Easy Series

EasyPact MVS
Modbus Communication Guide

User Guide

Easy Series offers essential and accessible value devices.

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Legal Information

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Safety Information

Important Information

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

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

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

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

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

Please Note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

About the Book

Document Scope

The aim of this document is to provide users, installers, and maintenance personnel with the technical information needed to operate the Modbus protocol on the EasyPact MVS circuit breakers.

Validity Note

This document is valid for EasyPact MVS circuit breakers with a BCM ULP circuit breaker communication module embedded. It is connected to an RS 485 serial line Modbus network using an IFM Modbus-SL interface for one circuit breaker.

This document describes the registers and commands available for the IMU modules with the following firmware version:

IMU Module	Part Number	Firmware Version
ETV trip system	–	–
BCM ULP module	33106	≥ V4.1.9
IO module	LV434063	≥ V003.004.005
IFM interface	LV434000	≥ V003.001.012

Online Information

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

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

Related Documents

Title of Documentation	Reference Number
EasyPact MVS Circuit Breakers – User Guide	MVS21734
IO Input/Output Application Module for One Circuit Breaker – User Guide	DOCA0055EN
ULP (Universal Logic Plug) System – User Guide	DOCA0093EN
EasyPact MVS – Installation Manual	MVS21735
EasyPact MVS Circuit Breaker Accessories – Installation Manual	MVS21736
EasyPact MVS Chassis Accessories – Installation Manual	MVS21737
EasyPact MVS – Interlocking of EasyPact MVS Devices – Installation Manual	MVS21738
Input/Output Application Module for One Circuit Breaker – Instruction Sheet	HRB49217
IFM - Modbus-SL Interface for One Circuit Breaker – Instruction Sheet	NVE85393
EasyPact MVS – Catalog	LVED211021EN

You can download these technical publications and other technical information from our website at https://www.se.com/en/download.

Trademark Notice

Modbus Communication with EasyPact MVS Circuit Breakers

What's in This Part

Introduction

Easy Series Master Range

Easy Series delivers a range of energy management and industrial automation products that focus on core features to meet the needs of customers at a value price. The Easy Series products are intuitive to set up and use. The series includes essential product lines such as circuit breakers, UPS, metering, motion and drives, human-machine interface, PLC, and push buttons.

Modbus Communication

The Modbus communication option enables Schneider Electric low voltage circuit breakers 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 EasyPact MVS circuit breakers with the BCM ULP circuit breaker communication module embedded.

The circuit breakers can be connected to an RS-485 serial line network with Modbus protocol using an IFM Modbus-SL interface for one circuit breaker.

Access to Functions

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

- read metering and diagnostic data
- read status conditions
- transfer of time-stamped events
- display protection settings
- read the circuit breakers identification and configuration data
- time-setting and synchronization

This list depends on the composition of the intelligent modular unit (IMU) (type of circuit breaker and ETV trip system) and the enabled functions.

Intelligent Modular Unit

A modular unit is a mechanical and electrical assembly containing one or more products to perform a function in a switchboard.

The circuit breaker with its internal communicating components (ETV trip system) and external ULP modules (IO module) connected to one communication interface is called an intelligent modular unit.

IFM Interface

What's in This Chapter

Overview

The IFM Modbus-SL interface for one circuit breaker enables an intelligent modular unit with an EasyPact MVS circuit breaker, to be connected to a two-wire Modbus-SL RS-485 serial line Modbus network. Each circuit breaker has its own IFM interface and a corresponding Modbus address.

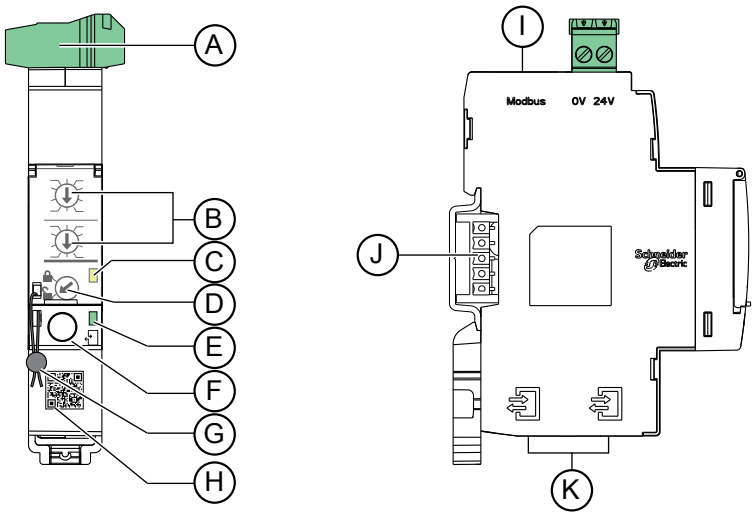
The part number of the IFM interface is LV434000.

Features

The main features of IFM interface are:

- Single Modbus serial line interface provided in
  - RJ45 connector interface
  - Stacking connection interface
- Rotary switches for address settings and padlock option
- Pushbutton for test functionality

Hardware Description



A	24 Vdc power supply terminal block
B	Modbus address rotary switches
C	Modbus traffic status LED
D	Modbus locking pad
E	ULP status LED
F	Test button
G	Mechanical lock
H	QR code to product information
I	RJ45 Modbus-SL port
J	Stacking accessory connection (TRV00217, optional)
K	2 RJ45 ULP ports

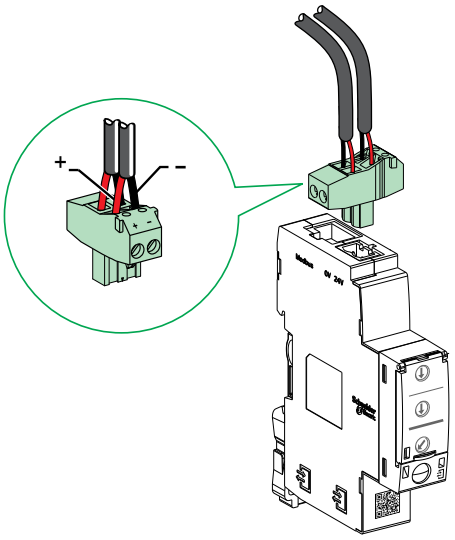
For information on installation, refer to NVE85393 IFM - Modbus-SL Interface for One Circuit Breaker – Instruction Sheet.

Mounting

The IFM interface is a DIN rail mounting device. The stacking accessory enables the interconnection of several IFM interfaces without additional wiring.

24 Vdc Power Supply

The IFM interface must always be supplied with 24 Vdc.



It is recommended to use an UL listed/UL recognized limited voltage/limited current or a class 2 power supply with a 24 Vdc, 3 A maximum.

NOTE: For 24 Vdc power supply connection, use copper conductors only.

Modbus Address Rotary Switches

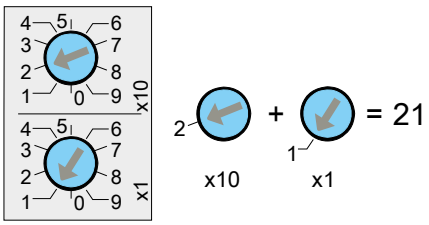
The IFM interface bears the Modbus address of the IMU to which it is connected. For more information regarding the IMU, refer to DOCA0093EN ULP (Universal Logic Plug) System – User Guide.

Define the Modbus address using the two address rotary switches on the front panel of the IFM interface.

The address range is 1 to 99. Do not to use the address 0, because it is reserved for broadcasting commands.

The IFM interface is initially configured with address 99.

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



Modbus Traffic Status LED

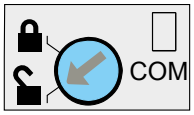
The Modbus traffic status LED provides information about the traffic transmitted or received by the IMU over the Modbus network.

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

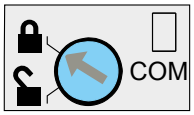
Modbus Locking Pad

The Modbus locking pad on the front panel of the IFM interface enables or disables remote control commands to be sent over the Modbus network to the IFM interface itself, and to the other modules of the IMU.

- If the arrow points to the open padlock (factory setting), 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 (refer to Set Absolute Time, page 131 and Get Current Time, page 131).

Test Button

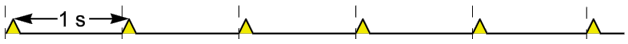
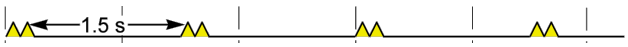
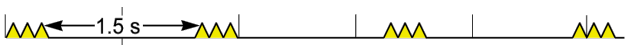
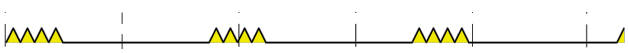
The test button tests the connection between all the ULP modules connected to the IFM interface.

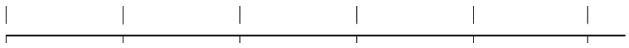
Pressing the test button launches the connection test for 15 seconds.

During the test, all the ULP modules keep working normally.

ULP Status LED

The yellow ULP status LED describes the mode of the ULP module.

ULP status LED	Mode	Action
	Nominal	None
	Conflict	Remove the extra ULP module
	Degraded	Replace the IFM interface at the next maintenance operation
	Test	None
	Non-critical firmware discrepancy	Contact Schneider Electric field service representative to check the firmware and hardware compatibility
	Non-critical hardware discrepancy	
	Configuration discrepancy	Install the missing features

ULP status LED	Mode	Action
	Critical firmware discrepancy	Contact Schneider Electric field service representative to check the firmware and hardware compatibility
	Critical hardware discrepancy	
	Stop	Replace the IFM interface
	Power off	Check the power supply

Schematics with EasyPact MVS Circuit Breakers

General Description

Depending on the type of circuit breaker used, the IFM interface must be connected to the circuit breaker by using one of the following configurations:

- Connect the IFM interface to a fixed electrically-operated EasyPact MVS circuit breaker with a BCM ULP module.
- Connect the IFM interface to a drawout EasyPact MVS circuit breaker with a BCM ULP module and its respective IO module.

For more information, refer to DOCA0093EN ULP (Universal Logic Plug) System – User Guide.

ULP Connection

NOTICE

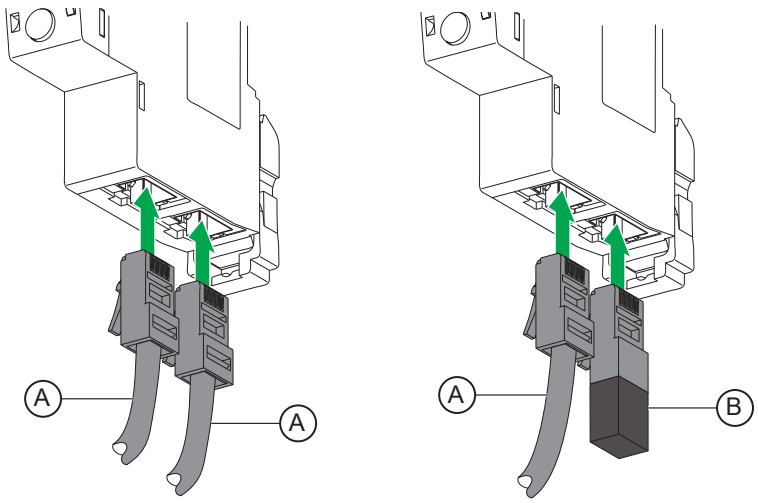
HAZARD OF EQUIPMENT DAMAGE

- Never connect a Modbus-SL device to an RJ45 ULP port.
- The RJ45 ULP ports of IFM interface are for BCM ULP modules only.
- Any other use can damage the IFM interface or the device connected to the IFM interface.
- To check if a BCM ULP module is compatible with the RJ45 ULP ports of IFM interface, refer to DOCA0093EN ULP (Universal Logic Plug) System – User Guide.

Failure to follow these instructions can result in equipment damage.

All the connection configurations require the circuit breaker BCM ULP cord.

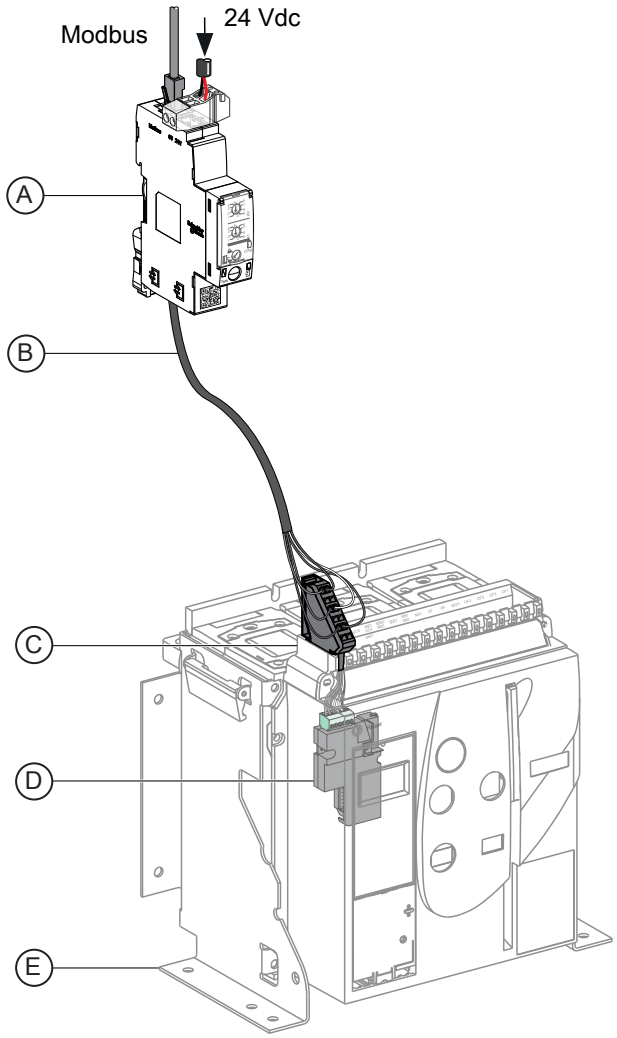
When the second RJ45 ULP port is not used, it must be closed with a BCM ULP line termination:



A Circuit breaker BCM ULP cord or RJ45 male/male ULP cord

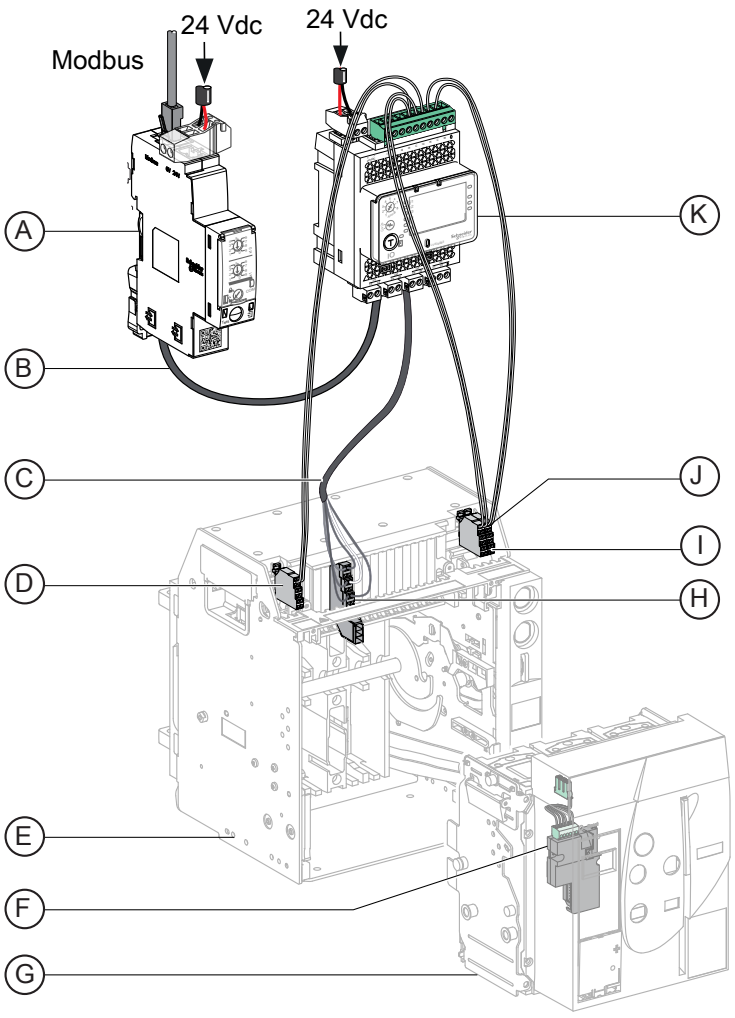
B ULP line termination

Connection of the IFM Interface to a Fixed Electrically-Operated EasyPact MVS Circuit Breaker



A	IFM module
B	BCM ULP cord
C	COM terminal block (E1 to E6)
D	BCM ULP module
E	Fixed electrically-operated circuit breaker

Connection of the IFM Interface to a Drawout EasyPact MVS Circuit Breaker



A	IFM module
B	BCM ULP cable
C	BCM ULP cord
D	Circuit breaker disconnected position contact (CD)
E	Circuit breaker cradle
F	BCM ULP module
G	Drawout circuit breaker
H	COM terminal block (E1 to E6)
I	Circuit breaker connected position contact (CE)
J	Circuit breaker test position contact (CT)
K	IO application module

Configuration

General Description

The IFM interface integrates automatic configuration (Auto-Speed sensing ON, factory setting). When connected to the Modbus network, the IFM interface automatically detects the network parameters.

Automatic Configuration

The Modbus slave address is defined by the two address rotary switches on the front panel of the IFM interface. When connected to the Modbus serial line network, the IFM interface automatically detects the network speed and parity. The Auto-Speed sensing algorithm tests the available Baud rates and parities, and automatically detects the Modbus communication network parameters. The Modbus master must send at least 25 frames on the Modbus network to allow the Auto-Speed sensing algorithm to work.

The transmission format is binary with one start bit, eight data bits, one stop bit in case of even or odd parity, and two stop bits in case of no parity.

If the Auto-Speed sensing algorithm does not detect the network parameters, it is recommended to follow this procedure:

Step	Action
1	Set up the IFM interface to Modbus address 1 (refer to Modbus Address Rotary Switches, page 11).
2	Send a read multiple register request (function code 0x03) to slave 1, at any address and for any number of registers.
3	Send this request at least 25 times.

NOTE: If the network speed or parity is changed after the IFM interface has automatically detected these settings, the IFM interface must be restarted (power off and on) to detect the new network parameters.

Modbus Protocol with EasyPact MVS Circuit Breakers

What's in This Part

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 is 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 one 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.

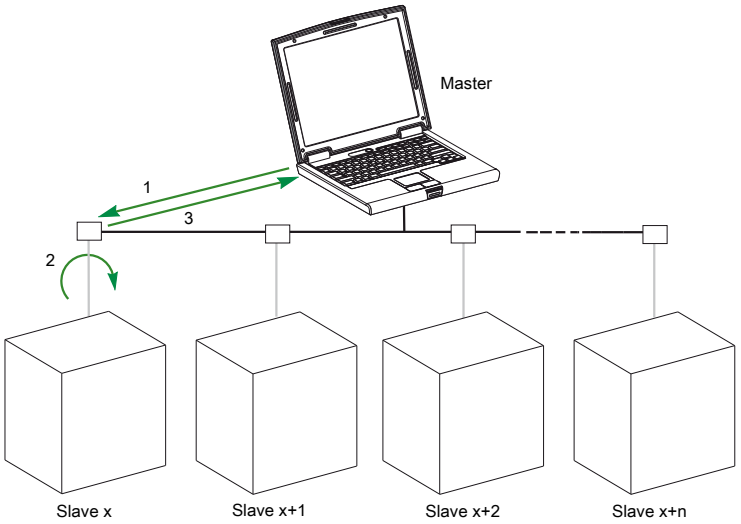
Master-Slave Communication Modes

The Modbus protocol can exchange information using two communication modes:

- unicast mode
- broadcast mode

Unicast Mode

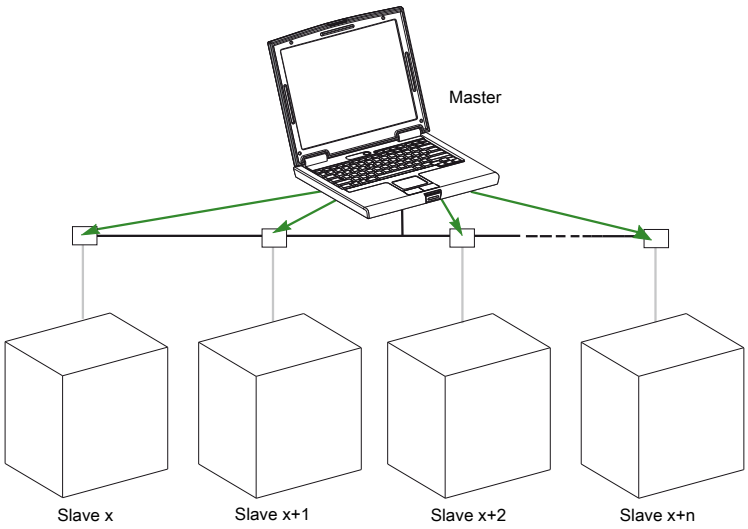
In unicast mode, the master addresses a slave using the specific address of the slave. The slave processes the request and replies to the master.



1	Request
2	Process
3	Reply

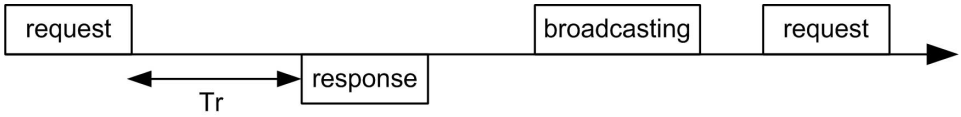
Broadcast Mode

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 required 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 is around 700 ms, so it is recommended to implement a 1 second time out after sending a Modbus request.

Data Exchange

The Modbus protocol uses two types of data:

- Single bit
- Register (16 bits)

EasyPact MVS circuit breakers support registers only.

Each register has a register number and 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. The tables detailed in the following parts of this document provide both register numbers (in decimal format) and corresponding addresses (in hexadecimal format). For example, the address of register number 12000 is 0x2EDF (11999).

Frames

All the frames exchanged with the Modbus protocol have a maximum size of 110 bytes and are composed of four 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 codes	1 byte or 2 bytes	Refer to function codes description (refer to Modbus Functions, page 23)
3	Data	n registers	Request or reply data
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 circuit breaker are described here.

Read Functions

The following read functions are available:

Function Code	Subfunction Code	Name	Description
3 (0x03)	–	Read holding registers	Read n output or internal registers
4 (0x04)	–	Read input registers	Read n input registers
43 (0x2B)	14 (0x0E)	Read device identification	Read the identification data of the slave
43 (0x2B)	15 (0x0F)	Get date and time	Read the date and time of the slave

NOTE: Number of registers n is limited to 52 with ETV trip system.

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 register to read (MSB)	0x03	Data length in bytes	0x02
Address of the register 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 0x03F7) is 0x022B = 555. Therefore, the rms current on phase 1 (I1) is 555 A.

Get Date and Time Example

The following table shows how to get the date and time 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	0x2B	Function code	0x2B
Subfunction code	0x0F	Subfunction code	0x0F
Reserved	0x00	Reserved	0x00
–	–	Date and time	Refer to Data Type: DATETIME, page 43.

Set Date and Time Example

The following table shows how to set date and time of a Modbus slave. The Modbus address of the Modbus slave is 47 = 0x2F, the new date is October 2, 2014, and the new time is 2:32:03:500 p.m.

NOTE: Use the broadcast mode (with Modbus slave address = 0) to set the date and time of all Modbus slaves.

Master Request		Slave Reply	
Field Name	**Example**	**Field Name**	**Example**
Modbus slave address	0x2F	Modbus slave address	0x2F
Function code	0x2B	Function code	0x2B
Subfunction code	0x10	Subfunction code	0x10
Reserved1	0x00	Reserved1	0x00
Not used	0x00	Not used	0x00
Year = 2014	0x0E	Year = 2014	0x0E
Month = October	0x0A	Month = October	0x0A
Day Of Month = 2	0x02	Day Of Month = 2	0x02
Hour = 14	0x0E	Hour = 14	0x0E
Minutes = 32	0x20	Minutes = 32	0x20
3 sec. 500 ms	0x0DAC	3 sec. 502 ms	0x0DAE

The normal response is an echo of the request that is returned after the date-time has been updated in the remote device. If the date-time structure content is not consistent with a true date-time (that is, an invalid date-time), the value returned in the Date-Time field is set to 0 by the device.

