V of the 24 Vdc power supply
Q	Control output
I2	Input number 2
I1	Input number 1
0 V	0 V of the 24 Vdc power supply

Status

	Channels											
	1	2	3	4	5	6	7	8	9	10	11	
Input I1 (bit 0)	14201	14241	14281	14321	14361	14401	14441	14481	14521	14561	14601	
Input I2 (bit 1)	14201	14241	14281	14321	14361	14401	14441	14481	14521	14561	14601	

Address	Register	No.	RW	Type	Default value	Svd	Function code	Description
0x3778	14201	1	R	BITMAP	0x0000	N	03, 100-4	Electrical status of inputs 1 and 2 of all connected devices ⁽¹⁾ .

(1) With bit assignment:

- Bit 0 = electrical level of input 1
- Bit 1 = electrical level of input 2
- Bits 2 to 15 = not used

NOTE:

Meaning of bits for inputs I1 and I2:

- 0 = no current
- 1 = input current

Orders

	Channels										
	1	2	3	4	5	6	7	8	9	10	11
Output Q (bit 0 and bit 1): Acti 9 product	14202	14242	14282	14322	14362	14402	14442	14482	14522	14562	14602

Address	Register	No.	RW	Type	Default value	Svd	Function code	Description
0x3779	14202	1	RW	BITMAP	0x0000	N	03, 06, 16, 100-4	Close and open order for products in the Acti 9 range ⁽¹⁾ .

(1) With bit assignment:

- Bit 0 = close order
- Bit 1 = open order
- Bits 2 to 15 = not used

	Channels										
	1	2	3	4	5	6	7	8	9	10	11
Output Q (bit 0 and bit 1): non-Acti 9 product	14203	14243	14283	14323	14363	14403	14443	14483	14523	14563	14603

Address	Register	No.	RW	Type	Default value	Svd	Function code	Description
0x377A	14203	1	RW	BITMAP	0x0000	N	03, 06, 16, 100-4	Deactivation and activation order for product not in the Acti 9 range ⁽¹⁾ .

(1) With bit assignment:

- Bit 0 = deactivation order
- Bit 1 = activation order
- Bits 2 to 15 = not used

NOTE:

- The I/O Smart Link device resets the bit to state 0 when the order is taken into account (unless no product is connected to the channel).
- If both bits 0 and 1 are set to 1, there is no effect on the system.

Power or Flow Indicators

	Channels										
	1	2	3	4	5	6	7	8	9	10	11
Input I1 power or flow indicator ⁽¹⁾	14205	14245	14285	14325	14365	14405	14445	14485	14525	14565	14605
Input I2 power or flow indicator ⁽¹⁾	14207	14247	14287	14327	14367	14407	14447	14487	14527	14567	14607

(1) Each channel (Ti24 interface) on the I/O Smart Link can support two counters:

- One counter connected to input I1
- One counter connected to input I2

Address	Register	No.	RW	X	Unit	Type	Default value	Svd	Function code	Description
0x377C	14205	2	R	X1	D	Float32	0	N	03, 100-4	Power or flow indicator for input 1 ⁽¹⁾ .
0x377E	14207	2	R	X1	D	Float32	0	N	03, 100-4	Power or flow indicator for input 2 ⁽¹⁾ .

(1) Each channel (Ti24 interface) on the I/O Smart Link can support two counters:

- One counter connected to input I1
- One counter connected to input I2

Consumption Meters

	Channels											
	1	2	3	4	5	6	7	8	9	10	11	
Input I1 consumption meter ⁽¹⁾	14209	14249	14289	14329	14369	14409	14449	14489	14529	14569	14609	
Input I2 consumption meter ⁽¹⁾	14211	14251	14291	14331	14371	14411	14451	14491	14531	14571	14611	

(1) Each channel (Ti24 interface) on the I/O Smart Link can support two meters:

- One meter connected to input I1
- One meter connected to input I2

Address	Register	No.	RW	X	Type	Default value	Svd	Function code	Description
0x3780	14209	2	R	X1	UINT32	0	Y	03, 100-4	Consumption meter on input 1.
0x3782	14211	2	R	X1	UINT32	0	Y	03, 100-4	Consumption meter on input 2.

