Low voltage electrical distribution

Compact NSX Modbus

Modbus communication

User manual
09/2009

Schneider Electric

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

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

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

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

Table of Contents

Safety Information

Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, 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 an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

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

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

CAUTION
CAUTION, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result in** equipment damage.

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 the installation, and has received safety training to recognize and avoid the hazards involved.

About the Book

At a Glance

Document Scope

The aim of this manual is to provide users, installers, and maintenance personnel with the technical information needed to operate the Modbus protocol on Compact NSX 100 to 630 A circuit breakers.

Validity Note

This documentation is valid for Compact NSX 100 to 630 A circuit breakers.

Related Documents

Title of Documentation	Reference Number
Compact NSX circuit breakers - User manual	LV434101
Micrologic 5 and 6 trip units - User manual	LV434104
ULP system - User manual	TRV99101
Compact NSX 100 to 630 A - Catalogue	LVPED208001EN

You can download these technical publications and other technical information from our website at www.schneider-electric.com.

User Comments

We welcome your comments about this document. You can reach us by e-mail at techcomm@schneider-electric.com.

Modbus Communication with Compact NSX

1

Introduction

This chapter describes the Modbus communication interface module. This module enables a Compact NSX circuit breaker to be connected to a Modbus network.

What's in this Chapter?

This chapter contains the following topics:

Introduction

General Description

The Modbus communication option enables a Compact NSX circuit breaker to be connected to a supervisor or to any other device with a master Modbus communication channel.

The Modbus communication option is available for the following Compact NSX configurations:

- Compact NSX circuit breaker with the BSCM (Breaker Status and Control Module) and with the communicating motor mechanism
- Compact NSX circuit breaker with Micrologic 5/6 trip unit

A Compact NSX circuit breaker is connected to a Modbus communication network through a Modbus communication interface module.

Access to Functions

The Modbus communication option provides access to many functions, including:

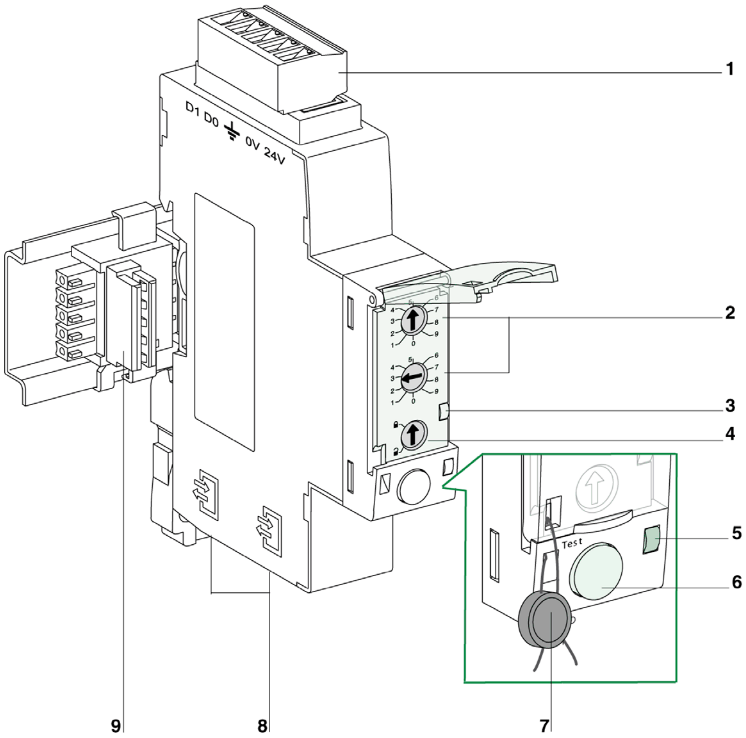
- reading of metering and diagnostic data
- reading of status conditions and remote operations
- transfer of time-stamped events
- displaying protection settings
- reading of the Compact NSX circuit breaker identification and configuration data
- time-setting and synchronization

The list depends on the application, the Compact NSX circuit breaker with its Micrologic trip unit type, and on the BSCM.

Modbus Communication Interface Module

General Description

The Modbus communication interface module enables a ULP (Universal Logic Plug) module, for example a Compact NSX circuit breaker, to be connected to a Modbus network. Each circuit breaker has its own Modbus communication interface module and a corresponding Modbus address.



1 5-pin screw type connector (Modbus connection and power supply)
2 Modbus address switches
3 Modbus traffic LED
4 Modbus locking pad
5 Test LED
6 Test button
7 Mechanical lock
8 2 RJ45 connectors
9 Stacking accessory

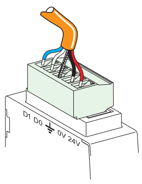
Mounting

The Modbus communication interface module is a DIN rail mounting device. The stacking accessory enables the user to interconnect several Modbus communication interface modules without additional wiring.

Description of the 5-pin connector

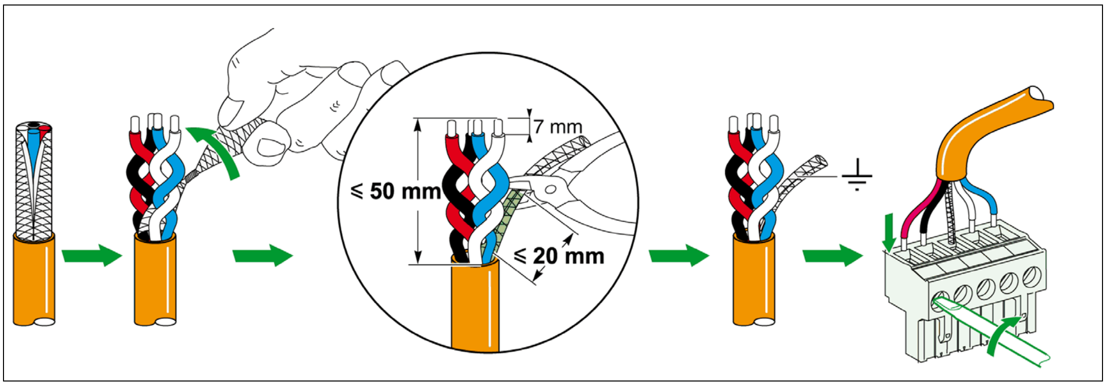
The 5-pin screw-type connector enables the Modbus communication interface module to be connected to the Modbus network (2 wires) and to the 24 V DC power supply.

Each pin has a corresponding marking in order to facilitate the wiring operations.

Connector	Marking	Color	Description	Unshielded Length	Stripped Length
	D1	Blue	Communication pair D1 : RS 485 B/B' signal or Rx+/Tx+ D0 : RS 485 A/A' signal or Rx-/Tx-	5 cm max	7 mm
	D0	White			
	⏚	–	Shield	2 cm max (1)	7 mm
	0 V	Black	0 V of the power supply	5 cm max	7 mm
	24 V	Red	24 V DC power supply		

(1) To prevent electromagnetic disturbance, the unshielded length of the Modbus cable shield shall be minimized.

Wiring of the 5-pin connector



NOTE: It is not allowed to connect more than 2 wires inside the same pin of the Modbus communication interface module connector.

Modbus Address Switches

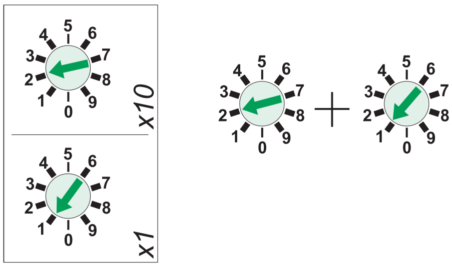
The Modbus communication interface module bears the Modbus address of the IMU (Intelligent Modular Unit) to which it is connected. See the *ULP System User manual* for more information regarding the intelligent modular unit.

The user defines the Modbus address using the 2 address switches on the front panel of the Modbus communication interface module.

The address range is 1 to 99. Value 0 is forbidden because it is reserved for broadcasting commands.

The Modbus communication interface module is initially configured with address 99.

Example of the configuration of the address rotary switches for address 21:



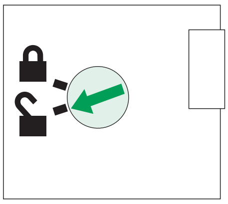
Modbus Traffic LED

The Modbus traffic yellow LED informs the user about the traffic transmitted or received by the Compact NSX circuit breaker over the Modbus network.

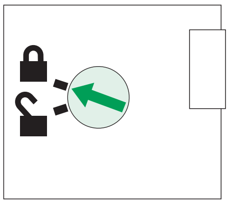
- When the Modbus address switches are on value 0, the LED is steady ON.
- When the Modbus address switches are on value anywhere between 1 and 99, the LED is ON during the transmission and reception of messages, OFF otherwise.

Modbus Locking Pad

The Modbus locking pad on the front panel of the Modbus communication interface module enables or disables remote control commands to be sent over the Modbus network to the Modbus communication interface module itself, and to the other modules (BSCM or Micrologic trip unit).



Remote control commands enabled



Remote control commands disabled

- If the arrow points to the open padlock, remote control commands are enabled.
- If the arrow points to the closed padlock, remote control commands are disabled.
  The only remote control commands that are enabled even if the arrow points to the closed padlock are the set absolute time and get current time commands. See *Set Absolute Time, page 117*.

For the other cases, the only way to modify parameters like the protection settings is through the Micrologic trip unit front panel or with the RSU software using the maintenance module connected to the Micrologic trip unit test plug.

Test Button

The test button tests the connection between all the modules connected to the Modbus communication interface module: Micrologic trip unit, front display module FDM121, and the maintenance module.

Pressing the test button launches the connection test for 15 seconds.

During the test, all the modules keep working normally.

Test LED

The yellow test LED describes the connection between the modules that are connected to the Modbus communication interface module.

Test LED status	Signification
ON: 50 ms / OFF: 950 ms	Nominal mode (no test running)
ON: 250 ms / OFF: 250 ms	ULP module address conflict: 2 identical ULP modules are detected in the same intelligent modular unit.
ON: 500 ms / OFF: 500 ms	Degraded mode (EEPROM is out of service)
ON: 1000 ms / OFF: 1000 ms	Test mode
Always ON	ULP connection is out of service
Always OFF	No power supply

Schematics

General Description

Depending on the configuration of the Compact NSX circuit breaker, the user must connect the Modbus communication interface module to the Compact NSX circuit breaker using one of the following configurations:

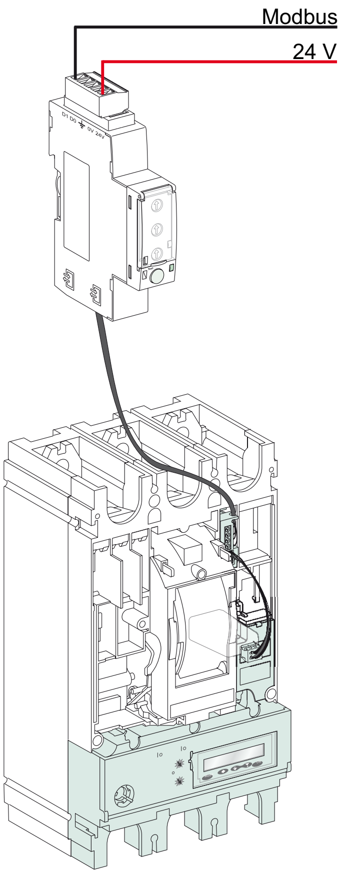
- connection of the Modbus communication interface module to the Micrologic trip unit
- connection of the Modbus communication interface module to the BSCM (Breaker Status and Control Module)
- connection of the Modbus communication interface module to the BSCM and to the Micrologic trip unit

All connection configurations require the NSX Cord or the insulated NSX Cord for system voltages greater than 480 V AC.

See the *Compact NSX Circuit Breakers User manual* for more information regarding the description and mounting of the Compact NSX circuit breaker compliant products (Micrologic trip unit, BSCM, NSX Cord).

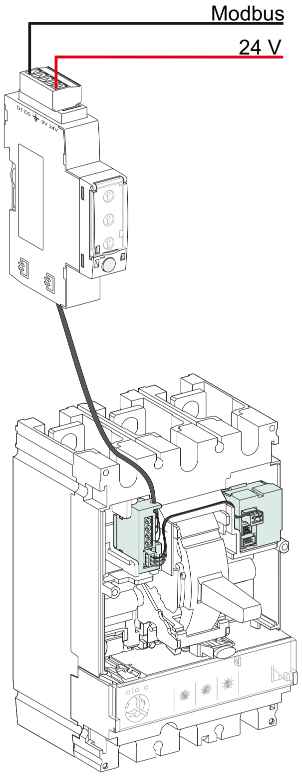
Connection of the Modbus Communication Interface Module to the Micrologic Trip Unit

The user can connect the Modbus communication interface module to the Micrologic trip unit using the NSX Cord:



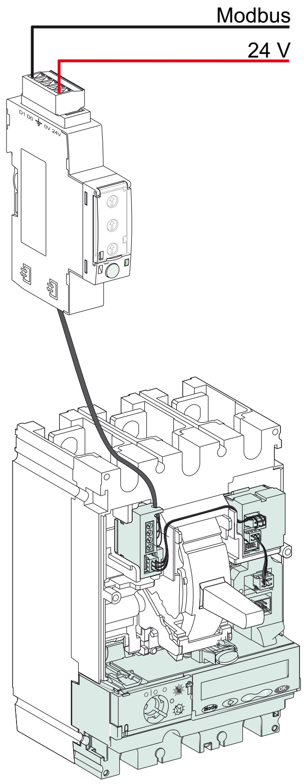
Connection of the Modbus Communication Interface Module to the BSCM

The user can connect the Modbus communication interface module to the BSCM using the NSX Cord:

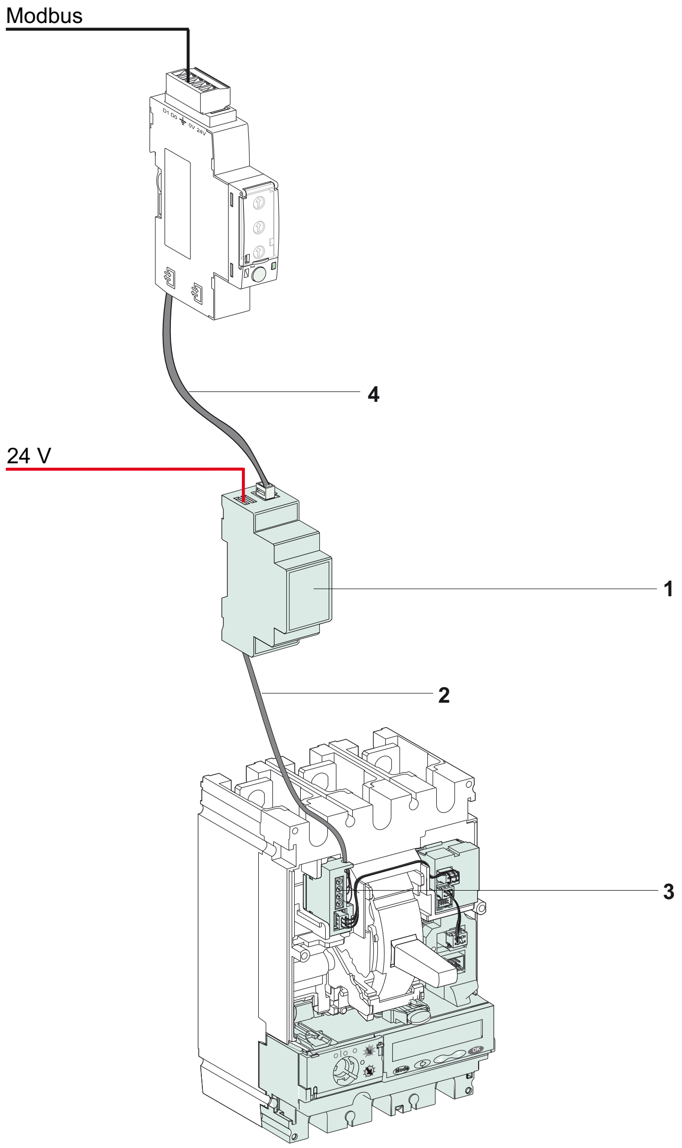


Connection of the Modbus Communication Interface Module to the BSCM and to the Micrologic Trip Unit

The user can connect the Modbus communication interface module to the BSCM and to the Micrologic trip unit using the NSX Cord:



The following figure presents the same connection schematic but with the insulated NSX Cord:



1 Electronic module with RJ45 female connector
2 1.3 m cable
3 Connector for Compact NSX internal connection
4 ULP cable

Configuration of the Modbus Communication Interface Module

General Description

2 configurations of the Modbus communication interface module are available:

- automatic configuration (Auto-Speed sensing ON): when connected to the Modbus network, the Modbus communication interface module automatically detects the network parameters (default configuration).
- personalized configuration (Auto-Speed sensing OFF): the user can personalize the network parameters using the RSU (Remote Setting Utility) software.

Automatic Configuration

The user defines the Modbus slave address using the 2 address switches on the front panel of the Modbus communication interface module. When connected to the Modbus network, the Modbus communication interface module automatically detects the network speed and parity. The Auto-Speed sensing algorithm tests the available baudrates and parities and automatically detects the network parameters. The Modbus master must send at least 15 frames on the Modbus network so that the auto-speed sensing algorithm works. It is recommended that the master sends the frames to the Modbus address 248.

The transmission format is binary with 1 start bit, 8 data bits, 1 stop bit in case of even or odd parity, and 2 stop bits in case of no parity.

NOTE: In case of problems with the Auto-Speed sensing algorithm, it is recommended to follow this procedure:

1. Set-up the Modbus communication interface module to Modbus address 1 (see *Modbus Address Switches, page 12*),
2. Send a **Read Multiple Register (FC03)** request to slave 1, at any address and for any number of registers,
3. Send this request at least 15 times.

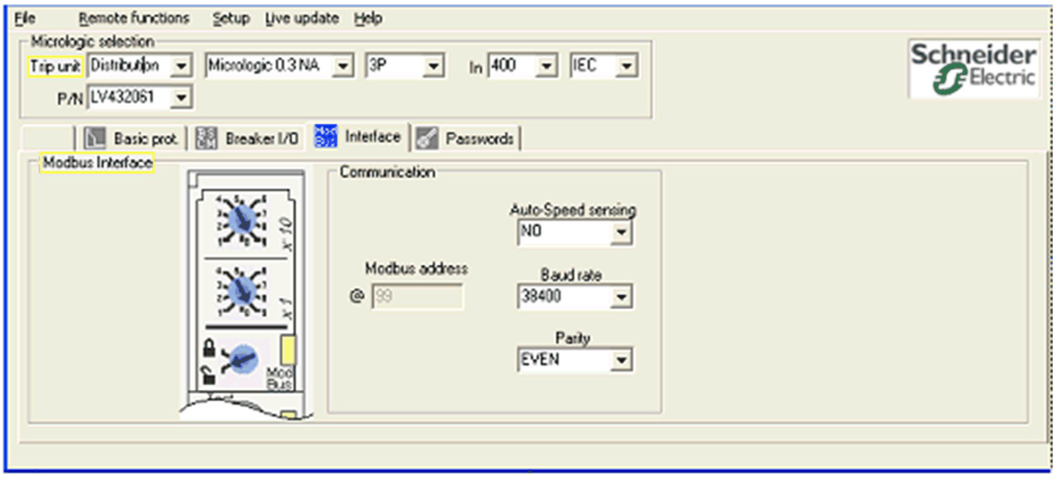
If the user decides to change the network speed or parity after the Modbus communication interface module has automatically detected these settings, the Modbus communication interface module must be restarted (power off/power on) in order to detect the new communication parameters.

Personalized Configuration

The user defines the Modbus slave address using the 2 address switches on the front panel of the Modbus communication interface module.

The user personalizes the network parameters with the RSU software.

The following figure shows the Modbus communication interface module configuration tab with RSU:



When the Auto-Speed sensing option is disabled, the user selects the network baud rate and parity:

- The supported baud rates are: 4800, 9600, 19200, and 38400 bauds.
- The supported parities are: even, odd, and none (it is possible to select 1 stop bit or 2 stop bits in case of no parity).

NOTE: It is not possible to change the Modbus address or the status of the locking pad with RSU.

The RSU software is available at www.schneider-electric.com.

See the *RSU Online Help* for more information regarding the Modbus communication interface module with RSU.

Modbus Protocol

2

Introduction

This chapter describes the Modbus master-slave protocol and the principle of the command interface.

What's in this Chapter?

This chapter contains the following topics:

Modbus Master-Slave Principle

Overview

The Modbus protocol exchanges information using a request-reply mechanism between a master (client) and a slave (server). The master-slave principle is a model for a communication protocol in which one device (the master) controls one or more other devices (the slaves). In a standard Modbus network there are 1 master and up to 31 slaves.

A detailed description of the Modbus protocol is available at www.modbus.org.

Characteristics of the Master-Slave Principle

The master-slave principle is characterized as follows:

- Only 1 master is connected to the network at a time.
- Only the master can initiate communication and send requests to the slaves.
- The master can address each slave individually using its specific address or all slaves simultaneously using address 0.
- The slaves can only send replies to the master.
- The slaves cannot initiate communication, either to the master or to other slaves.

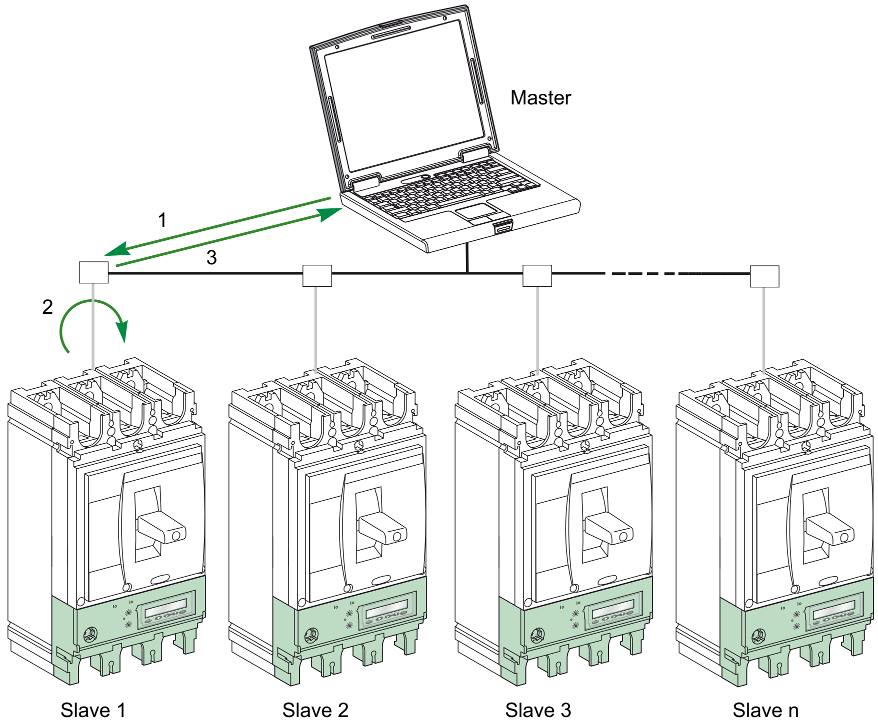
Master-Slave Communication Modes

The Modbus protocol can exchange information using 2 communication modes:

- request-reply mode
- broadcast mode

Request-Reply Mode

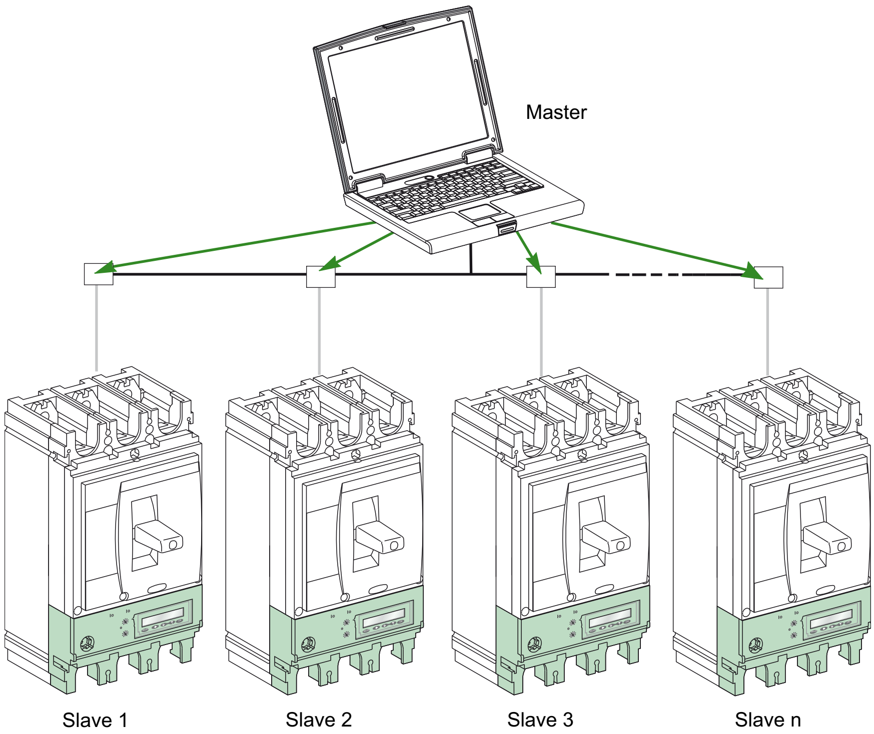
In request-reply mode, the master addresses a slave using the specific address of the slave. The slave processes the request then replies to the master.



1 Request
2 Process
3 Reply

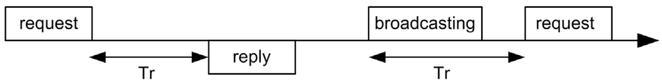
Broadcast Mode

The master can also address all slaves using address 0. This type of exchange is called broadcasting. The slaves do not reply to broadcasting messages.



Response time

The response time Tr is the time needed by a slave to respond to a request sent by the master:



Values with the Modbus protocol:
- Typical value < 10 ms for 90% of the exchanges
- Maximum value ≈ 700ms, so it is recommanded to implement a 1second time-out after receiving a Modbus request.

Data Exchange

The Modbus protocol uses 2 types of data:

- bits
- 16-bit words called registers

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

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

Registers and Addresses

The address of register number n is n-1. For example, the address of register number 12000 is 11999. In order to avoid confusion, the tables detailed in the following parts of this manual give both register numbers and corresponding addresses.

Frames

All the frames exchanged with the Modbus protocol have a maximum size of 256 bytes and are composed of 4 fields:

Field	Definition	Size	Description
1	Slave number	1 byte	Destination of the request • 0: broadcasting (all slaves concerned) • 1...247: unique destination
2	Function code	1 byte	See next paragraph
3	Data or sub-function code	n bytes	• Request or reply data • Sub-function code
4	Check	2 bytes	CRC16 (to check transmission errors)

Modbus Functions

General Description

The Modbus protocol offers a number of functions that are used to read or write data over the Modbus network. The Modbus protocol also offers diagnostic and network-management functions.

Only the Modbus functions handled by the Compact NSX circuit breaker are described here.

Read Functions

The following read functions are available:

Function code (dec)	Sub-function code (dec)	Name	Description
3	–	Read holding registers	Read n output or internal words.
4	–	Read input registers	Read n input words.
43	14	Read device identification	Read the identification data of the slave.

Read register example

The following table shows how to read the RMS current on phase 1 (I1) in register 1016. The address of register 1016 is 1016-1 = 1015 =0x03F7. The Modbus address of the Modbus slave is 47 = 0x2F.

Master request		Slave reply	
Field name	**Example**	**Field name**	**Example**
Modbus slave address	0x2F	Modbus slave address	0x2F
Function code	0x03	Function code	0x03
Address of the word to read (MSB)	0x03	Data length in bytes	0x02
Address of the word to read (LSB)	0xF7	Register value (MSB)	0x02
Number of registers (MSB)	0x00	Register value (LSB)	0x2B
Number of registers (LSB)	0x01	CRC MSB	0xXX
CRC MSB	0xXX	CRC LSB	0xXX
CRC LSB	0xXX	–	

The content of register 1016 (address 1015) is 0x022B = 555. Therefore the RMS current on phase 1 (I1) is 555 A.

Read device identification example

The Read Device Identification function is used to access in a standardized manner the information required to clearly identify a device. The description is made up of a set of objects (ASCII character strings).

A complete description of the Read Device Identification function is available at www.modbus.org.

The coding for the identification of the Modbus communication interface module is the following:

Name	Type	Description
Vendor name	STRING	‘Schneider Electric’ (18 characters)
Product code	STRING	‘TRV00210’
Firmware version	STRING	‘VX.Y.Z’ (at least 6 characters)
Vendor URL	STRING	‘www.schneider-electric.com’ (26 characters)
Product name	STRING	‘ULP/Modbus SL communication interface module’

Scattered Holding Register Read Function

The scattered holding register read function is available:

Function code (dec)	Sub-function code (dec)	Name	Description
100	4	Read scattered holding register	Read n non-contiguous words

The maximum value for n is 100.

The scattered holding register read function enables the user to:

- avoid reading a large block of contiguous words when only few words are needed
- avoid multiple use of functions 3 and 4 in order to read non-contiguous words

Example

The following table shows how to read addresses 101 = 0x65 and 103 = 0x67 of a Modbus slave. The Modbus address of the Modbus slave is 47 = 0x2F.

Master request		Slave reply	
Field name	**Example**	**Field name**	**Example**
Modbus slave address	0x2F	Modbus slave address	0x2F
Function code	0x64	Function code	0x64
Data length in bytes	0x06	Data length in bytes	0x06
Sub-function code	0x04	Sub-function code	0x04
Transmission number (1)	0xXX	Transmission number (1)	0xXX
Address of first word to read (MSB)	0x00	First word read (MSB)	0x12
Address of first word to read (LSB)	0x65	First word read (LSB)	0x0A
Address of second word to read (MSB)	0x00	Second word read (MSB)	0x74
Address of second word to read (LSB)	0x67	Second word read (LSB)	0x0C
CRC MSB	0xXX	CRC MSB	0xXX
CRC LSB	0xXX	CRC LSB	0xXX
(1) The master gives the transmission number in the request. The slave returns the same number in the reply.			