In case of 24 Vdc power loss, the date and time of the Modbus slaves without battery is not refreshed. Therefore, it is mandatory to set date and time for all Modbus slaves after recovering the 24 Vdc power supply.

Furthermore, due to the clock drift of each Modbus slave, it is mandatory to set date and time for all Modbus slaves periodically. The recommended period is 15 minutes.

Scattered Holding Register Read Function

The scattered holding register read function is available:

Function Code	Subfunction Code	Name	Description
100 (0x64)	4 (0x04)	Read scattered holding register	Read n non-contiguous registers

The maximum value for n is 21.

The scattered holding register read function enables the user to avoid:

- reading a large block of contiguous registers, when only few registers are required
- multiple use of functions 3 and 4 to read non-contiguous registers

Read Scattered Holding Register Example

The following table shows how to read the addresses of the register 664 (address 0x0297) and register 666 (address 0x0299) 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
Subfunction code	0x04	Subfunction code	0x04
Transmission number(1)	0xXX	Transmission number(1)	0xXX
Address of first register to read (MSB)	0x02	Value of the first register read (MSB)	0x12
Address of first register to read (LSB)	0x97	Value of the first register read (LSB)	0x0A
Address of second register to read (MSB)	0x02	Value of the second register read (MSB)	0x74
Address of second register to read (LSB)	0x99	Value of the second register 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	Subfunction Code	Name	Description
6 (0x06)	–	Preset single register	Write 1 register
16 (0x10)	–	Preset multiple registers	Write n registers
43 (0x2B)	16 (0x10)	Set date and time	Write the date and time of the slave

NOTE: Number of registers n is limited to 52 with ETV trip system.

Diagnostic Functions

The following diagnostic functions are available:

Function Code	Subfunction Code	Name	Description
8 (0x08)	–	Diagnostic	Manage diagnostic counters
8 (0x08)	10 (0x0A)	Clear counters and diagnostic register	Reset all diagnostic counters
8 (0x08)	11 (0x0B)	Return bus message counter	Read the counter of correct bus messages managed by the slave
8 (0x08)	12 (0x0C)	Return bus communication error counter	Read the counter of incorrect bus messages managed by the slave
8 (0x08)	13 (0x0D)	Return bus exception error counter	Read the counter of exception responses managed by the slave
8 (0x08)	14 (0x0E)	Return slave message counter	Read the counter of messages sent to the slave
8 (0x08)	15 (0x0F)	Return slave no response counter	Read the counter of broadcast messages
8 (0x08)	16 (0x10)	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 (0x08)	17 (0x11)	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 (0x08)	18 (0x12)	Return bus overrun counter	Read the counter of incorrect bus messages due to overrun errors
11 (0x0B)	–	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 diagnostic counters are reset to 0 when:

- the maximum value 65535 is reached,
- they are reset by a Modbus command (function code 8 and subfunction code 10),
- the power supply is lost,
- the 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 cannot handle it (for example, the request is to read a register that does not exist), the slave 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 four fields:

Field	Definition	Size	Description
1	Slave number	1 byte	Destination of the request • 1–247: unique destination
2	Exception function code	1 byte	Request function code + 128 (0x80)
3	Exception code	n bytes	Refer to Exception Codes, page 27
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 circuit breaker:

Exception Code	Name	Description
01 (0x01)	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 (0x02)	Illegal data address	The data address received by the slave is not an authorized address for the slave.
03 (0x03)	Illegal data value	The value in the request data field is not an authorized value for the slave.
04 (0x04)	Slave device failure	The slave fails to perform a requested action because of an unrecoverable error.
05 (0x05)	Acknowledge	The slave accepts the request but needs a long time to process it.

Exception Code	Name	Description
06 (0x06)	Slave device busy	The slave is busy processing another command. The master must send the request once the slave is available.
07 (0x07)	Negative acknowledgment	The slave cannot perform the programming request sent by the master.
08 (0x08)	Memory parity error	The slave detects a parity error in the memory when attempting to read extended memory.
10 (0x0A)	Gateway path unavailable	The gateway is overloaded or not correctly configured.
11 (0x0B)	Gateway target device failed to respond	The slave is not present on the network.

Illegal Data Address

This guide describes the registers available for each IMU module with the latest firmware revision. When a register described in the guide is not implemented in an IMU module that has an old firmware revision, an exception response is returned with the exception code 02 (0x02), illegal data address.

Contact Schneider Electric field service representative to update the firmware of the IMU modules.

Write Protection

General Description

⚠WARNING

HAZARD OF NUISANCE TRIPPING OR FAILURE TO TRIP

Protection setting adjustments must be done by qualified electrical personnel.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

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 protected (refer to Modbus Locking Pad, page 12) and software protected.

Software Protection

To prevent an inadvertent change to the ETV trip system configuration, remote modifications of the Modbus registers are protected by both of the following settings:

- a robust data structure and a set of dedicated Modbus registers
- a user profile password scheme

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

Password Management

Remote access to data on ETV trip systems and the ULP modules by using the communication network is protected by password.

Four user profiles are defined for remote access. Each IMU has a different password for each user profile. The password for each user profile is as follows:

User Profile	Password
Administrator	‘0000’=0x30303030
Services	‘1111’=0x31313131
Engineer	‘2222’=0x32323232
Operator	‘3333’=0x33333333

Each intrusive command via the command interface is assigned to one or several user profiles, and protected by the corresponding user profile password. The password for each intrusive command is indicated in the description of the command.

No password is required for non-intrusive commands through the command interface.

Command Interface

General Description

The command interface is used to send commands by Modbus.

Each command has a specific code. For example, command code 46728 (refer to Reset Minimum/Maximum, page 78) defines the command to reset minimum/maximum values of measurements.

The commands are protected by password when the command is intrusive. See each command documentation.

All commands can be blocked by configuration with the IFM interface. The command interface is disabled when the locking pad on the IFM interface is in the closed position. The command interface is enabled when the locking pad on the IFM interface is in the open position.

Executing a Command

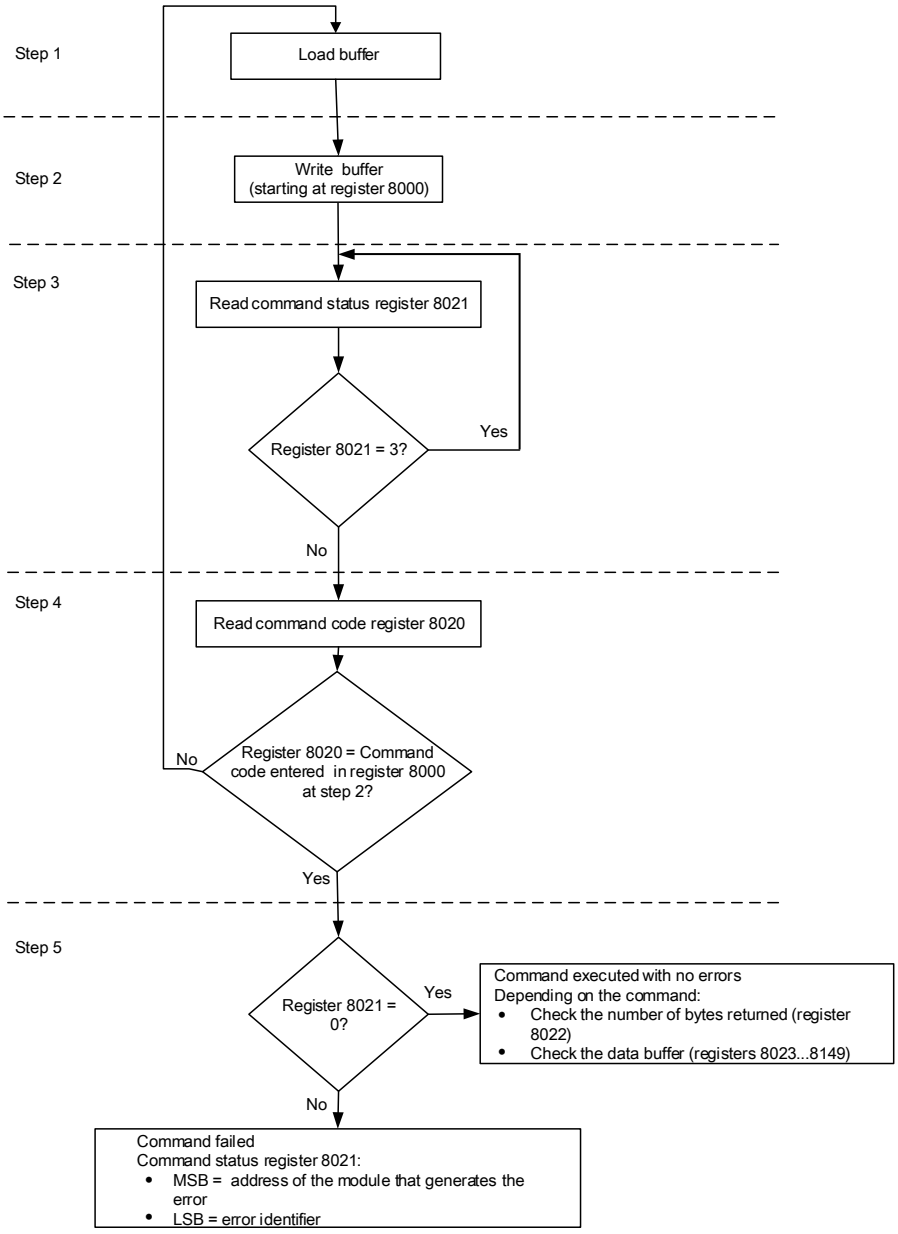
Follow these steps to execute a command:

Step	Action
1	Load a buffer.
2	Write this buffer with a write request (Modbus function 16) starting at register 8000.
3	Read the command status register 8021, and wait while its content shows that the command is still in progress (0x0003).
4	Read the command code register 8020: • If content of register 8020 is the command code entered in register 8000 at step 2, go to next step. • If content of register 8020 is different from the command code entered in register 8000 at step 2, restart from step 1.
5	Read the error code in the LSB of register 8021: • If LSB ≠ 0, then the command failed. Check the error code to understand the cause (see next paragraph). For example, if register 8021 returns 4609 (0x1201), then the error code is 1, which means that the password is not correct (insufficient user rights). • If LSB = 0, then the command is executed with no errors.

NOTE: The Modbus application will wait for the complete execution of one command before sending its next command. In case of no response, the Modbus application can resend the command. In this case, the first command will be aborted automatically.

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 8000 to 8149.

The three 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

Address	Register	Description	Comments
0x1F3F	8000	Command code	Writing at this register triggers the command using the parameters in the following registers.
0x1F40	8001	Parameter length	Number of bytes used for the parameters including this one (from 10 to 30). This value is provided for each command.
0x1F41	8002	Destination	A constant value provided for each command. Factory setting: 0x0000
0x1F42	8003	Security type	A constant value provided for each command: • 0 for non-intrusive commands not protected by password • 1 for intrusive commands protected by a password
0x1F43 0x1F44	8004 8005	Password	The password is composed of 4 ASCII bytes. The password to use depends on the command. This information is provided for each command.
0x1F45–0x1F4E	8006–8015	Additional parameters	Additional parameters define how the command is performed. Some commands have no additional parameters.
0x1F4F	8016	Reserved	Must be set to 0 (factory setting).
0x1F50	8017	Reserved	Must be set to 8019 (factory setting).
0x1F51	8018	Reserved	Must be set to 8020 (factory setting).
0x1F52	8019	Reserved	Must be set to 8021 (factory setting).
0x1F53	8020	Last command code	When the command has been executed, it holds the last command code.
0x1F54	8021	Command status	When the command exits the busy state, it holds the completion code.
0x1F55	8022	Data buffer size	Number of bytes returned.
0x1F56–0x1FD4	8023–8149	Data buffer	Returned values. It is empty if the previous register is 0.

Command Status

When the command is successful, the command status is 0.

When the command is in progress, the command status is 3.

When the command generates an error, the command status register contains:

- LSB: the error code
- MSB: the address of the module that generates the error

Module Returning the Command Result

The following table lists the addresses of the modules:

Module Address	Module
3 (0x03)	IFM Modbus-SL interface for one circuit breaker
18 (0x12)	BCM ULP circuit breaker communication module and ETV trip system
32 (0x20)	IO input/output application module 1 for one circuit breaker
33 (0x21)	IO input/output application module 2 for one circuit breaker

NOTE: The ETV trip system can be accessed using the same address as the BCM ULP module.

Result of the Command

The following table lists the codes corresponding to the result of the command.

Code	Description
0 (0x00)	Successful command
1 (0x01)	Insufficient user rights (incorrect password)
2 (0x02)	Access violation (IFM locking pad is locked (refer to Modbus Locking Pad, page 12) or intrusive command mode is locked).
3 (0x03)	Unable to perform a read access
4 (0x04)	Unable to perform a write access
5 (0x05)	Unable to execute service (IFM locking pad locked)
6 (0x06)	Not enough memory
7 (0x07)	Allocated memory is too small
8 (0x08)	Resource is not available
9 (0x09)	Resource does not exist
10 (0x0A)	Resource already exists
11 (0x0B)	Resource is out of order
12 (0x0C)	Access out of available memory
13 (0x0D)	String is too long
14 (0x0E)	Buffer is too small
15 (0x0F)	Buffer is too big
16 (0x10)	Input argument is out of range
17 (0x11)	Requested security level is not supported
18 (0x12)	Requested component is not supported
19 (0x13)	Command is not supported
20 (0x14)	Input argument has an unsupported value
21 (0x15)	Internal error during command
22 (0x16)	Time out during command
23 (0x17)	Checksum error during command
24 (0x18)	Unsupported destination
151 (0x97)	Circuit breaker tripped, reset before commands
152 (0x98)	Circuit breaker already closed

Code	Description
153 (0x99)	Circuit breaker already open
154 (0x9A)	Circuit breaker already reset
155 (0x9B)	Actuator in manual mode
156 (0x9C)	Actuator not present
157 (0x9D)	Bad ASIC configuration
158 (0x9E)	Previous command in progress
159 (0x9F)	Reset command forbidden
160 (0xA0)	Inhibit mode on
169 (0xA9)	Already in asked state
170 (0xAA)	Unable to preset counters
171 (0xAB)	Output command rejected, already assigned
172 (0xAC)	Emitter not allowed to perform the command
173 (0xAD)	Mode not relevant with requested command
174 (0xAE)	Session key is invalid
175 (0xAF)	Out of session scope
176 (0xB0)	Session is already opened
177 (0xB1)	No session is open
178 (0xB2)	No valid setting was submitted
180 (0xB4)	Wireless component not started
190 (0xBE)	Read and get an invalid value
191 (0xBF)	License is not installed

Command Not Supported

The guide describes the commands available for each IMU module with the latest firmware version. When a command described in the guide is not implemented in an IMU module that has an old firmware version, the command status is returned with the error code 19 (0x13), command is not supported.

Contact Schneider Electric field service representative to update the firmware of the IMU modules.

Command Examples

Reset Energy Measurements

The following table details the steps to send a command to reset the minimum/maximum energy measurements. The command itself has one parameter.

Step	Action
1	Load a buffer of 20 registers, word0 to word19. • Load into word0 the value 46728, the code corresponding to the reset minimum/maximum command. • Load into word1 the value 12, the length of the input parameters. The command itself has one parameter, add two bytes to 10, which is the length of the fixed part. • Load into word2 the value 4609 (0x1201), the destination. This value is a constant for the command. It is provided in the command description. • Load into word3 the value 1. • Load into word4 and word5 the 4 ASCII bytes of the Administrator or Operator password. Assuming this password is 'Pw57', load 20599 (0x5077) into word #4 and 13623 (0x3537) into word #5. • Load into word6 the value 512 (bit 9 set to one). This value requests that the energy measurement minimum/maximum be reset. • Load into word7 to word16 the value 0. • Load into word17 the value 8019, a command setup constant. • Load into word18 the value 8020, a command setup constant. • Load into word19 the value 8021, a command setup constant.
2	Write this buffer with a write request (Modbus function 16) of 20 registers, starting at register 8000.
3	Read the command status register 8021, and wait while its content shows that the command is still in progress (0x0003). If the command status does not change after a timeout (1 s), check the Modbus connection.
4	Read the command status register 8020: • If content of register 8020 is the command code entered in register 8000 at step 2, go to next step. • If content of register 8020 is different from the command code entered in register 8000 at step 2, restart from step 1.
5	Read the error code in the LSB of register 8021: • If LSB ≠ 0, then the command failed. Check the error code to understand the cause (see next paragraph). For example, if register 8021 returns 4609 (0x1201), then the error code is 1, which means that the password 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 of 20 registers, word0 to word19. • Load into word0 the value 768, the code corresponding to the read date/time command. • Load into word1 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 word2 the value 768 (0x0300), the destination. This value is a constant for the command. It is provided in the command description. • Load into word3 the value 0. • Load into word4 and word5 the value 0x0000 (no password required). • Load into word6 to word16 the value 0. • Load into word17 the value 8019, a command setup constant. • Load into word18 the value 8020, a command setup constant. • Load into word19 the value 8021, a command setup constant.
2	Write this buffer with a write request (Modbus function 16) of 20 registers, starting at register 8000.

Step	Action
3	Read the command status register 8021, and wait while its content shows that the command is still in progress (0x0003). If the command status does not change after a timeout (1 s), check the Modbus connection.
4	Read the command status register 8020: • If content of register 8020 is the command code entered in register 8000 at step 2, go to next step. • If content of register 8020 is different from the command code entered in register 8000 at step 2, restart from step 1.
5	Read the error code in the LSB of register 8021: • If LSB ≠ 0, then the command failed. Check the error code to understand the cause (see next paragraph). For example, if register 8021 returns 783 (0x030F), then the error code is 15 (0x0F), which means that the input argument is out of range (too many parameters). • If LSB = 0, then the command was executed with no errors.
6	If there were no errors, read the data buffer length in register 8022. Its value must be 8 for this command.
7	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 uses its date to time-stamp events and history registers.

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

1. External synchronization: The Modbus master synchronizes the IFM interface.
2. Internal synchronization: The IFM interface synchronizes all ULP modules connected in the IMU.

External Synchronization

The IFM interface is externally synchronized with the Modbus master using either of the two methods:

- the Modbus set date and time request, function code 43 (0x2B) and subfunction code 16 (0x10). The Modbus request is broadcasted to several communication interfaces or to one specific communication interface.
- the set absolute time command to the IFM interface using the command interface.

Internal Synchronization

When the IFM interface receives the date and time, it broadcasts the date and time to all the ULP modules connected in the IMU.

Modbus Registers Tables

General Description

The following chapters describe the Modbus registers of the ETV trip system 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:

- For each module, the registers are grouped in tables of logically related information, according to the module they relate to:
  - ETV trip system (refer to ETV Trip System Registers, page 58)
  - BCM ULP module (refer to BCM ULP Module Registers, page 83)
  - IO module (refer to IO Module Registers, page 94)
  - IFM interface (refer to IFM Interface Registers, page 126)
- For BCM ULP module, the files are described separately (refer to BCM ULP Module Files, page 90).
- For each module, the commands are described separately:
  - ETV trip system (refer to ETV Trip System Commands, page 77)
  - IO module (refer to IO Module Commands, page 118)
  - IFM interface (refer to IFM Interface Commands, page 130)

To find a register, use the ordered list of the registers with a cross reference to the page where these registers are described (refer to Appendix A: Cross References to Modbus Registers, page 135).

Table Format

Register tables have the following columns:

Address	Register	RW	X	Unit	Type	Range	Description

- **Address:** a 16-bit register address in hexadecimal. The address is the data used in the Modbus frame.
- **Register:** a 16-bit register number in decimal (register = address + 1).
- **RW:** register read-write status
  - **R:** the register can be read by using Modbus functions ☐ W: the register can be written by using Modbus functions
  - **RW:** the register can be read and written by using Modbus functions
  - **RC:** the register can be read by using the command interface
  - **WC:** the register can be written by using the command interface
- **X:** the scale factor. A scale of 10 means that the register contains the value multiplied by 10. So, the real value is the value in the register divided by 10. For example, register 1028 contains the I1 current unbalance (refer to Current Unbalance, page 60). The unit is % and the scale factor is 10. If the register returns 38, this means that I1 current unbalance is 38/10 = 3.8 %.

- **Unit:** the unit the information is expressed in.
- **Type:** the encoding data type (see data type description below).
- **Range:** the permitted values for this variable, usually a subset of what the format allows.
- **Description:** provides information about the register and restrictions that apply.

Data Types

Data Types	Description	Range
INT16U	16-bit unsigned integer	0 to 65535
INT16	16-bit signed integer	-32768 to +32767
INT32U	32-bit unsigned integer	0 to 4 294 967 295
INT32	32-bit signed integer	-2 147 483 648 to +2 147 483 647
INT64U	64-bit unsigned integer	0 to 18 446 744 073 709 600 000
INT64	64-bit signed integer	-9 223 372 036 854 775 808 to +9 223 372 036 854 775 807
FLOAT32	32-bit signed integer with a floating point	2^{-126} (1.0) to 2^{127} (2 - 2^{-23})
OCTET STRING	Text string	1 byte per character
MOD10000	Modulo operation (refer to Data Type: MOD10000, page 41)	–
DATE	Date and time (refer to Data Types: DATE and XDATE, page 41)	–
XDATE	Same as DATE with a fourth INT16U register for milliseconds information (refer to Data Types: DATE and XDATE, page 41)	–
DATETIME	Date and time in the IEC 60870-5 format (refer to Data Type: DATETIME, page 43)	–
ULP DATE	Date and time in ULP DATE format (refer to Data Type: ULP DATE, page 45)	–

Big-Endian Format

INT32, INT32U, INT64, and INT64U variables are stored in big-endian format: the most significant register is transmitted first, the least significant register is transmitted at last place.

Example

The total active energy is an INT64 variable coded in registers 32096 to 32099.

If

- register 32096 = 0
- register 32097 = 0
- register 32098 = 70 (0x0046)
- register 32099 = 2105 (0x0839)

then the total active energy is equal to 4 589 625 Wh = $0x2^{48}$ + $0x2^{32}$ + $70x2^{16}$ + $2105x2^{0}$

Data Type: FLOAT32

Data type FLOAT32 is represented in the single precision IEEE 754 (IEEE standard for floating-point arithmetic). A value N is calculated as indicated below:

$N = (-1)^S \times 2^{E-127} \times (1+M)$

Coefficient	Stands for	Description	Number of Bits
S	Sign	Defines the sign of the value: 0 = positive 1 = negative	1 bit
E	Exponent	Excess 127 binary integer added. When 0 < E < 255, the actual exponent is: e = E - 127.	8 bits
M	Mantissa	Magnitude, normalized binary significant	23 bits

Example:

0 = 0 **00000000** 00000000000000000000000

-1.5 = 1 **01111111** 10000000000000000000000

with:

- S = 1
- E = 01111111 = 127
- M = 10000000000000000000000 = $1x2^{-1} + 0x2^{-2} +...+ 0x2^{-23} = 0.5$
- N = $(-1) \times 2^0 \times (1+0.5) = -1.5$

Data Type: MOD10000

MOD10000 corresponds to n + 1 registers in the INT16 format. Each register contains an integer from - 9999 to 9999. A value V representing n + 1 registers in MOD10000 format is calculated as indicated below:

$V = sum(R[x] + R[x+1] \times 10000 +...+ R[x+n] \times 10000^n)$, where R[x] is the value of the register number x.