Operation Counters

	Channels											
	1	2	3	4	5	6	7	8	9	10	11	
I1 operation counter	14213	14253	14293	14332-3	14373	14413	14453	14493	14533	14573	14613	
I2 operation counter	14215	14255	14295	14335	14375	14415	14455	14495	14535	14575	14615	

Address	Register	No.	RW	X	Type	Default value	Svd	Function code	Description
0x3784	14213	2	RW	X1	UINT32	0	Y	03, 16, 100-4	Operation counter for channel 1/input 1. This register indicates the number of changes of state of input 1 from state 1 to state 0.

Running Hour Counters

	Channels										
	1	2	3	4	5	6	7	8	9	10	11
I1 input running time	14217	14257	14297	14337	14377	14417	14457	14497	14537	14577	14617

Address	Register	No.	RW	X	Unit	Type	Default value	Svd	Function code	Description
0x3788	14217	2	RW	X1	h	UINT32	0	Y	03, 16, 100-4	Running hours counter for channel 1/input 1. Counting starts when the input is activated.

Setting Date of Operation Counters

	Channels										
	1	2	3	4	5	6	7	8	9	10	11
Input I1 date	14219	14259	14299	14339	14379	14419	14459	14499	14539	14579	14619
Input I2 date	14223	14263	14303	14343	14383	14423	14463	14503	14543	14583	14623
Running hours parameter setting date on input I1	14227	14267	14307	14347	14387	14427	14467	14507	14547	14587	14627

Address	Register	No.	RW	Type	Range	Default value	Svd	Function code	Description
0x378A	14219	4	R	DATE	(¹)	(¹)	Y	03, 100-4	Date when the operation counter parameter was last set. This register indicates the date and time when the operation counter parameter was last set on input 1.
0x378E	14223	4	R	DATE	(¹)	(¹)	Y	03, 100-4	Date when the operation counter parameter was last set. This register indicates the date and time when the operation counter parameter was last set on input 2.
0x3792	14227	4	R	DATE	(¹)	(¹)	Y	03, 100-4	Date when the running hours counter parameter was last set. This register indicates the date and time when the running hours counter parameter was last set on input 1.

(1) See description of the DATETIME type, page 68.

Pulse Weight Settings (Meters)

	Channels										
	1	2	3	4	5	6	7	8	9	10	11
Pulse weight I1	14231	14271	14311	14351	14391	14431	14471	14511	14551	14591	14631

	Channels										
Pulse weight I2 ⁽¹⁾	14232	14272	14312	14352	14392	14432	14472	14512	14552	14592	14632
(1) Each channel (Ti24 interface) on the I/O Smart Link can support two pulse meters: <ul style="list-style-type: none"> • One meter connected to input I1 • One meter connected to input I2 											

Address	Register	No.	RW	X	Unit	Type	Range	Default value	Svd	Function code	Description
0x3796	14231	1	RW	X1	D	UNIT	0-65535	10	Y	03, 06, 16, 100-4	Pulse weight: this register can be used to set the value of the pulse weight for the meter connected to input 1 of channel 1.
0x3797	14232	1	RW	X1	D	UNIT	0-65535	10	Y	03, 06, 16, 100-4	Pulse weight: this register can be used to set the value of the pulse weight for the meter connected to input 2 of channel 1.

Modbus Tables for Connected Products

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iOF+SD24 Indication Auxiliary

Overview

The iOF+SD24 indication auxiliary is used to find out the status (OF) and the tripping status upon a fault (\overline{SD}) of the following devices:

- iC60 circuit breaker
- iID residual current circuit breaker
- iC40 circuit breaker
- iC40 XA circuit breaker
- iC40 ARC circuit breaker
- iCV40 circuit breaker
- iCV40 XA circuit breaker
- iCV40 VigiARC circuit breaker
- iID40 residual current circuit breaker
- iDPN ARC circuit breaker
- iDPN Vigi circuit breaker
- iDPN VigiARC circuit breaker
- iSW-NA remote tripping switch disconnecter

The Modbus information in the following table is given for an iOF+SD24 auxiliary connected to channel 1.