Write Functions

The following write functions are available:

Function code (dec)	Sub-function code (dec)	Name	Description
6	–	Preset single register	Write 1 word
16	–	Preset multiple registers	Write n words

Diagnostic Functions

The following diagnostic functions are available:

Function code (dec)	Sub-function code (dec)	Name	Description
8	–	Diagnostic	Manage diagnostic counters
8	10	Clear counters and diagnostic register	Reset all diagnostic counters
8	11	Return bus message counter	Read the counter of correct bus messages managed by the slave
8	12	Return bus communication error counter	Read the counter of incorrect bus messages managed by the slave
8	13	Return bus exception error counter	Read the counter of exception responses managed by the slave
8	14	Return slave message counter	Read the counter of messages sent to the slave
8	15	Return slave no response counter	Read the counter of broadcast messages
8	16	Return slave negative acknowledge counter	Read the counter of messages sent to the slave but not answered because of the Negative Acknowledge exception code 07
8	17	Return slave busy counter	Read the counter of messages sent to the slave but not answered because of the Slave Device Busy exception code 06
8	18	Return bus overrun counter	Read the counter of incorrect bus messages due to overrun errors
11	–	Get communication event counter	Read Modbus event counter

Diagnostic Counters

Modbus uses diagnostic counters to enable performance and error management. The counters are accessible using the Modbus diagnostic functions (function codes 8 and 11).The Modbus diagnostic counters and the Modbus event counter are described in the following table:

Counter number	Counter name	Description
1	Bus message counter	Counter of correct bus messages managed by the slave
2	Bus communication error counter	Counter of incorrect bus messages managed by the slave
3	Slave exception error counter	Counter of exception responses managed by the slave and incorrect broadcast messages
4	Slave message counter	Counter of messages sent to the slave
5	Slave no response counter	Counter of broadcast messages
6	Slave negative acknowledge counter	Counter of messages sent to the slave but not answered because of the Negative Acknowledge exception code 07
7	Slave busy count	Counter of messages sent to the slave but not answered because of the Slave Device Busy exception code 06
8	Bus character overrun counter	Counter of incorrect bus messages due to overrun errors
9	Comm. event counter	Modbus event counter (this counter is read with function code 11)

Counters Reset

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 power supply is lost, or
- when communication parameters are modified.

Modbus Exception Codes

Exception Responses

Exception responses from either the master (client) or a slave (server) can result from data processing errors. One of the following events can occur after a request from the master (client):

- If the slave (server) receives the request from the master (client) without a communication error and can handle the request correctly, it returns a normal response.
- If the slave (server) does not receive the request from the master (client) due to a communication error, it does not return a response. The master program eventually processes a timeout condition for the request.
- If the slave (server) receives the request from the master (client) but detects a communication error, it does not return a response. The master program eventually processes a timeout condition for the request.
- If the slave (server) receives the request from the master (client) without a communication error, but can not handle it (for example, the request is to read a register that does not exist), the server returns an exception response to inform the master of the nature of the error.

Exception Frame

The slave sends an exception frame to the master to report an exception response. An exception frame is composed of 4 fields:

Field	Definition	Size	Description
1	Slave number	1 byte	Destination of the request • 0: broadcasting (all slaves concerned) • 1...247: unique destination
2	Exception function code	1 byte	Request function code + 128 (0x80)
3	Exception code	n bytes	See next paragraph
4	Check	2 bytes	CRC16 (to check transmission errors)

Exception Codes

The exception response frame has two fields that differentiate it from a normal response frame:

- The exception function code of the exception response is equal to the function code of the original request plus 128 (0x80).
- The exception code depends on the communication error that the slave encounters.

The following table describes the exception codes handled by the Compact NSX circuit breaker:

Exception code (dec)	Name	Description
01	Illegal function	The function code received in the request is not an authorized action for the slave. The slave may be in the wrong state to process a specific request.
02	Illegal data address	The data address received by the slave is not an authorized address for the slave.
03	Illegal data value	The value in the request data field is not an authorized value for the slave.
04	Slave device failure	The slave fails to perform a requested action because of an unrecoverable error.
05	Acknowledge	The slave accepts the request but needs a long time to process it.
06	Slave device busy	The slave is busy processing another command. The master must send the request once the slave is free.
07	Negative acknowledgment	The slave can not perform the programming request sent by the master.
08	Memory parity error	The slave detects a parity error in the memory when attending to read extended memory.
10	Gateway path unavailable	The gateway is overloaded or not correctly configured.
11	Gateway target device failed to respond	The slave is not present on the network.

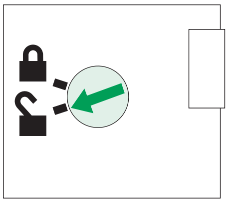
Write Protection

General Description

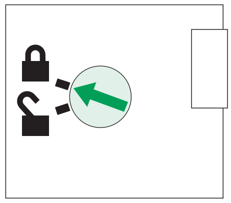
Remote modifications of Modbus registers can either be dangerous to personnel near the circuit breaker or can cause equipment damage if the protection settings are altered. Therefore, remote control commands are hardware and software protected.

Hardware Protection

The Modbus locking pad on the front panel of the Modbus communication interface module enables or disables remote control commands to be sent over the Modbus network to the Modbus communication interface module itself, and to the other modules (BSCM or Micrologic trip unit).



Remote control commands enabled



Remote control commands disabled

- If the arrow points to the open padlock, remote control commands are enabled.
- If the arrow points to the closed padlock, remote control commands are disabled.
  The only remote control commands that are enabled even if the arrow points to the closed padlock are the set absolute time and get current time commands. See *Set Absolute Time, page 117*.

For the other cases, the only way to modify parameters like the protection settings is through the Micrologic trip unit front panel or with the RSU software using the maintenance module connected to the Micrologic trip unit test plug.

Software Protection

To prevent an inadvertent change to the trip unit configuration, remote modifications of the Modbus registers is protected by both of the following:

- a robust data structure and a set of dedicated Modbus registers
- a multi-level password scheme

This combination is called the command interface. Failure to conform to this results in an error code and the operation is not performed. The hardware protection has always precedence over the software protection.

Password Management

General Description

4 passwords are defined, each corresponding to a level.

A level is assigned to a role:
- Levels 1, 2, and 3 are used for general purpose roles, like an operator role.
- Level 4 is the administrator level. The administrator level is required to write the settings to the Micrologic trip units using RSU.

For the Micrologic trip unit, all the commands are level 4 password protected except "Acknowledge a latched output", "Reset minimum/maximum", and "Start/Stop synchronization" commands which are level 3 or 4 password protected.

For the BSCM, all the commands are level 4 password protected except "Open circuit breaker", "Close circuit breaker", and "Reset circuit breaker" commands which are level 3 or 4 password protected.

For the Modbus communication interface module, all the commands are level 4 password protected except "Get current time" and "Set absolute time" commands which require no password.

Default Passwords

The default password values are:

Password Level	Default Value
Level 1	‘1111’ = 0x31313131
Level 2	‘2222’ = 0x32323232
Level 3	‘3333’ = 0x33333333
Level 4 (administrator level)	‘0000’ = 0x30303030

Password Modification with RSU

Passwords are modified with the RSU (Remote Setting Utility) software. The **Commissioning** user profile (default user profile) enables the user to modify passwords.

Passwords are composed of exactly 4 ASCII characters.They are case sensitive and the allowed characters are:
- digits from 0 to 9
- letters from a to z
- letters from A to Z

Password Reset with RSU

If the default passwords have been changed, 3 cases require to reset the passwords to their default values with RSU:

- A password is forgotten.
- A new module is added in the IMU (Intelligent Modular Unit): for example, a BSCM or a front display module FDM121.
- A faulty module is replaced in the IMU (Intelligent Modular Unit).

Resetting passwords with RSU is only available with the **Schneider service** user profile. See the *RSU online help* for more information regarding resetting passwords with RSU.

Command Interface

General Description

Remote control commands are enabled when the Modbus locking pad is in the open position. Remote modifications of the Modbus registers are performed through the command interface.

Each command has a specific code. For example, command code 45192 defines the command to setup the long time protection parameters.

NOTE: In case of multimaster Modbus application, please consult our technical support.

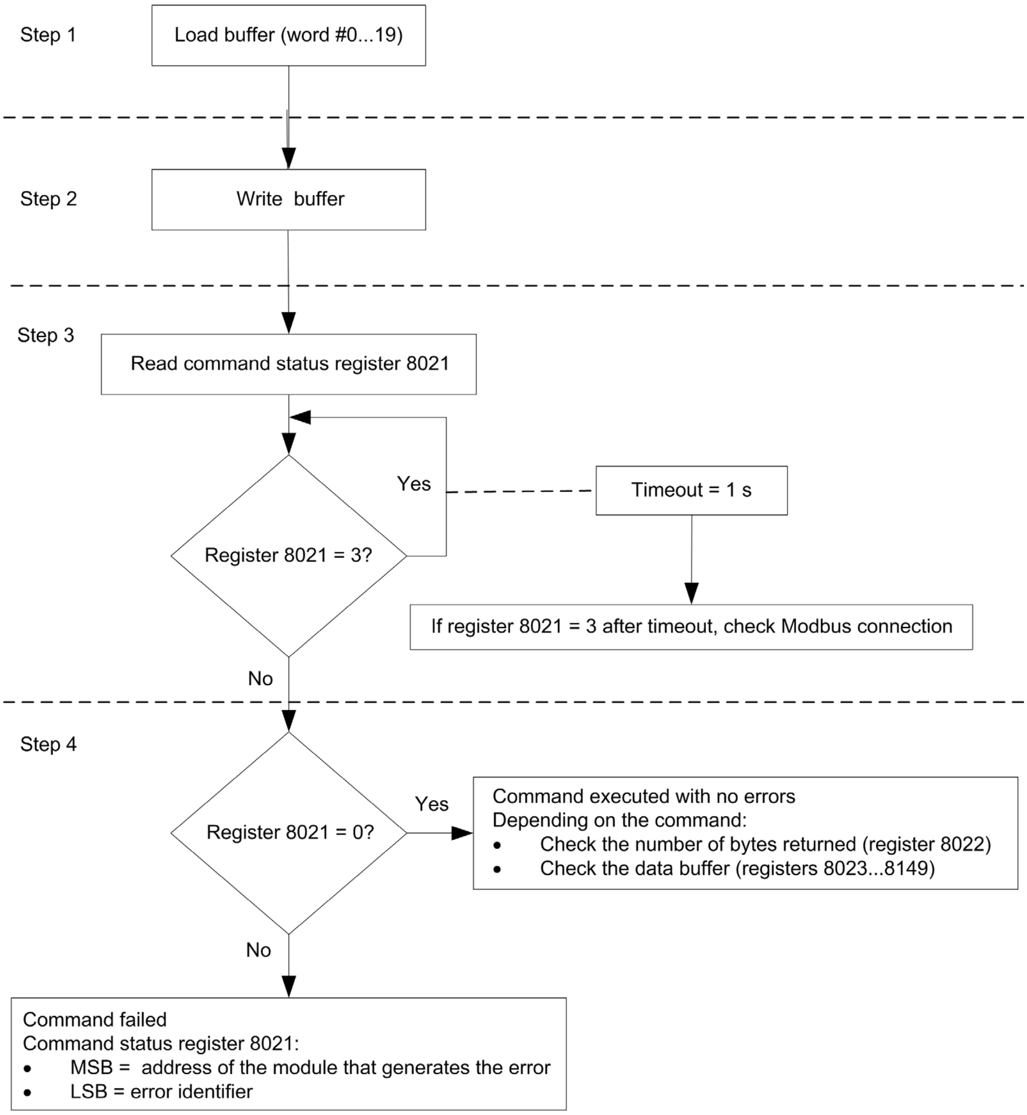
Executing a Command

Follow these steps to execute a command:

Step	Action
1	Load a buffer (word #0...19)
2	Write this buffer with a block write (Modbus function16) of 20 words, starting at register 8000.
3	Read the command status register 8021, and wait while its content shows the command is still in progress (0x0003).If the command status does not change after a timeout (1s), please check the Modbus connection.
4	Read the error identifier in LSB of register 8021: ● If LSB <> 0, then the command failed. Check the error identifier to understand the cause (see next paragraph). For example, if register 8021 returns 5121 (0x1401), then the error identifier is 1, which means that the password level is not correct (insufficient user rights). ● If LSB = 0, then the command was executed with no errors.

Command Diagram

The following diagram shows the steps to follow in order to execute a command:



Command Data Structure

The command data structure is defined as a set of values written in registers from 8000 to 8149.

The 3 main areas are:

- Input parameters: registers 8000 to 8015
  The command specific parameters are in registers 8006 to 8015.
- Command status: register 8021
- Returned values: registers 8022 to 8149

Register	Address	Description	Comments
8000	7999	Command Code	Writing at this address triggers the command using the parameters in the following registers.
8001	8000	Parameter length	Number of bytes used for the parameters including this one (from 10 to 30). This value is provided for each command.
8002	8001	Destination	A constant value provided for each command. Default value: 0x0000
8003	8002	Reserved	A constant value provided for each command (0 or 1)
8004 8005	8003 8004	Password	The password is composed of 4 ASCII bytes. The password level to use depends on the command. This information is provided for each command.
8006 8015	8005 8014	Additional Parameters	Additional parameters define how the command is performed. Some commands have no additional parameters.
8016	8015	Reserved	Must be set to 0 (default value).
8017	8016	Reserved	Must be set to 8019 (default value).
8018	8017	Reserved	Must be set to 8020 (default value).
8019	8018	Reserved	Must be set to 8021 (default value).
8020	8019	Reserved	–
8021	8020	Command Status	When the command exits the busy state, it holds the completion code.
8022	8021	Data Buffer Size	Number of bytes returned.
8023... 8149	8022... 8148	Data Buffer	Returned values. It is empty if the previous word is 0.

Command Status

When the command terminates, the command status register contains the IMU module's address (which is different from the Modbus address) and the error identifier:

- The MSB gives the address of the IMU module that generates the error. When the command is sent to one IMU module, it is usually the same as the address found in the destination register. When it is sent to all IMU modules, it is the address of the first module returning an error.

The following table lists the addresses of the modules:

Module	IMU Module Address
Maintenance module	1 (0x01)
Front display module FDM121	2 (0x02)
Modbus communication interface module	3 (0x03)
BSCM (Breaker Status and Control Module)	17 (0x11)
Micrologic trip unit	20 (0x14)

- The LSB gives the error identifier.

The following table lists the error identifiers:

Error Identifier	Description
0	Successful command
1	Insufficient user rights (incorrect password)
2	Access violation (Modbus communication interface module locking pad is locked. See *Modbus Locking Pad, page 13*)
3	Unable to perform a read access
4	Unable to perform a write access
5	Unable to execute the requested service
6	Not enough memory
7	Allocated memory is too small
8	Resource is not available
9	Resource does not exist
10	Resource already exists
11	Resource is out of order
12	Access out of available memory
13	String is too long
14	Buffer is too small
15	Buffer is too big
16	Input argument is out of range
17	Requested security level is not supported
18	Requested component is not supported
19	Command is not supported
20	Input argument has an unsupported value
21	Internal error during command
22	Timeout during command
23	Checksum error during command

The error identifiers listed in this table are generic. If a module or a command generates specific errors, they will be described after the corresponding command.

Command Examples

Open Circuit Breaker

The following table details the steps to perform in the master remote device to send a remote command to open the circuit breaker with the BSCM (see *Open Circuit Breaker, page 108*). The command itself has no parameters.

Step	Action
1	Load a buffer (word #0...19) • Load into word #0 the value 904, the code corresponding to the open circuit breaker command. • Load into word #1 the value 10, the length of the input parameters. The command itself has no parameters, 10 is the length of the fixed part. • Load into word #2 the value 4353 (0x1101), the destination. This value is a constant for the command.It is provided in the command description. • Load into word #3 the value 1. • Load into word #4 and #5 the 4 ASCII bytes for the level 3 or level 4 password. Assuming this password is ‘ABcd’, load 16706 (0x4142) into word #4 and 25444 (0x6364) into word #5. • Load into word #17 the value 8019, a command setup constant. • Load into word #18 the value 8020, a command setup constant. • Load into word #19 the value 8021, a command setup constant.
2	Write this buffer with a block write (Modbus function 16) of 20 words, starting at register 8000.
3	Read the command status register 8021, and wait while its content shows the command is still in progress (0x0003). If the command status does not change after a timeout (1s), please check the Modbus connection.
4	Read the error identifier in LSB of register 8021: • If LSB <> 0, then the command failed. Check the error identifier to understand the cause (see next paragraph). For example, if register 8021 returns 4353 (0x1101), then the error identifier is 1, which means that the password level is not correct (insufficient user rights). • If LSB = 0, then the command was executed with no errors.

Reset Energy Measurements

The following table details the steps to perform to send a command to reset the minimum/maximum energy measurements (see *Reset Minimum/Maximum, page 94*). The command itself has one parameter.

Step	Action
1	Load a buffer (word #0...19) • Load into word #0 the value 46728, the code corresponding to the reset minimum/maximum command. • Load into word #1 the value 12, the length of the input parameters. The command itself has one parameter, add 2 bytes to 10 which is the length of the fixed part. • Load into word #2 the value 5121 (0x1401), the destination. This value is a constant for the command. It is provided in the command description. • Load into word #3 the value 1. • Load into word #4 and #5 the 4 ASCII bytes for the level 3 or level 4 password. Assuming this password is ‘PW57’, load 20599 (0x5077) into word #4 and 13623 (0x3537) into word #5. • Load into word #6 the value 512 (bit 0 set to one). This value requests that the energy measurement minimum/maximum be reset. • Load into word #17 the value 8019, a command setup constant. • Load into word #18 the value 8020, a command setup constant. • Load into word #19 the value 8021, a command setup constant.
2	Write this buffer with a block write (Modbus function 16) of 20 words, starting at register 8000.
3	Read the command status register 8021, and wait while its content shows the command is still in progress (0x0003). If the command status does not change after a timeout (1 s), please check the Modbus connection.
4	Read the error identifier in LSB of register 8021: • If LSB <> 0, then the command failed. Check the error identifier to understand the cause (see next paragraph). For example, if register 8021 returns 5121 (0x1401), then the error identifier is 1, which means that the password level is not correct (insufficient user rights). • If LSB = 0, then the command was executed with no errors.

Read Date and Time

The following table details the steps to perform to send a command to read the date and time. The command itself has no parameters.The date and time are returned in a buffer.

Step	Action
1	Load a buffer (word #0...19) • Load into word #0 the value 768, the code corresponding to the read date/time command. • Load into word #1 the value 10, the length of the input parameters. The command itself has no parameters, the length is the length of the fixed part which is 10. • Load into word #2 the value 768 (0x0300), the destination. This value is a constant for the command. It is provided in the command description. • Load into word #3 the value 0. • Load into word #4 and #5 the value 0x0000 (no password required). • Load into word #17 the value 8019, a command setup constant. • Load into word #18 the value 8020, a command setup constant. • Load into word #19 the value 8021, a command setup constant.
2	Write this buffer with a block write (Modbus function 16) of 20 words, starting at register 8000.
3	Read the command status register 8021, and wait while its content shows the command is still in progress (0x0003). If the command status does not change after a timeout (1s), please check the Modbus connection.
4	Read the error identifier in LSB of register 8021: • If LSB <> 0, then the command failed. Check the error identifier to understand the cause (see next paragraph). For example, if register 8021 returns 783 (0x030F), then the error identifier is 1, which means that the input argument is out of range (too many parameters). • If LSB = 0, then the command was executed with no errors.
5	If there were no errors, read the data buffer length in register 8022. Its value must be 8 for this command.
6	In the data buffer: • register 8023 holds the month in the MSB, the day in the LSB. • register 8024 holds the year offset in the MSB (add 2000 to get the year) and the hour in the LSB. • register 8025 holds the minutes in the MSB, the seconds in the LSB. • register 8026 holds the milliseconds.

Date Management

Introduction

Each module of the IMU (Intelligent Modular Unit) uses its date to time-stamp events and history registers.

The date of the IMU modules is updated in 2 steps:

1. The Modbus master synchronizes the Modbus communication interface module (external synchronization).
2. The Modbus communication interface module synchronizes the IMU modules (internal synchronization).

Date Format

The date information is coded on 3 registers:

- Registers 1 and 2 return the date in number of seconds since 01/01/2000:
  - Register 1 returns the MSB of the date.
  - Register 2 returns the LSB of the date.
- Register 3 returns the complement in ms with the quality of the date.

The following table details the date registers:

Register	Type	Bit	Description
Register 1 Register 2	UDINT	–	Date in number of seconds since 01/01/2000
Register 3	UINT	–	Complement in milliseconds with quality of the date
		0...9	Encodes the milliseconds
		10...11	Not used
		12	Modbus communication interface module external synchronization status 0 = The Modbus communication interface module has not been externally synchronized within the last 2 hours. 1 = The Modbus communication interface module has been externally synchronized within the last 2 hours.
		13	IMU module internal synchronization status 0 = The IMU module has not been internally synchronized. 1 = The IMU module has been internally synchronized.
		14	Synchronization since last power on 0 = No 1 = Yes
		15	Reserved

External Synchronization

The user has 2 ways to externally synchronize the Modbus communication interface module:

- with the RSU (Remote Setting Utility) software
- with a Modbus request to the Modbus communication interface module. The Modbus request is broadcasted to several Modbus communication interface modules to synchronize them or to one specific Modbus communication interface module.

The Modbus communication interface module is considered as externally synchronized if the last synchronization has occured within the last 2 hours (bit 12 = 1).

Internal Synchronization

When the Modbus communication interface module recieves the synchronization request, it broadcasts it to all the modules within the IMU (Micrologic trip unit, BSCM, front display module FDM121,...).

An IMU module is considered as internally synchronized (bit 13 = 1) if the last external synchronization has occured within the last 2 hours (bit 12 = 1).

Date Counter

The date is counted in number of seconds since 01/01/2000.

In case of a power loss for an IMU module, the time counter is reset and will restart at 01/01/2000.

If an external synchronization occurs after a power loss, the time counter is updated and converts the synchronization date to the corresponding number of seconds since 01/01/2000.

If a synchronization has never occured since the last power loss, then bit 14 = 0.

If a synchronization has occured since the last power loss, then bit 14 = 1.

Date Conversion Principle

To convert the date from number of seconds since 01/01/2000 to current date, the following rules apply:

- 1 non-leap year = 365 days
- 1 leap year = 366 days
  Years 2000, 2004, 2008, 2012,...(multiple of 4) are leap years (except year 2100).
- 1 day = 86400 seconds
- 1 hour = 3600 seconds
- 1 minute = 60 seconds

The following table describes the steps to follow to convert the date from number of seconds since 01/01/2000 to current date:

Step	Action
1	S = Number of seconds since 01/01/2000 = (content of register 1 x 65536) + (content of register 2)
2	S = 86400 x D + s D = number of days since 01/01/2000 s = remaining number of seconds
3	D = (NL x 365) + (L x 366) + d NL = number of non-leap years since year 2000 L = number of leap years since year 2000 d = remaining number of days for the current year
4	Date = d + 1 = current date. For example, if d = 303, the current date corresponds to the 304^{th} day of the year, which corresponds to October 31 for the year 2007.
5	s = (3600 x h) + s’ h = number of hours s’ = remaining number of seconds
6	s’ = (60 x m) + s’’ m = number of minutes s’’ = remaining number of seconds
7	The current time is h:m:s’’

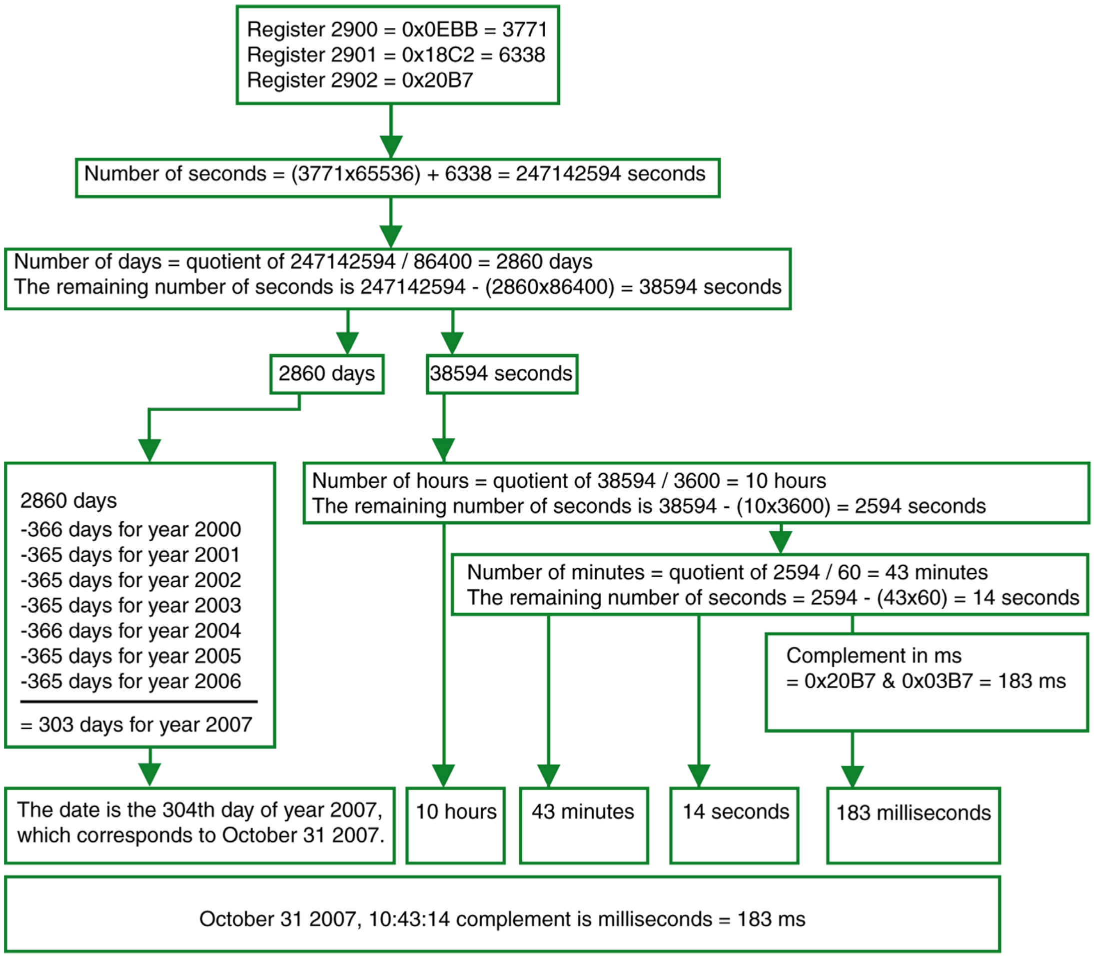
The complement of the date in milliseconds is coded on bits 0...9 of register 3. Bits 10...15 return the quality of the date (see *Date Format, page 35*).

To retrieve the complement in milliseconds, the user must use the logical AND operation between the register value and 0x03FF.

For example, if register 3 returns 0x15B7, the complement in milliseconds is
0x15B7 AND 0x03FF = 0x01B7 = 439 ms.

Date Conversion Example

The following example shows the date conversion of minimum/maximum current reset (see *Minimum/Maximum Measurements Reset Time, page 50*). Registers 2900 and 2901 return the date in number of seconds since 01/01/2000. Register 2902 returns the complement in ms with the quality of the date.



History Mechanism

General Description

The Modbus history registers enable the user to track the occurrence of specific events and their corresponding dates.

4 event history are available:
- Alarm history: the alarm history format corresponds to a series of 10 records. Each record is composed of 5 registers describing one alarm. See *Alarm History, page 55*.
- Trip history: the trip history format corresponds to a series of 17 records. Each record is composed of 7 registers describing one trip. See *Trip History, page 57*.
- Maintenance operation history: the maintenance operation history format corresponds to a series of 10 records. Each record is composed of 5 registers describing one maintenance operation. See *Maintenance Operation History, page 59*.
- BSCM event history: the BSCM event history format corresponds to a series of 10 records. Each record is composed of 5 registers describing one BSCM event. See *Event History, page 104*.

History Mechanism

Each event is time-stamped using the date format described in *Date Format, page 35*.

When the history is full, the oldest event record is discarded to make room for the most recent event record, which is pushed to the top of the history.

The records are ordered in decreasing occurrence time, the most recent occurrence is in the first record.

The following tables describe the history mechanism for a 10 records history format:

Before event E

Record	1	2	3	4	5	6	7	8	9	10
Event	E-1 (most recent event)	E-2	E-3	E-4	E-5	E-6	E-7	E-8	E-9	E-10 (oldest event)

After event E

Record	1	2	3	4	5	6	7	8	9	10
Event	E (most recent event)	E-1	E-2	E-3	E-4	E-5	E-6	E-7	E-8	E-9 (oldest event)

After event E, event E-10 is lost.

History Reading

A block read request is necessary to read a history record (see Modbus function read n input words, function code = 4, in *Read Functions, page 23*). For example, a block read request of 5 registers is necessary to read the most recent alarm record of the alarm history format (see *Alarm History, page 55*).

Furthermore, to read the last n records of a history format, a block read request of (m) x (n) registers is necessary, where m is the number of registers that compose the record. The history reading starts at the beginning of the block read.

For example, a block read request of 7x3 = 21 registers is necessary to read the most recent 3 trip records of the trip history format (see *Trip History, page 57*):

- The first 7 registers describe the first record of the trip history format (most recent trip).
- The next 7 registers describe the second record of the trip history format.
- The last 7 registers describe the third record of the trip history format.

When not used, history registers return 32768 (0x8000).