For example, to calculate the active energy Ep coded in 4 registers:

- register 2000 = 123 so R[x = 2000] = 123
- register 2001 = 4567
- register 2002 = 89
- register 2003 = 0

So $Ep = R[2000] + R[2001] \times 10000^1 + R[2002] \times 10000^2 + R[2003] \times 10000^3$

$= 123 + 4567 \times 10000 + 89 \times 10000^2 + 0$

= 8 945 670 123 kWh

Data Types: DATE and XDATE

This table presents DATE (registers 1 to 3) and XDATE (registers 1 to 4) data types:

Register	Type	Bit	Range	Description
1	INT16U	0–7	0x01–0x1F	Day
		8–14	0x01–0x0C	Month

Register	Type	Bit	Range	Description
		15	0–1	Quality of the date and time If the bit 15 is set, the date and time may be incorrect. There are two possibilities: • no synchronization with the supervisor • loss of power
2	INT16U	0–7	0x00–0x17	Hours
		8–15	0x50–0xC7	Year • 0x50 (80) to 0x63 (99) correspond to years 1980 to 1999 • 0x64 (100) to 0xC7 (199) correspond to years 2000 to 2099 For example, 0x70 (112) corresponds to year 2012.
3	INT16U	0–7	0x00–0x3B	Seconds
		8–15	0x00–0x3B	Minutes
4	INT16U	0–15	0x0000–0x03E7	Complement in milliseconds (available only for XDATE format)

For example, if the current date of BCM ULP coded in four registers is:

- register 679 = 0x0513
- register 680 = 0x700A
- register 681 = 0x222E
- register 682 = 0x0358

Then the current date and time of the BCM ULP is 19/05/2012 (May 19, 2012) at 10 hours, 34 minutes, 46 seconds, and 856 milliseconds.

Because:

- 0x0513
  - 0x05 = 5 (months)
  - 0x13 = 19 (days)
- 0x700A
  - 0x70 = 112 (years)
  - 0x0A = 10 (hours)
- 0x222E
  - 0x22 = 34 (minutes)
  - 0x2E = 46 (seconds)
- 0x0358 = 856 (milliseconds)

Data Type: DATETIME

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

Register	Type	Bit	Range	Description
1	INT16U	0–6	0x00–0x7F	Year: 0x00 (00) to 0x7F (127) correspond to years 2000 to 2127 For example, 0x0D (13) corresponds to year 2013.
		7–15	–	Reserved
2	INT16U	0–4	0x01–0x1F	Day
		5–7	–	Reserved
		8–11	0x00–0x0C	Month
		12–15	–	Reserved
3	INT16U	0–5	0x00–0x3B	Minutes
		6–7	–	Reserved
		8–12	0x00–0x17	Hours
		13–15	–	Reserved
4	INT16U	0–15	0x0000–0xEA5F	Milliseconds

Quality of DATETIME Time-Stamps

The quality of time-stamps coded with the DATETIME data type can be indicated in the register following the 4 registers of the time-stamp.

In this case, the time-stamp quality is coded as follows:

Bit	Description
0–11	Reserved
12	Externally synchronized: • 0 = Invalid • 1 = Valid
13	Synchronized: • 0 = Invalid • 1 = Valid
14	Date and time is set: • 0 = Invalid • 1 = Valid
15	Reserved

Quality of Bits in Registers

The quality of each bit of a register coded as INT16U data type as an enumeration of bits can be indicated in the register preceding the register.

Example:

The quality of each bit of the register 32001, circuit breaker status, is given in the preceding register, 32000.

The quality of the data corresponding to the bit 0 of register 32001, OF status indication contact, is given in the bit 0 of register 32000:

- bit 0 of register 32000 = quality of OF status indication
- bit 0 of register 32001 = OF status indication contact

If	Then
If bit 0 of register 32000 = 1 AND bit 0 of register 32001 = 0	The OF contact indicates that the device is open
If bit 0 of register 32000 = 1 AND bit 0 of register 32001 = 1	The OF contact indicates that the device is closed
If bit 0 of register 32000 = 0	The OF contact indication is invalid

Data Type: ULP DATE

ULP DATE is a data type used to code date and time. This table presents the ULP DATE data type.

Register	Type	Bit	Range	Description
1–2	INT32U	–	0x00000000–0xFFFFFFFF	Number of seconds since January 1, 2000
3	INT16U	–	–	Complement in milliseconds
		0–9	–	Encodes the milliseconds
		10–11	–	Not used
		12	0–1	IFM communication interface external synchronization status 0 = The communication interface has not been externally synchronized within the last 2 hours. 1 = The communication interface has been externally synchronized within the last 2 hours.
		13	0–1	ULP module internal synchronization status 0 = The ULP module has not been internally synchronized 1 = The ULP module has been internally synchronized
		14	0–1	Absolute date is set since last power on 0 = No 1 = Yes
		15	–	Reserved

ULP Date Counter

The date in ULP DATE format is counted in number of seconds since January 1, 2000.

In case of a power loss for an IMU module, the time counter is reset and will restart at January 1, 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 January 1, 2000.

ULP Date Conversion Principle

To convert the date from number of seconds since January 1, 2000, to current date, the following rules apply:

- 1 non-leap year = 365 days
- 1 leap year = 366 days

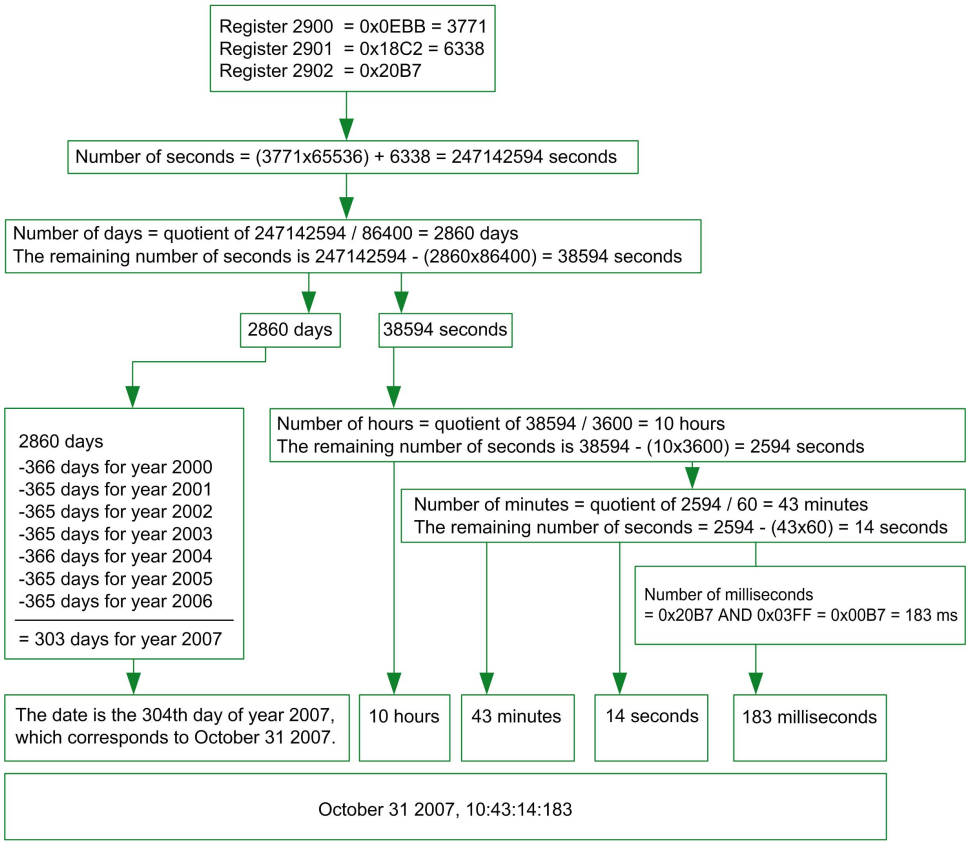
  Years 2000, 2004, 2008, 2012,...(multiple of 4) are leap years (except year 2100).
- 1 day = 86,400 seconds
- 1 hour = 3,600 seconds
- 1 minute = 60 seconds

Follow the steps in the below table to convert the date from number of seconds since January 1, 2000, to current date:

Step	Action
1	Calculate the number of seconds since January 1, 2000: S = (content of register 1 x 65536) + (content of register 2)
2	Calculate the number of days since January 1, 2000: D = integer value of the quotient of S / 86,400 Calculate the remaining number of seconds: s = S - (D x 86,400)
3	Calculate the number of days elapsed for the current year: d = D - (NL x 365) - (L x 366) with NL = number of non-leap years since year 2000 and L = number of leap years since year 2000
4	Calculate the number of hours: h = integer value of the quotient of s / 3600 Calculate the remaining number of seconds: s' = s - (h x 3600)
5	Calculate the number of minutes: m = integer value of the quotient of s' / 60 Calculate the remaining number of seconds: s'' = s' - (m x 60)
6	Calculate the number of milliseconds: ms = (content of register 3) AND 0x03FF **Result:** • The current date is date = d + 1. For example, if d = 303, the current date corresponds to the 304th day of the year, which corresponds to October 31, 2007. • The current time is h:m:s'':ms

ULP Date Conversion Example

Registers 2900 and 2901 return the date in number of seconds since January 1, 2000. Register 2902 returns the complement in ms with the quality of the date.



Notes

- The type column tells how many registers to read to get the variable. For instance INT16U requires reading one register, whereas INT32 requires reading two registers.
- Some variables must be read as a block of multiple registers, like the energy measurements. Reading the block partially results in an error.
- Reading from an undocumented register results in a Modbus exception (refer to Modbus Exception Codes, page 27).
- 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.
- For measures that depend on the presence of neutral as identified by register 3314 (refer to System Type, page 73), reading the value returns 32768 (0x8000) if not applicable. For each table where it occurs, it is explained in a footnote.
- Out of order and not applicable values depend on the data type.

Data Type	Out of Order and Not Applicable Values
INT16U	65535 (0xFFFF)
INT16	-32768 (0x8000)
INT32U	4294967295 (0xFFFFFFFF)
INT32	0x80000000
INT64U	0xFFFFFFFFFFFFFFFF
INT64	0x8000000000000000
FLOAT32	0xFFC00000

Standard Dataset

What's in This Part

Introduction

Description

The standard dataset is a global entity that collects the most useful information of each IMU module in one convenient table.

The benefit is that the full standard dataset can be read with only three read requests. Each module moves the data on a regular basis to the IFM interface. The IMU will answer faster to the Modbus command.

The standard dataset is defined in the 32000 to 32341 register range.

Table of Standard Dataset Common Registers

The main information required for remote supervision of an EasyPact MVS circuit breaker is contained in the table of common registers starting at register 32000.

One Modbus read request is limited to 125 registers maximum. Three Modbus read requests are necessary to read the entire table.

It contains the following information:

- Circuit breaker status
- Tripping causes
- Real-time values of main measurements: current, voltage, power, and energy

The content of this table of registers is detailed in Standard Dataset Common Registers (refer to Standard Dataset Common Registers, page 50).

It is recommended to use these common registers to optimize the response times and simplify the use of data.

Measurement Update Period

The update period for the common registers of the standard dataset is:

- One second for the following measurements:
  - Voltage
  - Current
  - Active and reactive power
  - Power factor
- Five seconds for the following measurements:
  - Energy
  - Minimum and maximum real-time measurement values

Standard Dataset Common Registers

Circuit Breaker Status Register

Address	Register	RW	Unit	Type	Range	Bit	Description
0x7CFF	32000	R	–	INT16U	–	–	Quality of each bit of register 32001 (refer to Quality of Bits in Registers, page 44): • 0 = Invalid • 1 = Valid
0x7D00	32001	R	–	INT16U	–	–	Circuit breaker status register
						0	OF status indication contact • 0 = The circuit breaker is open. • 1 = The circuit breaker is closed.
						1	SD trip indication contact • 0 = Circuit breaker is not tripped. • 1 = Circuit breaker is tripped due to electrical fault, shunt trip, or push-to-trip. Bit always equal to 0 for EasyPact MVS circuit breakers with motor mechanism.
						2	SDE fault trip indication contact • 0 = Circuit breaker is not tripped on electrical fault. • 1 = Circuit breaker is tripped due to electrical fault (including ground-fault test).
						3	CH spring charged contact • 0 = Spring discharged • 1 = Spring charged Bit always equal to 0 for EasyPact MVS circuit breakers with motor mechanism.
						4	Reserved
						5	PF ready to close contact • 0 = Not ready to close • 1 = Ready to close Bit always equal to 0 for EasyPact MVS circuit breakers with motor mechanism.
						6–14	Reserved
						15	Data availability If this bit is set at 1, all other bits of the register are not significant.

IO Status Registers

Address	Register	RW	Unit	Type	Range	Bit	Description
0x7D01	32002	R	–	INT16U	–	–	Quality of each bit of register 32003 (refer to Quality of Bits in Registers, page 44): • 0 = Invalid • 1 = Valid
0x7D02	32003	R	–	INT16U	–	–	IO1 module and M2C status
						0	Digital input 1 status: • 0 = Off • 1 = On
						1	Digital input 2 status:

Address	Register	RW	Unit	Type	Range	Bit	Description
							• 0 = Off • 1 = On
						2	Digital input 3 status: • 0 = Off • 1 = On
						3	Digital input 4 status: • 0 = Off • 1 = On
						4	Digital input 5 status: • 0 = Off • 1 = On
						5	Digital input 6 status: • 0 = Off • 1 = On
						6	Digital output 1 status: • 0 = Off • 1 = On
						7	Digital output 2 status: • 0 = Off • 1 = On
						8	Digital output 3 status: • 0 = Off • 1 = On
						9	Digital M2C output 1 status: • 0 = Off • 1 = On
						10	Digital M2C output 2 status: • 0 = Off • 1 = On
						11–14	Reserved
						15	Data availability If this bit is set at 1, all other bits of the register are not significant.
0x7D03	32004	R	–	INT16U	–	–	Quality of each bit of register 32005: • 0 = Invalid • 1 = Valid
0x7D04	32005	R	–	INT16U	–	–	IO2 module status
						0	Digital input 1 status: • 0 = Off • 1 = On
						1	Digital input 2 status: • 0 = Off • 1 = On
						2	Digital input 3 status: • 0 = Off • 1 = On
						3	Digital input 4 status: • 0 = Off • 1 = On
						4	Digital input 5 status: • 0 = Off • 1 = On

Address	Register	RW	Unit	Type	Range	Bit	Description
						5	Digital input 6 status: • 0 = Off • 1 = On
						6	Digital output 1 status: • 0 = Off • 1 = On
						7	Digital output 2 status: • 0 = Off • 1 = On
						8	Digital output 3 status: • 0 = Off • 1 = On
						9–14	Reserved
						15	Data availability If this bit is set at 1, all other bits of the register are not significant.

Tripping Cause

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

The tripping cause bit is reset as soon as the circuit breaker is closed again.

Address	Register	RW	Unit	Type	Range	Bit	Description
0x7D05	32006	R	–	INT16U	–	–	Quality of each bit of register 32007 (refer to Quality of Bits in Registers, page 44): • 0 = Invalid • 1 = Valid
0x7D06	32007	R	–	INT16U	–	–	Tripping cause for the standard protection functions
						0	Long-time protection Ir
						1	Short-time protection Isd
						2	Instantaneous protection Ii
						3	Ground-fault protection Ig
						4	Reserved
						5	Integrated instantaneous protection (SELLIM and DIN/DINF)
						6	Other protections
						7	Internal failure (overvoltage)
						8–14	Reserved
						15	If this bit is at 1, bits 0 to 14 are not valid.
0x7D07–0x7D1A	32008–32027	–	–	–	–	–	Reserved

Current

Address	Register	RW	Unit	Type	Range	Description
0x7D1B–0x7D1C	32028–32029	R	A	FLOAT32	–	RMS current on phase 1
0x7D1D–0x7D1E	32030–32031	R	A	FLOAT32	–	RMS current on phase 2
0x7D1F–0x7D20	32032–32033	R	A	FLOAT32	–	RMS current on phase 3
0x7D21–0x7D22	32034–32035	R	A	FLOAT32	–	RMS current on the neutral(1)
0x7D23–x7D24	32036–32037	R	A	FLOAT32	–	Maximum of RMS current of phases 1, 2, 3 and N (most loaded phase)(2)
0x7D25–0x7D26	32038–32039	R	–	FLOAT32	–	Current ratio on ground (Ig setting ratio)

(1) Value available when system type register returns 30 or 41.

(2) Value reset: see the reset minimum/maximum command.

Maximum Current Values

Maximum current values can be reset with the reset minimum/maximum command.

Address	Register	RW	Unit	Type	Range	Description
0x7D29–0x7D2A	32042–32043	R	A	FLOAT32	–	Maximum RMS current on phase 1
0x7D2B–0x7D2C	32044–32045	R	A	FLOAT32	–	Maximum RMS current on phase 2
0x7D2D–0x7D2E	32046–32047	R	A	FLOAT32	–	Maximum RMS current on phase 3
0x7D2F–0x7D30	32048–32049	R	A	FLOAT32	–	Maximum RMS current on the neutral(1)
0x7D31–0x7D32	32050–32051	R	A	FLOAT32	–	This is the highest (i.e. maximum) maximum current value since this measurement was last reset. The measurement looks at all 3 currents, MaxI1, MaxI2, MaxI3, and MaxIN, and keeps track of the highest value of any of them over time.

(1) Value available when system type register returns 30 or 41.

Voltage

Address	Register	RW	Unit	Type	Range	Description
0x7D37–0x7D38	32056–32057	R	V	FLOAT32	41.6–2250	RMS phase-to-phase voltage V12
0x7D39–0x7D3A	32058–32059	R	V	FLOAT32	41.6–2250	RMS phase-to-phase voltage V23
0x7D3B–0x7D3C	32060–32061	R	V	FLOAT32	41.6–2250	RMS phase-to-phase voltage V31
0x7D3D–0x7D3E	32062–32063	R	V	FLOAT32	24-1500	RMS phase-to-neutral voltage V1N(1)
0x7D3F–0x7D40	32064–32065	R	V	FLOAT32	24-1500	RMS phase-to-neutral voltage V2N(1)
0x7D41–0x7D42	32066–32067	R	V	FLOAT32	24-1500	RMS phase-to-neutral voltage V3N(1)

(1) Value available when system type register returns 40 or 41.

Power

Address	Register	RW	Unit	Type	Range	Description
0x7D47–0x7D48	32072–32073	R	W	FLOAT32	-16000000–16000000	Active power on phase 1(1) (2)
0x7D49–0x7D4A	32074–32075	R	W	FLOAT32	-16000000–16000000	Active power on phase 2(1) (2)
0x7D4B–0x7D4C	32076–32077	R	W	FLOAT32	-16000000–16000000	Active power on phase 3(1) (2)
0x7D4D–0x7D4E	32078–32079	R	W	FLOAT32	-16000000–16000000	Total active power(2)
0x7D4F–0x7D50	32080–32081	R	VAr	FLOAT32	-16000000–16000000	Reactive power on phase 1(1) (2)
0x7D51–0x7D52	32082–32083	R	VAr	FLOAT32	-16000000–16000000	Reactive power on phase 2(1) (2)
0x7D53–0x7D54	32084–32085	R	VAr	FLOAT32	-16000000–16000000	Reactive power on phase 3(1) (2)
0x7D55–0x7D56	32086–32087	R	VAr	FLOAT32	-16000000–16000000	Total reactive power(2)
0x7D57–0x7D58	32088–32089	R	VA	FLOAT32	0–16000000	Apparent power on phase 1(1)
0x7D59–0x7D5A	32090–32091	R	VA	FLOAT32	0–16000000	Apparent power on phase 2(1)
0x7D5B–0x7D5C	32092–32093	R	VA	FLOAT32	0–16000000	Apparent power on phase 3(1)
0x7D5D–0x7D5E	32094–32095	R	VA	FLOAT32	0–16000000	Total apparent power

(1) Value available when system type register returns 40 or 41.

(2) The sign for the active and reactive power depends on the configuration of the register 3316.

Energy

Energy is stored in big-endian format: the most significant register is transmitted first.

Address	Register	RW	Unit	Type	Range	Description
0x7D5F–0x7D62	32096–32099	R	Wh	INT64	–	Total active energy
0x7D63–0x7D66	32100–32103	R	VARh	INT64	–	Total reactive energy
0x7D67–0x7D94	32104–32149	–	–	–	–	Reserved

Ground-Fault Current

Address	Register	RW	Unit	Type	Range	Description
0x7D95–0x7D96	32150–32151	R	A	FLOAT32	–	Ground-fault current
0x7D97–0x7D9A	32152–32155	–	–	–	–	Reserved

Current Demand Values

Address	Register	RW	Unit	Type	Range	Description
0x7D9B–0x7D9C	32156–32157	R	A	FLOAT32	–	Current demand value on phase 1: I1 Dmd
0x7D9D–0x7D9E	32158–32159	R	A	FLOAT32	–	Current demand value on phase 2: I2 Dmd
0x7D9F–0x7DA0	32160–32161	R	A	FLOAT32	–	Current demand value on phase 3: I3 Dmd
0x7DA1–0x7DA2	32162–32163	R	A	FLOAT32	–	Current demand value on the neutral: IN Dmd(1)
(1) Value available when system type register returns 30 or 41.						

Power Demand Values

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

Address	Register	RW	Unit	Type	Range	Description
0x7DA3–0x7DA4	32164–32165	R	W	FLOAT32	–	Total active power demand: P Dmd
0x7DA5–0x7DA6	32166–32167	R	VAR	FLOAT32	–	Total reactive power demand: Q Dmd
0x7DA7–0x7DA8	32168–32169	R	VA	FLOAT32	–	Total apparent power demand: S Dmd
0x7DA9–0x7DC0	32170–32193	–	–	–	–	Reserved

Maximum Voltage Values

Address	Register	RW	Unit	Type	Range	Description
0x7DC1–0x7DC2	32194–32195	R	V	FLOAT32	41.6–2250	Maximum RMS phase-to-phase voltage V12
0x7DC3–0x7DC4	32196–32197	R	V	FLOAT32	41.6–2250	Maximum RMS phase-to-phase voltage V23
0x7DC5–0x7DC6	32198–32199	R	V	FLOAT32	41.6–2250	Maximum RMS phase-to-phase voltage V31
0x7DC7–0x7DC8	32200–32201	R	V	FLOAT32	24–1500	Maximum RMS phase-to-neutral voltage V1N(1)
0x7DC9–0x7DCA	32202–32203	R	V	FLOAT32	24–1500	Maximum RMS phase-to-neutral voltage V2N(1)
0x7DCB–0x7DCC	32204–32205	R	V	FLOAT32	24–1500	Maximum RMS phase-to-neutral voltage V3N(1)
(1) Value available when system type register returns 40 or 41.						

Power Factor

Address	Register	RW	Unit	Type	Range	Description
0x7DCD–0x7DCE	32206–32207	R	–	FLOAT32	–	Power factor on phase 1(1)
0x7DCF–0x7DD0	32208–32209	R	–	FLOAT32	–	Power factor on phase 2(1)
0x7DD1–0x7DD2	32210–32211	R	–	FLOAT32	–	Power factor on phase 3(1)
0x7DD3–0x7DD4	32212–32213	R	–	FLOAT32	–	Total power factor
0x7DD5–0x7E52	32214–32339	–	–	–	–	Reserved
(1) Value available when system type register returns 40 or 41.						

Inhibit Close Order

Address	Register	RW	Unit	Type	Range	Bit	Description
0x7E53	32340	R	–	INT16U	–	–	Quality of each bit of register 32341: • 0 = Invalid • 1 = Valid
0x7E54	32341	R	–	INT16U	–	–	Inhibit close order status
						0	Close breaker inhibited by IO module • 0 = Disable • 1 = Enable
						1	Close breaker inhibited by communication • 0 = Disable • 1 = Enable
						2–15	Reserved

ETV Trip System Data for EasyPact MVS Circuit Breakers

What's in This Part

ETV Trip System Registers

What's in This Chapter

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, and apparent power
- power factor

Voltage

Address	Register	RW	X	Unit	Type	Range	Description
0x03E7	1000	R	1	V	INT16U	0–1200	RMS phase-to-phase voltage V12
0x03E8	1001	R	1	V	INT16U	0–1200	RMS phase-to-phase voltage V23
0x03E9	1002	R	1	V	INT16U	0–1200	RMS phase-to-phase voltage V31
0x03EA	1003	R	1	V	INT16U	0–1200	RMS phase-to-neutral voltage V1N(1)
0x03EB	1004	R	1	V	INT16U	0–1200	RMS phase-to-neutral voltage V2N(1)
0x03EC	1005	R	1	V	INT16U	0–1200	RMS phase-to-neutral voltage V3N(1)
0x03ED	1006	R	1	V	INT16U	0–1200	Arithmetic mean of V12, V23, and V31: (V12 + V23 + V31) / 3 = V_{avg} L-L
0x03EE	1007	R	1	V	INT16U	0–1200	Arithmetic mean of V1N, V2N, and V3N: (V1N + V2N + V3N) / 3 = V_{avg} L-N(1)
(1) Value is not available when the system type in register 3314 is 30 or 31. Refer to System Type, page 73.							

