

# SIL-A

## Overcurrent & Earth Fault Protection Relay



### MODBUS PROTOCOL MANUAL

|           |  |          |
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# 1. MODBUS PROTOCOL

Communication parameters are:

Modbus RTU:

- Address and Baudrate
- 8 data bits
- No parity
- 1 stop bit

Modbus TCP/IP:

- IP: 192.168.0.122 (by default)
- Subnet: 255.255.255.0 (by default)
- Gateway: 192.168.0.1 (by default)
- Port number: 502
- Master Address: 1 (by default)
- Retries Number: 10 (by default)
- Confirmation time: 2000 ms (by default)

This document describes the steps to follow to read and write data on the SIL-A relay, as per the Modbus protocol. This memory map is only valid for one piece of equipment and one version of the memory. The positions of existing objects in the memory remain fixed from one version to the next, but new objects will naturally have new addresses which will, in turn, remain fixed in future versions. The memory map is described further on.

The standard Modbus protocol is used, so any program or PC can communicate easily with the equipment.

The SIL-A always acts as a slave, which means that it never initiates communications. The master is always responsible for initiating communications.

Only a subset of the Modbus functions is implemented:

- Reading function 3.
- Writing function 16.

The MODBUS/RTU protocol is independent from the hardware. Therefore, the physical layer can exist in different hardware configurations: RS232, RS485, fibre optic or Ethernet.

Specifically, the relay has a front RS232 port and, as an option, a rear RS485 port. The data stream in any of the configurations is "half-duplex".

Each byte of data is transmitted asynchronously and is made up of: 1 start bit, 8 data bits, 1 stop bit and 1 parity bit, if this is how it is programmed. Therefore, the data has 10 or 11 bits, depending on whether it includes parity.

If the relay only offers with Modbus on the front port, the address (1 to 247) is configurable but the rest of the parameters are fixed and equal to: baudrate 19200, No parity and stop bit 1.

If the relay offers RS485 Modbus protocol the the address (1 to 247) and the baudrate (4800, 9600, 19200 or 38400) can be but the rest of the parameters are fixed: without parity and with 1 stop bit.

The master must know the address of the slave that it is going to communicate with. No unit will act on requests from the master if the message is not addressed to them. The exception is when the 0 address, or "broadcast" address, is used, in which case the relay will act but will not send an answer of any type.

Communications are made in packages or frames, which are groups of data that are sent asynchronously. The master transmits a frame to the slave, and the slave then replies with another frame (except in the case of “broadcast” messages).

The end of the frame is marked by a dead time or silence time in the communication medium. The length of this time of silence varies depending on the transmission speed, as it is equivalent to 3 characters.

The following table shows the generic package format that is valid for transmission and reception. However, each function has its own peculiarities, as will be described further on.

### 1.1. Modbus RTU package format

|                         |                                      |  |
|-------------------------|--------------------------------------|--|
| <b>CUSTOMER ADDRESS</b> | 1 byte                               | Each device on a communication bus must have a unique address, otherwise two different units could reply simultaneously to the same request. All ports of the relay will use this address which can be set a value between 1 and 247. When the master transmits a frame with the slave address to 0 indicates a Broadcast. All the slaves in the communications bus will carry out the requested action, but no one will reply to the master. The Broadcast will only be accepted to write, as it makes no sense to make a read request in the Broadcast, as no one will reply this request. |
| <b>FUNCTION CODE</b>    | 1 byte                               | This is one of the function codes supported by the equipment. In this case, the only function codes supported are 3 to read and 16 to write. When the slave has to reply with an exception one of these frames, it is indicated by putting 1 in the most important bit of the correspondent function. Thus, an exception for the function 3, will be indicated with a 83 as a function code; and an exception for the function code 16 or 0x10 in hexadecimal, will be indicated with an 0x90.   |
| <b>DATA</b>             | N bytes                              | This part consists of a variable number of bytes, depending on the function code. It may include: addresses, data lengths, settings, commands or exception codes sent by the user.   |
| <b>CRC</b>              | 2 bytes                              | Control code of two bytes. The ModBus/RTU includes a 16-bit CRC in each frame, to detect errors. If the slave detects an erroneous frame, based on a CRC that is not correct, it won't take any action, nor will reply anything to the master. The management of the CRC is LSB-MSB.   |
| <b>DEAD TIME</b>        | Necessary time to transmit 3,5 Bytes | A frame is terminated when nothing is received for a period of 3,5 bytes. It means:<br>15 ms at 2400 bps<br>2 ms at 19200 bps<br>...etc.   |