Modbus Registers Tables

General Description

The following chapters describe the Modbus registers of the Micrologic trip unit and the Modbus registers of the modules connected to it. These registers provide information that can be read, like electrical measures, protection configuration, and monitoring information. The command interface enables the user to modify these registers in a controlled way.

The presentation rules of the Modbus registers are as follows:

- The registers are grouped according to the module they relate to:
  - Micrologic trip unit: see *Micrologic Trip Unit Registers, page 42*.
  - BSCM (Breaker Status and Control Module: see *BSCM Registers, page 100*.
  - Modbus communication interface module: see *Modbus Communication Interface Module Registers, page 112*.
- For each module, the registers are grouped in tables of logically related information. The tables are presented in increasing address.
- For each module, the commands are described:
  - Micrologic trip unit: see *Micrologic Trip Unit Commands, page 86*.
  - Breaker Status and Control Module (BSCM): see *BSCM Commands, page 106*.
  - Modbus communication interface module: see *Modbus Communication Interface Module Commands, page 115*.

The *Cross References to Modbus Registers, page 135* provides an ordered list of the registers with a cross reference to the page where these registers are described.

Table Format

Register tables have the following columns:

Register	Address	RW	X	Unit	Type	Range	A/E	Description

- **Register**: a 16 bit register number in decimal.
- **Address**: a 16 bit register address (one less than the register number).
- **RW**: whether the register is read only (R) or read-write (RW).
- **X**: the scale factor. A scale of 10 means that the register contains the value multiplied by 10. Hence the real value is the value in the register divided by 10.

  Example
  Register 1034 contains the active power on phase 1 (see *Active Power, page 44*). The unit is kW and the scale factor is 10.
  If the register returns 231, this means that the real active power on phase 1 is
  231/10 = 23.1 kW = 23100 W.

- **Unit**: the unit the information is expressed in.
- **Type**: the encoding data type.
- **Range**: the permitted values for this variable, usually a subset of what the format allows.
- **A/E**: the metering type of the Micrologic trip unit.
  - type A (Ammeter): current measurements
  - type E (Energy): current, voltage, power and energy measurements
- **Description**: provides information about the register and restrictions that apply.

Data Types

The following data types are found in the Modbus registers tables:

Label	Description	Range
UINT	16 bit unsigned integer	0 to 65535
INT	16 bit signed integer	-32768 to +32767
UDINT	32 bit unsigned integer	0 to 4 294 967 295
DINT	32 bit signed integer	-2 147 483 648 to +2 147 483 647
STRING	Text string	1 byte per character

Notes

- The **Type** column tells how many registers to read to get the variable. For instance UINT requires reading one word, whereas DINT requires reading two words.
- Some variables must be read as a set, like the long time protection variables. The whole set must be read as a block. Reading a partial number results in an error (see *History Reading, page 38*).
- Reading from an undocumented address results in a Modbus exception (see *Modbus Exception Codes, page 26*).
- Variables stored in 2 words like energy or dates are stored in big-endian format: the most significant word is transmitted first, the least significant second.
- Numerical values are given in decimal. When it is useful to have the corresponding value in hexadecimal, it is shown as a C language type constant: 0xdddd. For example, the decimal value 123 is represented in hexadecimal as: 0x007B.
- Out of order and not applicable values are represented as 32768 (0x8000 or 0x80000000 for 32 bit values).
- Out of range values are represented as 32767 (0x7FFF, for 16 bit values only).
- For measures that depend on the presence of neutral (as identified by register 3314, see *System Type, page 72*), reading the value will return 32768 (0x8000) if not applicable. For each table where it occurs, it is explained in a footnote.

Micrologic Trip Unit Data

3

Introduction

This chapter describes the Micrologic trip unit data.

What's in this Chapter?

This chapter contains the following sections:

3.1 Micrologic Trip Unit Registers

Introduction

This section describes the Micrologic trip unit registers.

What's in this Section?

This section contains the following topics:

Real-Time Measurements

General Description

The metering manager refreshes the real-time measurements every second. Real-time measurements include:

- voltage and voltage unbalance
- current and current unbalance
- active, reactive, apparent, and distortion power
- reactive power with harmonic
- power factor and fundamental power factor
- frequency
- THD (Total Harmonic Distortion)

Voltage

Register = 0 if voltage < 25 V.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
1000	999	R	1	V	UINT	0...850	E	RMS phase-to-phase voltage V12
1001	1000	R	1	V	UINT	0...850	E	RMS phase-to-phase voltage V23
1002	1001	R	1	V	UINT	0...850	E	RMS phase-to-phase voltage V31
1003	1002	R	1	V	UINT	0...850	E	Phase-to-neutral voltage V1N (1)
1004	1003	R	1	V	UINT	0...850	E	RMS phase-to-neutral voltage V2N (1)
1005	1004	R	1	V	UINT	0...850	E	RMS phase-to-neutral voltage V3N (1)
1006	1005	R	1	V	UINT	0...850	E	Arithmetic mean of V12, V23, and V31: (V12+V23+V31) / 3 = Vavg L-L.
1007	1006	R	1	V	UINT	0...850	E	Arithmetic mean of V1N, V2N, and V3N: (V1N+V2N+V3N) / 3 = Vavg L-N (1)
1145	1144	R	1	V	UINT	0...850	E	Vmax: maximum of V12, V23, and V31
1146	1145	R	1	V	UINT	0...850	E	Vmin: minimum of V12, V23, and V31
(1) Value not accessible for motor application and not accessible when the system type in register 3314 is 30 or 31. See *System Type, page 72*.								

Voltage Unbalance

Register	Address	RW	X	Unit	Type	Range	A/E	Description
1008	1007	R	10	%	INT	-1000...+1000	E	V12 phase-to-phase voltage unbalance with respect to the arithmetic mean of phase-to-phase voltages
1009	1008	R	10	%	INT	-1000...+1000	E	V23 phase-to-phase voltage unbalance with respect to the arithmetic mean of phase-to-phase voltages
1010	1009	R	10	%	INT	-1000...+1000	E	V31 phase-to-phase voltage unbalance with respect to the arithmetic mean of phase-to-phase voltages
1011	1010	R	10	%	INT	-1000...+1000	E	V1N phase-to-neutral voltage with respect to the arithmetic mean of phase-to-neutral voltages (1)
1012	1011	R	10	%	INT	-1000...+1000	E	V2N phase-to-neutral voltage with respect to the arithmetic mean of phase-to-neutral voltages (1)
1013	1012	R	10	%	INT	-1000...+1000	E	V3N phase-to-neutral voltage with respect to the arithmetic mean of phase-to-neutral voltages (1)
1014	1013	R	10	%	INT	-1000...+1000	E	Maximum phase-to-phase voltage unbalance value of registers 1008, 1009, and 1010
1015	1014	R	10	%	INT	-1000...+1000	E	Maximum phase-to-neutral voltage unbalance value of registers 1011, 1012, and 1013 (1)
(1) Value not accessible for motor application and not accessible when the system type in register 3314 is 30 or 31. See *System Type, page 72*.								

Current

Register	Address	RW	X	Unit	Type	Range	A/E	Description
1016	1015	R	1	A	UINT	0...20xIn	A/E	RMS current on phase 1: I1
1017	1016	R	1	A	UINT	0...20xIn	A/E	RMS current on phase 2: I2
1018	1017	R	1	A	UINT	0...20xIn	A/E	RMS current on phase 3: I3
1019	1018	R	1	A	UINT	0...20xIn	A/E	RMS current on neutral: IN (1)
1020	1019	R	1	A	UINT	0...20xIn	A/E	Maximum of I1, I2, I3, and IN
1021	1020	R	1	%	UINT	0...4000	A/E	% of Ig setting
1022	1021	R	1	%	UINT	0...4000	A/E	% of IΔn setting
1026	1025	R	1	A	UINT	0...20xIn	A/E	Minimum of I1, I2, and I3
1027	1026	R	1	A	UINT	0...20xIn	A/E	Arithmetic mean of I1, I2, and I3: (I1+I2+I3) / 3 = Iavg
(1) Value not accessible for motor application and not accessible when the system type in register 3314 is 31 or 40. See *System Type, page 72*.								

Current Unbalance

Register	Address	RW	X	Unit	Type	Range	A/E	Description
1028	1027	R	10	%	INT	-1000...+1000	E	I1 current unbalance with respect to the arithmetic mean of the phase currents
1029	1028	R	10	%	INT	-1000...+1000	E	I2 current unbalance with respect to the arithmetic mean of the phase currents
1030	1029	R	10	%	INT	-1000...+1000	E	I3 current unbalance with respect to the arithmetic mean of the phase currents
1031	1030	R	10	%	INT	-1000...+1000	E	IN current unbalance with respect to the arithmetic mean of the phase currents (1)
1032	1031	R	10	%	INT	-1000...+1000	E	Maximum current unbalance value of registers 1028, 1029, and 1030
(1) Value not accessible for motor application and not accessible when the system type in register 3314 is 31 or 40. See *System Type, page 72*.								

Active Power

The sign of the active power depends on the configuration of register 3316. See *Power Flow Sign, page 72*.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
1034	1033	R	10	kW	INT	-10000...+10000	E	Active power on phase 1: P1 (1)
1035	1034	R	10	kW	INT	-10000...+10000	E	Active power on phase 2: P2 (1)
1036	1035	R	10	kW	INT	-10000...+10000	E	Active power on phase 3: P3 (1)
1037	1036	R	10	kW	INT	-30000...+30000	E	Total active power: Ptot
(1) Value not accessible for motor application and not accessible when the system type in register 3314 is 30 or 31. See *System Type, page 72*.								

Reactive Power

The sign of the reactive power depends on the configuration of register 3316. See *Power Flow Sign, page 72*.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
1038	1037	R	10	kVAr	INT	-10000...+10000	E	Reactive power on phase 1: Q1 (1)
1039	1038	R	10	kVAr	INT	-10000...+10000	E	Reactive power on phase 2: Q2 (1)
1040	1039	R	10	kVAr	INT	-10000...+10000	E	Reactive power on phase 3: Q3 (1)
1041	1040	R	10	kVAr	INT	-30000...+30000	E	Total reactive power: Qtot
(1) Value not accessible for motor application and not accessible when the system type in register 3314 is 30 or 31. See *System Type, page 72*.								

Apparent Power

Register	Address	RW	X	Unit	Type	Range	A/E	Description
1042	1041	R	10	kVA	UINT	0...10000	E	Apparent power on phase 1: S1 (1)
1043	1042	R	10	kVA	UINT	0...10000	E	Apparent power on phase 2: S2 (1)
1044	1043	R	10	kVA	UINT	0...10000	E	Apparent power on phase 3: S3 (1)
1045	1044	R	10	kVA	UINT	0...30000	E	Total apparent power: Stot
(1) Value not accessible for motor application and not accessible when the system type in register 3314 is 30 or 31. See *System Type, page 72*.								

Power Factor

The sign of the power factor depends on the configuration of register 3318. See *Power Factor Sign, page 72*.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
1046	1045	R	100	–	INT	-100...+100	E	Power factor on phase 1:PF1 (1)
1047	1046	R	100	–	INT	-100...+100	E	Power factor on phase 2: PF2 (1)
1048	1047	R	100	–	INT	-100...+100	E	Power factor on phase 3: PF3 (1)
1049	1048	R	100	–	INT	-100...+100	E	Total power factor: PF
(1) Value not accessible for motor application and not accessible when the system type in register 3314 is 30 or 31. See *System Type, page 72*.								

Fundamental Power Factor (cosφ)

The sign of the fundamental power factor (cosφ) depends on the configuration of register 3318. See *Power Factor Sign, page 72*.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
1050	1049	R	100	–	INT	-100...+100	E	Fundamental power factor on phase 1: cosφ1 (1)
1051	1050	R	100	–	INT	-100...+100	E	Fundamental power factor on phase 2: cosφ2 (1)
1052	1051	R	100	–	INT	-100...+100	E	Fundamental power factor on phase 3: cosφ3 (1)
1053	1052	R	100	–	INT	-100...+100	E	Total fundamental power factor: cosφ
(1) Value not accessible for motor application and not accessible when the system type in register 3314 is 30 or 31. See *System Type, page 72*.								

Frequency

When the software cannot calculate the frequency it returns Not Evaluated = 32768 (0x8000).

Register	Address	RW	X	Unit	Type	Range	A/E	Description
1054	1053	R	10	Hz	UINT	150...4400	E	Network frequency: F

Fundamental Reactive Power

The sign of the reactive power depends on the configuration of register 3316. See *Power Flow Sign, page 72*.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
1080	1079	R	10	kVAr	INT	-10000 ...+10000	E	Fundamental reactive power on phase 1: Q1 Fund (1)
1081	1080	R	10	kVAr	INT	-10000 ...+10000	E	Fundamental reactive power on phase 2: Q2 Fund (1)
1082	1081	R	10	kVAr	INT	-10000 ...+10000	E	Fundamental reactive power on phase 3: Q3 Fund (1)
1083	1082	R	10	kVAr	INT	-30000 ...+30000	E	Total fundamental reactive power: Qtot Fund
(1) Value not accessible for motor application and not accessible when the system type in register 3314 is 30 or 31. See *System Type, page 72*.								

Distortion Power

Register	Address	RW	X	Unit	Type	Range	A/E	Description
1088	1087	R	10	kVAr	UINT	0...10000	E	Distortion power on phase 1: D1 (1)
1089	1088	R	10	kVAr	UINT	0...10000	E	Distortion power on phase 2: D2 (1)
1090	1089	R	10	kVAr	UINT	0...10000	E	Distortion power on phase 3: D3 (1)
1091	1090	R	10	kVAr	UINT	0...30000	E	Total distortion power: Dtot
(1) Value not accessible for motor application and not accessible when the system type in register 3314 is 30 or 31. See *System Type, page 72*.								

Total Harmonic Distortion (THD)

Register	Address	RW	X	Unit	Type	Range	A/E	Description
1092	1091	R	10	%	UINT	0...32766	E	Total harmonic distortion of V12 compared to the fundamental
1093	1092	R	10	%	UINT	0...32766	E	Total harmonic distortion of V23 compared to the fundamental
1094	1093	R	10	%	UINT	0...32766	E	Total harmonic distortion of V31 compared to the fundamental
1095	1094	R	10	%	UINT	0...32766	E	Total harmonic distortion of V1N compared to the fundamental (1)
1096	1095	R	10	%	UINT	0...32766	E	Total harmonic distortion of V2N compared to the fundamental (1)
1097	1096	R	10	%	UINT	0...32766	E	Total harmonic distortion of V3N compared to the fundamental (1)
1098	1097	R	10	%	UINT	0...32766	E	Total harmonic distortion of I1 compared to the fundamental
1099	1098	R	10	%	UINT	0...32766	E	Total harmonic distortion of I2 compared to the fundamental
1100	1099	R	10	%	UINT	0...32766	E	Total harmonic distortion of I3 compared to the fundamental
(1) Value not accessible for motor application and not accessible when the system type in register 3314 is 30 or 31. See *System Type, page 72*.								

Thermal Image of Motor

The thermal image of motor is available for motor application only.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
1144	1143	R	1	%	UINT	0...32766	E	Ith image

Minimum/Maximum Values of Real-Time Measurements

Minimum/Maximum Measurements Rule

Minimum and maximum measurements take into account the absolute value of real-time measurements. Therefore the following rule applies:

0<10<200<-400<600<-3800.

In this case:

- the minimeter = 0.
- the maximeter = -3800

NOTE: This rule does not apply for the power factor (PF) and for the fundamental power factor (cosφ):

- PF max (or cosφ max) is obtained for the smallest positive value of PF (or cosφ).
- PF min (or cosφ min) is obtained for the highest negative value of PF (or cosφ).

The reset minimum/maximum command (command code = 46728) configures the content of the minimum/maximum real-time measurements registers.

Minimum of Real-Time Measurements

Registers 1300 to 1599 hold the minimum values of real-time metering parameters:

- The address of the minimum value of a real-time metering parameter is equal to the address of the real-time metering parameter plus 300.

  Examples
  Register 1300 holds the minimum value of the phase-to-phase voltage V12 (register 1000).
  Register 1316 holds the minimum value of the current on phase 1 (register 1016).

- The order of the registers is the same as that of the real-time metering variables.
- The scale factors of the minimum values are the same as those of the real-time metering parameters.
- The minimum values of unbalance current and unbalance voltage are not available.
- The minimum values of Imin (register 1026), Vmax (register 1145), and Vmin (register 1146) are not available.

Maximum of Real-Time Measurements

Registers 1600 to 1899 hold the maximum values of real-time metering parameters:

- The addresses of the maximum value of a real-time metering parameter is equal to the addresses of the real-time metering parameter plus 600.

  Examples
  Register 1600 holds the maximum value of the phase-to-phase voltage V12 (register 1000).
  Register 1616 holds the maximum value of the current on phase 1 (register 1016).

- The order of the registers is the same as that of the real-time metering variables.
- The scale factors of the maximum values are the same as those of the real-time metering parameters.
- The maximum values of Imin (register 1026), Vmax (register 1145), and Vmin (register 1146) are not available.

Energy Measurements

General Description

The metering manager refreshes energy measurements every 1 second. Energy measurements are saved every 1 hour in the non volatile memory of the Micrologic trip unit.

Energy measurements include:

- active energy Ep
- reactive energy Eq
- apparent energy Es
- active energy counted positively (EpIn) or negatively (EpOut), according to the configuration of register 3316. See *Power Flow Sign, page 72*.
- reactive energy counted positively (EqIn) or negatively (EqOut), according to the configuration of register 3316. See *Power Flow Sign, page 72*.
- active energy and reactive energy are accumulated according to the configuration of register 3324 (absolute mode by default). See *Energy Accumulation Mode, page 73*.

Examples

If Ep = 7589 kWh, then:
- register 2000 = 0 (0x0000)
- register 2001 = 7589 (0x1DA5)

If Ep = 4589625 kWh, then:
- register 2000 = 70 (0x0046)
- register 2001 = 2105 (0x0839)

4589625 = 70x65536 + 2105

Energies are stored in big-endian format: the most significant word is transmitted first, the least significant second.

The reset minimum/maximum command (command code = 46728) configures the content of the energy registers.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
2000 2001	1999 2000	RW	1	kWh	DINT	-1 999 999 999 ...+1 999 999 999	E	Active energy: Ep
2004 2005	2003 2004	RW	1	kVArh	DINT	-1 999 999 999 ...+1 999 999 999	E	Reactive energy: Eq
2008 2009	2007 2008	RW	1	kWh	UDINT	0...1 999 999 999	E	Active energy counted positively: EpIn
2012 2013	2011 2012	RW	1	kWh	UDINT	0...1 999 999 999	E	Active energy counted negatively: EpOut
2016 2017	2015 2016	RW	1	kVArh	UDINT	0...1 999 999 999	E	Reactive energy counted positively: EqIn
2020 2021	2019 2020	RW	1	kVArh	UDINT	0...1 999 999 999	E	Reactive energy counted negatively: EqOut
2024 2025	2023 2024	RW	1	kVAh	UDINT	0...1 999 999 999	E	Apparent energy: Es
2028 2029	2027 2028	R	1	kWh	UDINT	0...1 999 999 999	E	Cumulative active energy counted positively (not resetable): EpIn
2030 2031	2029 2030	R	1	kWh	UDINT	0...1 999 999 999	E	Cumulative active energy counted negatively (not resetable): EpOut

Demand Measurements

General Description

Demand registers include:

- current demand
- active, reactive, and apparent power demand

The window duration of current demand depends on the configuration of register 3352. See *Demand Time, page 73*.

The window duration and the window type of power demand depend on the configuration of registers 3354 and 3355. See *Demand Time, page 73*.

The metering manager refreshes the demand measurements every 1 minute with the sliding window type.

The metering manager refreshes the demand measurements at the end of the window interval with the block window type.

Current Demand

Register	Address	RW	X	Unit	Type	Range	A/E	Description
2200	2199	R	1	A	UINT	0...20xIn	E	Current demand on phase 1: I1 Dmd
2201	2200	R	1	A	UINT	0...20xIn	E	Current demand on phase 2: I2 Dmd
2202	2201	R	1	A	UINT	0...20xIn	E	Current demand on phase 3: I3 Dmd
2203	2202	R	1	A	UINT	0...20xIn	E	Current demand on the neutral: IN Dmd (1)
2204	2203	R	1	A	UINT	0...20xIn	E	Maximum of current demand on phase 1: I1 Peak Dmd
2205	2204	R	1	A	UINT	0...20xIn	E	Maximum of current demand on phase 2: I2 Peak Dmd
2206	2205	R	1	A	UINT	0...20xIn	E	Maximum of current demand on phase 3: I3 Peak Dmd
2207	2206	R	1	A	UINT	0...20xIn	E	Maximum of current demand on the neutral: IN Peak Dmd (1)
(1) Value not accessible for motor application and not accessible when the system type in register 3314 is 31 or 40. See *System Type, page 72*.								

Active Power Demand

Register	Address	RW	X	Unit	Type	Range	A/E	Description
2224	2223	R	10	kW	INT	-30000...+30000	E	Total active power demand: P Dmd (1)
2225	2224	R	10	kW	INT	-30000...+30000	E	Maximum of total active power demand: P Peak Dmd
(1) For the block window type, this value is updated at the end of the window interval. For the sliding window type, the value is updated every 1 minute.								

Reactive Power Demand

Register	Address	RW	X	Unit	Type	Range	A/E	Description
2230	2229	R	10	kVAr	INT	-30000...+30000	E	Total reactive power demand: Q Dmd (1)
2231	2230	R	10	kVAr	INT	-30000...+30000	E	Maximum of total reactive power demand: Q Peak Dmd
(1) For the block window type, this value is updated at the end of the window interval. For the sliding window type, the value is updated every 1 minute.								

Apparent Power Demand

Register	Address	RW	X	Unit	Type	Range	A/E	Description
2236	2235	R	10	kVA	UINT	0...30000	E	Total apparent power demand: S Dmd (1)
2237	2236	R	10	kVA	UINT	0...30000	E	Maximum of total apparent power demand: S Peak Dmd
(1) For the block window type, this value is updated at the end of the window interval. For the sliding window type, the value is updated every 1 minute.								

Minimum/Maximum Measurements Reset Time

Minimum/Maximum Measurements Reset Time

The minimum/maximum measurements reset time registers enable the user to know all the dates relative to the last reset minimum/maximum command.

The reset minimum/maximum command (command code 46728) configures the content of the reset minimum/maximum registers.

A block read request of 30 registers is necessary to read the minimum/maximum measurements reset time (see *History Reading, page 38*).

Register	Address	RW	X	Unit	Type	Range	A/E	Description (1)
2900 2901	2899 2900	RW	1	s	UDINT	–	A/E	Date of reset of minimum/maximum current, in number of seconds since 01/01/2000
2902	2901	RW	1	ms	UINT	–	A/E	Complement in ms with quality of the date
2903 2904	2902 2903	RW	1	s	UDINT	–	E	Date of reset of minimum/maximum voltage, in number of seconds since 01/01/2000
2905	2904	RW	1	ms	UINT	–	E	Complement in ms with quality of the date
2906 2907	2905 2906	RW	1	s	UDINT	–	E	Date of reset of minimum/maximum power (P, Q, S), in number of seconds since 01/01/2000
2908	2907	RW	1	ms	UINT	–	E	Complement in ms with quality of the date
2909 2910	2908 2909	RW	1	s	UDINT	–	E	Date of reset of minimum/maximum power factor and cosφ, in number of seconds since 01/01/2000
2911	2910	RW	1	ms	UINT	–	E	Complement in ms with quality of the date
2912 2913	2911 2912	RW	1	s	UDINT	–	E	Date of reset of minimum/maximum total harmonic distortion, in number of seconds since 01/01/2000
2914	2913	RW	1	ms	UINT	–	E	Complement in ms with quality of the date
2915 2916	2914 2915	RW	1	s	UDINT	–	E	Date of reset of peak current demand, in number of seconds since 01/01/2000
2917	2916	RW	1	ms	UINT	–	E	Complement in ms with quality of the date
2918 2919	2917 2918	RW	1	s	UDINT	–	E	Date of reset of peak active, reactive and apparent power demand, in number of seconds since 01/01/2000
2920	2919	RW	1	ms	UINT	–	E	Complement in ms with quality of the date
2921 2922	2920 2921	RW	1	s	UDINT	–	E	Date of reset of minimum/maximum frequency, in number of seconds since 01/01/2000
2923	2922	RW	1	ms	UINT	–	E	Complement in ms with quality of the date
2924 2925	2923 2924	RW	1	s	UDINT	–	E	Date of reset of minimum/maximum thermal image of motor, in number of seconds since 01/01/2000 (motor application only)
2926	2925	RW	1	ms	UINT	–	E	Complement in ms with quality of the date
2927 2928	2926 2927	RW	1	s	UDINT	–	E	Date of reset of energy (active, reactive, and apparent), in number of seconds since 01/01/2000
2929	2928	RW	1	ms	UINT	–	E	Complement in ms with quality of the date
(1) See *Date Format, page 35*.								

Identification

Serial Number

The Micrologic trip unit serial number is composed of a maximum of 11 alphanumeric characters with the following format: PPYYWWDnnnn.

- PP = plant code
- YY = year of fabrication (05...99)
- WW = week of fabrication (01...53)
- D = day of fabrication (1...7)
- nnnn = sequence number (0001...9999)

A block read request of 6 registers is necessary to read the Micrologic trip unit serial number (see *History Reading, page 38*).

Register	Address	RW	X	Unit	Type	Range	A/E	Description
8700	8699	R	–	–	STRING	–	A/E	‘PP’
8701	8700	R	–	–	STRING	05...99	A/E	‘YY’
8702	8701	R	–	–	STRING	01...53	A/E	‘WW’
8703	8702	R	–	–	STRING	1...7	A/E	‘Dn’
8704	8703	R	–	–	STRING	00...99	A/E	‘nn’
8705	8704	R	–	–	STRING	01...99	A/E	‘n’ (the NULL character ends the serial number)

Hardware Version

Register	Address	RW	X	Unit	Type	Range	A/E	Description
8709	8708	R	1	–	UINT	0...15	A/E	Hardware version of the Micrologic trip unit

Square D Identification

Register	Address	RW	X	Unit	Type	Range	A/E	Description
8716	8715	R	–	–	UINT	15143...15145	A/E	Square D identification 15143 = distribution application, type A 15144 = distribution application, type E 15145 = motor application, type E

Protection Type

Register	Address	RW	X	Unit	Type	Range	A/E	Description
8740	8739	R	–	–	STRING	52...73	A/E	Micrologic trip unit protection type For Compact NSX 100/250: ‘52’ = LSI, ‘62’ = LSIG, ‘72’ = LSIV For Compact NSX 400/630: ‘53’ = LSI, ‘63’ = LSIG, ‘73’ = LSIV

Metering Type

Register	Address	RW	X	Unit	Type	Range	A/E	Description
8741	8740	R	–	–	STRING	A...E	A/E	Micrologic trip unit metering type: ‘A’ or ‘E’

Application

Register	Address	RW	X	Unit	Type	Range	A/E	Description
8747	8746	R	–	–	UINT	1...2	A/E	Application 1 = distribution 2 = motor

Standard

Register	Address	RW	X	Unit	Type	Range	A/E	Description
8748	8747	R	–	–	UINT	1...2	A/E	Standard 1 = UL 2 = IEC

Nominal Current

Register	Address	RW	X	Unit	Type	Range	A/E	Description
8750	8749	R	1	A	UINT	0...8000	A/E	Circuit breaker nominal current In

Pole

Register	Address	RW	X	Unit	Type	Range	A/E	Description
8751	8750	R	–	–	UINT	0...1	A/E	0 = 3-pole 1 = 4-pole

16 Hz 2/3

Register	Address	RW	X	Unit	Type	Range	A/E	Description
8752	8751	R	–	–	UINT	0...1	A/E	0 = not a 16 Hz 2/3 Micrologic trip unit application 1 = 16 Hz 2/3 Micrologic trip unit application

Firmware Version

A block read request of 5 registers is necessary to read the Micrologic trip unit firmware version (see *History Reading, page 38*).

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29994... 29998	29993... 29997	R	–	–	STRING	–	A/E	The Micrologic trip unit firmware version starts with a V character and has the following format: VX.Y.Z. X, Y, and Z are STRING type and in the 1...999 range.

Part Number

The part number starts with LV4 characters and has the following format: LV4XYZTW.

A block read request of 4 registers is necessary to read the Micrologic trip unit part number (see *History Reading, page 38*).

Register	Address	RW	X	Unit	Type	Range	A/E	Description
30000	29999	R	–	–	STRING	–	A/E	Example: ‘LV’
30001	30000	R	–	–	STRING	–	A/E	Example: ‘4X’
30002	30001	R	–	–	STRING	–	A/E	Example: ‘YZ’
30003	30002	R	–	–	STRING	–	A/E	Example: ‘TW’

Status

Alarms Status

The alarms status register tracks the current status of the alarms.

- If the alarm bit is set to 0, then the alarm is not active.
- If the alarm bit is set to 1, then the alarm is active.

The following table details the physical values for each bit of the alarms status register:

Register	Address	RW	X	Unit	Type	Range	A/E	Bit	Description
5704	5703	R	–	–	UINT	–	A/E	–	Alarms status register
							A/E	0	User-defined alarm 201
							A/E	1	User-defined alarm 202
							A/E	2	User-defined alarm 203
							A/E	3	User-defined alarm 204
							A/E	4	User-defined alarm 205
							A/E	5	User-defined alarm 206
							A/E	6	User-defined alarm 207
							A/E	7	User-defined alarm 208
							A/E	8	User-defined alarm 209
							A/E	9	User-defined alarm 210
							A/E	10	Long time protection Ir pre-alarm (PAL Ir)
							A/E	11	Earth leakage protection I∆n pre-alarm (PAL I∆n)
							A/E	12	Ground fault protection Ig pre-alarm (PAL Ig)
							–	13...15	Reserved

SDx Module Status

The SDx module status register tracks the status and the validity of the SDx outputs (2 outputs maximum).