Voltage Unbalance

Address	Register	RW	X	Unit	Type	Range	Description
0x03EF	1008	R	10	%	INT16	-1000–+1000	V12 phase-to-phase voltage unbalance in relation to the arithmetic mean of phase-to-phase voltages
0x03F0	1009	R	10	%	INT16	-1000–+1000	V23 phase-to-phase voltage unbalance in relation to the arithmetic mean of phase-to-phase voltages
0x03F1	1010	R	10	%	INT16	-1000–+1000	V31 phase-to-phase voltage unbalance in relation to the arithmetic mean of phase-to-phase voltages
0x03F2	1011	R	10	%	INT16	-1000–+1000	V1N phase-to-neutral voltage unbalance in relation to the arithmetic mean of phase-to-neutral voltages(1)
0x03F3	1012	R	10	%	INT16	-1000–+1000	V2N phase-to-neutral voltage unbalance in relation to the arithmetic mean of phase-to-neutral voltages(1)
0x03F4	1013	R	10	%	INT16	-1000– +1000	V3N phase-to-neutral voltage unbalance in relation to the arithmetic mean of phase-to-neutral voltages(1)
0x03F5	1014	R	10	%	INT16	-1000–+1000	Maximum phase-to-phase voltage unbalance value of registers 1008, 1009, and 1010
0x03F6	1015	R	10	%	INT16	-1000–+1000	Maximum phase-to-neutral voltage unbalance value of registers 1011, 1012, and 1013(1)
(1) Value is not available when the system type in register 3314 is 30 or 31. Refer to System Type, page 73.							

Current

Address	Register	RW	X	Unit	Type	Range	Description
0x03F7	1016	R	1	A	INT16U	0–32767	RMS current on phase 1: I1
0x03F8	1017	R	1	A	INT16U	0–32767	RMS current on phase 2: I2
0x03F9	1018	R	1	A	INT16U	0–32767	RMS current on phase 3: I3
0x03FA	1019	R	1	A	INT16U	0–32767	RMS current on the neutral: IN(1)
0x03FB	1020	R	1	A	INT16U	0–32767	Maximum of I1, I2, I3, and IN
0x03FC	1021	R	1	A	INT16U	0–32767	Ground-fault current(2) (3)
0x03FD–0x0401	1022–1026	–	–	–	–	–	Reserved
0x0402	1027	R	1	A	INT16U	0–32767	Arithmetic mean of I1, I2, and I3: (I1 + I2 + I3) / 3 = I_{avg}

(1) Value is not available when the system type in register 3314 is 30 or 31. Refer to System Type, page 73.

(2) Accessible only with ETV 6G trip system.

(3) If this current exceeds 32767 A, the register blocks at 32767.

Current Unbalance

Address	Register	RW	X	Unit	Type	Range	Description
0x0403	1028	R	10	%	INT16	-1000–+1000	I1 current unbalance in relation to the arithmetic mean of the phase currents
0x0404	1029	R	10	%	INT16	-1000–+1000	I2 current unbalance in relation to the arithmetic mean of the phase currents
0x0405	1030	R	10	%	INT16	-1000–+1000	I3 current unbalance in relation to the arithmetic mean of the phase currents
0x0406	1031	R	10	%	INT16	-1000–+1000	IN current unbalance in relation to the arithmetic mean of the phase currents(1)
0x0407	1032	R	10	%	INT16	-1000–+1000	Maximum current unbalance of registers 1028, 1029, and 1030

(1) Value is not available when the system type in register 3314 is 30 or 31. Refer to System Type, page 73.

Active Power

The flow sign of the active power depends on the configuration of register 3316 (refer to Power Flow Sign, page 73).

Address	Register	RW	X	Unit	Type	Range	Description
0x0409	1034	R	1	kW	INT16	-32767–+32767	Active power on phase 1: P1(1)
0x040A	1035	R	1	kW	INT16	-32767–+32767	Active power on phase 2: P2(1)
0x040B	1036	R	1	kW	INT16	-32767–+32767	Active power on phase 3: P3(1)
0x040C	1037	R	1	kW	INT16	-32767–+32767	Total active power: Ptot

(1) Value is not available when the system type in register 3314 is 30 or 31. Refer to System Type, page 73.

Reactive Power

Address	Register	RW	X	Unit	Type	Range	Description
0x040D	1038	R	1	kVAR	INT16	-32767–+32767	Reactive power on phase 1: Q1(1)
0x040E	1039	R	1	kVAR	INT16	-32767–+32767	Reactive power on phase 2: Q2(1)
0x040F	1040	R	1	kVAR	INT16	-32767–+32767	Reactive power on phase 3: Q3(1)
0x0410	1041	R	1	kVAR	INT16	-32767–+32767	Total reactive power: Qtot
(1) Value is not available when the system type in register 3314 is 30 or 31. Refer to System Type, page 73.							

Apparent Power

Address	Register	RW	X	Unit	Type	Range	Description
0x0411	1042	R	1	kVA	INT16U	0–32767	Apparent power on phase 1: S1(1)
0x0412	1043	R	1	kVA	INT16U	0–32767	Apparent power on phase 2: S2(1)
0x0413	1044	R	1	kVA	INT16U	0–32767	Apparent power on phase 3: S3(1)
0x0414	1045	R	1	kVA	INT16U	0–32767	Total apparent power: Stot
(1) Value is not available when the system type in register 3314 is 30 or 31. Refer to System Type, page 73.							

Power Factor

Address	Register	RW	X	Unit	Type	Range	Description
0x0415	1046	R	1000	–	INT16	-1000–+1000	Power factor on phase 1: PF1 (absolute value equal to |P1|/S1)(1)
0x0416	1047	R	1000	–	INT16	-1000–+1000	Power factor on phase 2: PF2 (absolute value equal to |P2|/S2)(1)
0x0417	1048	R	1000	–	INT16	-1000–+1000	Power factor on phase 3: PF3 (absolute value equal to |P3|/S3)(1)
0x0418	1049	R	1000	–	INT16	-1000–+1000	Total power factor: PF (absolute value equal to $\|P_{total}\|$ / S_{total})
(1) Value is not available when the system type in register 3314 is 30 or 31. Refer to System Type, page 73.							

Minimum/Maximum Values of Real-Time Measurements

Minimum/Maximum Measurements Rule

Minimum and maximum measurements take into account the relative value of real-time measurements. Therefore the following rule applies:
-3800<-400<0<200<600.

In this case:

- the minimum value = -3800
- the maximum value = 600

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

- PFmax (or cosϕ max.) is obtained for the smallest positive value of PF (or cosϕ).
- PFmin (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:

- Available only with ETV trip system.
- The register of the minimum value of a real-time metering parameter is equal to the register 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 arithmetic means and unbalance voltage (registers 1306–1315) and for unbalance current (registers 1327 to 1332) are not available with ETV trip system.

Maximum of Real-Time Measurements

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

- Available only with ETV trip system.
- The register of the maximum value of a real-time metering parameter is equal to the register 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 arithmetic means and unbalance voltage (registers 1606–1615) and for unbalance current (registers 1627 to 1632) are not available with ETV trip system.

Energy Measurements

General Description

Energy measurements include:

- active energy Ep
- reactive energy Eq
- apparent energy Es

Address	Register	RW	X	Unit	Type	Range	Description
0x07CF–0x07D2	2000–2003	RW	1	kWh	MOD10000	-10^{16} to $+10^{16}$	Total active energy: Ep(1)
0x07D3–0x07D6	2004–2007	RW	1	kVARh	MOD10000	-10^{16} to $+10^{16}$	Total reactive energy: Eq(1)
0x07D7–0x07E6	2008–2023	–	–	–	–	–	Reserved
0x07E7–0x07EA	2024–2027	RW	1	kVAh	MOD10000	-10^{16} to $+10^{16}$	Total apparent energy: Es
(1) Total active energy and total reactive energy are always counted positively with ETV trip system.							

NOTE:

- The ETV trip system screen displays positive values (only) up to 999 999 999 kWh. Over this value, the ETV trip system screen displays 999 999 999 kWh.
- MOD10000 format is explained in the data type description (refer to Data Type: MOD10000, page 41).

The behavior is the same for reactive energy and apparent energy.

Demand Measurements

General Description

Demand registers include:

- current demand
- active and apparent power demand

The window duration of current demand depends on the configuration of register 3352. Refer to Demand Time, page 74.

The window duration and the window type of power demand depend on the configuration of registers 3354 and 3355. Refer to Demand Time, page 74.

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

Address	Register	RW	X	Unit	Type	Range	Description
0x0897	2200	R	1	A	INT16U	0–32767	Current demand on phase 1: I1 Dmd
0x0898	2201	R	1	A	INT16U	0–32767	Current demand on phase 2: I2 Dmd
0x0899	2202	R	1	A	INT16U	0–32767	Current demand on phase 3: I3 Dmd
0x089A	2203	R	1	A	INT16U	0–32767	Current demand on the neutral: IN Dmd (1)
0x089B	2204	R	1	A	INT16U	0–32767	Maximum current demand on phase 1 since the last reset: I1 Peak Dmd
0x089C	2205	R	1	A	INT16U	0–32767	Maximum current demand on phase 2 since the last reset: I2 Peak Dmd
0x089D	2206	R	1	A	INT16U	0–32767	Maximum current demand on phase 3 since the last reset: I3 Peak Dmd
0x089E	2207	R	1	A	INT16U	0–32767	Maximum current demand on the neutral since the last reset: IN Peak Dmd

(1) Value is not available when the system type in register 3314 is 30 or 31. Refer to System Type, page 73.

Active Power Demand

Address	Register	RW	X	Unit	Type	Range	Description
0x08AF	2224	R	1	kW	INT16U	0–32767	Total active power demand: P Dmd (1)
0x08B0	2225	R	1	kW	INT16U	0–32767	Maximum total active power demand since the last reset: 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 15 seconds.

Apparent Power Demand

Address	Register	RW	X	Unit	Type	Range	Description
0x08BB	2236	R	1	kVA	INT16U	0–32767	Total apparent power demand: S Dmd (1)
0x08BC	2237	R	1	kVA	INT16U	0–32767	Maximum total apparent power demand since last reset: 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 15 seconds.

ETV Trip System Identification

Serial Number

Address	Register	RW	X	Unit	Type	Range	Description
0x21FB–0x21FE	8700–8703	R	1	–	OCTET STRING	–	Serial number encoded in ASCII

Firmware Version

Address	Register	RW	X	Unit	Type	Range	Description
0x2205	8710	R	1	–	INT16	–	ETV trip system firmware version. For example, the value 8244 corresponds to version 8.244.

Protection Type

Address	Register	RW	X	Unit	Type	Range	Description
0x2223	8740	R	1	–	OCTET STRING	20–70	Type of protection: ‘20’ = ETV 2I ‘50’ = ETV 5S ‘60’ = ETV 6G

Long-Time Rating Plug

Address	Register	RW	X	Unit	Type	Range	Description
0x2225	8742	R	1	–	INT16U	0–15	Type of long-time rating plug: 0 = missing 1 = IEC standard 2 = IEC low 3 = IEC High 7 = UL-A 8 = UL-B 9 = UL-C 10 = OFF 11 = UL-D 12 = UL-E 13 = UL-F 14 = UL-G 15 = UL-H

Status

M2C Programmable Contacts Status

The M2C status register indicates the status of the programmable contacts:

- status bit = 0: the contact is open.
- status bit = 1: the contact is closed.

The contact statuses are automatically updated, a reset is not possible.

Address	Register	RW	X	Unit	Type	Range	Bit	Description
0x229D	8857	R	–	–	INT16U	–	0	Contact 1 status
							1	Contact 2 status
							2–15	Reserved

Protection Status

The following table details the values for each bit of protection pick-up value registers:

- protection status bit = 0: protection pick-up value is not overrun.
- protection status bit = 1: protection pick-up value is overrun, even if the time delay has not expired.

Address	Register	RW	X	Unit	Type	Range	Bit	Description
0x229D	8862	R	–	–	INT16U	–	0	Long-time protection status
							1–15	Reserved
0x229E	8863	–	–	–	–	–	–	Reserved
0x229F	8864	R	–	–	INT16U	–	0	Ground-fault alarm status
							1–15	Reserved

Trip History

General Description

The trip history registers describe the last 10 encountered trips. The trip history format corresponds to a series of 10 records saved in a FIFO (first in first out) stack. The last record erases the oldest. Each record is composed of 20 registers describing one trip.

Register 9098 returns the number of faults recorded in the trip history (FIFO).

Register 9099 returns the value of the pointer for the last fault recorded in the trip history.

Example:
If the register 9098 = 10 and the register 9099 = 5, then the last fault recorded is the trip record 5.
In this case, the last but one is the alarm record 4.

NOTE: The contacts must be inspected each time the counter reaches a hundred mark.

Trip Record Number

A read request of 20x(n) registers is necessary to read the last n trip records, where 20 is the number of registers for each trip record.

For example, a read request of 20x3 = 60 registers is necessary to read the last 3 trip records of the trip history:

- The first 20 registers describe the first trip record.
- The next 20 registers describe the second trip record.
- The last 20 registers describe the third trip record.

Address	Register	Description
0x238B–0x239E	9100–9119	Trip record 0
0x239F–0x23B2	9120–9139	Trip record 1
0x23B3–0x23C6	9140–9159	Trip record 2
0x23C7–0x23DA	9160–9179	Trip record 3
0x23DB–0x23EE	9180–9199	Trip record 4
0x23EF–0x2402	9200–9219	Trip record 5
0x2403–0x2416	9220–9239	Trip record 6
0x2417–0x242A	9240–9259	Trip record 7
0x242B–0x243E	9260–9279	Trip record 8
0x243F–0x2452	9280–9299	Trip record 9

Trip Record

A read request of 20 registers is necessary to read a trip record.

The order and the description of the trip record registers are the same as that of the trip record 0:

Address	Register	RW	X	Unit	Type	Range	Description
0x238B–0x238E	9100–9103	R	–	–	XDATE	–	Trip date
0x238F	9104	R	–	–	INT16U	1000–1030	Trip code
0x2390–0x239E	9105–9119	–	–	–	–	–	Reserved

Trip Codes

Trip Code	Description
1000 (0x03E8)	Trip due to long-time protection Ir
1001 (0x03E9)	Trip due to short-time protection Isd
1002 (0x03EA)	Trip due to instantaneous protection Ii
1003 (0x03EB)	Trip due to ground-fault protection Ig
1004 (0x03EC)	Reserved
1005 (0x03ED)	Trip due to integrated instantaneous protection I >>
1006–1007 (0x03EE–0x03EF)	Reserved
1010–1015 (0x03F2–0x03F7)	Reserved
1016 (0x3F8)	Current unbalance
1017 (0x3F9)	I1 maximum demand
1018 (0x3FA)	I2 maximum demand
1019 (0x3FB)	I3 maximum demand
1020 (0x3FC)	IN maximum demand

Protection Parameters

Neutral Protection Parameters

The neutral protection is only available when system type in register 3314 is 30 or 41 (refer to System Type, page 73).

Address	Register	RW	X	Unit	Type	Range	Description
0x2230	8753	R	1	–	INT16U	0–2	Type of neutral protection: 0 = OFF 1 = N/2 (Ir/2) 2 = N (Ir)

Long-Time Protection Parameters

Address	Register	RW	X	Unit	Type	Range	Bit	Description
0x2231	8754	R	–	–	INT16U	0–1	–	Status: 0x0001 = On
0x2232	8755	RW	–	–	INT16U	–	–	Type of IDMTL curve
							0	Standard long-time curve I^2t (factory setting)
							1–15	Reserved
0x2233–0x2234	8756–8757	R	1	A	MOD10000	40–8000	–	Ir pick-up value
0x2235	8758	R	1	ms	INT16U	500–24000	–	tr time delay
0x2236–0x2239	8759–8762	–	–	–	–	–	–	Reserved
0x223A	8763	RW	–	–	INT16U	–	–	M2C programmable contact setting: Bit set to 1 = contact closed at the end of the time delay tr (factory setting) Bit set to 0 = contact open at the end of the time delay tr
							0	Always set to 1
							1–7	Reserved
							8	Contact 1
							9	Contact 2
							10–15	Reserved

Short-Time Protection Parameters

Address	Register	RW	X	Unit	Type	Range	Bit	Description
0x223B	8764	R	–	–	INT16U	0–1	–	Status: 0x0001 = On
0x223C	8765	R	–	–	INT16U	0–1	–	Type of protection: 0 = I^2t On 1 = I^2t Off
0x223D–0x223E	8766–8767	R	–	A	MOD10000	60–80000	–	Isd pick-up value
0x223F	8768	R	–	ms	INT16U	0–400	–	tsd time delay 0 s: valid only for the I^2t off position 100–400 ms: valid for the I^2t on and I^2t off positions
0x2240–0x2243	8769–8772	–	–	–	–	–	–	Reserved

Address	Register	RW	X	Unit	Type	Range	Bit	Description
0x2244	8773	RW	–	–	INT16U	–	–	M2C programmable contact setting: Bit set to 1 = contact closed at the end of the time delay tsd (factory setting) Bit set to 0 = contact open at the end of the time delay tsd
							0	Always set to 1
							1–7	Reserved
							8	Contact 1
							9	Contact 2
							14–15	Reserved

Instantaneous Protection Parameters

Address	Register	RW	X	Unit	Type	Range	Bit	Description
0x2245	8774	R	–	–	INT16U	0x0001–0x0101	–	0x0001 = protection active (factory setting) 0x0101 = protection OFF
0x2246	8775	–	–	–	–	–	–	Reserved
0x2247–0x2248	8776–8777	R	1	A	MO-D10000	200–120000	–	I pick-up value for the instantaneous protection
0x2249	8778	–	–	–	–	–	–	Reserved
0x224A–0x224D	8779–8782	–	–	–	–	–	–	Reserved
0x224E	8783	RW	–	–	INT16U	–	–	M2C programmable contact setting: Bit set to 1 = contact closed at the end of the time delay (factory setting) Bit set to 0 = contact open at the end of the time delay
							0	Always set to 1
							1–7	Reserved
							8	Contact 1
							9	Contact 2
							14–15	Reserved

Ground-Fault Protection Parameters

Address	Register	RW	X	Unit	Type	Range	Bit	Description
0x224F	8784	RW	–	–	INT16U	0x0001–0x0101	–	Protection status: 0x0001 = protection active (factory setting) 0x0101 = protection OFF
0x2250	8785	R	–	–	INT16U	0–1	–	Type of protection: 0 = I^2t On 1 = I^2t Off
0x2251–0x2252	8786–8787	R	1	A	MO-D10000	30–1200	–	Ig pickup for the ground-fault protection
0x2253	8788	R	1	ms	INT16U	0–400	–	tg tripping time delay for the ground-fault protection: 0 s = valid only for the I^2t off position 100–400 ms = valid for the I^2t on and I^2t off positions
0x2254–0x2257	8789–8792	–	–	–	–	–	–	Reserved

Address	Register	RW	X	Unit	Type	Range	Bit	Description
0x2258	8793	RW	–	–	INT16U	–	–	M2C programmable contact setting: Bit set to 1 = contact closed at the end of the time delay tg (factory setting) Bit set to 0 = contact open at the end of the time delay tg
							0	Always set to 1
							1–7	Reserved
							8	Contact 1
							9	Contact 2
							14–15	Reserved

Configuration of the M2C Programmable Contacts

General Description

The M2C has two programmable contacts, 1 and 2, that may be used to signal pick-up value overruns or status changes.

The M2C programmable contacts can be configured remotely via the communication interface.

M2C Programmable Contact Registers

The settings of the M2C programmable contacts are in the contact registers:

Contact Number	Contact Addresses	Contact Registers
1	0x2648–0x264E	9801–9807
2	0x264F–0x2655	9808–9814

M2C Programmable Contact 1 Description

The order and the description of the M2C programmable contact 2 is the same as that of contact 1:

Address	Register	RW	X	Unit	Type	Range	Description
0x2648	9801	RW	–	–	INT16U	0–4	Output mode
							0 = normal (non-latching) mode (factory setting) Contact closed each time for as long as the assigned alarm remains active.
							3 = forced to 1 The contact remains closed and is not controlled by the alarm status.
							4 = forced to 0 The contact remains open and is not controlled by the alarm status
0x2649–0x264D	9802–9806	–	–	–	–	–	Reserved
0x264E	9807	RW	–	–	INT16U	1000–1031	Owner alarm number for the contact 1. Factory setting = 0x8000 (no owner)

Type of Programmable Contacts

Address	Register	RW	X	Unit	Type	Range	Description
0x2672	9843	R	–	–	INT16U	0–6	0 = none 2 = M2C

Event Assignment to M2C Programmable Contacts

The M2C programmable contacts can be associated to a protection parameter event.

Depending on the protection parameter, a specific register can contain the programmable contact number which opens or closes at the end of the protection time delay (register 8763 as example).

Measurement Parameters

System Type

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

Address	Register	RW	X	Unit	Type	Range	Description
0x0CF1	3314	R-WC	–	–	INT16U	30, 31, 40, 41	System type Factory setting: 40 with ETV trip system

Determining system type:

If...	Then...	Result
the system type is a three-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 • Measurements of the neutral current is available. • 3 wattmeters method is not possible.
the system type is a three-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 • Measurements of the neutral current is not available . • 3 wattmeters method is not possible.
the system type is a three-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 • Measurements of the neutral current is not available. • 3 wattmeters method is possible.
the system type is a three-pole circuit breaker with external neutral current transformer and external neutral voltage tap, or if the system type is four-pole circuit breaker	system type = 41	• Measurements of the phase-to-phase voltages are available. • Measurements of the phase-to-neutral voltages are available • Measurements of the neutral current is available. • 3 wattmeters method is possible.

This table presents the text to choose on the ETV trip system display according to the system type determined previously:

If...	Then...
system type = 31	select **3W3ct**
system type = 40	select **4W3ct**
system type = 41	select **4W4ct**

Power Flow Sign

Address	Register	RW	X	Unit	Type	Range	Description
0x0CF3	3316	R-W	–	–	INT16U	0–1	Power flow sign: • 0 = the active power flows from upstream (top) to downstream (bottom) (factory setting). • 1 = the active power flows from downstream (bottom) to upstream (top).

Demand Time

The current demand configuration command (command code = 47243) configures the content of registers 3351 and 3352.

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

Address	Register	RW	X	Unit	Type	Range	Description
0x0D17	3352	R-WC	x1	min	INT16U	5–60	Duration of the current demand calculation window, adjustable in steps of 1 minute. The factory setting is 15 minutes (1)
0x0D1A	3355	R-WC	x1	min	INT16U	5–60	Duration of the power demand calculation window, adjustable in steps of 1 minute. The factory setting is 15 minutes.
(1) The duration in minutes of the current demand calculation window set in this register is used for the maximum current I1, I2, and I3, and IN protection functions. When these protection functions are active, it is possible to modify the duration of the calculation window whether the protective cover for the dial settings is closed or not, whether remote access is authorized (ETV trip system) or not, and whether the supervisor knows the remote access control word or not.							

Nominal Voltage

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

Address	Register	RW	X	Unit	Type	Range	Description
0x258F	9616	R-WC	1	V	INT16U	100–1150	Nominal primary voltage Vn on the voltage transformer. Factory setting = 690 V

Time-Stamped Information

General Description

The time-stamped information enables the user to know all the dates related to important information.