## 1.2. Function Codes

| HEX DEC CODE | MODBUS NAME               | DEFINITION           | COMMENT  |
|--------------|---------------------------|----------------------|--|
| 0x03<br>3    | Read Holding Registers    | Reading of Any Value | This function allows the master to read 1 or more consecutive addresses of a relay. The registers always are of 16 bits, with the most important byte at first. The maximum number of registers to be read in a package are 60.                              |
| HEX DEC CODE | MODBUS NAME               | DEFINITION           | COMMENT  |
| 0x10<br>16   | Preset Multiple Registers | Script               | This function allows to write one or more registers that represent one or more settings. The registers are values of 2 bytes of length, transmitted with the most important byte at first. The maximum number of registers to be written in a package is 60. |

## 1.3. Exceptions Responses

The error codes defined by the ModBus protocol are as follows:

|    |                      |   |
|----|----------------------|---|
| 01 | ILLEGAL FUNCTION     | The slave does not support any function with the function code received in this message.    |
| 02 | ILLEGAL DATA ADDRESS | The master is trying to do an operation in a wrong address.                                 |
| 03 | ILLEGAL DATA VALUE   | The slave has detected that the value sent by the master is not valid.                      |
| 04 | SLAVE DEVICE FAILURE | Indicates an error occurred in the slave while trying to execute the request of the master. |
| 05 | ACKNOWLEDGE          | Generic recognition.  |
| 06 | SLAVE DEVICE BUSY    | The slave is busy and unable to perform the required operation.                             |
| 07 | NEGATIVE ACKNOWLEDGE | Generic non-recognition.  |

When the data format takes up more than one BYTE, the most important BYTE is sent through the communications first, and the least important BYTE is sent last.

## 1.4. Data type

| TYPE           | LENGTH | DESCRIPTION  |
|----------------|--------|--|
| UCHAR          | 1/2    | Integer without sign of 1 byte   |
| BYTE           | 1/2    | Integer with sign of 1 byte  |
| BIT16          | 1      | Gathered bits type, groups of 16.<br>E. g.: 0x1A41 = 0001101001000001b   |
| BIT32          | 2      | Gathered bits type, groups of 32.  |
| ENUM           | 1      | Integer without sign of 16 bits. Each of the possible values of the integer will have a correspondence in the auxiliary list of the database. This list is the correspondence chain which must be shown for each of the values. Memory will only receive an integer value.<br>E. g.: 0, 1 Correspondence to "CLOSED", "OPEN" |
| DENUM          | 2      | Integer without sign of 32 bits  |
| UINT           | 1      | Integer without sign of 2 bytes  |
| INT            | 1      | Integer with sign of 2 bytes   |
| LONG           | 2      | Integer without sign of 4 bytes  |
| DWORD          | 2      | Integer with sign of 4 bytes   |
| FLOAT INVERSE  | 2      | Number in FLOAT INVERSEing decimal point "FLOAT INVERSE" of 4 bytes  |
| ASCIIxx        | xx/2   | String: In length variable character chain. Final of String marked with '\0'.<br>E. g.: "ABC" 0x41x42x43x00....  |
| MILIS          | 3      | <i>Minutes</i> (passed since 00:00 of 1/1/2000) (LONG). <i>milliseconds</i> (UINT)   |
| FH             | 5      | <i>Year</i> (UINT). <i>month</i> (UCHAR). <i>day</i> (UCHAR). <i>hour</i> (UCHAR). <i>minutes</i> (UCHAR). <i>seconds</i> (UCHAR). <i>hundredth</i> (UCHAR). <i>thousandth</i> (UINT)  |
| CONT           | 13     | Directory (UINT). Value (DWORD). Description (ASCII20)   |
| EVENT          | 9      | Criteria Directory (UINT). Event Identifier (UINT). Value (UINT). Associated Measure (UINT).Date and Time(FH)  |
| EVENTO         | 10     | Antiquity (UINT). Event (EVENT)  |
| CCRIT          | 6      | Criteria Number (UINT). Criteria Directory (UINT). Descriptive text (ASCII8)   |
| PEST           | 61     | Number of States (UINT). Protection State-1(BIT16). ... Protection State-60(BIT16)   |
| PCRIT          | 61     | Number of Criteria (UINT). Index of Criteria-1(UINT). ... Index of Criteria-60(UINT).  |
| CMED           | 8      | Number of Measure (UINT). Descriptive text (ASCII7). Unit(ASCII3).Primary Unit(ASCII5).Number of decimals(UCHAR)   |
| GAJU           | 61     | Number of Groups (UINT). Index of the Criteria-1(UINT). Index of the first setting of the Criteria-1(UINT). ... Index of the Criterion-30(UINT). Index of the first setting of the Criteria-30(UINT).  |
| ENUM TRIP VOLT | 1      | Integer without sign of 16 bits.<br>E. g.: 0, 1, 2 Correspondence to "12V", "17V", "22V"   |