Description	Address ⁽¹⁾	No. of register(s)	Type	Action	Values and meanings
Status					
OF status	0x3778	1	BITMAP	R	bit 0 = 0: circuit breaker open bit 0 = 1: circuit breaker closed
\overline{SD} status	0x3778	1	BITMAP	R	bit 1 = 0: device tripped (fault present) bit 1 = 1: device not tripped
Counters					
Number of circuit breaker opening/ closing cycles	0x3784	2	UINT32	RW	–
Number of trippings	0x3786	2	UINT32	RW	–
Load running time	0x3788	2	UINT32	RW	in hours
(1) To address the channel N ($1 \leq N \leq 11$) registers, add $40 \times (N - 1)$ to the channel 1 registers.					

OF+SD24 Indication Auxiliary

Overview

The OF+SD24 indication auxiliary is used to find out the status (OF) and the tripping status upon a fault (\overline{SD}) of the following circuit breakers and earth-leakage devices:

- C60 circuit breaker
- C120 circuit breaker
- DPN circuit breaker
- DPN Vigi residual current circuit breaker
- ID residual current circuit breaker
- C60H-DC miniature circuit breaker
- SW60-DC switch disconnecter
- C60PV-DC miniature circuit breaker
- C60NA-DC switch-disconnector
- C120NA-DC switch-disconnector

The Modbus information in the following table is given for an OF+SD24 auxiliary connected to channel 1.

Description	Address ⁽¹⁾	Type	Action	Values and meanings
Status				
OF status	0x3778	BITMAP	R	bit 0 = 0: circuit breaker open bit 0 = 1: circuit breaker closed
\overline{SD} status	0x3778	BITMAP	R	bit 1 = 0: device tripped (fault present) bit 1 = 1: device not tripped
Counters				
Number of circuit breaker opening/closing cycles	0x3784	UINT32	RW	–
Number of trippings	0x3786	UINT32	RW	–
Load running time	0x3788	UINT32	RW	in hours
(1) To address the channel N ($1 \leq N \leq 11$) registers, add $40 \times (N - 1)$ to the channel 1 registers.				

Meter with Pulse Output

Overview

The CEI 62053-31 standard applies to the following meters:

- iEM2000T
- iEM3110
- iEM3155
- iEM3210
- iEM3255
- iEM3355
- Meter with pulse output

The meter delivers a pulse output.

The Modbus information in the following table is given for a meter connected to channel 1.

The same channel (Ti24 interface) on the I/O Smart Link can take account of two meters:

- One meter connected to input I1
- One meter connected to input I2

Description	Address ⁽¹⁾	No. of register (s)	Type	Action	Values and meanings
Status					
Pulse output (meter 1)	0x3778	1	BITMAP	R	bit 0
Pulse output (meter 2)	0x3778	1	BITMAP	R	bit 1
Counters					
Power or flow indicator (meter 1)	0x377C	2	Float32	R	⁽²⁾
Power or flow indicator (meter 2)	0x377E	2	Float32	R	⁽²⁾
Consumption meter (meter 1)	0x3780	2	UINT32	R	⁽³⁾
Consumption meter (meter 2)	0x3782	2	UINT32	R	⁽³⁾
Settings					
Pulse weight (meter 1)	0x3796	1	UINT	RW	⁽²⁾
Pulse weight (meter 2)	0x3797	1	UINT	RW	⁽²⁾
<p>(1) To address the channel N ($1 \leq N \leq 11$) registers, add $40 \times (N - 1)$ to the channel 1 registers.</p> <p>(2) The register contains the flow value.</p> <ul style="list-style-type: none"> • The flow is: $(3600 \times \text{pulse weight})/t$, with t representing the time in seconds between two pulses. The result is expressed for one hour. • The pulse weight is 10 by default. The unit depends on the connected device: energy, gas, water, for example. <p>(3) The consumption value (associated with a channel) is obtained by multiplying the number of pulses (received by inputs I1 and I2 of this channel) by the pulse weight.</p>					

iACT24 Auxiliary for iCT Contactor

Overview

The iACT24 auxiliary:

- allows control and indication of a 230 Vac contactor iCT rated 25 A or higher from the I/O Smart Link by 24 Vdc signals (Y3),
- allows control by a maintained signal (Y2),
- is used to find out the contactor status (O/C status: open/closed status).