The time-stamped information table describes:

- the current date
- the last current demand and corresponding dates
- the last power demand and corresponding dates
- the last reset and corresponding dates

Current Date

Address	Register	RW	X	Unit	Type	Range	Description
0x2327–0x232A	9000–9003	R	–	–	XDATE	–	Current date of the protection manager

Last Current Demand

Address	Register	RW	X	Unit	Type	Range	Description
0x0BBC–0x0BBE	3005–3007	R	–	–	DATE	–	Date of last current demand maximum I1 (register 2204)
0x0BBF–0x0BC1	3008–3010	R	–	–	DATE	–	Date of last current demand maximum I2 (register 2205)
0x0BC2–0x0BC4	3011–3013	R	–	–	DATE	–	Date of last current demand maximum I3 (register 2206)
0x0BC5– 0x0BC7	3014–3016	R	–	–	DATE	–	Date of last current demand maximum on the neutral (register 2207)(1)
(1) Value is not available when the system type in register 3314 is 31 or 40. Refer to System Type, page 73.							

Last Power Demand

Address	Register	RW	X	Unit	Type	Range	Description
0x0BC8–0x0BCA	3017–3019	R	–	–	DATE	–	Date of last active power demand maximum (register 2224)
0x0BCB–0x0BCD	3020–3022	–	–	–	–	–	Reserved
0x0BCE–0x0BD0	3023–3025	R	–	–	DATE	–	Date of last apparent power demand maximum (register 2236)

Maintenance Indicators

Load Profile Counters

The load profile counters report the number of hours for each range of current in the ETV trip system. 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 read request of eight registers is necessary to read the load profile counters.

Address	Register	RW	X	Unit	Type	Range	Description
0x74B7–0x74B8	29880–29881	R	1	Hour	INT32U	0–4 294 967 295	Number of hours for 0–49% of the nominal current range
0x74B9–0x74BA	29882–29883	R	1	Hour	INT32U	0–4 294 967 295	Number of hours for 50–79% of the nominal current range
0x74BB–0x74BC	29884–29885	R	1	Hour	INT32U	0–4 294 967 295	Number of hours for 80–89% of the nominal current range
0x74BD–0x74BE	29886–29887	R	1	Hour	INT32U	0–4 294 967 295	Number of hours for 90–100% of the nominal current range

Miscellaneous

Nominal Current

Address	Register	RW	X	Unit	Type	Range	Description
0x222D	8750	R	1	A	INT16U	0–8000	Rated circuit breaker current Factory setting = 100 A (circuit breaker sensor plug not present)

Battery Status

Address	Register	RW	X	Unit	Type	Range	Description
0x228A	8843	R	1	%	INT16U	0–100	Battery-charge indicator: 100 % = U > 2800 mV 50 % = 2200 < U < 2800 mV 0 % = U < 2200 mV

ETV Trip System Commands

What's in This Chapter

List of ETV Trip System Commands and Error Codes

List of Commands

The following table lists the available ETV trip system commands, their corresponding command codes, and user profiles. Follow the command execution procedures accordingly (refer to Executing a Command, page 31):

Command	Command Code	User Profile
Set up ENVT presence (refer to Set Up ENVT Presence, page 78)	46472	Administrator
Reset minimum/maximum (refer to Reset Minimum/Maximum, page 78)	46728	Administrator or Operator
Current demand configuration (refer to Current Demand Configuration, page 80)	47243	Administrator
Power demand configuration (refer to Power Demand Configuration, page 80)	47244	Administrator
Set up nominal voltage Vn display (refer to Set Up Nominal Primary Voltage Vn Display, page 80)	47245	Administrator

Error Codes

Error codes generated by ETV trip systems are the generic error codes (refer to Result of the Command, page 34).

Measurement Configuration Commands

Set Up ENVT Presence

The user can read the ENVT (External Neutral Voltage Tap) presence parameters at register 3314 (refer to System Type, page 73).

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

Address	Register	X	Unit	Type	Range	Description
0x1F3F	8000	–	–	INT16U	46472	Command code = **46472**
0x1F40	8001	–	–	INT16U	12	Number of parameters (bytes) = 12
0x1F41	8002	–	–	INT16U	4609	Destination = 4609 (0x1201)
0x1F42	8003	–	–	INT16U	1	Security type of the command
0x1F43 0x1F44	8004 8005	–	–	OCTET STRING	–	Password of the command: Administrator user profile password
0x1F45	8006	–	–	INT16U	0–1	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) (refer to Minimum/Maximum Values of Real-Time Measurements, page 62).

The reset minimum/maximum command resets the energy measurements (registers 2000 to 2027) (refer to Energy Measurements, page 63).

The reset minimum/maximum command resets the peak demand measurements (registers 2200 to 2237) (refer to Demand Measurements, page 64).

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

Address	Register	X	Unit	Type	Range	Bit	Description
0x1F3F	8000	–	–	INT16U	46728	–	Command code = **46728**
0x1F40	8001	–	–	INT16U	12	–	Number of parameters (bytes) = 12
0x1F41	8002	–	–	INT16U	4609	–	Destination = 4609 (0x1201)
0x1F42	8003	–	–	INT16U	1	–	Security type of the command
0x1F43 0x1F44	8004 8005	–	–	OCTET STRING	–	–	Password of the command: Administrator or Operator user profile password
0x1F45	8006	–	–	INT16U	–	–	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.
						0	Reset minimum/maximum current (I1, I2, I3, IN, Imax, Ig, IΔn, Iavg, and Iunbal)
						1	Reset minimum/maximum voltage (V12, V13, V23, V1N, V2N, V3N, VavgL-L, VavgL-N, and Vunbal)
						2	Reset minimum/maximum power (active power, reactive power, apparent power, and distortion power)
						3	Reset minimum/maximum power factor and cosϕ
						4	Reserved
						5	Reset peak of current demand

Address	Register	X	Unit	Type	Range	Bit	Description
						6	Reset peak of active power, reactive power, and apparent power demand
						7–8	Reserved
						9	Reset energy (active, reactive, apparent)
						10–15	Reserved

Current Demand Configuration

The user can read the duration of the current demand calculation window at register 3352 (refer to Demand Time, page 74).

The user can read the current demand parameters from register 2200 to 2207 (refer to Current Demand, page 64).

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

Address	Register	X	Unit	Type	Range	Description
0x1F3F	8000	–	–	INT16U	47243	Command code = **47243**
0x1F40	8001	–	–	INT16U	12	Number of parameters (bytes) = 12
0x1F41	8002	–	–	INT16U	4609	Destination = 4609 (0x1201)
0x1F42	8003	–	–	INT16U	1	Security type of the command
0x1F43 0x1F44	8004 8005	–	–	OCTET STRING	–	Password of the command: Administrator user profile password
0x1F45	8006	–	Min	INT16U	5–60	Duration of the current demand calculation window, adjustable in step of 1. The factory setting is 15 minutes (sliding).

Power Demand Configuration

The user can read the power demand calculation method from register 3354 to 3355 (refer to Demand Time, page 74).

The user can read the power demand parameters from register 2224 to 2237 (refer to Active Power Demand, page 64).

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

Address	Register	X	Unit	Type	Range	Description
0x1F3F	8000	–	–	INT16U	47244	Command code = **47244**
0x1F40	8001	–	–	INT16U	14	Number of parameters (bytes) = 14
0x1F41	8002	–	–	INT16U	4609	Destination = 4609 (0x1201)
0x1F42	8003	–	–	INT16U	1	Security type of the command
0x1F43 0x1F44	8004 8005	–	–	OCTET STRING	–	Password of the command: Administrator user profile password
0x1F45	8006	–	–	INT16U	0–5	Power demand calculation method (window type): 0 = sliding (factory setting) 2 = fixed 5 = synchronized to communication
0x1F46	8007	–	Min	INT16U	5–60	Duration of the power demand calculation window, adjustable in step of 1. The factory setting is 15 minutes.

Set Up Nominal Primary Voltage Vn Display

The user can read the nominal voltage at register 9616 (refer to Nominal Voltage, page 74).

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

Address	Register	X	Unit	Type	Range	Description
0x1F3F	8000	–	–	INT16U	47245	Command code = **47245**
0x1F40	8001	–	–	INT16U	12	Number of parameters (bytes) = 12
0x1F41	8002	–	–	INT16U	4609	Destination = 4609 (0x1201)
0x1F42	8003	–	–	INT16U	1	Security type of the command
0x1F43 0x1F44	8004 8005	–	–	OCTET STRING	–	Password of the command: Administrator user profile password
0x1F45	8006	–	V	INT16U	0–65535	Nominal primary voltage Vn (factory setting = 690 V)

BCM ULP Module Data for EasyPact MVS Circuit Breakers

What's in This Part

BCM ULP Module Registers

What's in This Chapter

BCM ULP Module Identification

Product Identification

Address	Register	RW	X	Unit	Type	Range	Description
0x0202	515	R	–	–	INT16U	15139	Product identification = 15139 for the BCM ULP module

BCM ULP Module Identifier

Address	Register	RW	X	Unit	Type	Range	Description
0x0215–0x0216	534–535	RW	–	–	OCTET STRING	0x0000–0x7F7F	Short identifier of BCM ULP module coded over 4 ASCII characters Factory setting = 0x0000
0x0217–0x021E	536–543	RW	–	–	OCTET STRING	0x0000–0x7F7F	Long identifier of BCM ULP module coded over 16 ASCII characters Factory setting = 0x0000

BCM ULP Module Firmware Version

The BCM ULP module firmware version starts with a V character and has the following format: VX.Y.Z.

The firmware version is coded as follows: VX.Y.Z = VX*1000 + Y*100 + Z*10

For example if the value of the register is equal to 2000, the BCM ULP module firmware version is equal to V2.0.0.

Address	Register	RW	X	Unit	Type	Range	Description
0x0240	577	R	–	–	INT16U	–	BCM ULP module firmware version

Circuit Breaker Status

Tripping Cause

The tripping cause register indicates 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 bit is reset as soon as the circuit breaker is closed again.

Address	Register	RW	X	Unit	Type	Range	Bit	Description
0x0289	650	R	–	–	INT16U	–	–	Tripping cause for protection functions
							0	Long-time protection Ir
							1	Short-time protection Isd or Instantaneous-protection Ii
							2	Reserved
							3	Ground-fault protection Ig
							4	Reserved
							5	Integrated Instantaneous protection
							6	Other protection
							7	Internal failure (overvoltage)
							8–14	Reserved
							15	If this bit is at 1, bits 0 to 14 are not valid.

Circuit Breaker Status

Address	Register	RW	X	Unit	Type	Range	Bit	Description
0x0294	661	R	–	–	INT16U	–	–	Circuit breaker status register
							0	OF status indication contact 0 = The circuit breaker is open. 1 = The circuit breaker is closed.
							1	SD trip indication contact 0 = Circuit breaker is not tripped. 1 = Circuit breaker is tripped due to electrical default or shunt trip or push-to-trip. Bit always equal to 0 for EasyPact MVS circuit breakers with motor mechanism.
							2	SDE fault trip indication contact 0 = Circuit breaker is not tripped on electrical default. 1 = Circuit breaker is tripped due to electrical fault (including ground-fault test).
							3	CH spring charged contact 0 = Spring discharged 1 = Spring charged Bit always equal to 0 for EasyPact MVS circuit breaker.
							4	Reserved
							5	PF ready to close contact circuit breakers 0 = Not ready to close 1 = Ready to close Bit always equal to 0 for EasyPact MVS circuit breaker.
							6	Always 1
							7–15	Reserved

Time-Stamped Information

General Description

The time-stamped information enables to know all the dates relative to important information.

Date of Last Event

Address	Register	RW	X	Unit	Type	Range	Description
0x02A6–0x02A9	679–682	R	–	–	XDATE	–	Current date of BCM ULP module
0x02AB–0x02AD	684–686	R	–	–	DATE	–	Date of last circuit breaker opening
0x02AE–0x02B0	687–689	R	–	–	DATE	–	Date of last circuit breaker closing
0x02B1–0x02B3	690–692	R	–	–	DATE	–	Date of last trip without an electrical fault
0x02B4–0x02B6	693–695	R	–	–	DATE	–	Date of last trip with an electrical fault
0x02B7–0x02B9	696–698	R	–	–	DATE	–	Date of last “PF ready to close” status
0x02BA–0x02BC	699–701	R	–	–	DATE	–	Date of last “End of opening order” event. This event occurs when: • there is no action on the opening pushbutton on the front of the device • the fault-trip reset pushbutton is in (the device is reset) • the MN undervoltage release is powered (if present)
0x02BD–0x02BF	702–704	R	–	–	DATE	–	Date of last “CH spring charged” status

Counters

General Description

The BCM ULP module has counters that help managing the circuit breaker.

The BCM ULP module 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 of 65535.
- All counters (except the cumulating OF counter) can be preset to any value from 0 to 65535. The counters automatically cycle from 65535 to 0.
- A threshold is associated to the OF counter and to the close circuit breaker command counter. The thresholds can be set to any value from 0 to 65534. The factory setting is 5000. An alarm is generated when a counter reaches the threshold.

BCM ULP Module Counters

Address	Register	RW	X	Unit	Type	Range	Description
0x0229	554	R	–	–	INT16U	0–65535	Counter for the number of times the BCM ULP module is energized
0x022A	555	R	–	–	INT16U	0–65535	Counter for the number of times the BCM ULP module is reset whether following power loss or not

Counter Thresholds

Address	Register	RW	X	Unit	Type	Range	Description
0x0243	580	RW	–	–	INT16U	0–65535	OF counter threshold Factory setting = 5000

Circuit Breaker Operation Counters

Address	Register	RW	X	Unit	Type	Range	Description
0x0295	662	R	–	–	INT16	0–65535	Cumulating OF counter (non-resettable open to close counter)
0x0296	663	RW	–	–	INT16	0–65535	OF counter (resettable open to close counter)
0x0297	664	RW	–	–	INT16	0–65535	SD counter (close to SD position)
0x0298	665	RW	–	–	INT16	0–65535	SDE counter (close to SDE position)

Trip History

General Description

The trip history registers describe the last 17 encountered trips. The trip history format corresponds to a series of 17 records saved in a FIFO (first-in first-out) stack. The last record erases the oldest. Each record is composed of seven registers describing one trip.

Trip Record Number

A 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.

For example, a read request of 7x3 = 21 registers is necessary to read the last three trip records of the trip history:

- The first seven registers describe the first trip record.
- The next seven registers describe the second trip record.
- The last seven registers describe the third trip record.

Address	Register	Description
0x0095–0x009B	150–156	Trip record 0
0x009C–0x00A2	157–163	Trip record 1
0x00A3–0x00A9	164–170	Trip record 2
0x00AA–0x00B0	171–177	Trip record 3
0x00B1–0x00B7	178–184	Trip record 4
0x00B8–0x00BE	185–191	Trip record 5
0x00BF–0x00C5	192–198	Trip record 6
0x00C6–0x00CC	199–205	Trip record 7
0x00CD–0x00D3	206–212	Trip record 8
0x00D4–0x00DA	213–219	Trip record 9
0x00DB–0x00E1	220–226	Trip record 10
0x00E2–0x00E8	227–233	Trip record 11
0x00E9–0x00EF	234–240	Trip record 12
0x00F0–0x00F6	241–247	Trip record 13
0x00F7–0x00FD	248–254	Trip record 14
0x00FE–0x0104	255–261	Trip record 15
0x0105–0x010B	262–268	Trip record 16

Trip Record

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

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

Trip Record 1 (Most Recent Trip Record)							
Address	**Register**	**RW**	**X**	**Unit**	**Type**	**Range**	**Description**
0x0095	150	R	1	–	INT16U	0–65535	Trip code
0x0096–0x0098	151–153	R	1	–	ULP	–	Date of event (trip or acknowledge)
0x0099	154	R	1	–	INT16U	1–2	Event type MSB = 0 (reserved) Event occurrence: LSB = 1 Event completion: LSB = 2
0x009A	155	–	–	–	–	–	Reserved
0x009B	156	–	–	–	–	–	Reserved

Trip Codes

Trip Code	Description
1000 (0x03E8)	Trip due to long-time protection Ir
1001 (0x03E9)	Trip due to short-time protection Isd
1002 (0x03EA)	Trip due to instantaneous protection Ii
1003 (0x03EB)	Trip due to ground-fault protection Ig
1005 (0x03ED)	Trip due to integrated instantaneous protection I >>
1006–1015 (0x03EE–0x03F7)	Reserved
1016 (0x03F8)	Current unbalance
1017 (0x03F9)	I1 maximum demand
1018 (0x03FA)	I2 maximum demand
1019 (0x03FB)	I3 maximum demand
1020 (0x03FC)	IN maximum demand
1021–1022 (0x03FD–0x03FE)	Reserved
1023 (0x03FF)	Voltage unbalance
1024 (0x0400)	Reserved
1025 (0x0401)	Reverse power
1026–1027 (0x0402–0x0403)	Reserved
1028 (0x0404)	Phase rotation
1029 (0x0405)	Current load shedding
1030 (0x0406)	Power load shedding

BCM ULP Module Files

What's in This Chapter

Circuit Breaker Manager Event Log

General Description

The system stores the events that concern circuit breaker control (for example, opening or closing of the contacts) in the file number 30.

This file is made up of 100 records and each record is made up of five registers.

This file is reset in case of 24 Vdc power loss on the BCM ULP module or change of the communication parameter 4W/2W + ULP.

File Header

The following table describes the file header content:

Address	Register	RW	X	Unit	Type	Range	Description
0x02CD	718	R	–	–	INT16U	–	File status: 0x0000 = file disabled 0xFFFF = file enabled (factory setting)
0x02CE	719	R	–	–	INT16U	–	Type of file = 30
0x02CF	720	R	–	–	INT16U	–	File allocation = 0xFFFF
0x02D0	721	R	1	–	INT16U	–	Size of a record = 5 registers
0x02D1	722	R	–	–	INT16U	–	File filling mode: 0 = circular

File Status

The following table describes the file status content:

Address	Register	RW	X	Unit	Type	Range	Description
0x02DD	734	R	1	–	INT16U	100	Size of a file = 100 records
0x02DE	735	R	1	–	INT16U	5	Size of a record = 5 registers
0x02E0	737	R	1	–	INT16U	0–100	Number of records in the file
0x02E1	738	R	1	–	INT16U	0–8000	Sequence number of first record in the file (the oldest)
0x02E2	739	R	1	–	INT16U	0–8000	Sequence number of last record in the file (the most recent)
0x02E3– 0x02E5	740–742	R	–	–	DATE	–	Date of the last file reset Factory setting = 0x8000 0x8000 0x8000

Event Record

The following table shows the format of one record in the event log of the circuit breaker:

Registers	Type	Description
1–4	XDATE	Event date
5	INT16U	Event number (see table below)

Events

The following table shows the events in the event log of the circuit breaker:

Event Number	Description
1	RESET or system energized
2	Reserved
3	Spring charged
4	Circuit breaker opened (O)
5	Circuit breaker closed (F)
6	Circuit breaker tripped (SD)
7	Circuit breaker fault tripped (SDE)
8–11	Reserved
12	Modification of Modbus configuration (address, Baud rate, and parity)
13	Event log reset
14	Clock update input locally accepted
15	Clock update input locally rejected (synchronization by the supervisor)

IO Module Data for EasyPact MVS Circuit Breakers

What's in This Part

IO Module Registers

What's in This Chapter

Introduction

This section describes the IO module registers.

Registers 13824 to 15719 are held by the IO 1.

Registers 16824 to 18719 are held by the IO 2:

- The registers of the parameters of IO 2 are equal to the registers of the parameters of IO 1 plus 3000.

  Example:

  - Register 14599 holds the digital input status register of the IO 1.
  - Register 17599 holds the digital input status register of the IO 2.
- The order of the registers is the same as that of the IO 1.
- The characteristics (access type, size, range, and unit) are the same as those of the registers of IO 1.
- Registers 15360 to 16109 containing the predefined application are specific to the IO 1 because they hold the predefined applications.

Analog Inputs

Analog Input Register Mapping

The following table describes the analog inputs and corresponding registers and addresses of the IO module.

IO Module	Analog Input Addresses	Analog Input Registers
IO 1	0x35FF–0x3668	13824–13929
IO 2	0x41B7–0x4220	16824–16929

Analog Input Registers of IO 1

The order and the description of the analog input registers of IO 2 are the same as those of IO 1.

Address	Register	RW	Unit	Type	Range	Description
0x35FF–0x3600	13824–13825	–	–	–	–	Reserved
0x3601–0x3602	13826–13827	R	˚C	FLOAT32	-50–250	Analog input sensor Pt100 temperature value (updated once every 1 s)
0x3603	13828	R	–	INT16U	0–1	Data quality of the analog input: • 0 = Valid • 1 = Invalid
0x3604	13829	–	–	–	–	Reserved
0x3605–0x3608	13830–13833	R	–	DATETIME	–	Time-stamp of the last change of +/- 1 ˚C of the analog data value
0x3609–0x360C	13834–13837	–	–	–	–	Reserved
0x360D–0x360E	13838–13839	R	˚C	FLOAT32	-50–250	Analog input Pt100 maximum value
0x360F–0x3610	13840–13841	R	˚C	FLOAT32	-50–250	Analog input Pt100 minimum value
0x3611–0x3614	13842–13845	R	–	DATETIME	–	Time-stamp of minimum value of analog input value recorded
0x3615–0x3618	13846–13849	R	–	DATETIME	–	Time-stamp of maximum value of analog input value recorded
0x3619–0x361C	13850–13853	R	–	DATETIME	–	Time-stamp of last reset of min/max values of analog input value recorded
0x361D–0x361E	13854–13855	R	–	INT32U	0–65534	Switchboard temperature threshold 1 counter. This counter increments every time threshold 1 is exceeded.
0x361F–0x3620	13856–13857	R	–	INT32U	0–65534	Switchboard temperature threshold 2 counter. This counter increments every time threshold 2 is exceeded.
0x3621–0x3622	13858–13859	R	–	INT32U	0–65534	Switchboard temperature threshold 3 counter. This counter increments every time threshold 3 is exceeded.
0x3623–0x363A	13860–13883	R	–	OCTET STRING	–	Analog input identification coded over 45 ASCII characters(1)
0x363B	13884	R	–	INT16U	0–2	Analog input type(1) • 0 = Analog input is not valid (factory setting) • 1 = Not applicable • 2 = Pt100
0x363C	13885	–	–	–	–	Reserved
0x363D–0x363E	13886–13887	R	˚C	FLOAT32	-50–250	Switchboard temperature threshold 1 pick-up value (Pt100)(1) Factory setting = 50 ˚C

Address	Register	RW	Unit	Type	Range	Description
0x363F–0x3640	13888–13889	R	s	FLOAT32	1–3600	Switchboard temperature threshold 1 pick-up value delay (Pt100)(1) Factory setting = 10 s
0x3641–0x3642	13890–13891	R	˚C	FLOAT32	-50–250	Switchboard temperature threshold 1 drop-out value (Pt100)(1) Factory setting = 45 ˚C
0x3643–0x3644	13892–13893	R	s	FLOAT32	1–3600	Switchboard temperature threshold 1 drop-out time delay (Pt100)(1) Factory setting = 10 s
0x3645–0x3646	13894–13895	R	˚C	FLOAT32	-50–250	Switchboard temperature threshold 2 pick-up value (Pt100)(1) Factory setting = 60 ˚C
0x3647–0x3648	13896–13897	R	s	FLOAT32	1–3600	Switchboard temperature threshold 2 time delay (Pt100)(1) Factory setting = 10 s
0x3649–0x364A	13898–13899	R	˚C	FLOAT32	-50–250	Switchboard temperature threshold 2 drop-out value (Pt100)(1) Factory setting = 55 ˚C
0x364B–0x364C	13900–13901	R	s	FLOAT32	1–3600	Switchboard temperature threshold 2 drop-out time delay (Pt100)(1) Factory setting = 10 s
0x364D–0x364E	13902–13903	R	˚C	FLOAT32	-50–250	Switchboard temperature threshold 3 pick-up value (Pt100)(1) Factory setting = 70 ˚C
0x364F–0x3650	13904–13905	R	s	FLOAT32	1–3600	Switchboard temperature threshold 3 pick-up time delay (Pt100) (1) Factory setting = 10 s
0x3651–0x3652	13906–13907	R	˚C	FLOAT32	-50–250	Switchboard temperature threshold 3 drop-out value (Pt100)(1) Factory setting = 65 ˚C
0x3653–0x3654	13908–13909	R	s	FLOAT32	1–3600	Switchboard temperature threshold 3 drop-out time delay (Pt100)(1) Factory setting = 10 s
0x3655–0x3656	13910–13911	R	Ω	FLOAT32	200–650	Motor temperature sensor fault threshold
0x3657–0x3668	13912–13929	–	–	–	–	Reserved
(1) Contact Schneider Electric field service representative to set the value.						