When the data format takes up more than one BYTE, the most important BYTE is sent through the communications first, and the least important BYTE is sent last.

## 1.5. General Memory Map

| Function | Description                          | Start address | Number of registries | Format  | Reference                       |
|----------|--------------------------------------|---------------|----------------------|---------|---------------------------------|
| 16       | Write the Directory of Event         | 1             | 1                    | UINT    |                                 |
| 16       | Load data Profiling                  | 2             | 1                    |         |                                 |
| 16       | Write the number of the Setting List | 6             | 1                    | UINT    |                                 |
| 03       | Read of Model and Version            | 100           | 44                   | ASCII88 |                                 |
| 16       | Write access code                    | 168           | 2                    | UCHAR4  | See Passwords and Access Levels |
| 03 & 16  | Date and Time                        | 170           | 5                    | FH      |                                 |
| 03       | Modbus IP, Submask and Gateway       | 184           | 12                   |         | See IP, submask and Gateway     |
| 16       | Selection of Command                 | 200           | 2                    | UINT    | See Commands map                |
| 16       | Confirmation of Command              | 201           | 1                    | UINT    | See Commands map                |
| 03 & 16  | Counters                             | 202           | 2                    | CONT    | Openings Number                 |
| 03 & 16  | Counters                             | 204           | 2                    | CONT    | Accumulated Amperes             |
| 03 & 16  | Counters                             | 212           | 2                    | CONT    | Reclosings Number               |
| 03       | Serial number                        | 252           | 2                    | LONG    |                                 |
| 03       | Equipment identifier                 | 254           | 44                   | ASCII88 |                                 |
| 03       | Read and Delete the oldest Event     | 400           | 11                   | EVENTO2 | See States map (Event Number)   |
| 03       | One event reading                    | 410           | 11                   | EVENTO2 | See States map (Event Number)   |
| 16       | Delete All Events                    | 420           | 1                    | dummy   |                                 |

### 1.5.1. States Map

The function code implemented to **State reading** is **0x03 (Read Holding Registers)**

| Address | Description | Bit | Event NO | Status                  | SIL-A Adapatation B |
|---------|-------------|-----|----------|-------------------------|---------------------|
| 500     | General     | 00  | 01       | Trip                    | ✓                   |
|         |             | 03  | 07       | 50 Hz                   |                     |
|         |             | 04  | 08       | Trip Block / SHB enable |                     |
|         |             | 05  | 16       | Measurement error       |                     |
|         |             | 06  | 17       | Ready                   |                     |