- If the status bit is set to 0, then the output is open.
- If the status bit is set to 1, then the output is closed.
- If the validity bit is set to 0, then the output status is unknown.
- If the validity bit is set to 1, then the output status is known.

The following table details the physical values for each bit of the SDx module status register:

Register	Address	RW	X	Unit	Type	Range	A/E	Bit	Description
8857	8856	R	–	–	UINT	–	A/E	–	SDx module status register
							A/E	0	Status of output 1
							A/E	1	Status of output 2
							–	2...7	Reserved
							A/E	8	Validity of output 1
							A/E	9	Validity of output 2
							–	10...15	Reserved

Trip Status

The trip status register tracks the current status of the trip.

- If the trip bit is set to 0, then the trip is not active.
- If the trip bit is set to 1, then the trip is active.

The following table details the physical values for each bit of the trip status register:

Register	Address	RW	X	Unit	Type	Range	A/E	Bit	Description
10000	9999	R	–	–	UINT	–	A/E	–	Trip status register
							A/E	0	Long time protection Ir
							A/E	1	Short time protection Isd
							A/E	2	Instantaneous protection Ii
							A/E	3	Ground fault protection Ig
							A/E	4	Earth leakage (Vigi) protection IΔn
							A/E	5	Integrated instantaneous protection
							A/E	6	Internal failure (STOP)
							A/E	7	Instantaneous with earth leakage (Vigi) protection
							A/E	8	Unbalance motor protection Iunb
							A/E	9	Jam motor protection Ijam
							A/E	10	Underload motor protection Iund
							A/E	11	Longstart motor protection Ilong
							A/E	12	Reflex tripping protection
							–	13...15	Reserved

Alarm History

General Description

The alarm history registers describe the last 10 encountered alarms. The alarm history format corresponds to a series of 10 records. Each record is composed of 5 registers describing one alarm.

A block read request of 5x(n) registers is necessary to read the last n trip records, where 5 is the number of registers for each trip record. The reading starts at the beginning of the block read (see *History Reading, page 38*).

For example, a block read request of 5x3 = 15 registers is necessary to read the last 3 alarm records of the alarm history:

- The first 5 registers describe the first alarm record (most recent alarm).
- The next 5 registers describe the second alarm record.
- The last 5 registers describe the third alarm record.

When not used, alarm history registers return 32768 (0x8000).

Register	Address	Description
5732...5736	5731...5735	Alarm record 1 (most recent alarm)
5737...5741	5736...5740	Alarm record 2
5742...5746	5741...5745	Alarm record 3
5747...5751	5746...5750	Alarm record 4
5752...5756	5751...5755	Alarm record 5
5757...5761	5756...5760	Alarm record 6
5762...5766	5761...5765	Alarm record 7
5767...5771	5766...5770	Alarm record 8
5772...5776	5771...5775	Alarm record 9
5777...5781	5776...5780	Alarm record 10 (oldest alarm)

Alarm Record

A block read request of 5 registers is necessary to read an alarm record.

The order and the description of the alarms records registers are the same as that of alarm record 1:

Alarm record 1 (most recent alarm)								
Register	**Address**	**RW**	**X**	**Unit**	**Type**	**Range**	**A/E**	**Description**
5732	5731	R	1	–	UINT	0...65535	A/E	Alarm number (see next paragraph)
5733 5734	5732 5733	R	1	s	UDINT	–	A/E	Date of alarm in number of seconds since 01/01/2000
5735	5734	R	1	–	UINT	–	A/E	Complement in ms (always = 0) with quality of the date. See *Date Format, page 35*.
5736	5735	R	1	–	UINT	1...2	A/E	Event type MSB = 0 (reserved) Event occurrence: LSB = 1 Event completion: LSB = 2

Alarm Number

Alarm number	Alarm description
201	User-defined alarm 201
202	User-defined alarm 202
203	User-defined alarm 203
204	User-defined alarm 204
205	User-defined alarm 205
206	User-defined alarm 206
207	User-defined alarm 207
208	User-defined alarm 208
209	User-defined alarm 209
210	User-defined alarm 210
1013	Long time protection Ir pre-alarm (PAL Ir)
1014	Ground fault protection Ig pre-alarm (PAL Ig)
1015	Earth leakage protection IΔn pre-alarm (PAL IΔn)

The list of the pre-defined alarms from which the user can chose the 10 user-defined alarms is available at *User-Defined Alarms, page 63*.

Trip History

General Description

The trip history registers describe the last 17 encountered trip events. The trip history format corresponds to a series of 17 records. Each record is composed of 7 registers describing one trip.

A block read request of 7x(n) registers is necessary to read the last n trip records, where 7 is the number of registers for each trip record. The reading starts at the beginning of the block read (see *History Reading, page 38*).

For example, a block read request of 7x4 = 28 registers is necessary to read the last 4 trip records of the trip history:

- The first 7 registers describe the first trip record (most recent trip).
- The next 7 registers describe the second trip record.
- The next 7 registers describe the third trip record.
- The last 7 registers describe the fourth trip record.

When not used, trip history registers return 32768 (0x8000).

Register	Address	Description
9100...9106	9099...9105	Trip record 1 (most recent trip)
9107...9113	9106...9112	Trip record 2
9114...9120	9113...9119	Trip record 3
9121...9127	9120...9126	Trip record 4
9128...9134	9127...9133	Trip record 5
9135...9141	9134...9140	Trip record 6
9142...9148	9141...9147	Trip record 7
9149...9155	9148...9154	Trip record 8
9156...9162	9155...9161	Trip record 9
9163...9169	9162...9168	Trip record 10
9170...9176	9169...9175	Trip record 11
9177...9183	9176...9182	Trip record 12
9184...9190	9183...9189	Trip record 13
9191...9197	9190...9196	Trip record 14
9198...9204	9197...9203	Trip record 15
9205...9211	9204...9210	Trip record 16
9212...9218	9211...9217	Trip record 17 (oldest trip)

Trip Record

A block read request of 7 registers is necessary to read a trip record.

The order and the description of the trips records registers are the same as that of trip record 1:

Trip record 1 (most recent trip)								
Register	**Address**	**RW**	**X**	**Unit**	**Type**	**Range**	**A/E**	**Description**
9100	9099	R	1	–	UINT	0...65535	A/E	Trip code (see next paragraph)
9101 9102	9100 9101	R	1	s	UDINT	–	A/E	Date of event (trip or acknowledge) in number of seconds since 01/01/2000
9103	9102	R	1	–	UINT	–	A/E	Complement in ms with quality of the date. See *Date Format, page 35*.
9104	9103	R	1	–	UINT	1...2	A/E	Event type MSB = 0 (reserved) Event occurrence: LSB = 1 Event completion: LSB = 2
9105	9104	R	1	–	UINT	0...5	A/E	Faulty phase 0 = failure (no faulty phase) 1 = phase 1 2 = phase 2 3 = phase 3 4 = phase N 5 = phase 123 (motor application, ground fault, earth leakage)
9106	9105	R	1	A	UINT	0...65535	A/E	Interrupted current (peak)

Trip Code

Trip code	Trip description
1000 (16384)	Long time protection Ir
1001 (16385)	Short time protection Isd
1002 (16386)	Instantaneous protection Ii
1003 (16387)	Ground fault protection Ig
1004 (16388)	Earth leakage (Vigi) protection I∆n
1010 (16390)	Integrated instantaneous protection
1011 (16391)	STOP (trip unit internal failure)
1012 (16392)	Instantaneous with earth leakage (Vigi) protection
1032 (16640)	Unbalance motor protection
1033 (16641)	Jam motor protection
1034 (16642)	Underload motor protection
1035 (16643)	Longstart motor protection
1036 (16393)	Reflex tripping protection

Maintenance Operation History

General Description

The maintenance operation history registers describe the last 10 maintenance operations. The maintenance operation history format corresponds to a series of 10 records. Each record is composed of 5 registers describing one maintenance operation.

A block read request of 5x(n) registers is necessary to read the last n maintenance operation records, where 5 is the number of registers for each maintenance operation record. The reading starts at the beginning of the block read (see *History Reading, page 38*).

For example, a block read request of 5x2 = 10 registers is necessary to read the last 2 maintenance operation records of the maintenance operation history:

- The first 5 registers describe the first maintenance operation record (most recent maintenance operation).
- The last 5 registers describe the second maintenance record.

When not used, maintenance operation history registers return 32768 (0x8000).

Register	Address	Description
29500...29504	29499...29503	Maintenance operation record 1 (most recent maintenance operation)
29505...29509	29504...29508	Maintenance operation record 2
29510...29514	29509...29513	Maintenance operation record 3
29515...29519	29514...29518	Maintenance operation record 4
29520...29524	29519...29523	Maintenance operation record 5
29525...29529	29524...29528	Maintenance operation record 6
29530...29534	29529...29533	Maintenance operation record 7
29535...29539	29534...29538	Maintenance operation record 8
29540...29544	29539...29543	Maintenance operation record9
29545...29549	29544...29548	Maintenance operation record 10 (oldest maintenance operation)

Maintenance Operation Record

A block read request of 5 registers is necessary to read a maintenance operation record.

The order and the description of the maintenance operations records registers are the same as that of maintenance operation record 1:

Maintenance operation record 1 (most recent maintenance operation)								
Register	**Address**	**RW**	**X**	**Unit**	**Type**	**Range**	**A/E**	**Description**
29500	29499	R	1	–	UINT	0...65535	A/E	Maintenance operation code (see next paragraph)
29501 29502	29500 29501	R	1	s	UDINT	–	A/E	Date of maintenance operation in number of seconds since 01/01/2000
29503	29502	R	1	–	UINT	–	A/E	Complement in ms (always = 0) with quality of the date. See *Date Format, page 35*.
29504	29503	–	–	–	–	–	–	Reserved

Maintenance Operation Code

Maintenance operation code	Maintenance operation description
2000	Push to trip test (with maintenance module)
2001	Ground Fault inhibition
2003	Start numerical injection test
2004	End numerical injection test
2005	Ground fault test
2006	Earth leakage (Vigi) test
2007	Start alarm test
2008	End alarm test
2009	Start long time protection
2010	End long time protection
2011	Start short time protection
2012	End short time protection
2013	Start instantaneous protection
2014	Stop instantaneous protection
2015	Start integrated instant protection
2016	Stop integrated instant protection
2017	Start unbalance protection
2018	Stop unbalance protection
2019	Start ground fault protection
2020	Stop ground fault protection
2021	Start earth leakage (Vigi) protection
2022	Stop earth leakage (Vigi) protection
2023	Start thermal memory
2024	Stop thermal memory
2025	Start connection with maintenance module
2026	Stop connection with maintenance module
2027	Turn rotary wheel 1
2028	Turn rotary wheel 2
2029	Locking pad open
2030	Locking pad closed
2031	ZSI test
2033	Reset software
2034	Reset minimum/maximum of current measurements
2035	Reset minimum/maximum of voltage measurements
2036	Reset minimum/maximum of power measurements
2037	Reset minimum/maximum of power factor measurements
2038	Reset minimum/maximum of total harmonic distortion measurements
2039	Reset maximum of current demand measurement
2040	Reset maximum of power demand (active, reactive, and apparent)
2041	Reset minimum/maximum of frequency measurement
2042	Reset minimum/maximum of thermal image measurements
2043	Reset energy measurements
2044	Reset energy counter

Pre-Alarms

General Description

The RSU software enables the configuration of the following 3 pre-alarms:

- long time protection pre-alarm (PAL Ir),
- ground fault protection pre-alarm (PAL Ig), and
- earth leakage (Vigi) protection pre-alarm (PAL IΔn).

See the *RSU Online Help* for more information regarding the configuration of the pre-alarms.

Each alarm has a corresponding alarm code:

- PAL Ir = 1013
- PAL Ig = 1014
- PAL IΔn = 1015

Each alarm has a priority level that manages the alarm display on the front display module FDM121:

- no priority = N/A (not affected)
- low priority = 1. No alarm display on the front display module FDM121.
- medium priority = 2. The front display module FDM121 LED is steady ON.
- high priority = 3. The front display module FDM121 LED blinks and a pop-up screen informs the user that the alarm is active.

See the *Micrologic 5 and 6 Trip Units User manual* for more information regarding the relationship between alarm priority and front display module FDM121.

The pre-alarms registers describe the settings of the pre-alarms:

Register	Address	Description
6650...6659	6649...6658	Long time protection pre-alarm (PAL Ir)
6660...6669	6659...6668	Ground fault protection pre-alarm (PAL Ig)
6670...6679	6669...6678	Earth leakage (Vigi) protection pre-alarm (PAL IΔn)

Long Time Protection Pre-Alarm (PAL Ir)

A block read request of 10 registers is necessary to read the long time protection pre-alarm parameters (see *History Reading, page 38*).

Register	Address	RW	X	Unit	Type	Range	A/E	Description
6650	6649	R	–	–	UINT	–	A/E	The MSB gives the activity of the alarm: 0 = On, 1 = Off. The default value is 0 (On). The LSB gives the priority of the alarm: N/A, 1, 2, or 3. The default value is 2 (medium priority).
6651	6650	–	–	–	–	–	–	Reserved
6652	6651	R	1	%	INT	(1)	A/E	% of Ir pick-up value. The default value is 90.
6653	6652	–	–	–	–	–	–	Reserved
6654	6653	R	1	s	UINT	1	A/E	Pick-up delay value (fixed to 1 s)
6655	6654	R	1	%	INT	(1)	A/E	% of Ir drop-out value. The default value is 85.
6656	6655	–	–	–	–	–	–	Reserved
6657	6656	R	1	s	UINT	1	A/E	Drop-out delay value (fixed to 1 s)
6658	6657	–	–	–	–	–	–	Reserved
6659	6658	–	–	–	–	–	–	Reserved
(1) For distribution application, the range is 40...100. For motor application, the range is 10...95.								

Ground Fault Protection Pre-Alarm (PAL Ig)

A block read request of 10 registers is necessary to read the ground fault protection pre-alarm parameters (see *History Reading, page 38*).

Register	Address	RW	X	Unit	Type	Range	A/E	Description
6660	6659	R	–	–	UINT	–	A/E	The MSB gives the activity of the alarm: 0 = On, 1 = Off. The default value is 0 (On). The LSB gives the priority of the alarm: N/A, 1, 2, or 3. The default value is 2 (medium priority).
6661	6660	–	–	–	–	–	–	Reserved
6662	6661	R	1	%	INT	40...100	A/E	% of Ig pick-up value. The default value is 90.
6663	6662	–	–	–	–	–	–	Reserved
6664	6663	R	1	s	UINT	1	A/E	Pick-up delay value (fixed to 1 s)
6665	6654	R	1	%	INT	40...100	A/E	% of Ig drop-out value. The default value is 85.
6666	6665	–	–	–	–	–	–	Reserved
6667	6666	R	1	s	UINT	1	A/E	Drop-out delay value (fixed to 1 s)
6668	6667	–	–	–	–	–	–	Reserved
6669	6668	–	–	–	–	–	–	Reserved

Earth Leakage (Vigi) Protection Pre-Alarm (PAL I∆n)

A block read request of 10 registers is necessary to read the earth leakage (Vigi) protection pre-alarm parameters (see *History Reading, page 38*).

Register	Address	RW	X	Unit	Type	Range	A/E	Description
6670	6669	R	–	–	UINT	–	A/E	The MSB gives the activity of the alarm: 0 = On, 1 = Off. The default value is 0 (On). The LSB gives the priority of the alarm: N/A, 1, 2, or 3. The default value is 2 (medium priority).
6671	6670	–	–	–	–	–	–	Reserved
6672	6671	R	1	%	INT	40...100	A/E	% of I∆n pick-up value. The default value is 90.
6673	6672	–	–	–	–	–	–	Reserved
6674	6673	R	1	s	UINT	1	A/E	Pick-up delay value (fixed to 1 s)
6675	6674	R	1	%	INT	40...100	A/E	% of I∆n drop-out value. The default value is 85.
6676	6675	–	–	–	–	–	–	Reserved
6677	6676	R	1	s	UINT	1	A/E	Drop-out delay value (fixed to 1 s)
6678	6677	–	–	–	–	–	–	Reserved
6679	6678	–	–	–	–	–	–	Reserved

User-Defined Alarms

General Description

The RSU software enables the configuration of 10 user-defined alarms that can be chosen from a list of 150 pre-defined alarms.

See the *RSU Online Help* for more information regarding the configuration of the user-defined alarms.

Each user-defined alarm has a corresponding user-defined alarm number (201...210) and a corresponding alarm code (see next paragraph).

Each alarm has a priority level that manages the alarm display on the front display module FDM121:

- no priority = N/A (not affected)
- low priority = 1. No alarm display on the front display module FDM121.
- medium priority = 2. The front display module FDM121 LED is steady ON.
- high priority = 3. The front display module FDM121 LED blinks and a pop-up screen informs the user the alarm is active.

See the *Micrologic 5 and 6 Trip Units User manual* for more information regarding the relationship between alarm priority and front display module FDM121.

The settings of the 10 user-defined alarms are in the user-defined alarms registers:

Register	Address	Description
6770...6781	6769...6780	User-defined alarm 201
6782...6793	6781...6792	User-defined alarm 202
6794...6805	6793...6804	User-defined alarm 203
6806...6817	6805...6816	User-defined alarm 204
6818...6829	6817...6828	User-defined alarm 205
6830...6841	6829...6840	User-defined alarm 206
6842...6853	6841...6852	User-defined alarm 207
6854...6865	6853...6864	User-defined alarm 208
6866...6877	6865...6876	User-defined alarm 209
6878...6889	6877...6888	User-defined alarm 210

User-Defined Alarm Record

A block read request of 12 registers is necessary to read a user defined alarm record (see *History Reading, page 38*).

The order and the description of the user-defined alarms records are the same as that of user-defined alarm record 1:

User-defined alarm 201								
Register	**Address**	**RW**	**X**	**Unit**	**Type**	**Range**	**A/E**	**Description**
6770	6769	R	–	–	UINT	–	A/E	The MSB gives the activity of the alarm: 0 = On, 1 = Off. The default value is 1 (Off). The LSB gives the priority of the alarm: N/A, 1, 2, or 3. The default value is N/A (no priority).
6771	6770	R	–	–	UINT	–	A/E	Measurement identifier (1)
6772	6771	–	–	–	–	–	–	Reserved
6773	6772	R	1	(2)	INT	-32767 ...+32767	A/E	Threshold pick-up value The default value is 0.
6774	6773	–	–	–	–	–	–	Reserved
6775	6774	R	1	s	UINT	0...3000	A/E	Pick-up delay value. The default value is 0.
6776	6775	R	1	(2)	INT	-32767 ...+32767	A/E	Threshold drop-out value The default value is 0.
6777	6776	–	–	–	–	–	–	Reserved
6778	6777	R	1	s	INT	0...3000	A/E	Drop-out delay value. The default value is 0.
6779	6778	R	–	–	UINT	0...3	A/E	Operator: 0: ≥ , 1: ≤ , 2: = , 3:≥ /
6780	6779	R	–	–	UINT	1...1919	–	Alarm code (see next paragraph)
6781	6780	–	–	–	–	–	–	Reserved

(1) The value of the measurement identifier is the register number of the measurement. For example, the measurement identifier of current on phase 1 (I1) is 1016.
(2) The unit of the threshold depends on the measurement identifier. For example, if the measurement identifier is I1, then the unit is A.

Pre-Defined Alarms Codes

The following table describes the list of pre-defined alarms and corresponding codes from which the user can chose the 10 user-defined alarms and configure them with RSU:

Alarm code	Alarm description
1	Over current instantaneous phase 1
2	Over current instantaneous phase 2
3	Over current instantaneous phase 3
4	Over current instantaneous neutral
5	Ground fault protection alarm
6	Under current instantaneous phase 1
7	Under current instantaneous phase 2
8	Under current instantaneous phase 3
9	Over current unbalance phase 1
10	Over current unbalance phase 2
11	Over current unbalance phase 3
12	Over voltage (phase 1 to neutral)
13	Over voltage (phase 2 to neutral)
14	Over voltage (phase 3 to neutral)
15	Under voltage (phase 1 to neutral)
16	Under voltage (phase 2 to neutral)
17	Under voltage (phase 3 to neutral)
18	Over voltage unbalance (phase 1 to neutral)
19	Over voltage unbalance (phase 2 to neutral)
20	Over voltage unbalance (phase 3 to neutral)
21	Over total apparent power
22	Over total active power
23	Over total active reverse power
24	Over total reactive power
25	Over total reactive reverse power
26	Under total apparent power
27	Under total active power
29	Under total reactive power
31	Leading power factor (IEEE)
33	Leading or lagging power factor (IEC)
34	Lagging power factor (IEEE)
35	Over total harmonic distortion current phase 1
36	Over total harmonic distortion current phase 2
37	Over total harmonic distortion current phase 3
38	Over total harmonic distortion voltage (phase 1 to neutral)
39	Over total harmonic distortion voltage (phase 2 to neutral)
40	Over total harmonic distortion voltage (phase 3 to neutral)
41	Over total harmonic distortion voltage (phase 1 to 2)
42	Over total harmonic distortion voltage (phase 2 to 3)
43	Over total harmonic distortion voltage (phase 3 to 1)
54	Earth leakage (Vigi) protection alarm
55	Over current (average)
56	Over maximum current (I1, I2, I3, or neutral)
57	Under current instantaneous neutral
60	Under current (average)
61	Over current demand phase 1
62	Over current demand phase 2
63	Over current demand phase 3

Alarm code	Alarm description
64	Over current demand neutral
65	Under minimum current (I1, I2, or I3)
66	Under current demand phase 1
67	Under current demand phase 2
68	Under current demand phase 3
69	Under current demand neutral
70	Over maximum current unbalance (I1, I2, or I3)
71	Over voltage (phase 1 to 2)
72	Over voltage (phase 2 to 3)
73	Over voltage (phase 3 to 1)
75	Over voltage (average)
76	Under voltage (phase 1 to 2)
77	Under voltage (phase 2 to 3)
78	Under voltage (phase 3 to 1)
79	Over maximum voltage
80	Under voltage (average)
81	Under minimum voltage
82	Over maximum voltage unbalance (phases to neutral)
86	Over voltage unbalance (phase 1 to 2)
87	Over voltage unbalance (phase 2 to 3)
88	Over voltage unbalance (phase 3 to 1)
89	Over maximum voltage unbalance
90	Phase sequence
92	Under frequency
93	Over frequency
121	Leading cosφ (IEEE)
123	Leading or lagging cosφ (IEC)
124	Lagging cosφ (IEEE)
125	Over current thermal image motor
126	Under current thermal image motor
141	Over current maximum demand phase 1
142	Over current maximum demand phase 2
143	Over current maximum demand phase 3
144	Over current maximum demand neutral
145	Lead
146	Lag
147	Quadrant 1
148	Quadrant 2
149	Quadrant 3
150	Quadrant 4

Protection Parameters

Long Time Protection Parameters

A block read request of 10 registers is necessary to read the long time protection parameters (see *History Reading, page 38*).

The long time protection command (command code = 45192) configures the content of the long time protection registers.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
8754	8753	R	–	–	UINT	0...2	A/E	Status: 0 = Off, 1 = On, 2 = Inhibit
8755	8754	–	–	–	–	–	–	Reserved
8756	8755	RW	1	A	UINT	–	A/E	Ir pick-up value. The Ir range depends on the nominal current In.
8757	8756	–	–	–	–	–	–	Reserved
8758	8757	RW	1	ms	UINT	500 ...16000	A/E	tr time delay (distribution application) tr = 500, 1000, 2000, 4000, 8000, 16000 ms
8759	8758	RW	1	ms	UINT	5...30	E	Motor class (motor application only) Possible values = 5, 10, 20, 30 ms
8760	8759	R	–	–	–	–	–	Reserved
8761	8760	RW	–	–	UINT	1...2	E	Cool fan (motor application only) 1 = auto, 2 = motor
8762	8761	–	–	–	–	–	–	Reserved
8763	8762	–	–	–	–	–	–	Reserved

Short Time Protection Parameters

A block read request of 10 registers is necessary to read the short time protection parameters (see *History Reading, page 38*).

The short time protection command (command code = 45193) configures the content of the short time protection registers.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
8764	8763	R	–	–	UINT	0...2	A/E	Status: 0 = Off, 1 = On, 2 = Inhibit
8765	8764	RW	–	–	UINT	0...1	A/E	Type of protection: 0 = I^2t On, 1 = I^2t Off. For motor application, tsd = 30 ms and I^2t is Off (fixed values).
8766	8765	RW	10	–	UINT	(1)	A/E	Isd coefficient, adjustable in step of 5.
8767	8766	R	1	A	UINT	–	A/E	Isd pick-up value = (Ir) x (Isd coefficient) / 10
8768	8767	RW	1	ms	UINT	0...400	A/E	tsd time delay tsd = 0, 30, 100, 200, 300, 400 ms If tsd = 0 ms, then I^2t must be Off.
8769 8770	8768 8769	–	–	–	–	–	–	Reserved
8771	8770	–	–	–	–	–	–	Reserved
8772	8771	–	–	–	–	–	–	Reserved
8773	8772	–	–	–	–	–	–	Reserved

(1) For distribution application, the range is 15...100. For motor application, the range is 50...130.

Instantaneous Protection Parameters

A block read request of 10 registers is necessary to read the instantaneous protection parameters (see *History Reading, page 38*).

The instantaneous protection command (command code = 45194) configures the content of the instantaneous protection registers.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
8774	8773	R	–	–	UINT	0...2	A/E	Status: 0 = Off, 1 = On, 2 = Inhibit
8775	8774	–	–	–	–	–	–	Reserved
8776	8775	RW	10	–	UINT	(1)	A/E	Ii coefficient, adjustable in step of 5.
8777	8766	R	1	A	UINT	–	A/E	Ii pick-up value = (In) x (Ii coefficient) / 10
8778	8777	–	–	–	–	–	–	Reserved
8779 8780	8778 8779	–	–	–	–	–	–	Reserved
8781	8780	–	–	–	–	–	–	Reserved
8782	8781	–	–	–	–	–	–	Reserved
8783	8782	–	–	–	–	–	–	Reserved

(1) The Ii coefficient range depends on the circuit breaker size:
- For Compact NSX 100/160, the range is 15...150.
- For Compact NSX 250/400, the range is 15...120.
- For Compact NSX 630, the range is 15...110.

Ground Fault Protection Parameters

A block read request of 10 registers is necessary to read the ground fault protection parameters (see *History Reading, page 38*).

The ground fault protection command (command code = 45195) configures the content of the ground fault protection registers.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
8784	8783	R	–	–	UINT	0...1	A/E	Status: 0 = Off, 1 = On
8785	8784	RW	–	–	UINT	0...1	A/E	Type of protection: 0 = I^2t On, 1 = I^2t Off For motor application, tg = 0 ms and I^2t is Off (fixed values).
8786	8785	RW	100	–	UINT	–	A/E	Ig coefficient, adjustable in step of 5.
8787	8786	R	1	A	UINT	–	A/E	Ig pick-up value = (In) x (Ig coefficient) / 100 If Ground Fault protection is set to Off, Ig pick-up value = In
8788	8787	RW	1	ms	UINT	0...400	A/E	tg time delay tg = 0, 100, 200, 300, 400 ms. If tg = 0 ms, then I^2t must be Off.
8789 8790	8788 8789	–	–	–	–	–	–	Reserved
8791	8790	–	–	–	–	–	–	Reserved
8792	8791	–	–	–	–	–	–	Reserved
8793	8792	–	–	–	–	–	–	Reserved

Earth Leakage (Vigi) Protection Parameters

A block read request of 10 registers is necessary to read the earth leakage (Vigi) protection parameters (see *History Reading, page 38*).

The earth leakage (Vigi) protection command (command code = 45196) configures the content of the earth leakage (Vigi) protection registers.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
8794	8793	R	–	–	UINT	0...2	A/E	Status: 0 = Off, 1 = On, 2 = Inhibit
8795	8794	–	–	–	–	–	–	Reserved
8796	8795	RW	1	mA	UINT	–	A/E	Earth leakage current IΔn. The IΔn range depends on the nominal current In.
8797	8796	–	–	–	–	–	–	Reserved
8798	8797	RW	1	ms	UINT	0...1000	A/E	tΔn time delay tΔn = 0, 60, 150, 500, 1000 ms If IΔn = 0.03 mA, then tΔn = 0 ms.
8799 8800	8798 8799	–	–	–	–	–	–	Reserved
8801	8800	–	–	–	–	–	–	Reserved
8802	8801	–	–	–	–	–	–	Reserved
8803	8802	–	–	–	–	–	–	Reserved

Jam Protection Parameters

A block read request of 4 registers is necessary to read the jam protection parameters (see *History Reading, page 38*).

The jam protection is available for motor application only. The jam protection command (command code = 45448) configures the content of the jam protection registers.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
8900	8899	RW	–	–	UINT	0...1	E	Status: 0 = Off, 1 = On
8901	8900	RW	10	–	UINT	10...80	E	Ijam coefficient, adjustable in step of 1.
8902	8901	R	1	A	UINT	–	E	Ijam pick-up value = (Ir) x (Ijam coefficient) / 10
8903	8902	RW	1	s	UINT	1...30	E	tjam time delay

Unbalance Protection Parameters

A block read request of 4 registers is necessary to read the unbalance protection parameters (see *History Reading, page 38*).

The unbalance protection is available for motor application only. The unbalance protection command (command code = 45450) configures the content of the unbalance protection registers.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
8904	8903	R	–	–	UINT	0...2	E	Status: 0 = Off, 1 = On, 2 = Inhibit
8905	8904	RW	1	%	UINT	10...40	E	Iunbal coefficient
8906	8905	RW	1	s	UINT	1...10	E	tunbal time delay
8907	8906	R	–	–	–	–	–	Reserved

Underload Protection Parameters

A block read request of 4 registers is necessary to read the underload protection parameters (see *History Reading, page 38*).