Digital Inputs

Digital Input Register Mapping

Each digital input description is made up of 80 registers. The order and the description of the digital inputs 2, 3, 4, 5, and 6 are the same as those of digital input 1.

IO Module	Digital Input Number	Digital Input Addresses	Digital Input Registers
IO 1	I1	0x3669–0x36B8	13930–14009
	I2	0x36B9–0x3708	14010–14089
	I3	0x3709–0x3758	14090–14169
	I4	0x3759–0x37A8	14170–14249
	I5	0x37A9–0x37F8	14250–14329
	I6	0x37F9–0x3848	14330–14409
IO 2	I1	0x4221–0x4270	16930–17009
	I2	0x4271–0x42C0	17010–17089
	I3	0x42C1–0x4310	17090–17169
	I4	0x4311–0x4360	17170–17249
	I5	0x4361–0x43B0	17250–17329
	I5	0x43B1–0x4400	17330–17409

Digital Input 1 Registers of IO 1

The order and the description of the digital input 1 registers of IO 2 are the same as those of IO 1:

Address	Register	RW	Unit	Type	Range	Bit	Description
0x3669	13930	R	–	INT16U	–	–	Quality of each bit of register 13931: • 0 = Invalid • 1 = Valid
0x366A	13931	R	–	INT16U	–	0	Digital input status: • 0 = Off • 1 = On
						1	Digital input forced status: • 0 = Unforced • 1 = Forced
						2–15	Reserved
0x366B–0x366E	13932–13935	R	–	DATETIME	–	–	Time-stamp for the last input transition: • Last rising edge if input is configured as NO (normally open contact) • Last falling edge if input is configured as NC (normally closed contact) Valid if input signal type is a normal digital input (not valid for pulse digital input).
0x366F–0x3670	13936–13937	–	–	–	–	–	Reserved
0x3671–0x3672	13938–13939	R	–	INT32U	0–4294967294	–	Input counter value This counter increments for each rising edge of the input. Valid if input signal type is normal digital input.
0x3673–0x3676	13940–13943	R	–	DATETIME	–	–	Time-stamp for the last input change counter preset/reset Valid if input signal type is normal digital input.

Address	Register	RW	Unit	Type	Range	Bit	Description
0x3677–0x3678	13944–13945	R	–	INT32U	0–4294967294	–	Number of pulses received Valid if input signal type is pulse digital input.
0x3679–0x367C	13946–13949	R	–	INT64	–	–	Resettable value of consumption Value = pulse weight x number of pulses received Valid if input signal type is pulse digital input.
0x367D–0x3680	13950–13953	R	–	INT64	–	–	Accumulated non-resettable value of consumption Valid if input signal type is pulse digital input.
0x3681–0x3684	13954–13957	R	–	DATETIME	–	–	Time-stamp of last resettable consumption value reset Valid if input signal type is pulse digital input.
0x3685–0x3686	13958–13959	R	W	FLOAT32	–	–	Power calculation Valid if • Input signal type is pulse digital input • the pulse input is from Energy pulse counter
0x3687–0x369E	13960–13983	R	–	OCTET STRING	–	–	Digital input identification coded over 45 ASCII characters(1)
0x369F–0x36A0	13984–13985	R	s	FLOAT32	0.003–1	–	Digital input 1 filter time
0x36A1	13986	R	–	INT16U	0–1	–	Input contact type(1) • 0 = NO (normally open contact, factory setting) • 1 = NC (normally close contact)
0x36A2	13987	R	–	INT16U	0–1	–	Input signal type(1) • 0 = normal digital input (factory setting) • 1 = pulse digital input
0x36A3	13988	R	–	INT16U	0–1	–	Pulse polarity(1) • 0 = low to high (factory setting) • 1 = high to low Valid if input signal type is pulse digital input.
0x36A4	13989	R	–	INT16U	1–4	–	Pulse unit(1) • 1 = Wh (Watt-hour, factory setting) • 2 = VARh (Reactive Volt- Ampere hour) • 3 = VAh (Volt-Ampere hour) • 4 = m^3 (cubic meters) Valid if input signal type is pulse digital input.
0x36A5–0x36A6	13990–13991	R	–	FLOAT32	1–16777215	–	Pulse weight(1) (2) Valid if input signal type is pulse digital input. Factory setting = 1.0
0x36A7–0x36A8	13992–13993	R	–	INT32U	1–4294967294	–	Input counter threshold value(1) Valid if input signal type is normal digital input. Factory setting = 5000

Address	Register	RW	Unit	Type	Range	Bit	Description
0x36A9–0x36B8	13994–14009	–	–	–	–	–	Reserved

(1) Contact Schneider Electric field service representative to set the value.

(2) Examples:

- If each incoming pulse represents 125 kWh, and since consumption data must be expressed in watt-hours, the consumption pulse weight is 125,000.
- If each incoming pulse represents 1 US gallon, and since consumption data must be expressed in cubic meters, the consumption pulse weight is 0.003785.

Digital Outputs

Digital Output Register Mapping

Each digital output description is made up of 60 registers. The order and the description of the digital outputs 2 and 3 are the same as those of digital output 1.

IO Module	Digital Output Number	Digital Output Addresses	Digital Output Registers
IO 1	O1	0x3849–0x3884	14410–14469
	O2	0x3885–0x38C0	14470–14529
	O3	0x38C1–0x38FC	14530–14589
IO 2	O1	0x4401–0x443C	17410–17469
	O2	0x443D–0x4478	17470–17529
	O3	0x4479–0x44B4	17530–17589

Digital Output 1 Registers of IO 1

The order and the description of the digital output 1 registers of IO 2 are the same as those of IO 1:

Address	Register	RW	Unit	Type	Range	Bit	Description
0x3849	14410	R	–	INT16U	–	–	Quality of each bit of register 14411: • 0 = Invalid • 1 = Valid
0x384A	14411	R-WC	–	INT16U	–	0	Reserved
						1	Digital output status: • 0 = OFF • 1 = ON
		R				2	Digital output forced status: • 0 = Unforced • 1 = Forced
						3–15	Reserved
0x384B–0x384E	14412–14415	R	–	DATETIME	–	–	Time-stamp for the last output transition: • Last rising edge if output is configured as NO (normally open contact) • Last falling edge if output is configured as NC (normally closed contact)
0x384F–0x3850	14416–14417	–	–	–	–	–	Reserved
0x3851–0x3852	14418–14419	R	–	INT32U	1-4294967294	–	Output counter This counter increments for each rising edge of the output.
0x3853–0x3856	14420–14423	R	–	DATETIME	–	–	Time-stamp of the last reset for the output counter
0x3857–0x386E	14424–14447	R	–	OCTET STRING	–	–	Digital output identification coded over 45 ASCII characters
0x386F	14448	R	–	INT16U	0–2	–	Output operating mode(1): • 0 = Non-latching (factory setting) • 1 = Latched • 2 = Time delayed non-latching

Address	Register	RW	Unit	Type	Range	Bit	Description
0x3870	14449	R	s	INT16U	0–65534	–	On time for time delayed non-latching mode value(1). The time for the output to remain energized when the output is in time delayed non-latching mode (Factory setting = 0)
0x3871	14450	R	–	INT16U	0–1	–	Output contact type: • 0 = NO (normally open, factory setting) • 1 = NC (normally close)
0x3872	14451	R	–	INT16U	0–2	–	Indicates On/Off state of the discrete output when any fall back condition occurs: • 0 = OFF (factory setting) • 1 = ON • 2 = Freeze
0x3873–0x3874	14452–14453	R	–	INT32U	1-4294967294	–	Output counter threshold value(1) Factory setting = 5000
0x3875	14454	R	–	INT16U	0–2	–	Simple command for output(1): • 0 = No command • 1 = OFF • 2 = ON Valid if simple commands are enabled.
0x3876–0x3884	14455–14469	–	–	–	–	–	Reserved
(1) Contact Schneider Electric field service representative to set the value.							

Hardware Setting

Addresses and Registers List

The following table describes the hardware settings addresses, and registers regarding the IO module.

IO Module	Addresses	Registers
IO 1	0x38FD–0x3902	14590–14597
IO 2	0x44B5–0x44BA	17590–17595

Hardware Setting Registers for IO 1

The order and the description of the hardware setting registers for IO 2 are the same as those of IO 1.

Address	Register	RW	Unit	Type	Range	Description
0x38FD	14590	R	–	INT16U	1–9	Application rotary switch current position: • 1 = position 1 • 2 = position 2 • 3 = position 3 • 4 = position 4 • 5 = position 5 • 6 = position 6 • 7 = position 7 • 8 = position 8 • 9 = position 9
0x38FE	14591	R	–	INT16U	0–1	Remote setup padlock position: • 0 = Unlock • 1 = Lock
0x38FF	14592	R	–	INT16U	0–1	Dip switch1 position: • 0 = IO 1 • 1 = IO 2
0x3900	14593	R	–	–	–	Reserved
0x3901	14594	R	–	INT16U	1–9	Last validated application set by the test button located on the front of the IO module: • 1 = position 1 • 2 = position 2 • 3 = position 3 • 4 = position 4 • 5 = position 5 • 6 = position 6 • 7 = position 7 • 8 = position 8 • 9 = position 9
0x3902– 0x3904	14595– 14597	–	–	–	–	Reserved

Digital Input and Output Status

Addresses and Registers List

The following table describes the digital inputs and outputs status addresses, and registers regarding the IO module.

IO Module	Addresses	Registers
IO 1	0x3905–0x3908	14598–14601
IO 2	0x44BD–0x44C0	17598–17601

Digital Input and Output Status Registers for IO 1

The order and the description of the digital input and output status registers for IO 2 are the same as those of IO 1.

Address	Register	RW	Unit	Type	Range	Bit	Description
0x3905	14598	R	–	INT16U	–	–	Quality of each bit of register 14599: • 0 = Invalid • 1 = Valid
0x3906	14599	R	–	INT16U	–	–	Digital input status register: • Input status = 0 when input is OFF • Input status = 1 when input is ON
						0	I1 status
						1	I2 status
						2	I3 status
						3	I4 status
						4	I5 status
						5	I6 status
						6–15	Reserved
0x3907	14600	R	–	INT16U	–	–	Quality of each bit of register 14601: • 0 = Invalid • 1 = Valid
0x3908	14601	R–WC	–	INT16U	–	–	Digital output status register: • Output status = 0 when output is OFF • Output status = 1 when output is ON
						0	O1 status
						1	O2 status
						2	O3 status
						3–15	Reserved

IO Module Identification

Introduction

The order and the description of the IO module identification registers for IO 2 are the same as those of IO 1.

Addresses and Registers List

The following table describes the identification addresses, and registers regarding the IO module.

IO Module	Addresses	Registers
IO 1	0x392F–0x3982	14640–14723
IO 2	0x44E7–0x453A	17640–17723

IO Hardware Revision

The hardware revision is an ASCII string using the format XXX.YYY.ZZZ with:

- XXX = major version (000–127)
- YYY = minor version (000–255)
- ZZZ = revision number (000–255)

The NULL character ends the revision number.

Address	Register	RW	Unit	Type	Range	Description
0x3961–0x3966	14690–14695	R	–	OCTET STRING	–	Hardware revision

IO Module Firmware Revision

The hardware revision is an ASCII string using the format XXX.YYY.ZZZ with:

- XXX = major version (000–127)
- YYY = minor version (000–255)
- ZZZ = revision number (000–255)

The NULL character ends the revision number.

Address	Register	RW	Unit	Type	Range	Description
0x3967–0x396C	14696–14701	R	–	OCTET STRING	–	Firmware revision

Current Date and Time

Address	Register	RW	Unit	Type	Range	Description
0x396D–0x3970	14702–14705	R	–	DATETIME	–	Current date and time of the IO module in DATETIME format. The value is automatically updated when the DATETIME of IFM interface is set.

Serial Number

The IO 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 = production number of the device on the day (0001–9999)

A read request of six registers is necessary to read the IO module serial number.

Address	Register	RW	Unit	Type	Range	Description
0x3971–0x397A	14706-14715	R	–	OCTET STRING	–	Serial number
0x3971	14706	R	–	OCTET STRING	–	'PP'
0x3972	14707	R	–	OCTET STRING	'05'–'99'	'YY'
0x3973	14708	R	–	OCTET STRING	'01'–'53'	'WW'
0x3974	14709	R	–	OCTET STRING	'10'–'79'	'Dn'
0x3975	14710	R	–	OCTET STRING	'00'–'99'	'nn'
0x3976	14711	R	–	OCTET STRING	'0'–'9'	'n' (the NULL character ends the serial number)

Manufacturing Date and Time

Address	Register	RW	Unit	Type	Range	Description
0x397B–0x397E	14716–14719	R	–	DATETIME	–	Manufacturing date and time

Product Identification

Address	Register	RW	Unit	Type	Range	Description
0x392F	14640	R	–	INT16U	15150	Product identification = 15150 for the IO module
0x3930	14641	–	–	–	–	Reserved
0x397F–0x3982	14720–14723	R	–	OCTET STRING	–	Product code = 'LV434063'
0x3D1C–0x3D3B	15645–15676	R–WC	–	OCTET STRING	–	User application name
0x3D3C–0x3D45	15677–15686	R	–	OCTET STRING	–	Vendor name = 'Schneider Electric'
0x3D46–0x3D4D	15687–15694	R	–	OCTET STRING	–	Product range: 'Enerlinx'
0x3D4E–0x3D5D	15695–15710	R	–	OCTET STRING	–	Device family: 'IO device'
0x3D5E–0x3D65	15711–15718	R	–	OCTET STRING	–	Product model

Alarm Status

Addresses and Registers List

The following table describes the alarm status addresses, and registers regarding the IO module.

IO Module	Addresses	Registers
IO 1	0x3989–0x39A6	14730–14759
IO 2	0x4541–0x455E	17730–17759

Generic Alarm Status for IO 1

The order and the description of the generic alarm status registers for IO 2 are the same as those of IO 1.

Address	Register	RW	Unit	Type	Range	Bit	Description
0x3989	14730	R	–	INT16U	–	–	Quality of each bit of register 14731: • 0 = Invalid • 1 = Valid
0x398A	14731	R	–	INT16U	–	–	IO module history format register
						0	ULP format
						1	TI086 format
						2–15	Reserved
0x398B	14732	R	–	INT16U	–	–	Quality of each bit of register 14733: • 0 = Invalid • 1 = Valid
0x398C	14733	R	–	INT16U	–	–	IO module command type Factory setting = 3, both write command mechanisms are enabled.
						0	1 = Complex commands
						1	1 = Simple commands Simple commands can be disabled by sending a command
						2–15	Reserved
0x398D–0x3992	14734–14739	–	–	–	–	–	Reserved
0x3993	14740	R	–	INT16U	–	–	Quality of each bit of register 14741: • 0 = Invalid • 1 = Valid
0x3994	14741	R	–	INT16U	–	–	IO module generic alarm 1 status register.
						0	IO module in STOP mode: IO module is not working and must be replaced.
						1	IO module in ERROR mode: IO module is working in degraded mode.
						2	Threshold overrun on I1 counter
						3	Threshold overrun on I2 counter
						4	Threshold overrun on I3 counter
						5	Threshold overrun on I4 counter
						6	Threshold overrun on I5 counter
						7	Threshold overrun on I6 counter
						8	Threshold overrun on O1 counter
						9	Threshold overrun on O2 counter
						10	Threshold overrun on O3 counter

Address	Register	RW	Unit	Type	Range	Bit	Description
						11	Switchboard temperature threshold 1 overrun
						12	Switchboard temperature threshold 2 overrun
						13	Switchboard temperature threshold 3 overrun
						14–15	Reserved
0x3995	14742	R	–	INT16U	–	–	Quality of each bit of register 14743: • 0 = Invalid • 1 = Valid
0x3996	14743	R	–	INT16U	–	–	IO module generic alarm 2 status register.
						0	User-defined input 1 alarm
						1	User-defined input 2 alarm
						2	User-defined input 3 alarm
						3	User-defined input 4 alarm
						4	User-defined input 5 alarm
						5	User-defined input 6 alarm
						6–15	Reserved

Cradle Management Alarms for IO 1

Address	Register	RW	Unit	Type	Range	Bit	Description
0x3997	14744	R	–	INT16U	–	–	Quality of each bit of register 14745: • 0 = Invalid • 1 = Valid
0x3998	14745	R	–	INT16U	–	–	Cradle management alarms register
						0	Cradle position discrepancy
						1	Remove device from cradle and put it back
						2	Cradle has reached its maximum number of operations
						3	Remaining service life of cradle is below alarm threshold
						4	New ETV trip system has been detected
						5–7	Reserved
						8	Drawer position discrepancy
						9–15	Reserved

Motor Alarms for IO 1

Address	Register	RW	Unit	Type	Range	Bit	Description
0x3999	14746	R	–	INT16U	–	–	Quality of each bit of register 14747: • 0 = Invalid • 1 = Valid
0x399A	14747	R	–	INT16U	–	–	IO motor alarms
						0–15	Reserved

Miscellaneous Application Alarms for IO 1

Address	Register	RW	Unit	Type	Range	Bit	Description
0x399B	14748	R	–	INT16U	–	–	Quality of each bit of register 14749: • 0 = Invalid • 1 = Valid
0x399C	14749	R	–	INT16U	–	–	Other application alarms register
						0	Auxiliary contact of load contactor 1 is not closed.
						1	Auxiliary contact of load contactor 1 is not opened.
						2–15	Reserved
0x399D	14750	R	–	INT16U	–	–	Quality of each bit of register 14751: • 0 = Invalid • 1 = Valid
0x399E	14751	R	–	INT16U	–	–	Predefined input alarms register
						0	Reserved
						1	Control voltage presence contact
						2	Surge protection status contact
						3	Surge failure contact
						4	Switch-disconnector ON/OFF indication contact (OF)
						5	Fuse blown indication contact
						6	Emergency stop
						7	Switchboard temperature contact
						8	Switchboard ventilation contact
						9	Switchboard door contact
						10–15	Reserved
0x399F	14752	R	–	INT16U	–	–	Quality of each bit of register 14753: • 0 = Invalid • 1 = Valid
0x39A0	14753	R	–	INT16U	–	–	IO module discrepancy alarms register
						0	Critical hardware discrepancy
						1	Critical firmware discrepancy
						2	Non-critical hardware discrepancy
						3	Non-critical firmware discrepancy
						4–15	Reserved
0x39A1–0x39A6	14754–14759	–	–	–	–	–	Reserved

Applications

IO Application Status

Address	Register	RW	Unit	Type	Range	Bit	Description
0x3927	14632	R	–	INT16U	–	0	Cradle application enabled or disabled: • 0 = Disabled • 1 = Enabled
						1–15	Reserved
0x3928	14633	R	–	INT16U	–	–	Quality of each bit of register 14632: • 0 = Invalid • 1 = Valid

Cradle Management

The table describes the registers related to the cradle management application performed by IO 1 (predefined or user defined application).

The registers 18300–18329 are related to the cradle management application performed by IO 2 (predefined or user defined application).

Address	Register	RW	Unit	Type	Range	Bit	Description
0x3BC3	15300	R-RC	–	INT16U	–	–	Quality of each bit of register 15301: • 0 = Invalid • 1 = Valid
0x3BC4	15301	R-RC	–	INT16U	–	–	Cradle status
						0–7	Reserved
						8	Device in disconnected position (CD)
						9	Device in connected position (CE)
						10	Device in the test position (CT)
						11–15	Reserved
0x3BC5–0x3BC6	15302–15303	R-RC-WC	–	INT32U	0–65534	–	Cradle connected position counter. This counter increments for each rising edge of the cradle connected position
0x3BC7–0x3BC8	15304–15305	R-RC-WC	–	INT32U	0–65534	–	Cradle disconnected position counter . This counter increments for each rising edge of the cradle disconnected position
0x3BC9–0x3BCA	15306–15307	R-RC-WC	–	INT32U	0–65534	–	Cradle test position counter. This counter increments for each rising edge of the cradle test position
0x3BCB–0x3BCE	15308–15311	R-RC	–	DATETIME	–	–	Time-stamp of the last change for the cradle connected position
0x3BCF–0x3BD2	15312–15315	R-RC	–	DATETIME	–	–	Time-stamp of the last change for the cradle disconnected position
0x3BD3–0x3BD6	15316–15319	R-RC	–	DATETIME	–	–	Time-stamp of the last change for the cradle test position
0x3BD7–0x3BD8	15320–15321	R-WC	s	INT32U	–	–	Operating time since last grease maintenance
0x3BD9–0x3BDA	15322–15323	R-WC	s	INT32U	–	–	Operating time since last move connected position
0x3BDB	15324	R	–	INT16U	0-65534	–	Cradle contact regrease counter
0x3BDC–0x3BE0	15325–15329	–	–	–	–	–	Reserved

Light Control

The table describes the registers related to the Light control predefined application performed by IO 1.

The registers 18400–18409 are related to the Light control predefined application performed by IO 2.

Address	Register	RW	Unit	Type	Range	Description
0x3C27	15400	R	–	INT16U	0–1	Quality of register 15401: • 0 = Invalid • 1 = Valid (application is configured and running)
0x3C28	15401	R	–	INT16U	0–1	Light status: • 0 = Reset/OFF • 1 = Set/ON
0x3C29–0x3C2A	15402–15403	R	s	INT32U	0–54000	Remaining time in ON or OFF state (depending of the light status)
0x3C2B	15404	R	–	INT16U	0–2	Light simple command(1): • 0 = No command • 1 = Light OFF • 2 = Light ON
0x3C2C–0x3C30	15405–15409	–	–	–	–	Reserved
(1) Simple command means the value is controlled using a register. If simple commands are disabled, the use of a command interface is needed.						

Load Control

The table describes the registers related to the Load control predefined application performed by IO 1.

The registers 18410–18419 are related to the Load control predefined application performed by IO 2.

Address	Register	RW	Unit	Type	Range	Description
0x3C31	15410	R	–	INT16U	0–1	Quality of register 15411: • 0 = Invalid • 1 = Valid (application is configured and running)
0x3C32	15411	R	–	INT16U	0–1	Load status: • 0 = Reset/OFF • 1 = Set/ON
0x3C33–0x3C34	15412–15413	R	s	INT32U	0–54000	Remaining time in ON or OFF state (depending of the load status)
0x3C35	15414	R	–	INT16U	0–2	Load simple command(1): • 0 = No command • 1 = Load OFF • 2 = Load ON
0x3C36–0x3EEC	15415–16109	–	–	–	–	Reserved
(1) Simple command means the value is controlled using a register. If simple commands are disabled, the use of a command interface is needed.						

IO Module Events

What's in This Chapter

Event History

General Description

The event history registers describe the last 100 encountered events. The event history format corresponds to a series of 100 records. Each record is composed of five registers describing one event.

A read request of 5x(n) registers is necessary to read the last n event records, where 5 is the number of registers for each event record.

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

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

There are two event histories, 1 per IO module.

IO Module	Address	Register	Description
IO 1	0x39A7–0x39AB	14760–14764	Event record 1 (most recent event record)
	0x39AC–0x39B0	14765–14769	Event record 2
	0x39A7+5x(n-1)–0x39AB+5x(n-1)	14760+5x(n-1)–14764+5x(n-1)	Event record n
	0x3B96–0x3B9A	15255–15259	Event record 100
IO 2	0x455F–0x4563	17760–17764	Event record 1 (most recent event record)
	0x4564–0x4568	17765–17769	Event record 2
	0x455F+5x(n-1)–0x4563+5x(n-1)	17760+5x(n-1)–17764+5x(n-1)	Event record n
	0x474E–0x4752	18255–18259	Event record 100

Event Record

A block request of five registers is necessary to read an event record. The order and the description of the event record registers of IO 2 are the same as those of IO 1:

Event Record 1 (Most Recent Event Record)				
Register	**Address**	**RW**	**Type**	**Description**
0x39A7	14760	R	INT16U	Event code of IO 1 and IO 2 (refer to IO Module Events and Alarms, page 114)
0x39A8– 0x39AA	14761– 14763	R	ULP DATE	Date and time of the event (refer to Data Type: ULP DATE, page 45)
0x39AB	14764	R	INT16U	Event type MSB = 0 (reserved) Event occurrence: LSB = 1 Event completion: LSB = 2

Alarm Definition

Alarms are specific events that need to be reset.