|  |    |    |                       |
|--|----|----|-----------------------|
|  | 07 | 19 | Change of settings    |
|  | 08 | 21 | Set date/time         |
|  | 09 | 22 | Local Control         |
|  | 10 | 23 | Factory Settings      |
|  | 11 | 24 | Error Eeprom          |
|  | 12 | 28 | Eeprom changed        |
|  | 13 | 32 | Events error          |
|  | 15 | 15 | Reset                 |
|  | 16 |    | Pickup                |
|  | 17 |    | Phase A Pickup        |
|  | 18 |    | Phase B Pickup        |
|  | 19 |    | Phase C Pickup        |
|  | 20 |    | Ground Pickup         |
|  | 21 |    | Phase A Trip          |
|  | 22 |    | Phase B Trip          |
|  | 23 |    | Phase C Trip          |
|  | 24 |    | Ground Trip           |
|  | 25 |    | 50 Trip               |
|  | 26 |    | 50N/G Trip            |
|  | 27 |    | Phase Trip            |
|  | -  | 30 | New DFR               |
|  | -  | 47 | Active group by input |
|  | -  | 48 | Events Erased         |



| Address | Description | Bit | Event NO | Status                  | SIL-A<br>Adapatation C |
|---------|-------------|-----|----------|-------------------------|------------------------|
| 500     | General     | 00  | 01       | Trip                    | ✓                      |
|         |             | 03  | 07       | 50 Hz                   |                        |
|         |             | 04  | 08       | Trip Block / SHB enable |                        |
|         |             | 05  | 16       | Measurement error       |                        |
|         |             | 06  | 17       | Ready                   |                        |
|         |             | 07  | 19       | Change of settings      |                        |
|         |             | 08  | 21       | Set date/time           |                        |
|         |             | 09  | 22       | Local Control           |                        |
|         |             | 10  | 23       | Factory Settings        |                        |
|         |             | 11  | 24       | Error Eeprom            |                        |
|         |             | 12  | 28       | Eeprom changed          |                        |
|         |             | 13  | 32       | Events error            |                        |
|         |             | 15  | 15       | Reset                   |                        |
|         |             | 16  | 49       | Pickup                  |                        |
|         |             | 17  | 50       | Phase A Pickup          |                        |
|         |             | 18  | 51       | Phase B Pickup          |                        |
|         |             | 19  | 52       | Phase C Pickup          |                        |
|         |             | 20  | 53       | Ground Pickup           |                        |
|         |             | 21  | 54       | Phase A Trip            |                        |
|         |             | 22  | 55       | Phase B Trip            |                        |
|         |             | 23  | 56       | Phase C Trip            |                        |
|         |             | 24  | -        | Ground Trip             |                        |
|         |             | 25  | 58       | 50 Trip                 |                        |
|         |             | 26  | 59       | 50N/G Trip              |                        |
|         |             | 27  | -        | Phase Trip              |                        |
|         |             | -   | 30       | New DFR                 |                        |
|         |             | -   | 47       | Active group by input   |                        |
|         |             | -   | 48       | Events Erased           |                        |

| Address | Description | Bit | Event NO | Status     | SIL-A Adapatacion B | SIL-A Adapatacion C |
|---------|-------------|-----|----------|------------|---------------------|---------------------|
| 8200    | Oscilo      | -   | 16       | DFR Erased | ✓                   | ✓                   |

| Address | Description | Bit | Event NO | Status         | SIL-A Adapatacion B | SIL-A Adapatacion C |
|---------|-------------|-----|----------|----------------|---------------------|---------------------|
| 502     | Local COM   | 00  | -        | Local COM.     | ✓                   | ✓                   |
|         |             | 01  | -        | HMI Activity   |                     |                     |
|         |             | 17  | 02       | Open breaker   |                     |                     |
|         |             | 18  | 03       | Close breaker  |                     |                     |
|         |             | 19  | 04       | 79 Block       |                     |                     |
|         |             | 20  | 05       | 79 Unblock     |                     |                     |
|         |             | 21  | 06       | Local control  |                     |                     |
|         |             | 22  | 07       | Remote Control |                     |                     |
|         |             | 23  | 09       | Reset          |                     |                     |
|         |             | 25  | 08       | Reset TI       |                     |                     |