The Modbus information in the following table is given for an iACT24 auxiliary connected to channel 1.

Description	Address ⁽¹⁾	No. of register(s)	Type	Action	Values and meanings
Status					
O/C status: open/closed status	0x3778	1	BITMAP	R	bit 0 = 0: contactor open bit 0 = 1: contactor closed
Device present	0x3778	1	BITMAP	R	bit 1 = 0: connection fault or no connected device bit 1 = 1: connected device
Orders					
Deactivate contactor coil	0x3779	1	BITMAP	RW	bit 0 = 1: deactivate coil ⁽²⁾
Activate contactor coil	0x3779	1	BITMAP	RW	bit 1 = 1: activate coil ⁽²⁾
Counters					
Number of contactor open/close cycles	0x3784	2	UINT32	RW	–
Load running time for an NO contactor	0x3788	2	UINT32	RW	in hours
(1) To address the channel N ($1 \leq N \leq 11$) registers, add $40 \times (N - 1)$ to the channel 1 registers.					
(2) The I/O Smart Link device resets the bit to state 0 when the order is taken into account (unless no product is connected to the channel). If bits 0 and 1 of address 14201 are activated simultaneously, the I/O Smart Link device does nothing.					

iATL24 Auxiliary for iTL Impulse Relay

Overview

The iATL24 auxiliary:

- allows control and indication of a 230 Vac impulse relay iTL from the I/O Smart Link by 24 Vdc signals (Y3),
- allows control by a pulsed signal (Y2),
- is used to find out the impulse relay status (O/C status open/closed status).

The Modbus information in the following table is given for an iATL24 auxiliary connected to channel 1.

Description	Address ⁽¹⁾	No. of register(s)	Type	Action	Values and meanings
Status					
O/C status: open/closed status	0x3778	1	BITMAP	R	bit 0 = 0: impulse relay open bit 0 = 1: impulse relay closed
Device present	0x3778	1	BITMAP	R	bit 1 = 0: connection fault or no connected device bit 1 = 1: connected device
Orders					
Impulse relay contact opening	0x3779	1	BITMAP	RW	bit 0 = 1: Impulse relay contact opening ⁽²⁾
Impulse relay contact closing	0x3779	1	BITMAP	RW	bit 1 = 1: Impulse relay contact closing ⁽²⁾
Counters					
Number of impulse relay opening/closing cycles	0x3784	2	UINT32	RW	–
Load running time	0x3788	2	UINT32	RW	in hours
(1) To address the channel N ($1 \leq N \leq 11$) registers, add $40 \times (N - 1)$ to the channel 1 registers.					
(2) The I/O Smart Link device resets the bit to state 0 when the order is taken into account (unless no product is connected to the channel). If bits 0 and 1 of address 14201 are activated simultaneously, the I/O Smart Link device does nothing.					

Contactor and Relay (Not in the Acti 9 Range)

Overview

A contactor or relay powered with 24 Vdc allows control and indication of impulse relay or contactor from the I/O Smart Link by 24 Vdc signals (Y3). This should have the following characteristics:

- The relay or contactor coil must not draw more than 100 mA
- The indication contact must be low level type

The Modbus information in the following table is given for a contactor connected to channel 1.

Description	Address ⁽¹⁾	No. of register(s)	Type	Action	Values and meanings
Status					
OF status	0x3778	1	BITMAP	R	bit 0 = 0: contactor open bit 0 = 1: contactor closed
Orders					
Deactivate contactor coil	0x377A	1	BITMAP	RW	bit 0 = 1: deactivate coil ⁽²⁾
Activate contactor coil	0x377A	1	BITMAP	RW	bit 1 = 1: activate coil ⁽²⁾
Counters					
Number of contactor open/close cycles	0x3784	2	UINT32	RW	–
Load running time for an NO contactor	0x3788	2	UINT32	RW	in hours
(1) To address the channel N ($1 \leq N \leq 11$) registers, add $40 \times (N - 1)$ to the channel 1 registers.					
(2) The I/O Smart Link device resets the bit to state 0 when the order is taken into account (unless no product is connected to the channel). If bits 0 and 1 of address 14202 are activated simultaneously, the I/O Smart Link device does nothing.					