The underload protection is available for motor application only. The underload protection command (command code = 45449) configures the content of the underload protection registers.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
8908	8907	RW	–	–	UINT	0...1	E	Status: 0 = Off, 1 = On
8909	8908	RW	100	–	UINT	30...90	E	Iunderload coefficient, adjustable in step of 1.
8910	8909	R	1	A	UINT	–	E	Iunderload pick-up value = (Ir) x (Iunderload) / 100
8911	8910	RW	1	s	UINT	1...200	E	tunderload time delay

Longstart Protection Parameters

A block read request of 4 registers is necessary to read the longstart protection parameters (see *History Reading, page 38*).

The longstart protection is available for motor application only. The longstart protection command (command code = 45451) configures the content of the longstart protection registers.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
8912	8911	RW	–	–	UINT	0...1	E	Status: 0 = Off, 1 = On
8913	8912	RW	10	–	UINT	10...80	E	Ilongstart coefficient, adjustable in step of 1.
8914	8913	R	1	A	UINT	–	E	Ilongstart pick-up value = (Ir) x (Ilongstart coefficient) / 10
8915	8914	RW	1	s	UINT	1...200	E	tlongstart time delay

Neutral Protection Parameters

The neutral protection is only available when system type in register 3314 is 30 or 41. See *System Type, page 72*.

A block read request of 4 registers is necessary to read the neutral protection parameters (see *History Reading, page 38*).

The neutral protection command (command code = 45197) configures the content of the neutral protection registers.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
8916	8915	R	–	–	UINT	0... 2	A/E	Status: 0 = Off, 1 = On, 2 = Inhibit (1)
8917	8916	RW	–	–	UINT	0...3	A/E	Neutral coefficient pick-up value 0 = Off 1 = 0.5 2 = 1.0 3 = OSN
8918	8917	R	1	A	UINT	0...32766	–	Ir pick-up value
8919	8918	R	1	A	UINT	0...32766	–	Isd pick-up value
(1) For 40 A IEC and 60 A UL circuit breakers, the user cannot setup the neutral coefficient pick-up value to 0.5.								

Thermal Memory Inhibit Parameter

Register	Address	RW	X	Unit	Type	Range	A/E	Description
8930	8929	R	–	–	UINT	1... 2	A/E	Status: 1 = On, 2 = Inhibit

Configuration of the SDx Module

Output 1

A block read request of 3 registers is necessary to read the output 1 parameters (see *History Reading, page 38*).

The user can check the status and the validity of output 1 at register 8857 (see *SDx Module Status, page 53*).

Register	Address	RW	X	Unit	Type	Range	A/E	Description
9801	9800	R	1	–	UINT	0...4	A/E	Output mode 0 = normal mode 1 = latched mode 2 = time delayed mode 3 = closed forced mode 4 = open forced mode
9802	9801	R	1	s	UINT	1...360	A/E	Delay (if the output mode is set to 2) The default value is 1 s.
9803	9802	R	1	–	UINT	0...65535	A/E	Alarm identifier (201...210, 1013, 1014, 1015) The alarm identifier is set to 0 if there is no alarm.

Output 2

A block read request of 3 registers is necessary to read the output 2 parameters (see *History Reading, page 38*).

The user can check the status and the validity of output 2 at register 8857 (see *SDx Module Status, page 53*).

Register	Address	RW	X	Unit	Type	Range	A/E	Description
9808	9807	R	1	–	UINT	0...4	A/E	Output mode 0 = normal mode 1 = latched mode 2 = time delayed mode 3 = closed forced mode 4 = open forced mode
9809	9808	R	1	s	UINT	1...360	A/E	Delay (if the output mode is set to 2) The default value is 1 s.
9810	9809	R	1	–	UINT	0...65535	A/E	Alarm identifier (201...210, 1013, 1014, 1015) The alarm identifier is set to 0 if there is no alarm.

Measurement Parameters

System Type

The set up ENVT (External Neutral Voltage Tap) presence command (command code = 46472) configures the content of the system type register.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
3314	3313	RW	–	–	UINT	30...41	A/E	System type

Determining system type:

If...	Then...	Result
the system type is 3-pole circuit breaker with external neutral current transformer and without external neutral voltage tap	system type = 30.	• Measurements of the phase-to-phase voltages are available. • Measurements of the phase-to-neutral voltages are not available. • Measurement of the neutral current is available. • 3 wattmeters method is not possible.
the system type is 3-pole circuit breaker without external neutral current transformer and without external neutral voltage tap	system type = 31.	• Measurements of the phase-to-phase voltages are available. • Measurements of the phase-to-neutral voltages are not available. • Measurement of the neutral current is not available. • 3 wattmeters method is not possible.
the system type is 3-pole circuit breaker without external neutral current transformer and with external neutral voltage tap	system type = 40.	• Measurements of the phase-to-phase voltages are available. • Measurements of the phase-to-neutral voltages are available. • Measurement of the neutral current is not available. • 3 wattmeters method is possible.
the system type is 3-pole circuit breaker with external neutral current transformer and external neutral voltage tap, or if the system type is 4-pole circuit breaker	system type = 41.	• Measurements of the phase-to-phase voltages are available. • Measurements of the phase-to-neutral voltages are available. • Measurement of the neutral current is available. • 3 wattmeters method is possible.

Quadrant Total

Register	Address	RW	X	Unit	Type	Range	A/E	Description
2242	2241	R	–	–	UINT	1...4	E	Quadrant total
2243	2242	R	–	–	UINT	0...1	E	0 = lead 1 = lag

Power Flow Sign

The power flow sign command (command code = 47240) configures the content of the power flow sign register.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
3316	3315	RW	–	–	UINT	0...1	E	Power flow sign 0 = the active power flows from upstream (top) to downstream (bottom) (default). 1 = the active power flows from downstream (bottom) to upstream (top).

Power Factor Sign

The power factor sign configuration command (command code = 47241) configures the content of the power factor sign register.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
3318	3317	RW	–	–	UINT	0...2	E	Sign convention for the power factor and the fundamental power factor (cosφ) 0 = IEC convention 2 = IEEE convention (default)

Energy Accumulation Mode

The energy accumulation mode configuration command (command code = 47242) configures the content of the energy accumulation mode register.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
3324	3323	RW	–	–	UINT	0...1	E	Energy accumulation mode 0 = absolute accumulation (default) Ep = EpIn + EpOut Eq = EqIn + EqOut 1 = signed accumulation Ep = EpIn - EpOut Eq = EqIn - EqOut

Demand Time

The current demand configuration command (command code 47243) configures the content of register 3352.

The power demand configuration command (command code 47244) configures the content of registers 3354 and 3355.

See the *Micrologic 5 and 6 Trip Units User manual* for more information regarding the demand calculation method.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
3352	3351	RW	–	Min	UINT	5...60	E	Duration of the current demand calculation window, adjustable in step of 1 minute. The default value is 15 minutes.
3354	3353	RW	–	–	UINT	0...5	E	Power demand calculation method (window type) 0 = sliding 2 = block 5 = synchronized to communication The default value is 0 (sliding).
3355	3354	RW	–	Min	UINT	5...60	E	Duration of the power demand calculation window, adjustable in step of 1 minute. The default value is 15 minutes.

Nominal Voltage

The set up nominal voltage Vn display command (command code = 47245) configures the content of the nominal voltage register.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
9616	9615	RW	1	V	UINT	0...65535	A/E	Nominal voltage Vn (default value = 400 V)

Time-Stamped Information

General Description

The time-stamped information enables the user to know all the dates relative to important information like previous protection settings and minimum/maximum values of currents, voltages, and network frequency.

The time-stamped information table describes:

- the previous protection setup parameters and corresponding dates
- the minimum and maximum values of voltage measurements and corresponding dates
- the maximum values of current measurements and corresponding dates
- the minimum and maximum network frequencies and corresponding dates
- the peak demand of current and power and corresponding dates

A block read request of 100 registers is necessary to read the previous protection registers (29600...29699). The reading starts at the beginning of the block read (see *History Reading, page 38*).

Previous Long Time Protection Setup

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29600	29599	R	1	A	UINT	–	A/E	Previous Ir pick-up value. The Ir range depends on the nominal current In.
29601 29602	29600 29601	R	1	s	UDINT	–	A/E	Date of setup in number of seconds since 01/01/2000 (1)
29603	29602	R	1	ms	UINT	–	A/E	Complement in ms with quality of the date (1)
29604	29603	R	1	ms	UINT	500... 16000	A/E	Previous tr time delay (distribution application) Tr = 500, 1000, 2000, 4000, 8000, 16000 ms
29605 29606	29604 29605	R	1	s	UDINT	–	A/E	Date of setup in number of seconds since 01/01/2000 (1)
29607	29606	R	1	ms	UINT	–	A/E	Complement in ms with quality of the date (1)
29608	29607	R	1	–	UINT	5...30	A/E	Motor class (motor application only) Possible values = 5, 10, 20, 30
29609 29610	29608 29609	R	1	s	UDINT	–	A/E	Date of setup in number of seconds since 01/01/2000 (1)
29611	29610	R	1	ms	UINT	–	A/E	Complement in ms with quality of the date (1)
29612	29611	R	–	–	UINT	1...2	A/E	Previous cool fan setup (motor application only) 1 = auto, 2 =motor
29613 29614	29612 29613	R	1	s	UDINT	–	A/E	Date of setup in number of seconds since 01/01/2000 (1)
29615	29614	R	1	ms	UINT	–	A/E	Complement in ms with quality of the date (1)
(1) See *Date Format, page 35*.								

Previous Short Time Protection Setup

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29616	29615	R	10	–	UINT	15...100	A/E	Previous Isd coefficient pick-up value
29617 29618	29616 29617	R	1	s	UDINT	–	A/E	Date of setup in number of seconds since 01/01/2000 (1)
29619	29618	R	1	ms	UINT	–	A/E	Complement in ms with quality of the date (1)
29620	29619	R	1	ms	UINT	0...400	A/E	Previous tsd time delay tsd = 0, 100, 200, 300, 400 ms If tsd = 0 ms, then I^2t must be Off.
29621 29622	29620 29621	R	1	s	UDINT	–	A/E	Date of setup in number of seconds since 01/01/2000 (1)
29623	29622	R	1	ms	UINT	–	A/E	Complement in ms with quality of the date (1)
29624	29623	R	–	–	UINT	0...1	A/E	Previous type of protection: 0 = I^2t On, 1 = I^2t Off
29625 29626	29624 29625	R	1	s	UDINT	–	A/E	Date of setup in number of seconds since 01/01/2000 (1)
29627	29626	R	1	ms	UINT	–	A/E	Complement in ms with quality of the date (1)
(1) See *Date Format, page 35*.								

Previous Instantaneous Protection Setup

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29628	29527	R	10	–	UINT	(1)	A/E	Previous Ii coefficient pick-up value
29629 29630	29628 29629	R	1	s	UDINT	–	A/E	Date of setup in number of seconds since 01/01/2000
29631	29630	R	1	ms	UINT	–	A/E	Complement in ms with quality of the date. See *Date Format, page 35*.
(1) The Ii coefficient range depends on the circuit breaker size: • For Compact NSX 100/160, the range is 15...150. • For Compact NSX 250/400, the range is 15...120. • For Compact NSX 630, the range is 15...110.								

Previous Ground Fault Protection Setup

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29632	29631	R	100	ms	UINT	–	A/E	Previous Ig coefficient pick-up value. The Ig coefficient range depends on the nominal current In.
29633 29634	29632 29633	R	1	s	UDINT	–	A/E	Date of setup in number of seconds since 01/01/2000 (1)
29635	29634	R	1	ms	UINT	–	A/E	Complement in ms with quality of the date (1)
29636	29635	R	1	ms	UINT	0...400	A/E	Previous tg time delay tg = 0, 100, 200, 300, 400 ms
29637 29638	29636 29637	R	1	s	UDINT	–	A/E	Date of setup in number of seconds since 01/01/2000 (1)
29639	29638	R	1	ms	UINT	–	A/E	Complement in ms with quality of the date (1)
29640	29639	R	–	–	UINT	0...1	A/E	Previous type of protection: 0 = I^2t On, 1 = I^2t Off
29641 29642	29640 29641	R	1	s	UDINT	–	A/E	Date of setup in number of seconds since 01/01/2000 (1)
29643	29642	R	1	ms	UINT	–	A/E	Complement in ms with quality of the date (1)
(1) See *Date Format, page 35*.								

Previous Earth Leakage (Vigi) Protection Setup

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29644	29643	R	1	mA	UINT	–	A/E	Previous IΔn pick-up value. The IΔn depends on the nominal current In.
29645 29646	29644 29645	R	1	s	UDINT	–	A/E	Date of setup in number of seconds since 01/01/2000 (1)
29647	29646	R	1	ms	UINT	–	A/E	Complement in ms with quality of the date (1)
29648	29647	R	1	ms	UINT	0...1000	A/E	Previous tΔn time delay tΔn = 0, 60, 150, 500, 1000 ms If IΔn = 0.03 mA, then TΔn = 0 ms.
29649 29650	29648 29649	R	1	s	UDINT	–	A/E	Date of setup in number of seconds since 01/01/2000 (1)
29651	29650	R	1	ms	UINT	–	A/E	Complement in ms with quality of the date (1)
(1) See *Date Format, page 35*.								

Previous Jam Protection Setup

The jam protection is available for motor application only.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29652	29651	R	–	–	UINT	0...2	E	Previous setup status: 0 = Off, 1 = On
29653 29654	29652 29653	R	1	s	UDINT	–	E	Date of setup in number of seconds since 01/01/2000 (1)
29655	29654	R	1	ms	UINT	–	E	Complement in ms with quality of the date (1)
29656	29655	R	10	–	UINT	10...80	E	Previous Ijam coefficient pick-up value
29657 29658	29656 29657	R	1	s	UDINT	–	E	Date of setup in number of seconds since 01/01/2000 (1)
29659	29658	R	1	ms	UINT	–	E	Complement in ms with quality of the date (1)
29660	29659	R	–	s	UINT	1...30	E	Previous tjam time delay
29661 29662	29660 29661	R	1	s	UDINT	–	E	Date of setup in number of seconds since 01/01/2000 (1)
29663	29662	R	1	ms	UINT	–	E	Complement in ms with quality of the date (1)
(1) See *Date Format, page 35*.								

Previous Unbalance Protection Setup

The unbalance protection is available for motor application only.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29664	29663	R	1	%	UINT	10...40	E	Previous unbalance coefficient pick-up value
29665 29666	29664 29665	R	1	s	UDINT	–	E	Date of setup in number of seconds since 01/01/2000 (1)
29667	29666	R	1	ms	UINT	–	E	Complement in ms with quality of the date (1)
29668	29667	R	1	s	UINT	1...10	E	Previous tunbal time delay
29669 29670	29668 29669	R	1	s	UDINT	–	E	Date of setup in number of seconds since 01/01/2000 (1)
29671	29670	R	1	ms	UINT	–	E	Complement in ms with quality of the date (1)
(1) See *Date Format, page 35*.								

Previous Underload Protection Setup

The underload protection is available for motor application only.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29672	29671	R	–	–	UINT	0...2	E	Previous setup status: 0 = Off, 1 = On
29673 29674	29672 29673	R	1	s	UDINT	–	E	Date of setup in number of seconds since 01/01/2000 (1)
29675	29674	R	1	ms	UINT	–	E	Complement in ms with quality of the date (1)
29676	29675	R	100	–	UINT	30...90	E	Previous Iunderload coefficient pick-up value
29677 29678	29676 29677	R	1	s	UDINT	–	E	Date of setup in number of seconds since 01/01/2000 (1)
29679	29678	R	1	ms	UINT	–	E	Complement in ms with quality of the date (1)
29680	29679	R	–	s	UINT	1...200	E	Previous tunderload time delay
29681 29682	29680 29681	R	1	s	UDINT	–	E	Date of setup in number of seconds since 01/01/2000 (1)
29683	29682	R	1	ms	UINT	–	E	Complement in ms with quality of the date (1)
(1) See *Date Format, page 35*.								

Previous Longstart Protection Setup

The longstart protection is available for motor application only.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29684	29683	R	–	–	UINT	0...2	E	Previous setup status: 0 = Off, 1 = On
29685 29686	29684 29685	R	1	s	UDINT	–	E	Date of setup in number of seconds since 01/01/2000 (1)
29687	29686	R	1	ms	UINT	–	E	Complement in ms with quality of the date (1)
29688	29687	R	100	–	UINT	10...80	E	Previous Ilongstart coefficient pick-up value
29689 29690	29688 29689	R	1	s	UDINT	–	E	Date of setup in number of seconds since 01/01/2000 (1)
29691	29690	R	1	ms	UINT	–	E	Complement in ms with quality of the date (1)
29692	29691	R	–	s	UINT	1...200	E	Previous tlongstart time delay
29693 29694	29692 29693	R	1	s	UDINT	–	E	Date of setup in number of seconds since 01/01/2000 (1)
29695	29694	R	1	ms	UINT	–	E	Complement in ms with quality of the date (1)
(1) See *Date Format, page 35*.								

Previous Neutral Protection Setup

The neutral protection is only available when system type in register 3314 is 30 or 41. See *System Type, page 72*.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29696	29695	R	–	–	UINT	0...3	A/E	Previous neutral coefficient pick-up value 0 = Off 1 = 0.5 2 = 1.0 3 = OSN
29697 29698	29696 29697	R	1	s	UDINT	–	A/E	Date of setup in number of seconds since 01/01/2000
29699	29698	R	1	ms	UINT	–	A/E	Complement in ms with quality of the date. See *Date Format, page 35*.

Minimum/Maximum V12 Voltage Measurements

A block read request of 48 registers is necessary to read the minimum/maximum values of voltage, current, and frequency registers (29780...29827). The reading starts at the beginning of the block read (see *History Reading, page 38*).

Register = 0 if voltage < 25 V.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29780	29779	R	1	V	UINT	0...850	E	Minimum of RMS phase-to-phase voltage V12
29781 29782	29780 29781	R	1	s	UDINT	–	E	Date in number of seconds since 01/01/2000 (1)
29783	29782	R	1	ms	UINT	–	E	Complement in ms with quality of the date (1)
29784	29783	R	1	V	UINT	0...850	E	Maximum of RMS phase-to-phase voltage V12
29785 29786	29784 29785	R	1	s	UDINT	–	E	Date in number of seconds since 01/01/2000 (1)
29787	29786	R	1	ms	UINT	–	E	Complement in ms with quality of the date (1)
(1) See *Date Format, page 35*.								

Minimum/Maximum V23 Voltage Measurements

Register = 0 if voltage < 25 V.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29788	29787	R	1	V	UINT	0...850	E	Minimum of RMS phase-to-phase voltage V23
29789 29790	29788 29789	R	1	s	UDINT	–	E	Date in number of seconds since 01/01/2000 (1)
29791	29790	R	1	ms	UINT	–	E	Complement in ms with quality of the date (1)
29792	29791	R	1	V	UINT	0...850	E	Maximum of RMS phase-to-phase voltage V23
29793 29794	29792 29793	R	1	s	UDINT	–	E	Date in number of seconds since 01/01/2000 (1)
29795	29794	R	1	ms	UINT	–	E	Complement in ms with quality of the date (1)
(1) See *Date Format, page 35*.								

Minimum/Maximum V31 Voltage Measurements

Register = 0 if voltage < 25 V.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29796	29795	R	1	V	UINT	0...850	E	Minimum of RMS phase-to-phase voltage V31
29797 29798	29796 29797	R	1	s	UDINT	–	E	Date in number of seconds since 01/01/2000 (1)
29799	29798	R	1	ms	UINT	–	E	Complement in ms with quality of the date (1)
29800	29799	R	1	V	UINT	0...850	E	Maximum of RMS phase-to-phase voltage V31
29801 29802	29800 29801	R	1	s	UDINT	–	E	Date in number of seconds since 01/01/2000 (1)
29803	29802	R	1	ms	UINT	–	E	Complement in ms with quality of the date (1)
(1) See *Date Format, page 35*.								

Maximum I1 Current Measurement

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29804	29803	R	1	A	UINT	0...20xIn	A/E	Maximum of RMS current on phase 1: I1
29805 29806	29804 29805	R	1	s	UDINT	–	A/E	Date in number of seconds since 01/01/2000
29807	29806	R	1	ms	UINT	–	A/E	Complement in ms with quality of the date. See *Date Format, page 35*.

Maximum I2 Current Measurement

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29808	29807	R	1	A	UINT	0...20xIn	A/E	Maximum of RMS current on phase 2: I2
29809 29810	29808 29809	R	1	s	UDINT	–	A/E	Date in number of seconds since 01/01/2000
29811	29810	R	1	ms	UINT	–	A/E	Complement in ms with quality of the date. See *Date Format, page 35*.

Maximum I3 Current Measurement

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29812	29811	R	1	A	UINT	0...20xIn	A/E	Maximum of RMS current on phase 3: I3
29813 29814	29812 29813	R	1	s	UDINT	–	A/E	Date in number of seconds since 01/01/2000
29815	29814	R	1	ms	UINT	–	A/E	Complement in ms with quality of the date. See *Date Format, page 35*.

Maximum IN Current Measurement

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29816	29815	R	1	A	UINT	0...20xIn	A/E	Maximum of current on neutral: IN
29817 29818	29816 29817	R	1	s	UDINT	–	A/E	Date in number of seconds since 01/01/2000
29819	29818	R	1	ms	UINT	–	A/E	Complement in ms with quality of the date. See *Date Format, page 35*.

Minimum Network Frequency

When the software cannot calculate the frequency it returns Not Evaluated = 32768 (0x8000).

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29820	29819	R	10	Hz	UINT	150...4400	E	Minimum of network frequency
29821 29822	29820 29821	R	1	s	UDINT	–	E	Date in number of seconds since 01/01/2000
29823	29822	R	1	ms	UINT	–	E	Complement in ms with quality of the date. See *Date Format, page 35*.

Maximum Network Frequency

When the software cannot calculate the frequency it returns Not Evaluated = 32768 (0x8000).

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29824	29823	R	10	Hz	UINT	150...4400	E	Maximum of network frequency
29825 29826	29824 29825	R	1	s	UDINT	–	E	Date in number of seconds since 01/01/2000
29827	29826	R	1	ms	UINT	–	E	Complement in ms with quality of the date. See *Date Format, page 35*.

I1 Peak Demand Measurement

A block read request of 20 registers is necessary to read the peak demand of current and power (29828...29847). The reading starts at the beginning of the block read (see *History Reading, page 38*).

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29828	29827	R	1	A	UINT	0...20xIn	E	I1 peak demand
29829 29830	29828 29829	R	1	s	UDINT	–	E	Date in number of seconds since 01/01/2000
29831	29830	R	1	ms	UINT	–	E	Complement in ms with quality of the date. See *Date Format, page 35*.

I2 Peak Demand Measurement

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29832	29831	R	1	A	UINT	0...20xIn	E	I2 peak demand
29833 29834	29832 29833	R	1	s	UDINT	–	E	Date in number of seconds since 01/01/2000
29835	29834	R	1	ms	UINT	–	E	Complement in ms with quality of the date. See *Date Format, page 35*.

I3 Peak Demand Measurement

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29836	298355	R	1	A	UINT	0...20xIn	E	I3 peak demand
29837 29838	29836 29837	R	1	s	UDINT	–	E	Date in number of seconds since 01/01/2000
29839	29838	R	1	ms	UINT	–	E	Complement in ms with quality of the date. See *Date Format, page 35*.

IN Peak Demand Measurement

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29840	29839	R	1	A	UINT	0...20xIn	E	IN peak demand
29841 29842	29840 29841	R	1	s	UDINT	–	E	Date in number of seconds since 01/01/2000
29843	29842	R	1	ms	UINT	–	E	Complement in ms with quality of the date. See *Date Format, page 35*.

P Peak Demand Measurement

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29844	29843	R	10	kW	INT	-30000...+30000	E	P peak demand
29845 29846	29844 29845	R	1	s	UDINT	–	E	Date in number of seconds since 01/01/2000
29847	29846	R	1	ms	UINT	–	E	Complement in ms with quality of the date. See *Date Format, page 35*.

Maintenance Indicators

Time of Use Counter

The time of use counter reports the time of use of the circuit breaker. The time of use is written in the EEPROM every 1 hour. If the time of use counter reaches the maximum value 4 294 967 295 and a new time of use event occurs, then the counter is reset to 0.

A block read request of 2 registers is necessary to read the time of use counter (see *History Reading, page 38*).

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29851 29852	29850 29851	R	1	Hour	UDINT	0...4 294 967 295	A/E	Counter of time of use

Rate of Wear Counter

The rate of wear counter reports the percentage of the circuit breaker contact use.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29853	29852	R	1	%	UINT	0...32766	A/E	Rate of wear counter 0% = The circuit breaker contact is new > 100% = The circuit breaker contact must be changed

Boot Counter

The boot counter reports the number of cold starts (power-up) and the number of warm starts (software reset of the Micrologic trip unit).

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29854	29853	R	1	–	UINT	0...32766	A/E	Boot counter

EEPROM Writing Counter

The EEPROM writing counter reports the number of storage of the energy measurement in the EEPROM. The energy measurement is written in the EEPROM every 1 hour. If the EEPROM writing counter reaches the maximum value 4 294 967 295 and a new EEPROM writing event occurs, then the EEPROM writing counter is reset to 0.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29855 29856	29854 29855	R	1	–	UDINT	0...4 294 967 295	A/E	Counter of EEPROM writing

Load Profile Counters

The load profile counters report the number of hours for each range of current in the Micrologic trip unit. If the load profile counters reach the maximum value 4 294 967 295 and a new load profile event occurs, then the load profile counters are reset to 0.

A block read request of 8 registers is necessary to read the load profile counters (see *History Reading, page 38*).

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29880 29881	29879 29880	R	1	Hour	UDINT	0...4 294 967 295	A/E	Number of hours for the 0...49 % of the nominal current In range
29882 29883	29881 29882	R	1	Hour	UDINT	0...4 294 967 295	A/E	Number of hours for the 50...79 % of the nominal current In range
29884 29885	29883 29884	R	1	Hour	UDINT	0...4 294 967 295	A/E	Number of hours for the 80...89 % of the nominal current In range
29886 29887	29885 29886	R	1	Hour	UDINT	0...4 294 967 295	A/E	Number of hours for the 90...100 % of the nominal current In range

Temperature Profile Counters

The temperature profile counters report the number of hours for each range of temperature in the Micrologic trip unit. If the temperature profile counters reach the maximum value 4 294 967 295 and a new temperature profile event occurs, then the temperature profile counters are reset to 0.

A block read request of 12 registers is necessary to read the temperature profile counters (see *History Reading, page 38*).

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29890 29891	29889 29890	R	1	Hour	UDINT	0...4 294 967 295	A/E	Number of hours where the temperature is < -30 °C
29892 29893	29891 29892	R	1	Hour	UDINT	0...4 294 967 295	A/E	Number of hours where the temperature is in the -30...+59 °C range
29894 29895	29893 29894	R	1	Hour	UDINT	0...4 294 967 295	A/E	Number of hours where the temperature is in the +60...+74 °C range
29896 29897	29895 29896	R	1	Hour	UDINT	0...4 294 967 295	A/E	Number of hours where the temperature is in the +75...+89 °C range
29898 29899	29897 29898	R	1	Hour	UDINT	0...4 294 967 295	A/E	Number of hours where the temperature is in the +90...+99 °C range
29900 29901	29899 29900	R	1	Hour	UDINT	0...4 294 967 295	A/E	Number of hours where the temperature is > +100 °C

Protection Trips Counters

The protection trips counters report the number of protection trips for each type of protection: long time, short time, instantaneous, ground fault, earth leakage (Vigi), jam, unbalance, longstart, and underload protections. The protection trips counters stop incrementing when they reach the maximum value 10000.

A block read request of 9 registers is necessary to read the protection trips counters (see *History Reading, page 38*).

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29910	29909	R	1	–	UINT	0...10000	A/E	Number of long time protection trips
29911	29910	R	1	–	UINT	0...10000	A/E	Number of short time protection trips
29912	29911	R	1	–	UINT	0...10000	A/E	Number of instantaneous protection trips (including integrated instantaneous protection, instantaneous with earth leakage (Vigi) protection, and reflex protection)
29913	29912	R	1	–	UINT	0...10000	A/E	Number of ground fault protection trips
29914	29913	R	1	–	UINT	0...10000	A/E	Number of earth leakage (Vigi) protection trips
29915	29914	R	1	–	UINT	0...10000	A/E	Number of jam protection trips
29916	29915	R	1	–	UINT	0...10000	A/E	Number of unbalance protection trips
29917	29916	R	1	–	UINT	0...10000	A/E	Number of longstart protection trips
29918	29917	R	1	–	UINT	0...10000	A/E	Number of underload protection trips

Alarms Counters

The alarms counters report the number of occurrences of the alarms. When an alarm is configured, the associated counter is set to 0. The alarm counters stop incrementing when they reach the maximum value 10000.

A block read request of 13 registers is necessary to read the alarms counters (see *History Reading, page 38*).

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29940	29939	R	1	–	UINT	0...10000	A/E	Counter of user-defined alarm 201
29941	29940	R	1	–	UINT	0...10000	A/E	Counter of user-defined alarm 202
29942	29941	R	1	–	UINT	0...10000	A/E	Counter of user-defined alarm 203
29943	29942	R	1	–	UINT	0...10000	A/E	Counter of user-defined alarm 204
29944	29943	R	1	–	UINT	0...10000	A/E	Counter of user-defined alarm 205
29945	29944	R	1	–	UINT	0...10000	A/E	Counter of user-defined alarm 206
29946	29945	R	1	–	UINT	0...10000	A/E	Counter of user-defined alarm 207
29947	29946	R	1	–	UINT	0...10000	A/E	Counter of user-defined alarm 208
29948	29947	R	1	–	UINT	0...10000	A/E	Counter of user-defined alarm 209
29949	29948	R	1	–	UINT	0...10000	A/E	Counter of user-defined alarm 210
29950	29949	R	1	–	UINT	0...10000	A/E	Counter of pre-alarm Ir
29951	29950	R	1	–	UINT	0...10000	A/E	Counter of pre-alarm Ig
29952	29951	R	1	–	UINT	0...10000	A/E	Counter of pre-alarm IΔn

Maintenance Operations Counters

The maintenance operations counters report the number of some maintenance operations. The maintenance operations counters stop incrementing when they reach the maximum value 10000.