| Address | Description | Bit | Event NO | Status              | SIL-A Adapatacion B | SIL-A Adapatacion C |
|---------|-------------|-----|----------|---------------------|---------------------|---------------------|
| 504     | 50-1        | 00  | 01       | 50-1 Phase A Pickup | ✓                   | ✓                   |
|         |             | 01  | 02       | 50-1 Phase B Pickup |                     |                     |
|         |             | 02  | 03       | 50-1 Phase C Pickup |                     |                     |
|         |             | 03  | 04       | 50-1 Pickup         |                     |                     |
|         |             | 08  | 05       | 50-1 Phase A Trip   |                     |                     |
|         |             | 09  | 06       | 50-1 Phase B Trip   |                     |                     |
|         |             | 10  | 07       | 50-1 Phase C Trip   |                     |                     |
|         |             | 11  | 08       | 50-1 Trip           |                     |                     |

| Address | Description | Bit | Event NO | Status            | SIL-A Adapatation B | SIL-A Adapatation C |
|---------|-------------|-----|----------|-------------------|---------------------|---------------------|
| 506     | 51          | 00  | 01       | 51 Phase A Pickup | ✓                   | ✓                   |
|         |             | 01  | 02       | 51 Phase B Pickup |                     |                     |
|         |             | 02  | 03       | 51 Phase C Pckup  |                     |                     |
|         |             | 03  | 04       | 51 Pickup         |                     |                     |
|         |             | 08  | 05       | 51 Phase A Trip   |                     |                     |
|         |             | 09  | 06       | 51 Phase B Trip   |                     |                     |
|         |             | 10  | 07       | 51 Phase C Trip   |                     |                     |
|         |             | 11  | 08       | 51 Trip           |                     |                     |

| Address | Description | Bit | Event NO | Status       | SIL-A Adapatation B | SIL-A Adapatation C |
|---------|-------------|-----|----------|--------------|---------------------|---------------------|
| 508     | 50G-1       | 04  | 01       | 50G-1 Pickup | ✓                   | ✓                   |
|         |             | 12  | 02       | 50G-1 Trip   |                     |                     |

| Address | Description | Bit | Event NO | Status     | SIL-A Adapatation B | SIL-A Adapatation C |
|---------|-------------|-----|----------|------------|---------------------|---------------------|
| 510     | 51G         | 04  | 01       | 51G Pickup | ✓                   | ✓                   |
|         |             | 12  | 02       | 51G Trip   |                     |                     |

| Address | Description | Bit | Event NO | Status  | SIL-A Adapatation B | SIL-A Adapatation C |
|---------|-------------|-----|----------|---------|---------------------|---------------------|
| 512     | Inputs      | 00  | 17       | Input 1 | ✓                   | ✓                   |
|         |             | 01  | 18       | Input 2 |                     |                     |
|         |             | 02  | 19       | Input 3 |                     |                     |
|         |             | 03  | 20       | Input 4 |                     |                     |
|         |             | 04  | 21       | Input 5 |                     |                     |
|         |             | 05  | 22       | Input 6 |                     |                     |

| Address | Description | Bit | Event NO | Status   | SIL-A Adapatation B | SIL-A Adapatation C |
|---------|-------------|-----|----------|----------|---------------------|---------------------|
| 514     | Outputs     | 00  | 01       | Output 1 | ✓                   | ✓                   |
|         |             | 01  | 02       | Output 2 |                     |                     |
|         |             | 02  | 03       | Output 3 |                     |                     |
|         |             | 03  | 04       | Output 4 |                     |                     |

| Address | Description | Bit | Event NO | Status        | SIL-A Adaptation B | SIL-A Adaptation C |
|---------|-------------|-----|----------|---------------|--------------------|--------------------|
| 516     | Trip Block  | 00  | 01       | Phase A Block | ✓                  |                    |
|         |             | 01  | 02       | Phase B Block |                    |                    |
|         |             | 02  | 03       | Phase C Block |                    |                    |
|         |             | 03  | 04       | Phase Block   |                    |                    |