Acti 9 RCA iC60 Remote Control with Ti24 Interface

Overview

The Acti 9 RCA iC60 remote control:

- Should have a Ti24 interface (with product references A9C70122 and A9C70124)
- Can be used to control a iC60 circuit breaker via input Y1/Y2 local control depending on the selected mode and Y3 of its Ti24 interface.
The Y3 (24 Vdc) input can be controlled by one of the I/O Smart Link channels
- Can be used to find out the OF and \overline{SD} statuses of the circuit breaker associated with the Acti 9 RCA iC60 remote control

The Modbus information in the following table is given for an Acti 9 RCA iC60 remote control connected to channel 1.

Description	Address ⁽¹⁾	No. of register(s)	Type	Action	Values and meanings
Status					
OF status	0x3778	1	BITMAP	R	bit 0 = 0: circuit breaker open bit 0 = 1: circuit breaker closed
\overline{SD} status	0x3778	1	BITMAP	R	bit 1 = 0: device tripped (fault present) bit 1 = 1: device not tripped
Orders					
Activation of the open order	0x3779	1	BITMAP	RW	bit 0 = 1: activation of the open order ⁽²⁾
Activation of the close order	0x3779	1	BITMAP	RW	bit 1 = 1: activation of the close order ⁽²⁾
Counters					
Number of circuit breaker open/close cycles	0x3784	2	UINT32	RW	–
Number of trippings	0x3786	2	UINT32	RW	–
Load running time	0x3788	2	UINT32	RW	in hours
(1) To address the channel N ($1 \leq N \leq 11$) registers, add $40 \times (N - 1)$ to the channel 1 registers.					
(2) The I/O Smart Link device resets the bit to state 0 when the order is taken into account (unless no product is connected to the channel). If bits 0 and 1 of address 14201 are activated simultaneously, the I/O Smart Link device does nothing.					

Acti 9 Reflex iC60 Integrated Control Circuit Breaker With Ti24 Interface

Overview

The Acti 9 Reflex iC60 integrated control circuit breaker:

- Should have a Ti24 interface (with product references A9C6****).
- Can allow the device to be controlled via input Y3 of its Ti24 interface.
The Y3 (24 Vdc) input can be controlled by one of the I/O Smart Link channels.
- Can be used to indicate the state of the control circuit (O/C) and circuit breaker state (auto/OFF).

The Modbus information in the following table is given for an Acti 9 Reflex iC60 integrated control circuit breaker connected to channel 1.

Description	Address ⁽¹⁾	No. of register (s)	Type	Action	Values and meanings
Status					
O/C status: open/closed status	0x3778	1	BITMAP	R	bit 0 = 0: circuit breaker open bit 0 = 1: circuit breaker closed
auto/OFF status: handle position	0x3778	1	BITMAP	R	bit 1 = 0: handle in OFF position (device open) bit 1 = 1: handle in upper position: auto
Orders					
Activation of the open order	0x3779	1	BITMAP	RW	bit 0 = 1: activation of the open order ⁽²⁾
Activation of the close order	0x3779	1	BITMAP	RW	bit 1 = 1: activation of the close order ⁽²⁾
Counters					
Number of circuit breaker open/close cycles	0x3784	2	UINT32	RW	–
Number of trippings	0x3787	2	UINT32	RW	–
Load running time	0x3788	2	UINT32	RW	in hours
(1) To address the channel N (1 ≤ N ≤ 11) registers, add 40 × (N – 1) to the channel 1 registers.					
(2) The I/O Smart Link device resets the bit to state 0 when the order is taken into account (unless no product is connected to the channel). If bits 0 and 1 of address 14201 are activated simultaneously, the I/O Smart Link device does nothing.					

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Details of Modbus Functions

What's in This Chapter

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Overview

This appendix describes Modbus functions supported by the I/O Smart Link device that are not available on the www.modbus.org website. It is not attempting to describe the whole protocol.