The reset mode of an alarm can be:

- automatic: the alarm is reset automatically when the alarm is no more active.
- manual: the alarm is reset manually with the **Test/Reset** pushbutton located on the front face of the IO module and when the alarm is no more active.
- remote: the alarm is reset remotely with the Reset command sent via the communication and when the alarm is no more active.

IO Module Events and Alarms

IO 1 Events and Alarms

Code	Application	Description	Type	Priority	Reset Mode
1537 (0x0601)	General	IO1 Watchdog reset	Event	Medium	–
1538 (0x0602)	General	IO1 reset to factory setting	Event	Medium	–
1539 (0x0603)	General	IO1 failure (STOP mode)	Alarm	High	Manual or Remote
1540 (0x0604)	General	IO1 failure (ERROR mode)	Alarm	Medium	Manual or Remote
1541 (0x0605)	General	IO1 functional rotary switch position change	Event	Medium	–
1542 (0x0606)	General	IO1 setting locking pad rotary switch position change	Event	Medium	–
1543 (0x0607)	General	IO1 source address dip switch position change	Event	Medium	–
1552 (0x0610)	General	IO1 O1 rising edge (OFF/ON change)	Event	Low	–
1553 (0x0611)	General	IO1 O2 rising edge (OFF/ON change)	Event	Low	–
1554 (0x0612)	General	IO1 O3 rising edge (OFF/ON change)	Event	Low	–
1555 (0x0613)	General	IO1 I1 rising edge (OFF/ON change)	Event	Low	–
1556 (0x0614)	General	IO1 I2 rising edge (OFF/ON change)	Event	Low	–
1557 (0x0615)	General	IO1 I3 rising edge (OFF/ON change)	Event	Low	–
1558 (0x0616)	General	IO1 I4 rising edge (OFF/ON change)	Event	Low	–
1559 (0x0617)	General	IO1 I5 rising edge (OFF/ON change)	Event	Low	–
1560 (0x0618)	General	IO1 I6 rising edge (OFF/ON change)	Event	Low	–
1561 (0x0619)	General	IO1 threshold overrun on I1 counter	Alarm	Medium	Manual or Remote
1562 (0x061A)	General	IO1 threshold overrun on I2 counter	Alarm	Medium	Manual or Remote
1563 (0x061B)	General	IO1 threshold overrun on I3 counter	Alarm	Medium	Manual or Remote
1564 (0x061C)	General	IO1 threshold overrun on I4 counter	Alarm	Medium	Manual or Remote
1565 (0x061D)	General	IO1 threshold overrun on I5 counter	Alarm	Medium	Manual or Remote
1566 (0x061E)	General	IO1 threshold overrun on I6 counter	Alarm	Medium	Manual or Remote
1567 (0x061F)	General	IO1 threshold overrun on O1 counter	Alarm	Medium	Manual or Remote
1568 (0x0620)	General	IO1 threshold overrun on O2 counter	Alarm	Medium	Manual or Remote
1569 (0x0621)	General	IO1 threshold overrun on O3 counter	Alarm	Medium	Manual or Remote
1570 (0x0622)	General	IO1 I1 unforced/forced change	Event	Low	–
1571 (0x0623)	General	IO1 I2 unforced/forced change	Event	Low	–
1572 (0x0624)	General	IO1 I3 unforced/forced change	Event	Low	–
1573 (0x0625)	General	IO1 I4 unforced/forced change	Event	Low	–
1574 (0x0626)	General	IO1 I5 unforced/forced change	Event	Low	–
1575 (0x0627)	General	IO1 I6 unforced/forced change	Event	Low	–
1576 (0x0628)	General	IO1 O1 unforced/forced change	Event	Low	–
1577 (0x0629)	General	IO1 O2 unforced/forced change	Event	Low	–
1578 (0x062A)	General	IO1 O3 unforced/forced change	Event	Low	–
1579 (0x062B)	User-defined input acquisition	IO1 user-defined input 1	Alarm	Medium	Manual or Remote
1580 (0x062C)	User-defined input acquisition	IO1 user-defined input 2	Alarm	Medium	Manual or Remote
1581 (0x062D)	User-defined input acquisition	IO1 user-defined input 3	Alarm	Medium	Manual or Remote

Code	Application	Description	Type	Priority	Reset Mode
1582 (0x062E)	User-defined input acquisition	IO1 user-defined input 4	Alarm	Medium	Manual or Remote
1583 (0x062F)	User-defined input acquisition	IO1 user-defined input 5	Alarm	Medium	Manual or Remote
1584 (0x0630)	User-defined input acquisition	IO1 user-defined input 6	Alarm	Medium	Manual or Remote
1585 (0x0631)	Cooling system	IO1 switchboard temperature threshold 1 overrun	Alarm	Low	Auto
1586 (0x0632)	Cooling system	IO1 switchboard temperature threshold 2 overrun	Alarm	Medium	Manual or Remote
1587 (0x0633)	Cooling system	IO1 switchboard temperature threshold 3 overrun	Alarm	High	Manual or Remote

IO 2 Events and Alarms

Code	Application	Description	Type	Priority	Reset Mode
1793 (0x0701)	General	IO2 watchdog reset	Event	Medium	–
1794 (0x0702)	General	IO2 reset to factory settings	Event	Medium	–
1795 (0x0703)	General	IO2 module failure (STOP mode)	Alarm	High	Manual or Remote
1796 (0x0704)	General	IO2 module failure (ERROR mode)	Alarm	Medium	Manual or Remote
1797 (0x0705)	General	IO2 functional rotary switch position change	Event	Medium	–
1798 (0x0706)	General	IO2 setting locking pad rotary switch position change	Event	Medium	–
1799 (0x0707)	General	IO2 source address dip switch position change	Event	–	–
1808 (0x0710)	General	IO2 O1 rising edge (OFF/ON change)	Event	Low	–
1809 (0x0711)	General	IO2 O2 rising edge (OFF/ON change)	Event	Low	–
1810 (0x0712)	General	IO2 O3 rising edge (OFF/ON change)	Event	Low	–
1811 (0x0713)	General	IO2 I1 rising edge (OFF/ON change)	Event	Low	–
1812 (0x0714)	General	IO2 I2 rising edge (OFF/ON change)	Event	Low	–
1813 (0x0715)	General	IO2 I3 rising edge (OFF/ON change)	Event	Low	–
1814 (0x0716)	General	IO2 I4 rising edge (OFF/ON change)	Event	Low	–
1815 (0x0717)	General	IO2 I5 rising edge (OFF/ON change)	Event	Low	–
1816 (0x0718)	General	IO2 I6 rising edge (OFF/ON change)	Event	Low	–
1817 (0x0719)	General	IO2 threshold overrun on I1 counter	Alarm	Medium	Manual or Remote
1818 (0x071A)	General	IO2 threshold overrun on I2 counter	Alarm	Medium	Manual or Remote
1819 (0x071B)	General	IO2 threshold overrun on I3 counter	Alarm	Medium	Manual or Remote
1820 (0x071C)	General	IO2 threshold overrun on I4 counter	Alarm	Medium	Manual or Remote
1821 (0x071D)	General	IO2 threshold overrun on I5 counter	Alarm	Medium	Manual or Remote
1822 (0x071E)	General	IO2 threshold overrun on I6 counter	Alarm	Medium	Manual or Remote
1823 (0x071F)	General	IO2 threshold overrun on O1 counter	Alarm	Medium	Manual or Remote
1824 (0x0720)	General	IO2 threshold overrun on O2 counter	Alarm	Medium	Manual or Remote
1825 (0x0721)	General	IO2 threshold overrun on O3 counter	Alarm	Medium	Manual or Remote
1826 (0x0722)	General	IO2 I1 unforced/forced change	Event	Low	–
1827 (0x0723)	General	IO2 I2 unforced/forced change	Event	Low	–
1828 (0x0724)	General	IO2 I3 unforced/forced change	Event	Low	–
1829 (0x0725)	General	IO2 I4 unforced/forced change	Event	Low	–

Code	Application	Description	Type	Priority	Reset Mode
1830 (0x0726)	General	IO2 I5 unforced/forced change	Event	Low	–
1831 (0x0727)	General	IO2 I6 unforced/forced change	Event	Low	–
1832 (0x0728)	General	IO2 O1 unforced/forced change	Event	Low	–
1833 (0x0729)	General	IO2 O2 unforced/forced change	Event	Low	–
1834 (0x072A)	General	IO2 O3 unforced/forced change	Event	Low	–
1835 (0x072B)	User-defined input acquisition	IO2 user-defined input 1	Alarm	Medium	Manual or Remote
1836 (0x072C)	User-defined input acquisition	IO2 user-defined input 2	Alarm	Medium	Manual or Remote
1837 (0x072D)	User-defined input acquisition	IO2 user-defined input 3	Alarm	Medium	Manual or Remote
1838 (0x072E)	User-defined input acquisition	IO2 user-defined input 4	Alarm	Medium	Manual or Remote
1839 (0x072F)	User-defined input acquisition	IO2 user-defined input 5	Alarm	Medium	Manual or Remote
1840 (0x0730	User-defined input acquisition	IO2 user-defined input 6	Alarm	Medium	Manual or Remote
1841 (0x0731)	Cooling system	IO2 switchboard temperature threshold 1 overrun	Alarm	Low	Auto
1842 (0x0732)	Cooling system	IO2 switchboard temperature threshold 2 overrun	Alarm	Medium	Manual or Remote
1843 (0x0733)	Cooling system	IO2 switchboard temperature threshold 3 overrun	Alarm	High	Manual or Remote

NOTE: The alarm exit priority is fixed in IO firmware. The value is Low, when available.

IO 1 and IO 2 Events and Alarms

Code	Application	Description	Type	Priority	Reset Mode
2304 (0x0900)	Cradle management	Cradle position discrepancy	Alarm	Medium	Manual or Remote
2305 (0x0901)	Cradle management	Cradle connected contact change	Alarm	Low	Manual or Remote
2306 (0x0902)	Cradle management	Cradle disconnected contact change	Alarm	Low	Manual or Remote
2307 (0x0903)	Cradle management	Cradle test contact change	Alarm	Low	Manual or Remote
2308 (0x0904)	Cradle management	Remove device from cradle and put it back	Alarm	Medium	Manual or Remote
2309 (0x0905)	Cradle management	Cradle has reached its maximum number of operations	Alarm	High	Manual or Remote
2310 (0x0906)	Cradle management	Remaining service life of cradle is below alarm threshold	Alarm	Medium	Manual or Remote
2311 (0x0907)	Cradle management	New ETV control unit has been detected.	Alarm	High	Manual or Remote
2560 (0x0A00)	Load control	Auxiliary contact of the load contactor 1 is not closed	Alarm	Medium	Manual or Remote
2561 (0x0A01)	Load control	Auxiliary contact of the load contactor 1 is not opened	Alarm	Medium	Manual or Remote
2817 (0x0B01)	Predefined input acquisition	Control voltage presence contact	Alarm	Medium	Manual or Remote
2818 (0x0B02)	Predefined input acquisition	Surge protection status contact	Alarm	Medium	Manual or Remote
2819 (0x0B03)	Predefined input acquisition	Surge failure contact	Alarm	Medium	Manual or Remote
2820 (0x0B04)	Predefined input acquisition	Switch-disconnector ON/OFF indication contact (OF)	Alarm	Medium	Manual or Remote

Code	Application	Description	Type	Priority	Reset Mode
2821 (0x0B05)	Predefined input acquisition	Fuse blown indication contact	Alarm	Medium	Manual or Remote
2822 (0x0B06)	Predefined input acquisition	Emergency stop	Alarm	High	Manual or Remote
2823 (0x0B07)	Cooling system	Switchboard temperature contact	Alarm	Medium	Manual or Remote
2824 (0x0B08)	Cooling system	Switchboard ventilation contact	Alarm	Medium	Manual or Remote
2825 (0x0B09)	Cooling system	Switchboard door contact	Alarm	Medium	Manual or Remote
3328 (0x0D00)	General	Critical hardware modules discrepancy	Alarm	High	Auto
3329 (0x0D01)	General	Critical firmware modules discrepancy	Alarm	High	Auto
3330 (0x0D02)	General	Non-critical hardware modules discrepancy	Alarm	Medium	Auto
3331 (0x0D03)	General	Non-critical firmware modules discrepancy	Alarm	Medium	Auto

IO Module Commands

What's in This Chapter

List of IO Module Commands

List of Commands

There are two types of command:

- generic commands, which work independently of the application selected.
- application commands, which are dedicated to an application. A command is only valid if the related application is configured.

The following table lists the available IO module commands, their corresponding application, command codes and user profiles. Follow the command execution procedures accordingly. (refer to Executing a Command, page 31).

Application	Command	Command code	User profile
Generic	Change output state (refer to Change Output State, page 119)	1672	Administrator or Operator
Generic	Reset IO module alarms (refer to Reset IO Module Alarm, page 119)	41099	Administrator or Operator
Generic	Enable/Disable simple commands (refer to Enable/Disable Simple Commands, page 119)	41100	Administrator or Operator
Generic	Acknowledge latched output (refer to Acknowledge Latched Output, page 120)	41102	Administrator or Operator
Generic	Reset analog input minimum/maximum values (refer to Reset Analog Input Minimum/Maximum Values, page 120)	42890	Administrator or Operator
Cradle management	Preset cradle counters (refer to Preset Cradle Counters, page 121)	41352	Administrator or Operator
Cradle management	Preset cradle regrease timers (refer to Preset Regrease Timers, page 121)	41353	Administrator or Operator
Light control	Light control (refer to Light Control, page 122)	42120	Administrator or Operator
Load control	Load control (refer to Load Control, page 122)	42376	Administrator or Operator
Pulse counter management	Preset input pulse counter (refer to Preset Input Pulse Counters, page 123)	42888	Administrator or Operator
Cooling system	Preset switchboard temperature threshold counter (refer to Preset Switchboard Temperature Threshold Counters, page 123)	42889	Administrator or Operator

IO Module Error Codes

The error codes generated by the IO module are the generic error codes (refer to Result of the Command, page 34).

Generic Commands

Change Output State

To change the output state, set the command registers in the following way:

Address	Register	Unit	Type	Range	Description
0x1F3F	8000	–	INT16U	1672	Command code = **1672**
0x1F40	8001	–	INT16U	13	Number of parameters (bytes) = 13
0x1F41	8002	–	INT16U	–	Destination = • IO 1: 8193 (0x2001) • IO 2: 8449 (0x2101)
0x1F42	8003	–	INT16U	1	Security type of the command
0x1F43–0x1F44	8004–8005	–	OCTET STRING	–	Password of the command: Administrator or Operator user profile password
0x1F45	8006	–	INT16U	1–3	Output number: • 1 = output 1 • 2 = output 2 • 3 = output 3
0x1F46	8007	–	INT16U	–	Value to set: • 0x0000 = Change output state to 0 (OFF) • 0x0100 = Change output state to 1 (ON)

Reset IO Module Alarm

The alarms can be read from the alarm status register (refer to Alarm Status, page 106).

To reset IO module alarms, set the command registers in the following way:

Address	Register	Unit	Type	Range	Description
0x1F3F	8000	–	INT16U	41099	Command code = **41099**
0x1F40	8001	–	INT16U	10	Number of parameters (bytes) = 10
0x1F41	8002	–	INT16U	–	Destination = • IO 1: 8193 (0x2001) • IO 2: 8449 (0x2101)
0x1F42	8003	–	INT16U	1	Security type of the command
0x1F43–0x1F44	8004–8005	–	OCTET STRING	–	Password of the command: Administrator or Operator user profile password

Enable/Disable Simple Commands

To enable or disable the simple commands, set the command registers in the following way:

Address	Register	Unit	Type	Range	Description
0x1F3F	8000	–	INT16U	41100	Command code = **41100**
0x1F40	8001	–	INT16U	11	Number of parameters (bytes) = 11
0x1F41	8002	–	INT16U	–	Destination = • IO 1: 8193 (0x2001) • IO 2: 8449 (0x2101)
0x1F42	8003	–	INT16U	1	Security type of the command

Address	Register	Unit	Type	Range	Description
0x1F43–0x1F44	8004–8005	–	OCTET STRING	–	Password of the command: Administrator or Operator user profile password
0x1F45	8006	–	INT16U	–	MSB: Enable or disable: • 0 = Disable simple command • 1 = Enable simple command LSB: 0 (not used)

Acknowledge Latched Output

To acknowledge the latched output, set the command registers in the following way:

Address	Register	Unit	Type	Range	Description
0x1F3F	8000	–	INT16U	41102	Command code = **41102**
0x1F40	8001	–	INT16U	11	Number of parameters (bytes) = 11
0x1F41	8002	–	INT16U	–	Destination = • IO 1: 8193 (0x2001) • IO 2: 8449 (0x2101)
0x1F42	8003	–	INT16U	1	Security type of the command
0x1F43–0x1F44	8004–8005	–	OCTET STRING	–	Password of the command: Administrator or Operator user profile password
0x1F45	8006	–	INT16U	–	MSB: • 0x01 = Digital output relay 1 • 0x02 = Digital output relay 2 • 0x03 = Digital output relay 3 • 0xFF = Unlatch all digital output LSB: 0 (not used)

Reset Analog Input Minimum/Maximum Values

The analog input maximum and minimum values can be read from the analog input registers (refer to Analog Input Registers of IO 1, page 95).

To reset the minimum/maximum analog input values, set the command registers in the following way:

Address	Register	Unit	Type	Range	Description
0x1F3F	8000	–	INT16U	42890	Command code = **42890**
0x1F40	8001	–	INT16U	10	Number of parameters (bytes) = 10
0x1F41	8002	–	INT16U	–	Destination = • IO 1: 8193 (0x2001) • IO 2: 8449 (0x2101)
0x1F42	8003	–	INT16U	1	Security type of the command
0x1F43–0x1F44	8004–8005	–	OCTET STRING	–	Password of the command: Administrator or Operator user profile password

Application Commands

Preset Cradle Counters

The cradle counter values can be read from the cradle management registers (refer to Cradle Management, page 109).

To preset the cradle counters, set the command registers in the following way:

Address	Register	Unit	Type	Range	Description
0x1F3F	8000	–	INT16U	41352	Command code = **41352**
0x1F40	8001	–	INT16U	16	Number of parameters (bytes) = 16
0x1F41	8002	–	INT16U	–	Destination = • IO 1: 8193 (0x2001) • IO 2: 8449 (0x2101)
0x1F42	8003	–	INT16U	1	Security type of the command
0x1F43–0x1F44	8004–8005	–	OCTET STRING	–	Password of the command: Administrator or Operator user profile password
0x1F45	8006	–	INT16U	0–65535	Connected counter reset/preset: • 0–65534 = preset value of the connected counter • 65535 (0xFFFF) = do not preset the connected counter
0x1F46	8007	–	INT16U	0–65535	Disconnected counter reset/preset: • 0–65534 = preset value of the disconnected counter • 65535 (0xFFFF) = do not preset the disconnected counter
0x1F47	8008	–	INT16U	0–65535	Test counter reset/preset: • 0–65534 = preset value of the test counter • 65535 (0xFFFF) = do not preset the test counter

Preset Regrease Timers

To preset regrease timers, set the command registers in the following way:

Address	Register	Unit	Type	Range	Description
0x1F3F	8000	–	INT16U	41353	Command code = **41353**
0x1F40	8001	–	INT16U	18	Number of parameters (bytes) = 18
0x1F41	8002	–	INT16U	–	Destination = • IO 1: 8193 (0x2001) • IO 2: 8449 (0x2101)
0x1F42	8003	–	INT16U	1	Security type of the command
0x1F43–0x1F44	8004–8005	–	OCTET STRING	–	Password of the command: Administrator or Operator user profile password
0x1F45–0x1F46	8006–8007	–	INT16U	–	Operating time since last grease maintenance • 0–157766400 = preset value of regrease timer counter • 4294967295 (0xFFFFFFFF) = No preset
0x1F47–0x1F48	8008–8009	–	INT32U	–	Operating time since last move in rack in position (delay from last disconnection) • 0–28944000 = preset value of remove timer • 4294967295 (0xFFFFFFFF) = No preset

Light Control

The light command status can be read from the light control registers (refer to Light Control, page 110).

To control the light, set the command registers in the following way:

Address	Register	Unit	Type	Range	Bit	Description
0x1F3F	8000	–	INT16U	42120	–	Command code = **42120**
0x1F40	8001	–	INT16U	13	–	Number of parameters (bytes) = 13
0x1F41	8002	–	INT16U	–	–	Destination = IO 1: 8193 (0x2001)
0x1F42	8003	–	INT16U	1	–	Security type of the command
0x1F43–0x1F44	8004–8005	–	OCTET STRING	–	–	Password of the command: Administrator or Operator user profile password
0x1F45	8006	–	INT16U	–	–	MSB: State
					0	• 0 = Light OFF • 1 = Light ON
					1	• 0 = without time delay • 1 = with time delay
					–	LSB = Timer (MSB) 1–54000 seconds (if bit 1 in set state) Any value 0–0xffff (if bit 1 in reset state)
0x1F46	8007	–	INT16U	–	–	MSB = Timer (LSB) 1–54000 seconds (if bit 1 is in set state) Any value 0–0xffff (if bit 1 is in reset state) LSB = 0 (not used)

Load Control

The load command status can be read from the load control registers (refer to Load Control, page 110).