| Address | Description | Bit | Event NO | Status      | SIL-A Adaptation B | SIL-A Adaptation C |
|---------|-------------|-----|----------|-------------|--------------------|--------------------|
| 518     | 50BF        | 04  | 01       | 50BF pickup | ✓                  |                    |
|         |             | 12  | 02       | 50BF Trip   |                    |                    |

| Address | Description | Bit | Event NO | Status                                  | SIL-A Adaptation B | SIL-A Adaptation C |
|---------|-------------|-----|----------|---|--------------------|--------------------|
| 520     | 52          | 00  | 01       | 52 Start                                | ✓                  | ✓                  |
|         |             | 01  | 02       | 52 Error                                |                    |                    |
|         |             | 02  | 03       | 52 Open                                 |                    |                    |
|         |             | 03  | 04       | 52 Opening time                         |                    |                    |
|         |             | 04  | 05       | 52 Opening error                        |                    |                    |
|         |             | 05  | 06       | 52 Closed                               |                    |                    |
|         |             | 06  | 07       | 52 Closing time                         |                    |                    |
|         |             | 07  | 08       | 52 Closing error                        |                    |                    |
|         |             | 08  | 09       | 52 Excessive total openings             |                    |                    |
|         |             | 09  | 10       | 52 Excessive accumulated amperes (I2t). |                    |                    |
|         |             | 10  | 11       | 52 Excessive openings in a time window  |                    |                    |
|         |             | 11  | 12       | 52 a                                    |                    |                    |
|         |             | 12  | 13       | 52 b                                    |                    |                    |

| Address | Description | Bit | Event NO | Status   | SIL-A Adaptation B | SIL-A Adaptation C |
|---------|-------------|-----|----------|----------|--------------------|--------------------|
| 522     | 49          | 04  | 01       | 49 Alarm | ✓                  | ✓                  |
|         |             | 12  | 02       | 49 Trip  |                    |                    |

| Address | Description   | Bit | Event NO | Status               | SIL-A Adaptation B | SIL-A Adaptation C |
|---------|---------------|-----|----------|----------------------|--------------------|--------------------|
| 524     | Remote Modbus | 00  | -        | Remote communication | ✓                  | ✓                  |
|         |               | 17  | 02       | Open breaker         |                    |                    |
|         |               | 18  | 03       | Close breaker        |                    |                    |
|         |               | 19  | 04       | 79 Block             |                    |                    |
|         |               | 20  | 05       | 79 Unblock           |                    |                    |
|         |               | 21  | 06       | Local control        |                    |                    |
|         |               | 22  | 07       | Remote Control       |                    |                    |
|         |               | 23  | 09       | Reset                |                    |                    |
|         |               | 25  | 08       | Reset TI             |                    |                    |

| Address | Description | Bit | Event NO | Status                 | SIL-A Adaptation B | SIL-A Adaptation C |
|---------|-------------|-----|----------|------------------------|--------------------|--------------------|
| 526     | 79          | 00  | 01       | 79 Standby             | ✓                  | ✓                  |
|         |             | 01  | 02       | 79 Reclosing time      |                    |                    |
|         |             | 02  | 03       | 79 Is 52 Open?         |                    |                    |
|         |             | 03  | 04       | 79 Hold time           |                    |                    |
|         |             | 04  | 05       | 79 Closing time        |                    |                    |
|         |             | 05  | 06       | 79 Reset time.         |                    |                    |
|         |             | 06  | 07       | 79 Lockout             |                    |                    |
|         |             | 07  | 08       | 79 Safe time           |                    |                    |
|         |             | 08  | 09       | 79 Manual opening time |                    |                    |
|         |             | 09  | -        | 79 Enabled             |                    |                    |