Function 8: Modbus Diagnostics

Structure of Modbus Messages Concerning I/O Smart Link Diagnostic Counter Management

Request

Definition	Number of Bytes	Value
Server number	1 byte	0x00 to 0x63
Function code	1 byte	0x08
Sub-function code	2 bytes	See the table "Sub-function codes" later in this topic
Data	2 bytes	0x0000

Sub-function codes

Sub-function codes (Decimal)	Description
-	Data passed in the request data field is to be returned (looped back) in the response.
10 (0 x 0A)	Resets all diagnostic counters.. Counters are also cleared upon power-up.
11 (0 x 0B)	Reads the correct bus messages managed by the server counter.
12 (0 x 0C)	Reads the incorrect bus messages managed by the server counter.
13 (0 x 0D)	Reads the exception responses managed by the server counter.
14 (0 x 0E)	Reads the messages sent to the server counter.
15 (0 x 0F)	Reads the broadcast message counter.
17 (0 x 11)	Reads the messages sent to the server counter sent to the server but without a response because of exception code 06: server device busy.
18 (0 x 12)	Reads the incorrect bus messages due to overload errors counter.
-	Clears the overrun error counter.

Response

Definition	Number of Bytes	Value
Server number	1 byte	0x00 to 0x63
Function code	1 byte	0x08
Sub-function code	2 bytes	See the preceding list
Diagnostic counter	2 bytes	Value of diagnostic counter corresponding to the sub-function code

Resetting Counters

The counters are reset to 0:

- when they reach the maximum value 65535,
- when they are reset by a Modbus command (function code 8, sub-function code 10),
- when the power is cut off, or
- when the communication parameters are modified.

Function 43-14: Read I/O Smart Link ID

Structure of Modbus Read I/O Smart Link ID Messages

The ID consists of ASCII characters called objects.

Request for basic information

Definition	Number of Bytes	Value
Server number	1 byte	0x00–0x63
Function code	1 byte	0x2B
Sub-function code	1 byte	0x0E
Product ID	1 byte	0x01
Object identifier	1 byte	0x00

Response with basic information

Definition	Number of Bytes	Value	
Server number	1 byte	0x00–0x63	
Function code	1 byte	0x2B	
Sub-function code	1 byte	0x0E	
Product ID	1 byte	0x01	
Conformity level	1 byte	0x01	
Reserved	1 byte	0x00	
Reserved	1 byte	0x00	
Number of objects	1 byte	0x03	
Object 0: manufacturer name	Object number	1 byte	0x00
	Object length	1 byte	0x12
	Object content	18 bytes	Schneider Electric
Object 1: product code	Object number	1 byte	0x01
	Object length	1 byte	0x08
	Object content	8 bytes	A9XMSB11
Object 2: version number	Object number	1 byte	0x02
	Object length	1 byte	0x0B
	Object content	11 bytes	xxx.yyy.zzz

Request for complete information

Definition	Number of Bytes	Value
Server number	1 byte	0x00–0x63
Function code	1 byte	0x2B
Sub-function code	1 byte	0x0E
Product ID	1 byte	0x02
Object identifier	1 byte	0x00

Response with complete information

Definition		Number of Bytes	Value
Server number		1 byte	0x00–0x63
Function code		1 byte	0x2B
Sub-function code		1 byte	0x0E
Product ID		1 byte	0x02
Conformity level		1 byte	0x02
Reserved		1 byte	0x00
Reserved		1 byte	0x00
Number of objects		1 byte	0x05
Object 0: manufacturer name	Object number	1 byte	0x00
	Object length	1 byte	0x12
	Object content	18 bytes	Schneider Electric
Object 1: product code	Object number	1 byte	0x01
	Object length	1 byte	0x08
	Object content	8 bytes	A9XMSB11
Object 2: version number	Object number	1 byte	0x02
	Object length	1 byte	0x0B
	Object content	11 bytes	xxx.yyy.zzz
Object 3: manufacturer URL	Object number	1 byte	0x03
	Object length	1 byte	0x13
	Object content	19 bytes	https://www.se.com/
Object 4: product name	Object number	1 byte	0x04
	Object length	1 byte	0x0E
	Object content	14 bytes	I/O Smart Link

NOTE: The preceding table describes how to read the ID of a Modbus I/O Smart Link server.