To control the load, set the command registers in the following way:

Address	Register	Unit	Type	Range	Bit	Description
0x1F3F	8000	–	INT16U	42376	–	Command code = **42376**
0x1F40	8001	–	INT16U	13	–	Number of parameters (bytes) = 13
0x1F41	8002	–	INT16U	–	–	Destination = IO 1: 8193 (0x2001)
0x1F42	8003	–	INT16U	1	–	Security type of the command
0x1F43–0x1F44	8004–8005	–	OCTET STRING	–	–	Password of the command: Administrator or Operator user profile password
0x1F45	8006	–	INT16U	–	–	MSB: State
					0	• 0 = Load OFF • 1= Load ON
					1	• 0 = without time delay • 1= with time delay
					–	LSB = Timer (MSB) 1–54000 seconds (if bit 1 in set state) Any value 0–0xffff (if bit 1 in reset state)
0x1F46	8007	–	INT16U	–	–	MSB = Timer (LSB) 1–54000 seconds (if bit 1 in set state) Any value 0–0xffff (if bit 1 in reset state)
					–	LSB = 0 (not used)

Preset Input Pulse Counters

To preset pulse counters, set the command registers in the following way:

Address	Register	Unit	Type	Range	Description
0x1F3F	8000	–	INT16U	42888	Command code = **42888**
0x1F40	8001	–	INT16U	34	Number of parameters (bytes) = 34
0x1F41	8002	–	INT16U	–	Destination = • IO 1: 8193 (0x2001) • IO 2: 8449 (0x2101)
0x1F42	8003	–	INT16U	1	Security type of the command
0x1F43–0x1F44	8004–8005	–	OCTET STRING	–	Password of the command: Administrator or Operator user profile password
0x1F45–0x1F46	8006–8007	–	INT32U	0–4294967295	I1 pulse counter reset/preset: • 0–4294967294 = preset value of the I1 pulse counter • 4294967295 (0xFFFFFFFF) = do not preset the I1 pulse counter
0x1F47–0x1F48	8008–8009	–	INT32U	0–4294967295	I2 pulse counter reset/preset: • 0–4294967294 = preset value of the I2 pulse counter • 4294967295 (0xFFFFFFFF) = do not preset the I2 pulse counter
0x1F49–0x1F4A	8010–8011	–	INT32U	0–4294967295	I3 pulse counter reset/preset: • 0–4294967294 = preset value of the I3 pulse counter • 4294967295 (0xFFFFFFFF) = do not preset the I3 pulse counter
0x1F4B–0x1F4C	8012–8013	–	INT32U	0–4294967295	I4 pulse counter reset/preset: • 0–4294967294 = preset value of the I4 pulse counter • 4294967295 (0xFFFFFFFF) = do not preset the I4 pulse counter
0x1F4D–0x1F4E	8014–8015	–	INT32U	0–4294967295	I5 pulse counter reset/preset: • 0–4294967294 = preset value of the I5 pulse counter • 4294967295 (0xFFFFFFFF) = do not preset the I5 pulse counter
0x1F55–0x1F56	8022–8023	–	INT32U	0–4294967295	I6 pulse counter reset/preset: • 0–4294967294 = preset value of the I6 pulse counter • 4294967295 (0xFFFFFFFF) = do not preset the I6 pulse counter

Preset Switchboard Temperature Threshold Counters

To preset switchboard temperature threshold counters, set the command registers in the following way:

Address	Register	Unit	Type	Range	Description
0x1F3F	8000	–	INT16U	42889	Command code = **42889**
0x1F40	8001	–	INT16U	16	Number of parameters (bytes) = 16
0x1F41	8002	–	INT16U	–	Destination = • IO 1: 8193 (0x2001) • IO 2: 8449 (0x2101)
0x1F42	8003	–	INT16U	1	Security type of the command

Address	Register	Unit	Type	Range	Description
0x1F43–0x1F44	8004–8005	–	OCTET STRING	–	Password of the command: Administrator or Operator user profile password
0x1F45	8006	–	INT16U	0–65535	Switchboard temperature threshold 1 counter reset/ preset: • 0–65534 = preset value of the switchboard temperature threshold 1 counter • 65535 (0xFFFF) = do not preset the counter
0x1F46	8007	–	INT16U	0–65535	Switchboard temperature threshold 2 counter reset/ preset: • 0–65534 = preset value of the switchboard temperature threshold 2 counter • 65535 (0xFFFF) = do not preset the counter
0x1F47	8008	–	INT16U	0–65535	Switchboard temperature threshold 3 counter reset/ preset: • 0–65534 = preset value of the switchboard temperature threshold 3 counter • 65535 (0xFFFF) = do not preset the counter

IFM Interface Data for EasyPact MVS Circuit Breakers

What's in This Part

IFM Interface Registers

What's in This Chapter

IFM Interface Identification

IFM Interface Firmware Revision

The IFM interface firmware revision starts at register 11776 and has a maximum length of eight registers.

The firmware revision is an ASCII string using the format XXX.YYY.ZZZ with:

- XXX = major version (000–127)
- YYY = minor version (000–255)
- ZZZ = revision number (000–255)

The NULL character ends the revision number.

Address	Register	RW	Unit	Type	Range	Description
0x2DFF–0x2E06	11776–11783	R	–	OCTET STRING	–	Firmware revision

Serial Number for IFM Interface LV434000

The serial number of IFM interface LV434000 is composed of a maximum of 17 alphanumeric characters with the following format: PPPPPPYYWWDLnnnn0.

- PPPPPP = plant code
- YY = year of fabrication (05–99)
- WW = week of fabrication (01–53)
- D = day of fabrication (1–7)
- L = line or machine number (0-9 or a-z)
- nnnn = production number of the device on the day (0001–9999)

A read request of 10 registers is necessary to read the IFM interface serial number.

Address	Register	RW	Unit	Type	Range	Description
0x2E5C-0x2E5E	11869-11871	R	–	OCTET STRING	–	‘PPPPPP’
0x2E5F	11872	R	–	OCTET STRING	‘05’–‘99’	‘YY’
0x2E60	11873	R	–	OCTET STRING	‘01’–‘53’	‘WW’
0x2E61	11874	R	–	OCTET STRING	D: ‘1’–‘7’ L: ‘0’–‘9’ or ‘a’–‘z	‘DL’
0x2E62	11875	R	–	OCTET STRING	‘00’–‘99’	‘nn’
0x2E63	11876	R	–	OCTET STRING	‘00’–‘99’	‘nn’
0x2E64-0x2E65	11877-11878	R	–	OCTET STRING	‘0’	‘0’ (the NULL character ends the serial number)

Product Identification

Address	Register	RW	Unit	Type	Range	Description
0x2E7C	11901	R	–	INT16U	–	Product identification = 15146 for the IFM interface

Read Device Identification

The Read Device Identification function is used to access in a standardized manner the information required to identify a device clearly. 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 IFM interface is explained in the following table:

Name	Type	Description
Vendor name	OCTET STRING	'Schneider Electric' (18 characters)
Product code	OCTET STRING	'LV434000'
Firmware revision	OCTET STRING	'XXX.YYY.ZZZ' from IFM interface revision 002.002.000
Vendor URL	OCTET STRING	'https://www.schneider-electric.com' (33 characters)
Product name	OCTET STRING	'ULP/Modbus-SL communication interface module'

IMU Identification

Address	Register	RW	Unit	Type	Range	Description
0x2E18–0x2E2E	11801–11823	R	–	OCTET STRING	–	Reserved
0x2E2F–0x2E38	11824–11833	R	–	OCTET STRING	–	Vendor name = 'Schneider Electric'
0x2E39–0x2E42	11834–11843	R	–	OCTET STRING	–	Product Code = 'LV434000'
0x2E43–0x2E5B	11844–11868	R	–	OCTET STRING	–	Reserved

Modbus Network Parameters

Modbus Locking Pad Position

Address	Register	RW	Unit	Type	Range	Description
0x2E72	11891	R	–	INT16U	1–3	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

Address	Register	RW	Unit	Type	Range	Description
0x306E	12399	R	–	INT16U	0–1	Auto-Speed sensing state • 0 = Auto-Speed sensing is disabled • 1 = Auto-Speed sensing is enabled (factory setting)

IFM Interface Modbus Address

Address	Register	RW	Unit	Type	Range	Description
0x306F	12400	R	–	INT16U	1–99	IFM interface Modbus address

Modbus Parity

Address	Register	RW	Unit	Type	Range	Description
0x3070	12401	R	–	INT16U	1–3	Modbus parity • 1 = no parity (none) • 2 = even parity (factory setting) • 3 = odd parity

Modbus Baud Rate

Address	Register	RW	Unit	Type	Range	Description
0x3071	12402	R	–	INT16U	5–8	Modbus Baud rate • 5 = 4800 Baud • 6 = 9600 Baud • 7 = 19200 Baud (factory setting) • 8 = 38400 Baud

Number of Stop Bits

Address	Register	RW	Unit	Type	Range	Description
0x3072	12403	R	–	INT16U	0–5	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

IFM Interface Commands

What's in This Chapter

List of IFM Interface Commands

List of Commands

The following table lists the IFM interface commands, their corresponding command codes and user profiles. Follow the command execution procedures accordingly (refer to Executing a Command, page 31).

Command	Command code	User profile
Get current time (refer to Get Current Time, page 131)	768	No password required
Set absolute time (refer to Set Absolute Time, page 131)	769	No password required
Read IMU name and location (refer to Read IMU Name and Location, page 132)	1024	No password required
Write IMU name and location (refer to Write IMU Name and Location, page 132)	1032	Administrator

Error Codes

Error codes generated by the IFM interface are the generic error codes (refer to Result of the Command, page 34).

IFM Interface 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 IFM interface) points to the closed padlock, the get current time command is still enabled.

To get the current time for all modules, set the command registers in the following way:

Address	Register	Unit	Type	Range	Description
0x1F3F	8000	–	INT16U	768	Command code = **768**
0x1F40	8001	–	INT16U	10	Number of parameters (bytes) = 10
0x1F41	8002	–	INT16U	768	Destination = 768 (0x0300)
0x1F42	8003	–	INT16U	0	Security type of the command
0x1F43–0x1F44	8004–8005	–	OCTET STRING	0	Password of the command = 0 (no password required)

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 IFM interface) points to the closed padlock, the set absolute time command is still enabled.

To set the absolute time for all the IMU modules, set the command registers in the following way:

Address	Register	Unit	Type	Range	Description
0x1F3F	8000	–	INT16U	769	Command code = **769**
0x1F40	8001	–	INT16U	18	Number of parameters (bytes) = 18
0x1F41	8002	–	INT16U	768	Destination = 768 (0x0300)
0x1F42	8003	–	INT16U	0	Security type of the command
0x1F43–0x1F44	8004–8005	–	OCTET STRING	0	Password of the command = 0 (no password required)
0x1F45	8006	–	INT16U	–	MSB = month (1–12) LSB = day in the month (1–31)
0x1F46	8007	–	INT16U	–	MSB = year (0–99, 0 meaning year 2000) LSB = hour (0–23)
0x1F47	8008	–	INT16U	–	MSB = minute (0–59) LSB = second (0–59)
0x1F48	8009	ms	INT16U	0–999	Milliseconds (0–999)

In case of 24 Vdc power loss, date and time counter is reset and will restart at January 1 2000. It is therefore mandatory to set absolute time for all the IMU modules after recovering the 24 Vdc 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 15 minutes.

Read IMU Name and Location

To read the IMU name and location, set the command registers in the following way:

Address	Register	Unit	Type	Range	Description
0x1F3F	8000	–	INT16U	1024	Command code = **1024**
0x1F40	8001	–	INT16U	16	Number of parameters (bytes) = 16
0x1F41	8002	–	INT16U	768	Destination = 768 (0x0300)
0x1F42	8003	–	INT16U	0	Security type of the command
0x1F43–0x1F44	8004–8005	–	OCTET STRING	–	Password of the command = 0 (no password required)
0x1F45–0x1F46	8006–8007	–	INT32U	–	17039489 = read IMU name (load 0x0104 into register 8006, 0x0081 into 8007) 17039490 = read IMU location (load 0x0104 into register 8006, 0x0082 into 8007)
0x1F47	8008	–	INT16U	2048	2048

The IMU name and location are returned to command registers in the following way:

Address	Register	Unit	Type	Range	Description
0x1F53	8020	–	INT16U	1024	Last Command Code
0x1F54	8021	–	INT16U	–	Command status 0 = command succeeded Otherwise, command failed
0x1F55	8022	–	INT16U	–	Number of bytes returned (0 if command failed)
0x1F56	8023	–	OCTET STRING	–	If command succeeded MSB = first character of IMU name or location LSB = second character of IMU name or location
0x1F57–0x1F6D	8024–8046	–	OCTET STRING	–	Depends on the length of the IMU name or location and ends by the NULL character 0x00

Write IMU Name and Location

The IMU name and location can be read from register 11801 to 11868.

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

Address	Register	Unit	Type	Range	Description
0x1F3F	8000	–	INT16U	1032	Command code = 1032
0x1F40	8001	–	INT16U	16–62	Number of parameters (bytes) = depends on the length of the IMU name or location (up to 46 characters)
0x1F41	8002	–	INT16U	0	Destination = 0 (0x0000)
0x1F42	8003	–	INT16U	1	Security type of the command
0x1F43–0x1F44	8004–8005	–	OCTET STRING	–	Password of the command: Administrator user profile password
0x1F45–0x1F46	8006–8007	–	INT32U	–	17039489 = write IMU name (load 0x0104 into register 8006, 0x0081 into 8007) 17039490 = write IMU location (load 0x0104 into register 8006, 0x0082 into 8007)
0x1F47	8008	–	INT16U	2048	2048

Address	Register	Unit	Type	Range	Description
0x1F48	8009	–	OCTET STRING	–	MSB = First character of the IMU name or location LSB = Second character of the IMU name or location
0x1F49–0x1F5F	8010–8038	–	OCTET STRING	–	Depends on the length of the IMU name or location and ends by the NULL character 0x00

Appendices

What's in This Part

Appendix 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

Address	Register	Module	Description	Page
0x0095–0x009B	150–156	BCM ULP module	Trip history	(refer to Trip History, page 87)
0x0202	515	BCM ULP module	Product identification	(refer to Product Identification, page 84)
0x0215–0x021E	534–543	BCM ULP module	BCM ULP module identifier	(refer to BCM ULP Module Identifier, page 84)
0x0229–0x022A	554–555	BCM ULP module	BCM ULP module counters	(refer to Counters, page 87)
0x0240	577	BCM ULP module	Firmware version	(refer to BCM ULP Module Firmware Version, page 84)
0x0243–0x0244	580–581	BCM ULP module	Counter thresholds	(refer to Counter Thresholds, page 87)
0x0289–0x028A	650–651	BCM ULP module	Tripping cause	(refer to Tripping Cause, page 85)
0x0294	661	BCM ULP module	Circuit breaker status	(refer to Circuit Breaker Status, page 85)
0x0295–0x0298	662–665	BCM ULP module	Circuit breaker operation counters	(refer to Circuit Breaker Operation Counters, page 87)
0x02A6–0x02A9	679–682	BCM ULP module	Current date of BCM ULP module	(refer to Date of Last Event, page 86)
0x02AB–0x02BD	684–702	BCM ULP module	Date of last event	(refer to Date of Last Event, page 86)
0x03E7–0x03F6	1000–1015	ETV trip system	Voltage and voltage unbalance (real-time measurements)	(refer to Voltage, page 59 and Voltage Unbalance, page 59)
0x03F7–0x0407	1016–1032	ETV trip system	Current and current unbalance (real-time measurements)	(refer to Current, page 60 and Current Unbalance, page 60)
0x0409–0x0414	1034–1045	ETV trip system	Active, reactive, and apparent power (real-time measurements)	(refer to Active Power, page 60, Reactive Power, page 61, and Apparent Power, page 61)
0x0415–0x041C	1046–1053	ETV trip system	Power factor and fundamental power factor (real-time measurements)	(refer to Power Factor, page 61)
0x0513–0x0522	1300–1315	ETV trip system	Voltage (minimum of real-time measurement)	(refer to Minimum of Real-Time Measurements, page 62)
0x0523–0x0533	1316–1332	ETV trip system	Current (minimum of real-time measurement)	(refer to Minimum of Real-Time Measurements, page 62)
0x0535–0x0540	1334–1345	ETV trip system	Active, reactive, and apparent power (minimum of real-time measurement)	(refer to Minimum of Real-Time Measurements, page 62)
0x0541–0x0548	1346–1353	ETV trip system	Power factor (minimum of real-time measurement)	(refer to Minimum of Real-Time Measurements, page 62)
0x054B–0x0551	1356–1362	ETV trip system	Fundamental voltage (minimum of real-time measurement)	(refer to Minimum of Real-Time Measurements, page 62)
0x0557–0x055B	1368–1372	ETV trip system	Fundamental current (minimum of real-time measurement)	(refer to Minimum of Real-Time Measurements, page 62)
0x055F–0x0562	1376–1379	ETV trip system	Fundamental active power (minimum of real-time measurement)	(refer to Minimum of Real-Time Measurements, page 62)

Address	Register	Module	Description	Page
0x0563–0x0566	1380–1383	ETV trip system	Fundamental reactive power (minimum of real-time measurement)	(refer to Minimum of Real-Time Measurements, page 62)
0x0567–0x056A	1384–1387	ETV trip system	Fundamental apparent power (minimum of real-time measurement)	(refer to Minimum of Real-Time Measurements, page 62)
0x0583–0x0585	1412–1414	ETV trip system	Voltage to current phase shift (minimum of real-time measurement)	(refer to Minimum of Real-Time Measurements, page 62)
0x0586–0x0589	1415–1418	ETV trip system	K-Factor (minimum of real-time measurement)	(refer to Minimum of Real-Time Measurements, page 62)
0x058A–0x0593	1419–1428	ETV trip system	Peak factor (minimum of real-time measurement)	(refer to Minimum of Real-Time Measurements, page 62)
0x0598–0x059A	1433–1435	ETV trip system	Voltage-to-voltage phase shift (minimum of real-time measurement)	(refer to Minimum of Real-Time Measurements, page 62)
0x063F–0x064E	1600–1615	ETV trip system	Voltage (maximum of real-time measurement)	(refer to Maximum of Real-Time Measurements, page 62)
0x064F–0x065F	1616–1632	ETV trip system	Current (maximum of real-time measurement)	(refer to Maximum of Real-Time Measurements, page 62)
0x0661–0x066C	1634–1645	ETV trip system	Active, reactive, and apparent power (maximum of real-time measurement)	(refer to Maximum of Real-Time Measurements, page 62)
0x066D–0x0674	1646–1653	ETV trip system	Power factor (maximum of real-time measurement)	(refer to Maximum of Real-Time Measurements, page 62)
0x0677–0x067D	1656–1662	ETV trip system	Fundamental voltage (maximum of real-time measurement)	(refer to Maximum of Real-Time Measurements, page 62)
0x0683–0x0687	1668–1672	ETV trip system	Fundamental current (maximum of real-time measurement)	(refer to Maximum of Real-Time Measurements, page 62)
0x068B–0x068E	1676–1679	ETV trip system	Fundamental active power (maximum of real-time measurement)	(refer to Maximum of Real-Time Measurements, page 62)
0x068F–0x0692	1680–1683	ETV trip system	Fundamental reactive power (maximum of real-time measurement)	(refer to Maximum of Real-Time Measurements, page 62)
0x0693–0x0696	1684–1687	ETV trip system	Fundamental apparent power (maximum of real-time measurement)	(refer to Maximum of Real-Time Measurements, page 62)
0x06AF–0x06B1	1712–1714	ETV trip system	Voltage to current phase shift (maximum of real-time measurement)	(refer to Maximum of Real-Time Measurements, page 62)
0x06B2–0x06B5	1715–1718	ETV trip system	K-Factor (maximum of real-time measurement)	(refer to Maximum of Real-Time Measurements, page 62)
0x06B6–0x06BF	1719–1728	ETV trip system	Peak factor (maximum of real-time measurement)	(refer to Maximum of Real-Time Measurements, page 62)
0x06C4–0x06C6	1733–1735	ETV trip system	Voltage-to-voltage phase shift (maximum of real-time measurement)	(refer to Maximum of Real-Time Measurements, page 62)
0x07CF–0x07EA	2000–2027	ETV trip system	Energy measurements	(refer to Energy Measurements, page 63)
0x0897–0x08C0	2200–2241	ETV trip system	Demand measurements	(refer to Current Demand, page 64)
0x0BB7–0x0BF7	3000–3064	ETV trip system	Time-stamped information	(refer to Time-Stamped Information, page 75)
0x0CF1	3314	ETV trip system	System type	(refer to System Type, page 73)
0x0D16–0x0D1A	3351–3355	ETV trip system	Demand time	(refer to Demand Time, page 74)
0x21FB–0x21FE	8700–8703	ETV trip system	Serial number	(refer to Serial Number, page 65)

Address	Register	Module	Description	Page
0x2205	8710	ETV trip system	Firmware version	(refer to Firmware Version, page 65)
0x2223	8740	ETV trip system	Protection type	(refer to Protection Type, page 65)
0x2225	8742	ETV trip system	Long-time rating plug	(refer to Long-Time Rating Plug, page 65)
0x222D	8750	ETV trip system	Nominal current	(refer to Nominal Current, page 76)
0x2230	8753	ETV trip system	Neutral protection parameters	(refer to Neutral Protection Parameters, page 69)
0x2231–0x223A	8754–8763	ETV trip system	Long-time protection	(refer to Long-Time Protection Parameters, page 69)
0x223B–0x2244	8764–8773	ETV trip system	Short-time protection	(refer to Short-Time Protection Parameters, page 69)
0x2245–0x224E	8774–8783	ETV trip system	Instantaneous protection	(refer to Instantaneous Protection Parameters, page 70)
0x224F–0x2258	8784–8793	ETV trip system	Ground-fault protection	(refer to Ground-Fault Protection Parameters, page 70)
0x228A	8843	ETV trip system	Battery status	(refer to Battery Status, page 76)
0x2298	8857	ETV trip system	M2C programmable contacts status	(refer to M2C Programmable Contacts Status, page 66)
0x229D–0x229F	8862–8864	ETV trip system	Protection status	(refer to Protection Status, page 66)
0x2327–0x2372	9000–9075	ETV trip system	Time-stamped information	(refer to Time-Stamped Information, page 75)
0x238B–0x2452	9100–9299	ETV trip system	Trip history	(refer to Trip History, page 67)
0x258F–0x2590	9616–9617	ETV trip system	Nominal voltage Vn	(refer to Nominal Voltage, page 74)
0x2648–0x2671	9801–9842	ETV trip system	Configuration of the M2C programmable contacts	(refer to Configuration of the M2C Programmable Contacts, page 72)
0x2672	9843	ETV trip system	Type of M2C programmable contacts	(refer to Type of Programmable Contacts, page 72)
0x2DFF–0x2E06	11776–11783	IFM interface	Firmware version	(refer to IFM Interface Firmware Revision, page 127)
0x2E18–0x2E2E	11801–11823	IFM interface	IMU name	(refer to IMU Identification, page 128)
0x2E45–0x2E5B	11846–11868	IFM interface	IMU location	(refer to IMU Identification, page 128)
0x2E72	11891	IFM interface	Modbus locking pad position	(refer to Modbus Locking Pad Position, page 129)
0x2E7C	11901	IFM interface	Product identification	(refer to Product Identification, page 127)
0x306E	12399	IFM interface	Auto-Speed sensing state	(refer to Auto-Speed Sensing State, page 129)
0x306F	12400	IFM interface	IFM interface Modbus address	(refer to IFM Interface Modbus Address, page 129)
0x3070	12401	IFM interface	Modbus parity	(refer to Modbus Parity, page 129)
0x3071	12402	IFM interface	Modbus Baud rate	(refer to Modbus Baud Rate, page 129)
0x3072	12403	IFM interface	Number of stop bits	(refer to Number of Stop Bits, page 129)
0x35FF–0x3668	13824–13929	IO module	Analog input of IO 1	(refer to Analog Inputs, page 95)
0x3669–0x3848	13930–14409	IO module	Digital input of IO 1	(refer to Digital Inputs, page 97)
0x3849–0x38FC	14410–14589	IO module	Digital output of IO 1	(refer to Digital Outputs, page 100)

Address	Register	Module	Description	Page
0x38FD–0x3902	14590–14595	IO module	Hardware setting of IO 1	(refer to Hardware Setting, page 102)
0x3905–0x3908	14598–14601	IO module	Digital input and output status of IO 1	(refer to Digital Input and Output Status, page 103)
0x392F–0x3982	14640–14723	IO module	IO 1 identification	(refer to IO Module Identification, page 104)
0x3989–0x39A4	14730–14759	IO module	Alarm status of IO 1	(refer to Alarm Status, page 106)
0x3BC3–0x3BE0	15300–15329	IO module	Cradle management of IO 1	(refer to Cradle Management, page 109)
0x3C27–3C30	15400–15409	IO module	Light control of IO 1	(refer to Light Control, page 110)
0x3C31–3EEC	15410–16109	IO module	Load control of IO 1	(refer to Load Control, page 110)
0x41B8–0x4220	16824–16929	IO module	Analog input of IO 2	(refer to Analog Inputs, page 95)
0x4221–0x4400	16930–17409	IO module	Digital input of IO 2	(refer to Digital Inputs, page 97)
0x4401–0x44B4	17410–17589	IO module	Digital output of IO 2	(refer to Digital Outputs, page 100)
0x44B5–0x44BA	17590–17595	IO module	Hardware setting of IO 2	(refer to Hardware Setting, page 102)
0x44BD–0x44C0	17598–17601	IO module	Digital input and output status of IO 2	(refer to Digital Input and Output Status, page 103)
0x44E7–0x453A	17640–17723	IO module	IO 2 identification	(refer to IO Module Identification, page 104)
0x4541–0x455E	17730–17759	IO module	Alarm status of IO 2	(refer to Alarm Status, page 106)
0x477B–0x4798	18300–18329	IO module	Cradle management of IO 2	(refer to Cradle Management, page 109)
0x74B7–0x74BE	29880–29887	ETV trip system	Load profile counters	(refer to Load Profile Counters, page 76)
0x7CFF–0x7E4E	32000–32341	IFM interface	Standard dataset	(refer to Standard Dataset Common Registers, page 50)

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