A block read request of 7 registers is necessary to read the maintenance operations counters (see *History Reading, page 38*).

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29980	29979	R	–	–	UINT	0...10000	A/E	Counter of Micrologic trip unit locking pad activation
29981	29980	R	–	–	UINT	0...10000	A/E	Counter of connections of the maintenance module
29982	29981	R	–	–	UINT	0...10000	A/E	Counter of ground fault test operation (using Micrologic keypad only)
29983	29982	R	–	–	UINT	0...10000	A/E	Counter of earth leakage (Vigi) test operation
29984	29983	R	–	–	UINT	0...10000	A/E	Counter of ZSI (Zone Selective Interlocking) test operation
29985	29984	R	–	–	UINT	0...10000	A/E	Counter of numerical injection test operation

Miscellaneous

Current Date

A block read request of 3 registers is necessary to read the current date (see *History Reading, page 38*).

The set absolute time command (command code 769) configures the content of the current date registers.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
3000 3001	2999 3000	RW	1	s	UDINT	–	A/E	Date in number of seconds since 01/01/2000
3002	3001	RW	1	ms	UINT	–	A/E	Complement in ms with quality of the date. See *Date Format, page 35*.

Temperature

Register	Address	RW	X	Unit	Type	Range	A/E	Description
8851	8850	R	1	°C	INT	- 30...+120	A/E	Temperature of the Micrologic trip unit

Time Remaining Until Long Time Tripping

Time remaining until long time tripping is evaluated every second. If another protection is tripped, then time remaining until long time tripping continues to be evaluated.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
8865	8864	R	1	s	UINT	1...7200	A/E	Time remaining until long time tripping (1)
(1) Time left until long time tripping = 32768 (0x8000) if ● long time protection is already tripped, ● time remaining until long time tripping is below 1 s, or ● no default is detected by long time protection. If time remaining until long time tripping is > 7200 s, then time remaining until long time tripping = 7200 s.								

Phase Rotation

Register	Address	RW	X	Unit	Type	Range	A/E	Description
8872	8871	R	1	–	UINT	0...1	E	0 = 123 phase sequence 1 = 132 phase sequence

Failure Status

Register	Address	RW	X	Unit	Type	Range	A/E	Bit	Description
29390	29389	R	–	–	UINT	–	A/E	–	Failure status
							A/E	0	Reserved
							A/E	1	STOP (internal failure) 0 = No internal failure 1 = Internal failure
							A/E	2	ERROR (internal failure) 0 = No internal failure 1 = Internal failure
							A/E	3...15	Reserved

NOTE: In the case of a STOP event, it is mandatory to replace the Micrologic trip unit. In the case of an ERROR event, it is advised to replace the Micrologic trip unit (the core protection functions still work but it is preferable to replace the Micrologic trip unit).

Micrologic Trip Unit Rotary Switches

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29990	29989	R	1	–	UINT	1...9	A/E	Position of Micrologic trip unit rotary switch 1 (Ir)
29991	29990	R	1	–	UINT	1...9	A/E	Position of Micrologic trip unit rotary switch 2 (Isd, Ig/I∆n)

Micrologic Trip Unit Locking Pad Status

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29992	29991	R	1	–	UINT	0...1	A/E	0 = Micrologic trip unit locking pad open 1 = Micrologic trip unit locking pad closed

Auxiliary 24 V Power Supply

Register	Address	RW	X	Unit	Type	Range	A/E	Description
29993	29992	R	1	–	UINT	0...1	A/E	0 = auxiliary 24 V power supply is not present 1 = auxiliary 24 V power supply is present

Micrologic Trip Unit LED

Register	Address	RW	X	Unit	Type	Range	A/E	Bit	Description
30005	30004	R	–	–	UINT	–	A/E	–	Micrologic trip unit LED
							A/E	0	Ready LED 0 = not ready (LED is not blinking) 1 = ready (LED is blinking)
							A/E	1	Pre-alarm LED (distribution application only) 0 = pre-alarm is not active (LED is steady off) 1 = pre-alarm is active (LED is steady on)
							A/E	2	Overload LED 0 = overload is not active (LED is steady off) 1 = overload is active (LED is steady on)
							A/E	3...15	Reserved

3.2 Micrologic Trip Unit Commands

Introduction

This section describes the Micrologic trip unit commands.

What's in this Section?

This section contains the following topics:

Protection Commands

General Description

The Modbus protection commands are described the following way:

- location of the registers where the user reads the corresponding parameters of the protection command
- description of the registers where the user sets the parameters of the protection command

List of Protection Commands

The following table lists the available protection commands, their corresponding command codes and password levels. Refer to *Executing a Command, page 29* for the procedure to follow in order to write a command.

Command	Command code	Password level
Long time protection	45192	Level 4
Short time protection	45193	Level 4
Instantaneous protection	45194	Level 4
Ground fault protection	45195	Level 4
Earth leakage (Vigi) protection	45196	Level 4
Neutral protection	45197	Level 4
Jam protection	45448	Level 4
Underload protection	45449	Level 4
Unbalance protection	45450	Level 4
Longstart protection	45451	Level 4

Long Time Protection

The user can read the long time protection parameters from register 8754 to 8763. See *Long Time Protection Parameters, page 67*.

To set the long time protection parameters, the user must set up the command registers the following way:

Register	Address	X	Unit	Type	Range	A/E	Description
8000	7999	–	–	UINT	45192	A/E	Command code = **45192**
8001	8000	–	–	UINT	18	A/E	Number of parameters (bytes) = 18
8002	8001	–	–	UINT	5121	A/E	Destination = 5121 (0x1401)
8003	8002	–	–	UINT	1	A/E	1
8004 8005	8003 8004	–	–	STRING	–	A/E	Level 4 password (default value = ‘0000’ = 0x30303030)
8006	8005	1	A	UINT	–	A/E	Ir pick-up value. The Ir range depends on the nominal current In and on the position of the Micrologic trip unit rotary switch 1 (Ir).
8007	8006	1	ms	UINT	500 ...16000	A/E	tr time delay (distribution application only) tr = 500, 1000, 2000, 4000, 8000, 16000 ms
8008	8007	–	–	UINT	5...30	A/E	Motor class (motor application only) Possible values = 5, 10, 20, 30
8009	8008	–	–	UINT	1... 2	A/E	Cool fan (motor application only) 1 = auto, 2 = motor

Short Time Protection

The user can read the short time protection parameters from register 8764 to 8773. See *Short Time Protection Parameters, page 67*.

To set the short time protection parameters, the user must set up the command registers the following way:

Register	Address	X	Unit	Type	Range	A/E	Description
8000	7999	–	–	UINT	45193	A/E	Command code = **45193**
8001	8000	–	–	UINT	16	A/E	Number of parameters (bytes) = 16
8002	8001	–	–	UINT	5121	A/E	Destination = 5121 (0x1401)
8003	8002	–	–	UINT	1	A/E	1
8004 8005	8003 8004	–	–	STRING	–	A/E	Level 4 password (default value = ‘0000’ = 0x30303030)
8006	8005	10	–	UINT	15...100	A/E	Isd coefficient, adjustable in step of 5. Isd pick-up value = (Ir) x (Isd coefficient) / 10
8007	8006	1	ms	UINT	0...400	A/E	tsd time delay tsd= 0, 100, 200, 300, 400 ms If tsd = 0 ms, then I^2t must be Off.
8008	8007	–	–	UINT	0...1	A/E	Type of protection: 0 = I^2t On, 1 = I^2t Off For motor application, tsd = 0 ms and I^2t is Off (fixed values).

Instantaneous Protection

The user can read the instantaneous protection parameters from register 8774 to 8783. See *Instantaneous Protection Parameters, page 68*.

To set the instantaneous protection parameters, the user must set up the command registers the following way:

Register	Address	X	Unit	Type	Range	A/E	Description
8000	7999	–	–	UINT	45194	A/E	Command code = **45194**
8001	8000	–	–	UINT	12	A/E	Number of parameters (bytes) = 12
8002	8001	–	–	UINT	5121	A/E	Destination = 5121 (0x1401)
8003	8002	–	–	UINT	1	A/E	1
8004 8005	8003 8004	–	–	STRING	–	A/E	Level 4 password (default value = ‘0000’ = 0x30303030)
8006	8005	10	–	UINT	(1)	A/E	Ii coefficient, adjustable in step of 5. Ii pick-up value = (In) x (Ii coefficient) / 10

(1) The Ii coefficient range depends on the circuit breaker size:
- For Compact NSX 100/160, the range is 15...150.
- For Compact NSX 250/400, the range is 15...120.
- For Compact NSX 630, the range is 15...110.

Ground Fault Protection

The user can read the ground fault protection parameters from register 8784 to 8793. See *Ground Fault Protection Parameters, page 68*.

To set the ground fault protection parameters, the user must set up the command registers the following way:

Register	Address	X	Unit	Type	Range	A/E	Description
8000	7999	–	–	UINT	45195	A/E	Command code = **45195**
8001	8000	–	–	UINT	16	A/E	Number of parameters (bytes) = 16
8002	8001	–	–	UINT	5121	A/E	Destination = 5121 (0x1401)
8003	8002	–	–	UINT	1	A/E	1
8004 8005	8003 8004	–	–	STRING	–	A/E	Level 4 password (default value = '0000' = 0x30303030)
8006	8005	100	–	UINT	–	A/E	Ig coefficient, adjustable in step of 5. The value is defined by the position of the Micrologic trip unit rotary switch 2 (Ig). Value 0 means the ground fault protection is off. Ig pick-up value = (In) x (Ig coefficient) / 100
8007	8006	1	ms	UINT	0...400	A/E	tg time delay tg = 0, 100, 200, 300, 400 ms If tg = 0 ms, then I^2t must be Off.
8008	8007	–	–	UINT	0...1	A/E	Type of protection: 0 = I^2t On, 1 = I^2t Off For motor application, tg = 0 ms and I^2t is Off (fixed values).

Earth leakage (Vigi) Protection

The user can read the earth leakage (Vigi) protection parameters from register 8794 to 8803. See *Earth Leakage (Vigi) Protection Parameters, page 69*.

To set the earth leakage (Vigi) protection parameters, the user must set up the command registers the following way:

Register	Address	X	Unit	Type	Range	A/E	Description
8000	7999	–	–	UINT	45196	A/E	Command code = **45196**
8001	8000	–	–	UINT	14	A/E	Number of parameters (bytes) = 14
8002	8001	–	–	UINT	5121	A/E	Destination = 5121 (0x1401)
8003	8002	–	–	UINT	1	A/E	1
8004 8005	8003 8004	–	–	STRING	–	A/E	Level 4 password (default value = '0000' = 0x30303030)
8006	8005	1	mA	UINT	–	A/E	$I\Delta n$ value. The $I\Delta n$ depends on the nominal current In.
8007	8006	1	ms	UINT	0...1000	A/E	$t\Delta n$ time delay $t\Delta n$ = 0, 60, 150, 500, 1000 ms If $I\Delta n$ = 0.03 mA, then $t\Delta n$ = 0 ms

Neutral Protection

The neutral protection is only available when system type in register 3314 is 30 or 41. See *System Type, page 72*.

The user can read the neutral protection parameters from register 8916 to 8919. See *Neutral Protection Parameters, page 70*.

To set the neutral protection registers, the user must set up the command registers the following way:

Register	Address	X	Unit	Type	Range	A/E	Description
8000	7999	–	–	UINT	45197	A/E	Command code = **45197**
8001	8000	–	–	UINT	12	A/E	Number of parameters (bytes) = 12
8002	8001	–	–	UINT	5121	A/E	Destination = 5121 (0x1401)
8003	8002	–	–	UINT	1	A/E	1
8004 8005	8003 8004	–	–	STRING	–	A/E	Level 4 password (default value = ‘0000’ = 0x30303030)
8006	8005	–	–	UINT	0...3	A/E	Neutral coefficient pickup value 0 = Off 1 = 0.5 2 = 1.0 3 = OSN

Jam Protection

The jam protection is available for motor application only.

The user can read the jam protection parameters from registers 8900 to 8903. See *Jam Protection Parameters, page 69*.

To set the jam protection parameters, the user must set up the command registers the following way:

Register	Address	X	Unit	Type	Range	A/E	Description
8000	7999	–	–	UINT	45448	E	Command code = **45448**
8001	8000	–	–	UINT	16	E	Number of parameters (bytes) = 16
8002	8001	–	–	UINT	5121	E	Destination = 5121 (0x1401)
8003	8002	–	–	UINT	1	E	1
8004 8005	8003 8004	–	–	STRING	–	E	Level 4 password (default value = ‘0000’ = 0x30303030)
8006	8005	–	–	UINT	0...1	E	Activation: 0 = Off, 1 = On
8007	8006	10	–	UINT	10...80	E	Ijam coefficient, adjustable in step of 1. Ijam pick-up value = (Ir) x (Ijam coefficient) / 10
8008	8007	1	s	UINT	1...30	E	tjam time delay

Underload Protection

The underload protection is available for motor application only.

The user can read the underload protection parameters from register 8908 to 8911. See *Underload Protection Parameters, page 69*.

To set the underload protection parameters, the user must set up the command registers the following way:

Register	Address	X	Unit	Type	Range	A/E	Description
8000	7999	–	–	UINT	45449	E	Command code = **45449**
8001	8000	–	–	UINT	16	E	Number of parameters (bytes) = 16
8002	8001	–	–	UINT	5121	E	Destination = 5121 (0x1401)
8003	8002	–	–	UINT	1	E	1
8004 8005	8003 8004	–	–	STRING	–	E	Level 4 password (default value = ‘0000’ = 0x30303030)
8006	8005	–	–	UINT	0...1	E	Activation: 0 = Off, 1 = On
8007	8006	100	–	UINT	30...90	E	Iunderload coefficient, adjustable in step of 1. Iunderload pick-up value = (Ir) x (Iunderload) / 100
8008	8007	1	s	UINT	1...200	E	tunderload time delay

Unbalance Protection

The unbalance protection is available for motor application only.

The user can read the unbalance protection parameters from register 8904 to 8907. See *Unbalance Protection Parameters, page 69*.

To set the unbalance protection parameters, the user must set up the command registers the following way:

Register	Address	X	Unit	Type	Range	A/E	Description
8000	7999	–	–	UINT	45450	E	Command code = **45450**
8001	8000	–	–	UINT	14	E	Number of parameters (bytes) = 14
8002	8001	–	–	UINT	5121	E	Destination = 5121 (0x1401)
8003	8002	–	–	UINT	1	E	1
8004 8005	8003 8004	–	–	STRING	–	E	Level 4 password (default value = ‘0000’ = 0x30303030)
8006	8005	1	%	UINT	10...40	E	Iunbal coefficient
8007	8006	1	s	UINT	1...10	E	tunbal time delay

Longstart Protection

The longstart protection is available for motor application only.

The user can read the underload protection parameters from register 8912 to 8915. See *Longstart Protection Parameters, page 70*.

To set the longstart protection parameters, the user must set up the command registers the following way:

Register	Address	X	Unit	Type	Range	A/E	Description
8000	7999	–	–	UINT	45451	E	Command code = **45451**
8001	8000	1	–	UINT	16	E	Number of parameters (bytes) = 16
8002	8001	–	–	UINT	5121	E	Destination = 5121 (0x1401)
8003	8002	–	–	UINT	1	E	1
8004 8005	8003 8004	–	–	STRING	–	E	Level 4 password (default value = ‘0000’ = 0x30303030)
8006	8005	–	–	UINT	0...1	E	Activation: 0 = Off, 1 = On
8007	8006	10	–	UINT	10...80	E	Ilongstart coefficient, adjustable in step of 1. Ilongstart pick-up value = (Ir) x (Ilongstart coefficient) / 10
8008	8007	1	s	UINT	1...200	E	tlongstart time delay

Acknowledge Event Commands

List of Acknowledge Event Commands

The following table lists the available acknowledge event commands, their command codes and password levels:

Command	Command code	Password level
Acknowledge a latched output	45216	Level 3 or 4
Acknowledge a trip	45217	Level 4

Acknowledge a Latched Output

The user can read the SDx module outputs parameters from register 9801 to 9810. See *Configuration of the SDx Module, page 71*.

To acknowledge a latched output, the user must set up the command registers the following way:

Register	Address	X	Unit	Type	Range	A/E	Description
8000	7999	–	–	UINT	45216	A/E	Command code = **45216**
8001	8000	–	–	UINT	12	A/E	Number of parameters (bytes) = 12
8002	8001	–	–	UINT	5121	A/E	Destination = 5121 (0x1401)
8003	8002	–	–	UINT	1	A/E	1
8004 8005	8003 8004	–	–	STRING	–	A/E	Level 3 or 4 password • For level 4, default value = ‘0000’ = 0x30303030 • For level 3, default value = ‘3333’ = 0x33333333
8006	8005	–	–	UINT	1...2	A/E	1 = relay 1, 2 = relay 2

Acknowledge a Trip

To acknowledge a trip, the user must set up the command registers the following way:

Register	Address	X	Unit	Type	Range	A/E	Description
8000	7999	–	–	UINT	45217	A/E	Command code = **45217**
8001	8000	–	–	UINT	10	A/E	Number of parameters (bytes) = 10
8002	8001	–	–	UINT	5121	A/E	Destination = 5121 (0x1401)
8003	8002	–	–	UINT	1	A/E	1
8004 8005	8003 8004	–	–	STRING	–	A/E	Level 4 password (default value = ‘0000’ = 0x30303030)

Measurement Configuration Commands

List of Measurement Configuration Commands

The following table lists the available measurement configuration commands, their corresponding command codes and password levels:

Command	Command code	Password level
Set up ENVT presence	46472	Level 4
Reset minimum/maximum	46728	Level 3 or 4
Start/stop synchronization	46729	Level 3 or 4
Power flow sign configuration	47240	Level 4
Power factor sign configuration	47241	Level 4
Energy accumulation mode configuration	47242	Level 4
Current demand configuration	47243	Level 4
Power demand configuration	47244	Level 4
Set up nominal voltage Vn display	47245	Level 4

Set up ENVT presence

The user can read the ENVT (External Neutral Voltage Tap) presence parameters at register 3314. See *System Type, page 72*.

To set up ENVT presence, the user must set up the command registers the following way:

Register	Address	X	Unit	Type	Range	A/E	Description
8000	7999	–	–	UINT	46472	E	Command code = **46472**
8001	8000	–	–	UINT	12	E	Number of parameters (bytes) = 12
8002	8001	–	–	UINT	5121	E	Destination = 5121 (0x1401)
8003	8002	–	–	UINT	1	E	1
8004 8005	8003 8004	–	–	STRING	–	E	Level 4 password (default value = ‘0000’ = 0x30303030)
8006	8005	–	–	UINT	0...1	E	0 = ENVT is not present 1 = ENVT is present

Reset Minimum/Maximum

The reset minimum/maximum command resets the minimum values of real-time measurements (registers 1300 to 1599) and the maximum values of real-time measurements (registers 1600 to 1899). See *Minimum/Maximum Values of Real-Time Measurements, page 47*.

The reset minimum/maximum command resets the energy measurements (registers 2000 to 2025). See *Energy Measurements, page 48*.

The reset minimum/maximum command resets the peak demand measurements (registers 2200 to 2237). See *Demand Measurements, page 49*.

The user can read the minimum and maximum values of current, voltage, and frequency measurements and the corresponding dates from register 29780 to 29827. See *Minimum/Maximum V12 Voltage Measurements, page 77*.

The user can read the dates of the reset minimum/maximum command from register 2900 to 2929. See *Minimum/Maximum Measurements Reset Time, page 50*.

To reset minimum/maximum values of measurements, the user must set up the command registers the following way:

Register	Address	Type	Range	A/E	Bit	Description
8000	7999	UINT	46728	–	–	Command code = **46728**
8001	8000	UINT	12	–	–	Number of parameters (bytes) = 12
8002	8001	UINT	5121	–	–	Destination = 5121 (0x1401)
8003	8002	UINT	1	–	–	1
8004 8005	8003 8004	STRING	–	–	–	Level 3 or 4 password • For level 4, default value = ‘0000’ = 0x30303030 • For level 3, default value = ‘3333’ = 0x33333333
8006	8005	UINT	–	–	–	Reset minimum/maximum of metering variables • To reset the metering variable, set the bit to 1. • To keep the current values, set the bit to 0.
				A/E	0	Reset minimum/maximum current (I1, I2, I3, IN, Imax, Ig, IΔn, Iavg, and Iunbalance)
				E	1	Reset minimum/maximum voltage (V12, V13, V23, V1N, V2N, V3N, Vavg L-L, Vavg L-N, and Vunbalance)
				E	2	Reset minimum/maximum power (active power, reactive power, apparent power, and distortion power)
				E	3	Reset minimum/maximum power factor and cosφ
				E	4	Reset minimum/maximum total harmonic distortion (THD)
				E	5	Reset peak of current demand
				E	6	Reset peak of active power, reactive power, and apparent power demand
				E	7	Reset minimum/maximum frequency
				E	8	Reset minimum/maximum thermal image (motor application only)
				E	9	Reset energy (active, reactive, apparent)
				–	10...15	Reserved

Start/Stop Synchronization

The start/stop synchronization command is used to start or stop the calculation of the current or power demand. The first command starts the calculation, the next command updates the value of current or power demand and then restarts the calculation. The time period between two commands must be less than 1 hour.

To start/stop synchronization, the user must set up the command registers the following way:

Register	Address	X	Unit	Type	Range	A/E	Description
8000	7999	–	–	UINT	46729	E	Command code = **46729**
8001	8000	–	–	UINT	12	E	Number of parameters (bytes) = 12
8002	8001	–	–	UINT	5121	E	Destination = 5121 (0x1401)
8003	8002	–	–	UINT	1	E	1
8004 8005	8003 8004	–	–	STRING	–	E	Level 3 or 4 password • For level 4, default value = ‘0000’ = 0x30303030 • For level 3, default value = ‘3333’ = 0x33333333
8006	8005	–	–	UINT	–	E	Start/stop synchronization = 1

Power Flow Sign Configuration

The user can read the power flow sign configuration at register 3316. See *Power Flow Sign, page 72*.

To set the power flow sign parameters, the user must set up the command registers the following way:

Register	Address	X	Unit	Type	Range	A/E	Description
8000	7999	–	–	UINT	47240	E	Command code = **47240**
8001	8000	–	–	UINT	12	E	Number of parameters (bytes) = 12
8002	8001	–	–	UINT	5121	E	Destination = 5121 (0x1401)
8003	8002	–	–	UINT	1	E	1
8004 8005	8003 8004	–	–	STRING	–	E	Level 4 password (default value = ‘0000’ = 0x30303030)
8006	8005	–	–	UINT	0...1	E	Power flow sign 0 = the active power flows from upstream (top) to downstream (bottom) (default) 1 = the active power flows from downstream (bottom) to upstream (top).

Power Factor Sign Configuration

The user can read the power factor sign configuration at register 3318. See *Power Factor Sign, page 72*.

To set the power factor sign parameters, the user must set up the command registers the following way:

Register	Address	X	Unit	Type	Range	A/E	Description
8000	7999	–	–	UINT	47241	E	Command code = **47241**
8001	8000	–	–	UINT	12	E	Number of parameters (bytes) = 12
8002	8001	–	–	UINT	5121	E	Destination = 5121 (0x1401)
8003	8002	–	–	UINT	1	E	1
8004 8005	8003 8004	–	–	STRING	–	E	Level 4 password (default value = ‘0000’ = 0x30303030)
8006	8005	–	–	UINT	0...2	E	Sign convention for the power factor and the fundamental power factor (cosφ) 0 = IEC convention 2 = IEEE convention (default)

Energy Accumulation Mode Configuration

The user can read the energy accumulation mode configuration at register 3324. See *Energy Accumulation Mode, page 73*.

To set the energy accumulation mode parameters, the user must set up the command registers the following way:

Register	Address	X	Unit	Type	Range	A/E	Description
8000	7999	–	–	UINT	47242	E	Command code = **47242**
8001	8000	–	–	UINT	12	E	Number of parameters (bytes) = 12
8002	8001	–	–	UINT	5121	E	Destination = 5121 (0x1401)
8003	8002	–	–	UINT	1	E	1
8004 8005	8003 8004	–	–	STRING	–	E	Level 4 password (default value = ‘0000’ = 0x30303030)
8006	8005	–	–	UINT	0...1	E	Energy accumulation mode 0 = absolute accumulation (default) 1 = signed accumulation

Current Demand Configuration

The user can read the duration of the current demand calculation window at register 3352. See *Demand Time, page 73*.

The user can read the current demand parameters from register 2200 to 2207. See *Current Demand, page 49*.

To start current demand, the user must set up the command registers the following way:

Register	Address	X	Unit	Type	Range	A/E	Description
8000	7999	–	–	UINT	47243	E	Command code = **47243**
8001	8000	–	–	UINT	12	E	Number of parameters (bytes) = 12
8002	8001	–	–	UINT	5121	E	Destination = 5121 (0x1401)
8003	8002	–	–	UINT	1	E	1
8004 8005	8003 8004	–	–	STRING	–	E	Level 4 password (default value = ‘0000’ = 0x30303030)
8006	8005	–	Min	UINT	5...60	E	Duration of the current demand calculation window, adjustable in step of 1. The default value is 15 minutes (sliding).

Power Demand Configuration

The user can read the power demand calculation method from register 3354 to 3355. See *Demand Time, page 73*.

The user can read the power demand parameters from register 2224 to 2237. See *Active Power Demand, page 49*.

To start power demand, the user must set up the command registers the following way:

Register	Address	X	Unit	Type	Range	A/E	Description
8000	7999	–	–	UINT	47244	E	Command code = **47244**
8001	8000	–	–	UINT	14	E	Number of parameters (bytes) = 14
8002	8001	–	–	UINT	5121	E	Destination = 5121 (0x1401)
8003	8002	–	–	UINT	1	E	1
8004 8005	8003 8004	–	–	STRING	–	E	Level 4 password (default value = ‘0000’ = 0x30303030)
8006	8005	–	Min	UINT	0...5	E	Power demand calcultation method (window type): 0 = sliding 2 = fixed 5 = synchronized to communication The default value is 0 (sliding)
8007	8006	–	Min	UINT	5...60	E	Duration of the power demand calculation window, adjustable in step of 1. The default value is 15 minutes.

Set Up Nominal Voltage Vn Display

The user can read the nominal voltage at register 9616. See *Nominal Voltage, page 73*.

To set the nominal voltage Vn display parameters, the user must set up the command registers the following way:

Register	Address	X	Unit	Type	Range	A/E	Description
8000	7999	–	–	UINT	47245	E	Command code = **47245**
8001	8000	–	–	UINT	12	E	Number of parameters (bytes) = 12
8002	8001	–	–	UINT	5121	E	Destination = 5121 (0x1401)
8003	8002	–	–	UINT	1	E	1
8004 8005	8003 8004	–	–	STRING	–	E	Level 4 password (default value = ‘0000’ = 0x30303030)
8006	8005	–	V	UINT	0...65535	E	Nominal voltage Vn (default value = 400 V)

BSCM Data

4

Introduction

This chapter describes the BSCM (Breaker Status and Control Module) data.

What's in this Chapter?

This chapter contains the following sections:

4.1 BSCM Registers

Introduction

This section describes the BSCM registers.

What's in this Section?

This section contains the following topics:

Identification

Square D Identification

Register	Address	RW	X	Unit	Type	Range	A/E	Description
551	550	R	–	–	UINT	15149	A/E	Square D identification = 15149 for the BSCM

Serial Number

The BSCM serial number is composed of a maximum of 11 alphanumeric characters with the following format: PPYYWWDnnnn.

- PP = plant code
- YY = year of fabrication (05...99)
- WW = week of fabrication (01...53)
- D = day of fabrication (1...7)
- nnnn = sequence number (0001...9999)

A block read request of 6 registers is necessary to read the BSCM serial number (see *History Reading, page 38*).

Register	Address	RW	X	Unit	Type	Range	A/E	Description
552	551	R	–	–	STRING	–	A/E	‘PP’
553	552	R	–	–	STRING	05...99	A/E	‘YY’
554	553	R	–	–	STRING	01...53	A/E	‘WW’
555	554	R	–	–	STRING	1...7	A/E	‘Dn’
556	555	R	–	–	STRING	00...99	A/E	‘nn’
557	556	R	–	–	STRING	01...99	A/E	‘n’ (the NULL character ends the serial number)

Status

Circuit Breaker Status

Register	Address	RW	X	Unit	Type	Range	A/E	Bit	Description
563	562	R	–	–	UINT	–	A/E	–	Circuit breaker status register
							A/E	0	OF input status 0 = circuit breaker is open 1 = circuit breaker is closed
							A/E	1	SD input status 0 = circuit breaker is not tripped 1 = circuit breaker is tripped due to electrical default or shunt trip or push to trip
							A/E	2	SDE input status 0 = circuit breaker is not tripped on electrical default 1 = circuit breaker is tripped due to electrical default (including Ground fault test and Earth leakage test)
							–	3...15	Reserved (forced to 0)

Communicating Motor Mechanism Status

Register	Address	RW	X	Unit	Type	Range	A/E	Bit	Description
564	563	R	–	–	UINT	–	A/E	–	Communicating motor mechanism status register
							A/E	0	Motor mechanism 0 = not available 1 = available
							A/E	1	Manu/auto mode 0 = manu 1 = auto
							A/E	2	Last command 0 = last command succeeded 1 = last command failed
							A/E	3	Enable automatic reset 0 = automatic reset is not enabled 1 = automatic reset is enabled
							A/E	4	Enable reset even if SDE 0 = reset is not enable if the circuit breaker is tripped on electrical default. 1 = reset is enabled even if the circuit breaker is tripped on electrical default.
							A/E	5	Local/Remote mode This mode is selected in the Front Display Module (FDM121) menu. 0 = Remote mode (default value) The communicating motor mechanism is controlled through a Modbus command only. 1 = Local mode The communicating motor mechanism is controlled through the Front Display Module (FDM121) menu only.
							–	6...15	Reserved (forced to 0)

Maintenance Indicators

General Description

The BSCM has 7 counters that help managing the Compact NSX circuit breaker.