Function 43-15: Read Date and Time

Structure of Modbus Read Date and Time Messages

Request

Definition	Number of Bytes	Value	Example
Server number	1 byte	0x2F	47
Function code	1 byte	0x2B	43
Sub-function code	1 byte	0x0F	15
Reserved	1 byte	0x00	Reserved

Response

Definition			Number of Bytes	Value	Example
Server number			1 byte	0x2F	47
Function code			1 byte	0x2B	43
Sub-function code			1 byte	0x0F	15
Reserved			1 byte	0x00	Reserved
Date and time ⁽¹⁾	byte 1	Not used	1 byte	0x00	Not used
	byte 2	Year	1 byte	0x0A	Year 2010
	byte 3	Month	1 byte	0x0B	Month of November
	byte 4	Day of the month	1 byte	0x02	Second day of the month
	byte 5	Hour	1 byte	0x0E	14 hours
	byte 6	Minute	1 byte	0x20	32 minutes
	byte 7 and byte 8	Millisecond	2 bytes	0x0DAC	3.5 seconds
(1) See description of the DATETIME type, page 68.					

Function 43-16: Write Date and Time

Structure of Modbus Write Date and Time Messages

Request

Definition			Number of Bytes	Value	Example
Server number			1 byte	0x2F	47
Function code			1 byte	0x2B	43
Sub-function code			1 byte	0x10	16
Reserved			1 byte	0x00	Reserved
Date and time ⁽¹⁾	byte 1	not used	1 byte	0x00	Not used
	byte 2	Year	1 byte	0x0A	Year 2010
	byte 3	Month	1 byte	0x0B	Month of November
	byte 4	Day of the month	1 byte	0x02	Second day of the month
	byte 5	Hour	1 byte	0x0E	14 hours
	byte 6	Minute	1 byte	0x20	32 minutes
	byte 7 and byte 8	Millisecond	2 bytes	0x0DAC	3.5 seconds
(1) See description of the DATETIME type, page 68.					

Response

Definition			Number of Bytes	Value	Example
Server number			1 byte	0x2F	47
Function code			1 byte	0x2B	43
Sub-function code			1 byte	0x10	15
Reserved			1 byte	0x00	Reserved
Date and time ⁽¹⁾	byte 1	Not used	1 byte	0x00	Not used
	byte 2	Year	1 byte	0x0A	Year 2010
	byte 3	Month	1 byte	0x0B	Month of November
	byte 4	Day of the month	1 byte	0x02	Second day of the month
	byte 5	Hour	1 byte	0x0E	14 hours
	byte 6	Minute	1 byte	0x20	32 minutes
	byte 7 and byte 8	Millisecond	2 bytes	0x0DAE	3.502 seconds
(1) See description of the DATETIME type, page 68.					

Function 100-4: Read Non-Adjacent Words

Structure of Modbus Read n Non-Adjacent Words Messages Where $n \leq 100$

Request

Definition	Number of Bytes	Value
Modbus server number	1 byte	0x2F
Function code	1 byte	0x64
Length of data in bytes	1 byte	0x06
Sub-function code	1 byte	0x04
Transmission number ⁽¹⁾	1 byte	0xXX
Address of the first word to be read (MSB)	1 byte	0x00
Address of the first word to be read (LSB)	1 byte	0x65
Address of the second word to be read (MSB)	1 byte	0x00
Address of the second word to be read (LSB)	1 byte	0x67
(1) The client gives the transmission number in the request.		

NOTE: The preceding table describes how to read addresses 101 = 0x65 and 103 = 0x67 of a Modbus server. The Modbus server number is 47 = 0x2F.

Response

Definition	Number of Bytes	Value
Modbus server number	1 byte	0x2F
Function code	1 byte	0x64
Length of data in bytes	1 byte	0x06
Sub-function code	1 byte	0x04
Transmission number ⁽¹⁾	1 byte	0xXX
First word read (MSB)	1 byte	0x12
First word read (LSB)	1 byte	0x0A
Second word read (MSB)	1 byte	0x74
Second word read (LSB)	1 byte	0x0C
(1) The server sends back the same number in the response.		

NOTE: The preceding table describes how to read addresses 101 = 0x65 and 103 = 0x67 of a Modbus server. The Modbus server number is 47 = 0x2F.

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