The BSCM counters have the following properties:

- All the counters are saved in non-volatile memory to prevent data loss in case of power loss.
- The cumulating OF counter is read only. It stops incrementing when it reaches the maximum value 4 294 967 295.
- The user can preset all counters (except the cumulating OF counter) to any value between 0 and 65535. The counters stop incrementing when they reach the maximum value 65535.
- A threshold is associated to the OF counter and to the close circuit breaker command counter. The user can set the threshold to any value between 0 and 65534. The default value is 5000. An alarm is generated when a counter reaches the threshold.

Counters

Register	Address	RW	X	Unit	Type	Range	A/E	Description
571 572	570 571	R	1	–	UDINT	0...4 294 967 295	A/E	Cumulating OF counter (non resetable open to close counter)
573	572	RW	1	–	UINT	0...65535	A/E	OF counter (resetable open to close counter)
574	573	RW	1	–	UINT	0...65535	A/E	SD counter (Close to SD position)
575	574	RW	1	–	UINT	0...65535	A/E	SDE counter (Close to SDE position)
576	575	RW	1	–	UINT	0...65535	A/E	Open circuit breaker command counter
577	576	RW	1	–	UINT	0...65535	A/E	Close circuit breaker command counter
578	577	RW	1	–	UINT	0...65535	A/E	Reset circuit breaker command counter
579	578	–	–	–	–	–	–	Reserved
580	579	–	–	–	–	–	–	Reserved
581	580	RW	1	–	UINT	0...65535	A/E	OF counter threshold The default value is 5000.
582	581	RW	1	–	UINT	0...65535	A/E	Close circuit breaker command counter threshold The default value is 5000.

Event History

General Description

The BSCM event history registers describe the last 10 encountered events. The BSCM events format corresponds to a series of 10 records. Each record is composed of 5 registers describing one BSCM event.

A block read request of 5x(n) registers is necessary to read the last n BSCM event records, where 5 is the number of registers for each event record. The reading starts at the beginning of the block read (see *History Reading, page 38*).

For example, a block read request of 5x3 = 15 registers is necessary to read the last 3 BSCM event records of the BSCM event history:

- The first 5 registers describe the first BSCM event record (most recent event).
- The next 5 registers describe the second BSCM event record.
- The last 5 registers describe the third BSCM event record.

Register	Address	Description
602	601	Event counter
603...607	602...606	Event record 1(most recent event)
608...612	607...611	Event record 2
613...617	612...616	Event record 3
618...622	617...621	Event record 4
623...627	622...626	Event record 5
628...632	627...631	Event record 6
633...637	632...636	Event record 7
638...642	637...641	Event record 8
643...647	642...646	Event record 9
648...652	647...651	Event record 10 (oldest event)

Event Counter

The event counter is incremented whenever a new event is logged. If the counter reaches the maximum value 65535 and a new event is logged, then the counter is reset to 0.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
602	601	R	1	–	UINT	0...65535	A/E	BSCM event counter

Event Record

The order and the description of the events records registers are the same as that of event record 1:

Event 1 (most recent event)								
Register	**Address**	**RW**	**X**	**Unit**	**Type**	**Range**	**A/E**	**Description**
603	602	R	1	–	UINT	0...65535	A/E	BSCM event identifier (see next paragraph)
604 605	603 604	R	1	s	UDINT	0...4 294 967 295	A/E	Date of event in number of seconds since 01/01/2000
606	605	R	1	ms	UINT	0...65535	A/E	Complement in ms with quality of the date. See *Date Format, page 35*.
607	606	R	1	–	UINT	1...2	A/E	Event status 1 = event occurrence, 2 = event completion

Event Identifier

Event Identifier	Event
1024	SD contact change (occurrence = close to SD position)
1025	Threshold of OF counter is reached
1026	Threshold of close command counter is reached
1027	STOP (internal failure)
1028	ERROR (internal failure)
1029	OF contact change (occurrence = open to close position)
1030	SDE contact change (occurrence = close to SDE position)
1031	Manu/auto mode (occurrence = manu to auto position)
1040	Open command
1041	Close command
1042	Reset command

NOTE: In the case of a STOP event, it is mandatory to replace the BSCM. In the case of an ERROR event, it is advised to replace the BSCM (the core protection functions still work but it is preferable to replace the BSCM).

4.2 BSCM Commands

Introduction

This section describes the BSCM commands.

What's in this Section?

This section contains the following topics:

Commands and Error Codes

List of Commands

The following table lists the available BSCM commands, their corresponding command codes and password levels. Refer to *Executing a Command, page 29* for the procedure to follow in order to write a command.

Command	Command code	Password level
Open circuit breaker	904	Level 3 or 4
Close circuit breaker	905	Level 3 or 4
Reset circuit breaker	906	Level 3 or 4
Enable/disable automatic reset	42636	Level 4
Enable/disable reset even if SDE	42637	Level 4
Preset counters	42638	Level 4
Set up thresholds	42639	Level 4

Error Codes

In addition to generic error codes, the BSCM commands generate the following error codes returned in register 8021:

Error code (dec)	Description
4363=0x110B	BSCM is out of order.
4503=0x1197	Circuit breaker is tripped. It must be reset before the command.
4504=0x1198	Circuit breaker is already closed.
4505=0x1199	Circuit breaker is already open.
4506=0x119A	Circuit breaker is already reset.
4507=0x119B	Actuator is in manual mode. Remote commands are not allowed.
4508=0x119C	Actuator is not present.
4510=0x119E	A previous command is still in progress.
4511=0x119F	Reset command is forbidden when SDE is set.

Any other positive error code means an internal error.

Circuit Breaker Control Commands

Open Circuit Breaker

To open the circuit breaker, the user must set up the command registers the following way:

Register	Address	X	Unit	Type	Range	A/E	Description
8000	7999	–	–	UINT	904	A/E	Command code = **904**
8001	8000	–	–	UINT	10	A/E	Number of parameters (bytes) = 10
8002	8001	–	–	UINT	4353	A/E	Destination = 4353 (0x1101)
8003	8002	–	–	UINT	1	A/E	1
8004 8005	8003 8004	–	–	STRING	–	A/E	Level 3 or 4 password • For level 4, default value = '0000' = 0x30303030 • For level 3, default value = '3333' = 0x33333333

Close Circuit Breaker

To close the circuit breaker, the user must set up the command registers the following way:

Register	Address	X	Unit	Type	Range	A/E	Description
8000	7999	–	–	UINT	905	A/E	Command code = **905**
8001	8000	–	–	UINT	10	A/E	Number of parameters (bytes) = 10
8002	8001	–	–	UINT	4353	A/E	Destination = 4353 (0x1101)
8003	8002	–	–	UINT	1	A/E	1
8004 8005	8003 8004	–	–	STRING	–	A/E	Level 3 or 4 password • For level 4, default value = '0000' = 0x30303030 • For level 3, default value = '3333' = 0x33333333

Reset Circuit Breaker

To reset the circuit breaker, the user must set up the command registers the following way:

Register	Address	X	Unit	Type	Range	A/E	Description
8000	7999	–	–	UINT	906	A/E	Command code = **906**
8001	8000	–	–	UINT	10	A/E	Number of parameters (bytes) = 10
8002	8001	–	–	UINT	4353	A/E	Destination = 4353 (0x1101)
8003	8002	–	–	UINT	1	A/E	1
8004 8005	8003 8004	–	–	STRING	–	A/E	Level 3 or 4 password • For level 4, default value = '0000' = 0x30303030 • For level 3, default value = '3333' = 0x33333333

Enable/Disable Automatic Reset

The user can read the automatic reset parameters at register 564 (bit 3). See *Communicating Motor Mechanism Status, page 102*.

To enable/disable automatic reset, the user must set up the command registers the following way:

Register	Address	X	Unit	Type	Range	A/E	Description
8000	7999	–	–	UINT	42636	A/E	Command code = **42636**
8001	8000	–	–	UINT	12	A/E	Number of parameters (bytes) = 12
8002	8001	–	–	UINT	4353	A/E	Destination = 4353 (0x1101)
8003	8002	–	–	UINT	1	A/E	1
8004 8005	8003 8004	–	–	STRING	–	A/E	Level 4 password (default value = '0000' = 0x30303030)
8006	8005	–	–	UINT	0...1	A/E	0 = automatic reset in not enabled 1 = automatic reset is enabled

Enable/Disable Reset even if SDE

The user can read the reset parameters at register 564 (bit 4). See *Communicating Motor Mechanism Status, page 102*.

To enable/disable reset even if SDE, the user must set up the command registers the following way:

Register	Address	X	Unit	Type	Range	A/E	Description
8000	7999	–	–	UINT	42637	A/E	Command code = **42637**
8001	8000	–	–	UINT	12	A/E	Number of parameters (bytes) = 12
8002	8001	–	–	UINT	4353	A/E	Destination = 4353 (0x1101)
8003	8002	–	–	UINT	1	A/E	1
8004 8005	8003 8004	–	–	STRING	–	A/E	Level 4 password (default value = ‘0000’ = 0x30303030)
8006	8005	–	–	UINT	0...1	A/E	0 = reset is not enabled if SDE = 1 1 = reset is enabled even if SDE = 1

Counters Commands

Preset Counters

The user can read the values of the counters from register 571 to 578. See *Counters, page 103*.

To preset the counters, the user must set up the command registers the following way:

Register	Address	X	Unit	Type	Range	A/E	Description
8000	7999	–	–	UINT	42638	A/E	Command code = **42638**
8001	8000	–	–	UINT	22	A/E	Number of parameters (bytes) = 22
8002	8001	–	–	UINT	4353	A/E	Destination = 4353 (0x1101)
8003	8002	–	–	UINT	1	A/E	1
8004 8005	8003 8004	–	–	STRING	–	A/E	Level 4 password (default value = ‘0000’ = 0x30303030)
8006	8005	1	–	UINT	0...6553 5	A/E	0...65534 = preset value of the OF counter 65535 = do not preset the OF counter
8007	8006	1	–	UINT	0...6553 5	A/E	0...65534 = preset value of the SD counter 65535 = do not preset the SD counter
8008	8007	1	–	UINT	0...6553 5	A/E	0...65534 = preset value of the SDE counter 65535 = do not preset the SDE counter
8009	8008	1	–	UINT	0...6553 5	A/E	0...65534 = preset value of the open circuit breaker command counter 65535 = do not preset the open circuit breaker command counter
8010	8009	1	–	UINT	0...6553 5	A/E	0...65534 = preset value of the close circuit breaker command counter 65535 = do not preset the close circuit breaker command counter
8011	8010	1	–	UINT	0...6553 5	A/E	0...65534 = preset value of the reset circuit breaker command counter 65535 = do not preset the reset circuit breaker command counter

Set Up Thresholds

The user can read the values of the thresholds from register 581 to 582. See *Counters, page 103*.

To set up the thresholds, the user must set up the command registers the following way:

Register	Address	X	Unit	Type	Range	A/E	Description
8000	7999	–	–	UINT	42639	A/E	Command code = **42639**
8001	8000	–	–	UINT	22	A/E	Number of parameters (bytes) = 22
8002	8001	–	–	UINT	4353	A/E	Destination = 4353 (0x1101)
8003	8002	–	–	UINT	1	A/E	1
8004 8005	8003 8004	–	–	STRING	–	A/E	Level 4 password (default value = ‘0000’ = 0x30303030)
8006	8005	1	–	UINT	0...6553 5	A/E	0...65534 = value of the OF counter threshold 65535 = do not change the OF counter threshold
8007	8006	1	–	UINT	65535	A/E	65535 (no threshold is associated to the SD counter)
8008	8007	1	–	UINT	65535	A/E	65535 (no threshold is associated to the SDE counter)
8009	8008	1	–	UINT	65535	A/E	65535 (no threshold is associated to the open circuit breaker command counter)
8010	8009	1	–	UINT	0...6553 5	A/E	0...65534 = value of the close circuit breaker command counter threshold 65535 = do not change close circuit breaker command counter threshold
8011	8010	1	–	UINT	65535	A/E	65535 (no threshold is associated to the reset circuit breaker command counter)

Modbus Communication Interface Module Data

5

Introduction

This chapter describes the Modbus communication interface module data.

What's in this Chapter?

This chapter contains the following sections:

5.1 Modbus Communication Interface Module Registers

Introduction

This section describes the Modbus communication interface module registers.

What's in this Section?

This section contains the following topics:

Identification

Firmware Version

The Modbus communication interface module firmware version starts with a V character and has the following format: VX.Y.Z ended by the NULL character (0x00). The firmware version starts at register 11776 and has a maximum length of 7 registers.

X, Y, and Z are in the 1...999 range.

A block read request of 7 registers is necessary to read the Modbus communication interface module firmware version (see *History Reading, page 38*).

Serial Number

The Modbus communication interface module serial number is composed of a maximum of 11 alphanumeric characters with the following format: PPYYWWDnnnn.

- PP = plant code
- YY = year of fabrication (05...99)
- WW = week of fabrication (01...53)
- D = day of fabrication (1...7)
- nnnn = sequence number (0001...9999)

A block read request of 6 registers is necessary to read the Modbus communication interface module serial number (see *History Reading, page 38*).

Register	Address	RW	X	Unit	Type	Range	A/E	Description
11784	11783	R	–	–	STRING	–	A/E	‘PP’
11785	11784	R	–	–	STRING	05...99	A/E	‘YY’
11786	11785	R	–	–	STRING	01...53	A/E	‘WW’
11787	11786	R	–	–	STRING	1...7	A/E	‘Dn’
11788	11787	R	–	–	STRING	00...99	A/E	‘nn’
11789	11788	R	–	–	STRING	00...99	A/E	‘n ’ (the NULL character ends the serial number)

Square D Identification

Register	Address	RW	X	Unit	Type	Range	A/E	Description
11901	11900	R	–	–	UINT	–	A/E	Square D identification = 15146 for the Modbus communication interface module

Hardware Version

Register	Address	RW	X	Unit	Type	Range	A/E	Description
11903 ...11906	11902 ...11905	R	1	–	STRING	–	A/E	Hardware version of the Modbus communication interface module

Modbus Network Parameters

IMU Identification

The IMU (Intelligent Modular Unit) is the set of modules (Micrologic trip unit, BSCM, front display module FDM121) connected to one Modbus communication interface module. When not programmed, these registers return 0 (0x0000). The front display module FDM121 displays the IMU name but it is limited to the first 12 characters.

Register	Address	RW	X	Unit	Type	Range	A/E	Description
11801 11823	11800 11822	R	–	–	STRING	–	A/E	IMU name = up to 47 ASCII characters ended by the NULL character 0x00
11846 11868	11845 11867	R	–	–	STRING	–	A/E	IMU location = up to 47 ASCII characters ended by the NULL character 0x00

Modbus Locking Pad Position

Register	Address	RW	X	Unit	Type	Range	A/E	Description
11891	11890	R	–	–	UINT	1...3	A/E	Modbus locking pad position 1 = Modbus locking pad is on the locked position 3 = Modbus locking pad is on the open position

Auto-Speed Sensing State

Register	Address	RW	X	Unit	Type	Range	A/E	Description
12399	12398	R	–	–	UINT	0...1	A/E	Auto-Speed sensing state 0 = Auto-Speed sensing is disabled 1 = Auto-Speed sensing is enabled (default)

Modbus Address of Modbus Communication Interface Module

Register	Address	RW	X	Unit	Type	Range	A/E	Description
12400	12399	R	–	–	UINT	1...99	A/E	Modbus address of Modbus communication interface module

Modbus Parity

Register	Address	RW	X	Unit	Type	Range	A/E	Description
12401	12400	R	–	–	UINT	1...3	A/E	Modbus parity 1 = no parity 2 = even parity (default) 3 = odd parity

Modbus Baudrate

Register	Address	RW	X	Unit	Type	Range	A/E	Description
12402	12401	R	–	–	UINT	5...8	A/E	Modbus baudrate 5 = 4800 bauds 6 = 9600 bauds 7 = 19200 bauds (default) 8 = 38400 bauds

Number of Stop Bits

Register	Address	RW	X	Unit	Type	Range	A/E	Description
12403	12402	R	–	–	UINT	0...5	A/E	Number of stop bits 0 = no change 1 = Standard Modbus 2 = 1/2 stop bit 3 = 1 stop bit 4 = 1 and 1/2 stop bit 5 = 2 stop bits

5.2 Modbus Communication Interface Module Commands

Introduction

This section describes the Modbus communication interface module commands.

What's in this Section?

This section contains the following topics:

List of Modbus Communication Interface Module Commands

List of Commands

The following table lists the Modbus communication interface module commands, their corresponding command codes and password levels. Refer to *Executing a Command, page 29* for the procedure to follow in order to write a command.

Command	Command code	Password level
Get current time	768	no password required
Set absolute time	769	no password required
Read IMU name and location	1024	4
Write IMU name and location	1032	4

Modbus Communication Interface Module Commands

Get Current Time

The get current time command is not hardware protected. When the arrow of the Modbus locking pad (located on the front panel of the Modbus communication interface module) points to the closed padlock, the get current time command is still enabled.

To get the current time for all modules, the user must setup the command registers the following way:

Register	Address	X	Unit	Type	Range	A/E	Description
8000	7999	–	–	UINT	768	A/E	Command code = **768**
8001	8000	–	–	UINT	10	A/E	Number of parameters (bytes) = 10
8002	8001	–	–	UINT	768	A/E	Destination = 768 (0x0300)
8003	8002	–	–	UINT	0	A/E	0
8004 8005	8003 8004	–	–	STRING	0	A/E	Password = 0 (load 0x0000 into registers 8004 and 8005)

The following registers contain the time data:
- register 8023 holds the month in the MSB, the day in the LSB.
- register 8024 holds the year offset in the MSB (add 2000 to get the year) and the hour in the LSB.
- register 8025 holds the minutes in the MSB, the seconds in the LSB.
- register 8026 holds the milliseconds.

Set Absolute Time

The set absolute time command is not hardware protected. When the arrow of the Modbus locking pad (located on the front panel of the Modbus communication interface module) points to the closed padlock, the set absolute time command is still enabled.

To set the absolute time for all the IMU modules, the user must setup the command registers the following way:

Register	Address	X	Unit	Type	Range	A/E	Description
8000	7999	–	–	UINT	769	A/E	Command code = **769**
8001	8000	–	–	UINT	18	A/E	Number of parameters (bytes) = 18
8002	8001	–	–	UINT	768	A/E	Destination = 768 (0x0300)
8003	8002	–	–	UINT	0	A/E	0
8004 8005	8003 8004	–	–	STRING	0	A/E	Password = 0 (load 0x0000 into registers 8004 and 8005)
8006	8005	–	–	UINT	–	A/E	MSB = month (1...12) LSB = day in the month (1...31)
8007	8006	–	–	UINT	–	A/E	MSB = year (0...99, 0 meaning year 2000) LSB = hour (0...23)
8008	8007	–	–	UINT	–	A/E	MSB = minute (0...59) LSB = second (0...59)
8009	8008	–	ms	UINT	0...999	A/E	Milliseconds (0...999)

In case of 24 V DC power loss, date and time counter is reset and will restart at January 1st 2000. It is therefore mandatory to set absolute time for all the IMU modules after recovering the 24 V DC power supply. Furthermore, due to the clock drift of each IMU module, it is mandatory to set absolute time for all the IMU modules periodically. Recommended period is at least every hour.

Read IMU Name and Location

The user can read the IMU name and location from register 11801 to 11861. See *IMU Identification, page 114*.

The front display module FDM121 displays the IMU name but it is limited to the first 14 characters.

To read the IMU name and location, the user must set up the command registers the following way:

Register	Address	X	Unit	Type	Range	A/E	Description
8000	7999	–	–	UINT	1024	A/E	Command code = **1024**
8001	8000	–	–	UINT	16	A/E	Number of parameters (bytes) = 16
8002	8001	–	–	UINT	768	A/E	Destination = 768 (0x0300)
8003	8002	–	–	UINT	1	A/E	0
8004 8005	8003 8004	–	–	STRING	–	A/E	Password = 0 (load 0x0000 into registers 8004 and 8005)
8006 8007	8005 8006	–	–	UDINT	–	A/E	17039489 = read IMU name (load 0x0104 into register 8006, 0x0081 into 8007) 17039490 = read IMU location (load 0x0104 into register 8006, 0x0082 into 8007)
8008	8007	–	–	UINT	2048	A/E	2048

The response to this command will have the following format:

Register	Address	X	Unit	Type	Range	A/E	Description
8021	8020	–	–	UINT	–	A/E	Command status 0 = command succeeded Otherwise, command failed
8022	8021	–	–	UINT	–	A/E	Number of bytes returned (0 if command failed)
8023	8022	–	–	STRING	–	A/E	If command succeeded MSB = first character of IMU name or location LSB = second character of IMU name or location
...	...	–	–	STRING	–	A/E	Depends on the length of the IMU name or location and is ended by the NULL character 0x00

Write IMU Name and Location

The user can read the IMU name and location from register 11801 to 11861. See *IMU Identification, page 114*.

The front display module FDM121 displays the IMU name but it is limited to the first 14 characters.

To write the IMU name and location, the user must set up the command registers the following way:

Register	Address	X	Unit	Type	Range	A/E	Description
8000	7999	–	–	UINT	1032	A/E	Command code = **1032**
8001	8000	–	–	UINT	18...32	A/E	Number of parameters (bytes) = depends on the length of the IMU name or location (up to 47 ASCII characters ended by the NULL character 0x00)
8002	8001	–	–	UINT	768	A/E	Destination = 0 (0x0000)
8003	8002	–	–	UINT	1	A/E	1
8004 8005	8003 8004	–	–	STRING	–	A/E	Level 4 password (default value = ‘0000’ = 0x30303030)
8006 8007	8005 8006	–	–	UDINT	–	A/E	17039489 = set IMU name (load 0x0104 into register 8006, 0x0081 into 8007) 17039490 = set IMU location (load 0x0104 into register 8006, 0x0082 into 8007)
8008	8006	–	–	UINT	2048	A/E	2048
8009	8008	–	–	STRING	–	A/E	MSB = First character of the IMU name or location LSB = Second character of the IMU name or location
...	...	–	–	STRING	–	A/E	Depends on the length of the IMU name or location and is ended by the NULL character 0x00

5.3 Communication Profile

Introduction

The Modbus communication interface module holds the communication profile registers.

What's in this Section?

This section contains the following topics:

Communication Profile

General Description

The communication profile is a global entity that collects the most useful information of each ULP module in one convenient table.

The benefit is that in one location the user can, with one block read function, get up-to-date information. Each module pushes the data on a regular basis so that the structure is refreshed with current values.

The communication profile is defined in the 12000-12180 register range.

NOTE: The communication profile is compatible with previous versions of the Micrologic trip unit. For this reason data read directly in the Modbus registers is organized in a different way than in the communication profile.

Update period

The measurement update period with Modbus communication is:

- 1 second for the following measurements:
  - voltage and voltage unbalance,
  - current and current unbalance,
  - active, reactive, apparent, and distortion power,
  - reactive power with harmonic,
  - power factor and fundamental power factor,
  - frequency,
- 5 seconds for the following measurements:
  - energy,
  - minimum and maximum values of real-time measurements.
  - THD (Total Harmonic Distorsion).

Modbus Registers

Table of Communication Profile Common Registers

The main information needed for remote supervision of a Compact NSX, Compact NS or Masterpact NT/NW circuit breaker is contained in the table of common registers starting at register 12000.

This compact table of 113 registers can be read with a single Modbus request.

It contains the following information:
- Circuit breaker status
- Trip unit protection status
- Real-time values of main measurements: current, voltage, power, energy, total harmonic distortion

The content of this table of registers is detailed in the List of Common Registers (Communication Profile) section.

Use of these common registers is highly recommended to optimize response times and simplify use of data.

NOTE: For Compact NS/Masterpact circuit breakers, the communication profile (table of common registers) must be activated by writing 1 in register 800.

Maintenance Data Registers

Maintenance data for a Compact NSX, Compact NS or Masterpact NT/NW circuit breaker is not available in the table of common registers.

This must be read by specific read requests according to the type of circuit breaker.

See registers 29851 onwards for Compact NSX.

See registers 9094 onwards for Compact NS/Masterpact.

Measurement Update Period

The update period for the common registers is:
- 1 second for the following measurements:
  - Voltage and voltage unbalance
  - Current and current unbalance
  - Active, reactive, apparent, and distortion power
  - Reactive power with harmonics
  - Power factor and fundamental power factor
  - Frequency
- 5 seconds for the following measurements:
  - Energy
  - Minimum and maximum real-time measurement values
  - Total harmonic distortion (THD)

Register Tables Format

The register tables consist of the following columns:

Register	Address	R/W	X	Unit	Type	Range	A/E	A/P/H	Description

- **Register**: Number of the 16-bit register in decimal number format.
- **Address**: Address of the 16-bit register (one less than the register number).
- **R/W**: The register is either read-only (R), or read-write (R/W).
- **X**: Scale factor. Scale 10 means that the register contains the value multiplied by 10. The actual value is therefore the register value divided by 10.

  Example
  Register 12036 contains the network frequency. The unit is Hz and the scale factor is 10.
  If the register contains the value 502, this means that the network frequency is
  502/10 = 50.2 Hz.

- **Unit**: Unit in which the information is expressed.
- **Type**: Type of encoding data.
- **Range**: Permitted values for this register, usually a subset of what the format allows.
- **A/E**: Types of Micrologic Compact NSX trip unit for which the register is available.
  - Type A (ammeter): Current measurements
  - Type E (energy): Current, voltage, power and energy measurements
- **A/P/H**: Types of Masterpact NT/NW and Compact NS Micrologic trip unit for which the register is available.
  - Type A (ammeter): Current measurements
  - Type P (power): Current, voltage, power and energy measurements
  - Type H (harmonics): Current, voltage, power, energy and energy quality measurements
- **Description**: Provides information about the register and the restrictions applying to it.

Data Types

The following data types appear in the Modbus register tables:

Label	Description	Range
UINT	Unsigned 16-bit integer	0 to 65,535
INT	Signed 16-bit integer	-32,768 to +32,767
UDINT	Unsigned 32-bit integer	0 to 4,294,967,295
DINT	Signed 32-bit integer	-2,147,483,648 to +2,147,483,647
STRING	Text string	1 byte per character

Notes

- The **type** column indicates the number of registers to be read in order to obtain the variable. For example, UINT asks for one word to be read whereas DINT requires 2 words to be read.
- Reading from an undocumented address results in a Modbus exception.
- Variables stored in 2 words (energy, for example) are stored in big-endian format: the most significant word is transmitted first, the least significant second.
- Digital values are given in decimal format. When there is an advantage in having the corresponding value in hexadecimal format, this is given as a constant in C language: 0xdddd. For example, the decimal value 123 is represented in hexadecimal format as 0x007B.
- Non-functioning and non-applicable values are represented by 32,768 (0x8000 or 0x8000000 for 32-bit values).
- Out-of-limit values are represented by 32,767 (0x7FFF, for 16-bit values only).
- For measurements which depend on presence of the neutral, value readout returns 32,768 (0x8000) if not applicable. For each table where this appears, an explanation is given in a footnote.

Communication Profile Common Registers

Data Validity

Register	Address	R/W	X	Unit	Type	Range	A/E	A/P/H	Description
12000	11999	R	1	-	UINT	-	A/E	A/P/H	Indicates the validity of each bit in the circuit breaker status register (12001).

Circuit Breaker Status Register

Register	Address	R/W	X	Unit	Type	Range	A/E	A/P/H	Bit	Description
12001	12000	R	–	–	UINT	–	A/E	A/P/H	–	Circuit breaker status register
							A/E	A/P/H	0	OF status 0 = The circuit breaker is open 1 = The circuit breaker is closed
							A/E	A/P/H	1	SD trip indication • For Compact NS and NSX: 0 = circuit breaker is not tripped. 1 = circuit breaker is tripped due to electrical default or shunt trip or push to trip. • For Masterpact: Always 0
							A/E	A/P/H	2	SDE fault trip indication 0 = circuit breaker is not tripped on electrical default. 1 = circuit breaker is tripped due to electrical default (including Ground fault test and Earth leakage test).
							–	A/P/H	3	CH loaded (only with Masterpact motor mechanism) 0 = Spring discharged 1 = Spring loaded
							–	–	4	Reserved
							–	A/P/H	5	PF ready to close 0 = Not ready to close 1 = Ready to close
							–	A/P/H	6	Distinction between Compact/Masterpact 0 = Compact 1 = Masterpact
							–	–	7...14	Reserved
							A/E	A/P/H	15	Data availability If this bit is at 1, the circuit breaker status is not available.
12002 12003	12001 12002	R	–	–	UINT	–	–	-	-	Reserved

Tripping Cause

The tripping cause register provides information about the cause of the trip for the basic protection functions. When a bit is at 1 in the register, it indicates that a trip has occurred and has not been acknowledged.

Register	Address	R/W	X	Unit	Type	Range	A/E	A/P/H	Bit	Description
12004	12003	R	–	–	UINT	–	A/E	A/P/H	–	Tripping cause for the basic protection functions
							A/E	A/P/H	0	Long time protection Ir
							A/E	A/P/H	1	Short time protection Isd
							A/E	A/P/H	2	Instantaneous protection Ii
							A/E	A/P/H	3	Ground fault protection Ig
							A/E	A/P/H	4	Earth leakage protection (Vigi module) IΔn
							A/E	A/P/H	5	Integrated instantaneous protection
							A/E	–	6	Internal failure (STOP)
							–	A	6	Other protections
							–	P/H	6	Internal failure (temperature)
							–	P/H	7	Internal failure (overvoltage)
							–	P/H	8	Other protection (see register 12005)
							A/E	–	9	Instantaneous with earth leakage protection (Vigi module) on the trip unit
							E	–	10	Unbalance motor protection
							E	–	11	Jam motor protection
							E	–	12	Underload motor protection
							E	–	13	Long start motor protection
							A/E	–	14	Reflex tripping protection
							A/E	A/P/H	15	If this bit is at 1, bits 0 to 14 are not valid.
12005	12004	R	–	–	UINT	–	–	P/H	–	Tripping causes for the advanced protection functions
12006 12007	12005 12006	R	–	–	UINT	–	–	–	–	Reserved

Overrun of the Protection Setpoints

The alarm setpoint registers provide information about overrun of the standard and advanced protection setpoints. A bit is at 1 once a setpoint overrun has occurred, even if the time-out has not expired.

Register	Address	R/W	X	Unit	Type	Range	A/E	A/P/H	Bit	Description
12008	12007	R	–	–	UINT	–	A/E	P/H	–	Overrun of the standard protection setpoints
							A/E	P/H	0	Long time protection pick-up
							–	–	1...14	Reserved
							A/E	P/H	15	If this bit is at 1, bits 0 to 14 are not valid.
12009	12008	R	–	–	UINT	–	–	P/H	–	Overrun of the advanced protection setpoints
							–	P/H	0	Current unbalance
							–	P/H	1	Maximum current on phase 1
							–	P/H	2	Maximum current on phase 2
							–	P/H	3	Maximum current on phase 3
							–	P/H	4	Maximum current on the neutral
							–	P/H	5	Minimum voltage
							–	P/H	6	Maximum voltage
							–	P/H	7	Voltage unbalance
							–	P/H	8	Maximum power
							–	P/H	9	Reverse power
							–	P/H	10	Minimum frequency
							–	P/H	11	Maximum frequency
							–	P/H	12	Phase rotation
							–	P/H	13	Load shedding based on the current
							–	P/H	14	Load shedding based on the power
							–	P/H	15	If this bit is at 1, bits 0 to 14 are not valid.
12010	12009	R	–	–	UINT	–	–	P/H	–	Continuation of the previous register
							–	P/H	0	Ground fault alarm
							–	P/H	1	Earth leakage alarm (Vigi module)
							–	–	2...14	Reserved
							–	P/H	15	If this bit is at 1, bits 0 to 14 are not valid.

Alarms

The alarm register provides information about the pre-alarms and the user-defined alarms. A bit is set to 1 once an alarm is active.

Register	Address	R/W	X	Unit	Type	Range	A/E	A/P/H	Bit	Description
12011	12010	R	–	–	UINT	–	A/E	–	–	Pre-alarm register
							A/E	–	0	Long time protection time pre-alarm (PAL Ir)
							A/E	–	1	Earth leakage protection pre-alarm (Vigi module) (PAL IΔn)
							A/E	–	2	Ground fault protection pre-alarm (PAL Ig)
							–	–	3...14	Reserved
							A/E	–	15	If this bit is at 1, bits 0 to 14 are not valid.
12012	12011	R	–	–	UINT	–	A/E	–	–	Register of user-defined alarms
							A/E	–	0	User-defined alarm 201
							A/E	–	1	User-defined alarm 202
							A/E	–	2	User-defined alarm 203
							A/E	–	3	User-defined alarm 204
							A/E	–	4	User-defined alarm 205
							A/E	–	5	User-defined alarm 206
							A/E	–	6	User-defined alarm 207
							A/E	–	7	User-defined alarm 208
							A/E	–	8	User-defined alarm 209
							A/E	–	9	User-defined alarm 210
							–	–	10...14	Reserved
							A/E	–	15	If this bit is at 1, bits 0 to 14 are not valid.
12013... 12015	12012... 12014	R	–	–	UINT	–	–	–	–	Reserved

Currents

Register	Address	R/W	X	Unit	Type	Range	A/E	A/P/H	Description
12016	12015	R	1	A	UINT	0...20xIn	A/E	A/P/H	Rms current on phase 1: I1
12017	12016	R	1	A	UINT	0...20xIn	A/E	A/P/H	Rms current on phase 2: I2
12018	12017	R	1	A	UINT	0...20xIn	A/E	A/P/H	Rms current on phase 3: I3
12019	12018	R	1	A	UINT	0...20xIn	A/E	A/P/H	Rms current on the neutral: IN (1)
12020	12019	R	1	A	UINT	0...20xIn	A/E	A/P/H	Maximum of I1, I2, I3, and IN
12021	12020	R	1	(2)	UINT	–	A/E	A/P/H	Ground fault current Ig. The range depends on the nominal current In.
12022	12021	R	1	(3)	UINT	–	A/E	A/P/H	Ground leakage current IΔn. The range depends on the nominal current In.

(1) Value cannot be accessed for motor applications and in cases of 3-pole circuit breakers without external neutral current transformer (ENCT).
(2) This value is only available:
- For Masterpact NT/NW and Compact NS Micrologic 6.0 trip units, expressed in amps
- For Compact NSX Micrologic 6.2 and 6.3 trip units, expressed as %Ig

(3) This value is only available:
- For Masterpact NT/NW and Compact NS Micrologic 7.0 trip units, expressed in milliamps
- For Compact NSX Micrologic 7.2 and 7.3 trip units, expressed as %IΔn

Maximum Current Values

Register	Address	R/W	X	Unit	Type	Range	A/E	A/P/H	Description
12023	12022	R	1	A	UINT	0...20xIn	A/E	A/P/H	Maximum rms current on phase 1: I1
12024	12023	R	1	A	UINT	0...20xIn	A/E	A/P/H	Maximum rms current on phase 2: I2
12025	12024	R	1	A	UINT	0...20xIn	A/E	A/P/H	Maximum rms current on phase 3: I3
12026	12025	R	1	A	UINT	0...20xIn	A/E	A/P/H	Maximum rms current on the neutral: IN (1)
12027	12026	R	1	A	UINT	0...20xIn	A/E	A/P/H	Maximum rms current out of the 4 previous registers
12028	12027	R	1	(2)	UINT	–	A/E	A/P/H	Maximum ground fault current Ig. The range depends on the current In.
12029	12028	R	1	(3)	UINT	–	A/E	A/P/H	Maximum ground leakage current IΔn. The range depends on the nominal current In.

(1) Value cannot be accessed for motor applications and in cases of 3-pole circuit breakers without external neutral current transformer (ENCT).
(2) This value is only available:
- For Masterpact NT/NW and Compact NS Micrologic 6.0 trip units, expressed in amps
- For Compact NSX Micrologic 6.2 and 6.3 trip units, expressed as %Ig

(3) This value is only available:
- For Masterpact NT/NW and Compact NS Micrologic 7.0 trip units, expressed in milliamps
- For Compact NSX Micrologic 7.2 and 7.3 trip units, expressed as %IΔn

Voltages

Register = 0 if the voltage < 25 V.

Register	Address	R/W	X	Unit	Type	Range	A/E	A/P/H	Description
12030	12029	R	1	V	UINT	0...850	E	P/H	Rms phase-to-phase voltage V12
12031	12030	R	1	V	UINT	0...850	E	P/H	Rms phase-to-phase voltage V23
12032	12031	R	1	V	UINT	0...850	E	P/H	Rms phase-to-phase voltage V31
12033	12032	R	1	V	UINT	0...850	E	P/H	Rms phase-to-neutral voltage V1N (1)
12034	12033	R	1	V	UINT	0...850	E	P/H	Rms phase-to-neutral voltage V2N (1)
12035	12034	R	1	V	UINT	0...850	E	P/H	Rms phase-to-neutral voltage V3N (1)

(1) Value cannot be accessed for motor applications and in cases of 3-pole circuit breakers without external neutral voltage transformer (ENVT).

Frequency

When the software cannot calculate the frequency, it returns Not available = 32,768 (0x8000).

Register	Address	R/W	X	Unit	Type	Range	A/E	A/P/H	Description
12036	12035	R	10	Hz	UINT	150...4400	E	P/H	Network frequency: F
12037	12036	R	10	Hz	UINT	150...4400	E	P/H	Network frequency maximum

Power

Register	Address	R/W	X	Unit	Type	Range	A/E	A/P/H	Description
12038	12037	R	(3)	kW	UINT	-10000...+10000	E	P/H	Active power on phase 1: P1 (1) (2)
12039	12038	R	(3)	kW	UINT	-10000...+10000	E	P/H	Active power on phase 2: P2 (1) (2)
12040	12039	R	(3)	kW	UINT	-10000...+10000	E	P/H	Active power on phase 3: P3 (1) (2)
12041	12040	R	(3)	kW	UINT	-30000...+30000	E	P/H	Total active power: Ptot (2)
12042	12041	R	(3)	kVAR	UINT	-10000...+10000	E	P/H	Reactive power on phase 1: Q1 (1) (2)
12043	12042	R	(3)	kVAR	UINT	-10000...+10000	E	P/H	Reactive power on phase 2: Q2(1) (2)
12044	12043	R	(3)	kVAR	UINT	-10000...+10000	E	P/H	Reactive power on phase 3: Q3(1) (2)
12045	12044	R	(3)	kVAR	UINT	-30000...+30000	E	P/H	Total reactive power: Qtot (2)
12046	12045	R	(3)	kVA	UINT	0...10000	E	P/H	Apparent power on phase 1: S1 (1)
12047	12046	R	(3)	kVA	UINT	0...10000	E	P/H	Apparent power on phase 2: S2 (1)
12048	12047	R	(3)	kVA	UINT	0...10000	E	P/H	Apparent power on phase 3: S3 (1)
12049	12048	R	(3)	kVA	UINT	0...30000	E	P/H	Total apparent power: Stot

(1) Value cannot be accessed for motor applications and in cases of 3-pole circuit breakers without external neutral current transformer (ENCT).
(2) The sign for the active and reactive power depends on the Micrologic configuration.
(3) The scale factor depends on the type of Micrologic trip unit:
- The scale factor is 10 for Compact NSX Micrologic 5.2, 5.3, 6.2, 6.3, 7.2 or 7.3 trip units.
- The scale factor is 1 for Masterpact NT/NW and Compact NS Micrologic 5.0, 6.0 or 7.0 trip units.

Energy

Energies are stored in big-endian format: the most significant word is transmitted first, the least significant second.

Register	Address	R/W	X	Unit	Type	Range	A/E	A/P/H	Description
12050 12051	12049 12050	R	1	kWh	DINT	-1 999 999 999 ...+1 999 999 999	E	P/H	Active energy: Ep
12052 12053	12051 12052	R	1	kVARh	DINT	-1 999 999 999 ...+1 999 999 999	E	P/H	Reactive energy: Eq
12054 12055	12053 12054	R	1	kWh	UDINT	0...1 999 999 999	E	P/H	Active energy counted positively: EpIn
12056 12057	12055 12056	R	1	kWh	UDINT	0...1 999 999 999	E	P/H	Active energy counted negatively: EpOut
12058 12059	12057 12058	R	1	kVARh	UDINT	0...1 999 999 999	E	P/H	Reactive energy counted positively: EqIn
12060 12061	12059 12060	R	1	kVARh	UDINT	0...1 999 999 999	E	P/H	Reactive energy counted negatively: EqOut
12062 12063	12061 12062	R	1	kVAh	UDINT	0...1 999 999 999	E	P/H	Total apparent energy: Es
12064 12065	12063 12064	R	1	kWh	UDINT	0...1 999 999 999	E	–	Active energy counted positively (non-resettable): EpIn
12066 12067	12065 12066	R	1	kWh	UINT	0...1 999 999 999	E	–	Active energy counted negatively (non-resettable): EpOut
12068... 12079	12067... 12078	–	–	–	–	–	–	–	Reserved

Current Demand Values

Register	Address	R/W	X	Unit	Type	Range	A/E	A/P/H	Description
12080	12079	R	1	A	UINT	0...20xIn	E	P/H	Current demand value on phase 1: I1 Dmd
12081	12080	R	1	A	UINT	0...20xIn	E	P/H	Current demand value on phase 2: I2 Dmd
12082	12081	R	1	A	UINT	0...20xIn	E	P/H	Current demand value on phase 3: I3 Dmd
12083	12082	R	1	A	UINT	0...20xIn	E	P/H	Current demand value on the neutral: IN Dmd (1)

(1) Value cannot be accessed for motor applications and in cases of 3-pole circuit breakers without external neutral current transformer (ENCT).

Power Demand Values

When the window is fixed type, this value is updated at the end of the window. For the sliding type, the value is updated every 15 seconds.

Register	Address	R/W	X	Unit	Type	Range	A/E	A/P/H	Description
12084	12083	R	(1)	kW	UINT	-30000...+30000	E	P/H	Demand value of the total active power: Ptot Dmd
12085	12084	R	(1)	kVAR	UINT	-30000...+30000	E	P/H	Demand value of the total reactive power: Qtot Dmd
12086	12085	R	(1)	kVA	UINT	0...30000	E	P/H	Demand value of the total apparent power: Stot Dmd
12087... 12089	12086... 12088	–	–	–	–	–	–	–	Reserved

(1) The scale factor depends on the type of Micrologic trip unit:
- The scale factor is 10 for Compact NSX Micrologic 5.2, 5.3, 6.2, 6.3, 7.2 or 7.3 trip units.
- The scale factor is 1 for Masterpact NT/NW and Compact NS Micrologic 5.0, 6.0 or 7.0 trip units.

Maximum Voltage Values

Register = 0 if the voltage < 25 V.

Register	Address	R/W	X	Unit	Type	Range	A/E	A/P/H	Description
12090	12089	R	1	V	UINT	0...850	E	P/H	Maximum rms phase-to-phase voltage V12
12091	12090	R	1	V	UINT	0...850	E	P/H	Maximum rms phase-to-phase voltage V23
12092	12091	R	1	V	UINT	0...850	E	P/H	Maximum rms phase-to-phase voltage V31
12093	12092	R	1	V	UINT	0...850	E	P/H	Maximum rms phase-to-neutral voltage V1N (1)
12094	12093	R	1	V	UINT	0...850	E	P/H	Maximum rms phase-to-neutral voltage V2N (1)
12095	12094	R	1	V	UINT	0...850	E	P/H	Maximum rms phase-to-neutral voltage V3N (1)

(1) Value cannot be accessed for motor applications and in cases of 3-pole circuit breakers without external neutral voltage transformer (ENVT).

Power Factor

The sign for the fundamental power factor (cosφ) depends on the Micrologic configuration.

Register	Address	R/W	X	Unit	Type	Range	A/E	A/P/H	Description
12096	12095	R	(2)	-	INT	(2)	E	P/H	Power factor on phase 1: PF1 (1)
12097	12096	R	(2)	-	INT	(2)	E	P/H	Power factor on phase 2: PF2 (1)
12098	12097	R	(2)	-	INT	(2)	E	P/H	Power factor on phase 3: PF3 (1)
12099	12098	R	(2)	-	INT	(2)	E	P/H	Total power factor: PF
12100	12099	R	(2)	-	INT	(2)	E	H	Fundamental power factor on phase 1: cosφ1 (1)
12101	12100	R	(2)	-	INT	(2)	E	H	Fundamental power factor on phase 2: cosφ2 (1)
12102	12101	R	(2)	-	INT	(2)	E	H	Fundamental power factor on phase 3: cosφ3 (1)
12103	12102	R	(2)	-	INT	(2)	E	H	Total fundamental power factor: cosφ

(1) Value cannot be accessed for motor applications and in cases of 3-pole circuit breakers without external neutral voltage transformer (ENVT).
(2) The scale factor and range depend on the type of Micrologic trip unit:
- The scale factor is 100 and the range is -100...+100 for Compact NSX Micrologic 5.2, 5.3, 6.2, 6.3, 7.2 or 7.3 trip units.
- The scale factor is 1000 and the range is -1000...+1000 for Masterpact NT/NW and Compact NS Micrologic 5.0, 6.0 or 7.0 trip units.

Total Harmonic Distortion (THD)

Register	Address	R/W	X	Unit	Type	Range	A/E	A/P/H	Description
12104	12103	R	10	%	UINT	0...32766	E	H	Total harmonic distortion of V12 compared to the fundamental
12105	12104	R	10	%	UINT	0...32766	E	H	Total harmonic distortion of V23 compared to the fundamental
12106	12105	R	10	%	UINT	0...32766	E	H	Total harmonic distortion of V21 compared to the fundamental
12107	12106	R	10	%	UINT	0...32766	E	H	Total harmonic distortion of V1N compared to the fundamental
12108	12109	R	10	%	UINT	0...32766	E	H	Total harmonic distortion of V2N compared to the fundamental
12109	12108	R	10	%	UINT	0...32766	E	H	Total harmonic distortion of V3N compared to the fundamental
12110	12109	R	10	%	UINT	0...32766	E	H	Total harmonic distortion of I1 compared to the fundamental
12111	12110	R	10	%	UINT	0...32766	E	H	Total harmonic distortion of I2 compared to the fundamental
12112	12111	R	10	%	UINT	0...32766	E	H	Total harmonic distortion of I3 compared to the fundamental

(1) Value cannot be accessed for motor applications and in cases of 3-pole circuit breakers without external neutral voltage transformer (ENVT).

Miscellaneous

Register	Address	RW	X	Unit	Type	Range	A/E	Description
12160	12159	R	1	–	UINT	0...32766	A/E	Trip counter
12161	12160	R	1	–	UINT	0...32766	A/E	Counter of alarms with priority level = 3 (high)
12162	12161	R	1	–	UINT	0...32766	A/E	Counter of alarms with priority level = 2 (medium)
12163	12162	R	1	–	UINT	0...32766	A/E	Counter of alarms with priority level = 1 (low)

Readout Examples

Readout Example of a Modbus Register

The table below shows how to read the rms current on phase 1 (I1) in register 12016.
- The address of register 12016 equals 12016 - 1 = 12015 = 0x2EEF.
- The Modbus address of the Modbus slave is 47 = 0x2F.

Request from the Master		**Response from the Slave**	
Field name	**Example**	**Field name**	**Example**
Modbus slave address	0x2F	Modbus slave address	0x2F
Function code	0x03	Function code	0x03
Address of word to be read (MSB)	0x2E	Data length in bytes	0x02
Address of word to be read (LSB)	0xEF	Register value (MSB)	0x02
Number of registers (MSB)	0x00	Register value (LSB)	0x2B
Number of registers (LSB)	0x01	MSB CRC	0xXX
MSB CRC	0xXX	LSB CRC	0xXX
LSB CRC	0xXX	–	–

The content of register 12016 (address 12015) is 0x022B = 555.

The rms current on phase 1 (I1) is thus 555 A.

Readout Example of the Table of Common Registers

The table below shows how to read the table of common registers. This table starts at register 12000 and consists of 113 registers.
- The address of register 12000 equals 12000-1 = 11999 = 0x2EDF.
- The table length is 113 registers = 0x71.
- The number of bytes is 113x2 = 226 bytes = 0xE2.
- The Modbus address of the slave is 47 = 0x2F.

Request from the Master		**Response from the Slave**	
Field name	**Example**	**Field name**	**Example**
Modbus slave address	0x2F	Modbus slave address	0x2F
Function code	0x03	Function code	0x03
Address of word to be read (MSB)	0x2E	Data length in bytes	0xE2
Address of word to be read (LSB)	0xDF	Value of register 12000 (MSB)	0xXX
Number of registers (MSB)	0x00	Value of register 12000 (LSB)	0xXX
Number of registers (LSB)	0x71	Value of register 12001 (MSB)	0xXX
MSB CRC	0xXX	Value of register 12001 (LSB)	0xXX
LSB CRC	0xXX	–	0xXX
		–	0xXX
		Value of register 12112 (MSB)	0xXX
		Value of register 12112 (LSB)	0xXX
		MSB CRC	0xXX
		LSB CRC	0xXX

Communication Test

Introduction

We recommend you use the RCU (Remote Control Utility) to test communication on the various circuit breakers. You can download the RCU software from our website at www.schneider-electric.com.

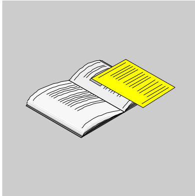
Presentation of the RCU Software

The RCU (Remote Control Utility) is simple SCADA software designed for:
- Compact NSX circuit breakers
- Masterpact circuit breakers
- Power Meters

The RCU software allows users to monitor and control their equipment and helps installers to check and validate newly installed equipment.

Depending on which device the RCU software is connected to, it allows the user to:
- Display the I, U, E, THD measurements
- Display the date and time
- Display the device identification and maintenance data
- Control the device (for circuit breakers only)
- Save the P, FP, E measurements every 5 minutes

Appendices



Cross references to Modbus Registers

A

Cross References to Modbus Registers

General Description

The following table gives cross references to the Modbus registers used by the communication modules. The registers are listed in ascending order.

Cross References Table

Register	Address	Module	Variable	Page
551	550	BSCM	Square D identification	*101*
552...557	551...556	BSCM	Serial number	*101*
563	562	BSCM	Circuit breaker status	*102*
564	563	BSCM	Communicating motor mechanism status	*102*
571...582	570...581	BSCM	BSCM counters	*103*
602...652	601...651	BSCM	BSCM event counter and BSCM events	*104*
1000...1015	999...1014	Micrologic trip unit	Voltage and voltage unbalance (real-time measurements)	*43*
1016...1032	1015...1031	Micrologic trip unit	Current and current unbalance (real-time measurements)	*44*
1034...1045	1033...1044	Micrologic trip unit	Power (active power, reactive power with harmonic, apparent power) (real-time measurements)	*44*
1046...1053	1045...1052	Micrologic trip unit	Power factor and fundamental power factor (real-time measurements)	*45*
1054	1053	Micrologic trip unit	Frequency (real-time measurement)	*45*
1080...1091	1079...1090	Micrologic trip unit	Fundamental reactive power and distortion power (real-time measurements)	*45*
1092...1100	1091...1099	Micrologic trip unit	Total harmonic distortion (real-time measurement)	*46*
1144	1143	Micrologic trip unit	Thermal image of motor (real-time measurement)	*46*
1145	1144	Micrologic trip unit	Vmax: maximum of V12, V23, and V3 (real-time measurement)	*43*
1146	1145	Micrologic trip unit	Vmin: minimum of V12, V23, and V31 (real-time measurement)	*43*
1300...1315	1299...1314	Micrologic trip unit	Voltage (minimum of real-time measurement)	*47*
1316...1332	1315...1331	Micrologic trip unit	Current (minimum of real-time measurement)	*47*
1334...1345	1333...1344	Micrologic trip unit	Power (active power, reactive power with harmonic, apparent power) (minimum of real-time measurement)	*47*
1346...1353	1345...1352	Micrologic trip unit	Power factor (minimum of real-time measurement)	*47*
1354	1353	Micrologic trip unit	Frequency (minimum of real-time measurement)	*47*
1380...1391	1379...1390	Micrologic trip unit	Fundamental reactive power and distortion power (minimum of real-time measurements)	*47*
1392...1411	1391...1410	Micrologic trip unit	Total harmonic distortion (minimum of real-time measurement)	*47*
1444	1443	Micrologic trip unit	Thermal image of motor (minimum of real-time measurement)	*47*
1600...1615	1599...1614	Micrologic trip unit	Voltage (maximum of real-time measurement)	*47*
1616...1632	1615...1631	Micrologic trip unit	Current (maximum of real-time measurement)	*47*

Register	Address	Module	Variable	Page
1634...1645	1633...1644	Micrologic trip unit	Power (active power, reactive power with harmonic, apparent power) (maximum of real-time measurement)	*47*
1646...1653	1645...1652	Micrologic trip unit	Power factor (maximum of real-time measurement)	*47*
1654	1653	Micrologic trip unit	Frequency (maximum of real-time measurement)	*47*
1680...1691	1679...1690	Micrologic trip unit	Fundamental reactive power and distortion power (maximum of real-time measurements)	*47*
1692...1711	1691...1710	Micrologic trip unit	Total harmonic distortion (maximum of real-time measurement)	*47*
1744	1743	Micrologic trip unit	Thermal image of motor (maximum of real-time measurement)	*47*
2000...2031	1999...2030	Micrologic trip unit	Energy	*48*
2200...2237	2199...2236	Micrologic trip unit	Demand	*49*
2242...2243	2241...2242	Micrologic trip unit	Quadrant total	*72*
2900...2929	2899...2928	Micrologic trip unit	Minimum/maximum measurements reset time	*50*
3000...3002	2999...3001	Micrologic trip unit	Current date	*84*
3314	3313	Micrologic trip unit	System type	*72*
3316	3315	Micrologic trip unit	Power flow sign	*72*
3318	3317	Micrologic trip unit	Power factor sign	*72*
3324	3323	Micrologic trip unit	Energy accumulation mode	*73*
3352...3355	3351...3354	Micrologic trip unit	Demand time	*73*
5704	5703	Micrologic trip unit	Alarm status register	*53*
5732...5781	5731...5780	Micrologic trip unit	Alarm history	*55*
6650...6679	6649...6678	Micrologic trip unit	Pre-alarms	*61*
6770...6889	6769...6888	Micrologic trip unit	User-defined alarms	*63*
8000...8149	7999...8148	Micrologic trip unit	Command interface	*29*
8700...8705	8699...8704	Micrologic trip unit	Serial number	*51*
8709	8708	Micrologic trip unit	Hardware version	*51*
8716	8715	Micrologic trip unit	Square D identification	*51*
8740	8739	Micrologic trip unit	Protection type	*51*
8741	8740	Micrologic trip unit	Metering type (A, E)	*51*
8747	8746	Micrologic trip unit	Application (distribution, motor)	*51*
8748	8747	Micrologic trip unit	Standard (IEC, UL)	*52*
8750	8749	Micrologic trip unit	Nominal current	*52*
8751	8750	Micrologic trip unit	Pole	*52*
8752	8751	Micrologic trip unit	16 Hz 2/3	*52*
8754...8763	8753...8762	Micrologic trip unit	Long time protection	*67*
8764...8773	8763...8772	Micrologic trip unit	Short time protection	*67*
8774...8783	8773...8782	Micrologic trip unit	Instantaneous protection	*68*
8784...8793	8783...8792	Micrologic trip unit	Ground fault protection	*68*
8794...8803	8793...8802	Micrologic trip unit	Earth leakage (Vigi) protection	*69*
8851	8850	Micrologic trip unit	Temperature	*84*
8857	8856	Micrologic trip unit	SDx module status	*53*
8865	8864	Micrologic trip unit	Time remaining until long time tripping	*84*
8872	8871	Micrologic trip unit	Phase rotation	*84*
8900...8903	8899...8902	Micrologic trip unit	Jam protection	*69*
8904...8907	8903...8906	Micrologic trip unit	Unbalance protection	*69*
8908...8911	8907...8910	Micrologic trip unit	Underload protection	*69*
8912...8915	8911...8914	Micrologic trip unit	Longstart protection	*70*
8916...8919	8915...8918	Micrologic trip unit	Neutral protection	*70*
8930	8929	Micrologic trip unit	Thermal memory inhibit parameter	*70*
9100...9218	9099...9217	Micrologic trip unit	Trip history	*57*

Register	Address	Module	Variable	Page
9616	9615	Micrologic trip unit	Nominal voltage Vn	*73*
9801...9810	9800...9809	Micrologic trip unit	Configuration of the SDx module outputs	*71*
10000	9999	Micrologic trip unit	Trip status register	*54*
11776...11782	11775...11781	Modbus communication interface	Firmware version	*113*
11784...11789	11783...11788	Modbus communication interface	Serial number	*113*
11801...11823	11800...11822	Modbus communication interface	IMU name	*114*
11846...11868	11845...11867	Modbus communication interface	IMU location	*114*
11891	11890	Modbus communication interface	Modbus locking pad position	*114*
11901	11900	Modbus communication interface	Square D identification	*113*
11903...11906	11902...11905	Modbus communication interface	Hardware version	*113*
12000...12163	11999...12162	Modbus communication interface	Communication profile	
12399	12398	Modbus communication interface	Auto-Speed sensing state	*114*
12400	12399	Modbus communication interface	Modbus address	*114*
12401	12400	Modbus communication interface	Modbus parity	*114*
12402	12401	Modbus communication interface	Modbus baudrate	*114*
12403	12402	Modbus communication interface	Number of stop bits	*114*
29390	29389	Micrologic trip unit	Failure status	*84*
29500...29549	29499...29548	Micrologic trip unit	Maintenance operation history	*59*
29600...29699	29599...29698	Micrologic trip unit	Previous protection settings	*74*
29780...29819	29779...29818	Micrologic trip unit	Time-stamped minimum/maximum measurements	*77*
29820...29827	29819...29826	Micrologic trip unit	Time-stamped minimum/maximum network frequency	*79*
29851...29852	29850...29851	Micrologic trip unit	Time of use counter	*81*
29853	29852	Micrologic trip unit	Rate of wear counter	*81*
298534	29853	Micrologic trip unit	Boot counter	*81*
29855...29856	29854...29855	Micrologic trip unit	EEPROM writing counter	*81*
29880...29887	29879...29886	Micrologic trip unit	Load profile counters	*81*
29890...29901	29889...29900	Micrologic trip unit	Temperature profile counters	*82*
29910...29918	29909...29907	Micrologic trip unit	Protection trips counters	*82*
29940...29952	29939...29951	Micrologic trip unit	Alarms counters	*83*
29980...29986	29979...29985	Micrologic trip unit	Maintenance operations counters	*83*
29990...29991	29989...29990	Micrologic trip unit	Rotary switches positions	*85*
29992	29991	Micrologic trip unit	Locking pad status	*85*
29993	29992	Micrologic trip unit	Auxiliary 24 V power supply	*85*
29994...29998	29993...29997	Micrologic trip unit	Firmware version	*52*
30000...30003	29999...30002	Micrologic trip unit	Part number	*52*
30005	30004	Micrologic trip unit	Micrologic trip unit LED	*85*

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Modbus Compact NSX - User manual

Compact NSX

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