| Address | Description | Bit | Event NO | Status              | SIL-A Adapatation B | SIL-A Adapatation C |
|---------|-------------|-----|----------|---------------------|---------------------|---------------------|
| 528     | 50-2        | 00  | 1        | 50-2 Phase A Pickup | ✓                   |                     |
|         |             | 01  | 2        | 50-2 Phase B Pickup |                     |                     |
|         |             | 02  | 3        | 50-2 Phase C Pickup |                     |                     |
|         |             | 03  | 4        | 50-2 Pickup         |                     |                     |
|         |             | 08  | 5        | 50-2 Phase A Trip   |                     |                     |
|         |             | 09  | 6        | 50-2 Phase B Trip   |                     |                     |
|         |             | 10  | 7        | 50-2 Phase C Trip   |                     |                     |
|         |             | 11  | 8        | 50-2 Trip           |                     |                     |

| Address | Description | Bit | Event NO | Status       | SIL-A Adapatation B | SIL-A Adapatation C |
|---------|-------------|-----|----------|--------------|---------------------|---------------------|
| 530     | 50G-2       | 04  | 01       | 50G-2 Pickup | ✓                   |                     |
|         |             | 12  | 02       | 50G-2 Trip   |                     |                     |

| Address | Description | Bit | Event NO | Status    | SIL-A Adapatation B | SIL-A Adapatation C |
|---------|-------------|-----|----------|-----------|---------------------|---------------------|
| 532     | 46          | 04  | 01       | 46 Pickup | ✓                   | ✓                   |
|         |             | 12  | 02       | 46 Trip   |                     |                     |

| Address | Description | Bit | Event NO | Status                | SIL-A Adapatation B | SIL-A Adapatation C |
|---------|-------------|-----|----------|-----------------------|---------------------|---------------------|
| 534     | CLP         | 00  |          | CLP Disable           | ✓                   | ✓                   |
|         |             | 01  |          | 52 Closed             |                     |                     |
|         |             | 02  |          | 52 Open               |                     |                     |
|         |             | 03  |          | 52 definitive Opening |                     |                     |
|         |             | 04  |          | Close Cold Load       |                     |                     |
|         |             | 05  |          | Open Cold Load        |                     |                     |
|         |             | 12  | 02       | Cold Load Pickup      |                     |                     |

| Address | Description | Bit | Event NO | Status       | SIL-A Adapatation B      | SIL-A Adapatation C |
|---------|-------------|-----|----------|--------------|--------------------------|---------------------|
| 536     | 74TCS       | 04  | 01       | 74TCS Pickup | ✓<br>Configurable inputs | ✓<br>Fixed inputs   |
|         |             | 12  | 02       | 74TCS Alarm  |                          |                     |

| Address | Description | Bit | Event NO | Status      | SIL-A Adapatation B | SIL-A Adapatation C |
|---------|-------------|-----|----------|-------------|---------------------|---------------------|
| 538     | 74CT        | 04  | 01       | 74CT Pickup | ✓                   |                     |
|         |             | 12  | 02       | 74CT Alarm  |                     |                     |

| Address | Description                               | Bit | Event NO | Status               | SIL-A Adapatation B | SIL-A Adapatation C        |
|---------|---|-----|----------|----------------------|---------------------|----------------------------|
| 540     | Remote DNP3.0<br>Remote<br>IEC60870-5-103 | 00  | -        | Remote communication | ✓                   | ✓<br>Only Serial<br>DNP3.0 |
|         |   | 17  | 02       | Open breaker         |                     |                            |
|         |   | 18  | 03       | Close breaker        |                     |                            |
|         |   | 19  | 04       | 79 Block             |                     |                            |
|         |   | 20  | 05       | 79 Unblock           |                     |                            |
|         |   | 21  | 06       | Local control        |                     |                            |
|         |   | 22  | 07       | Remote Control       |                     |                            |
|         |   | 23  | 09       | Reset                |                     |                            |
|         |   | 25  | 08       | Reset TI             |                     |                            |

| Address | Description | Bit | Event NO | Status | SIL-A Adapatation B | SIL-A Adapatation C |
|---------|-------------|-----|----------|--------|---------------------|---------------------|
| 542     | Leds        | 00  | -        | Led 1  | ✓                   | ✓                   |
|         |             | 01  | -        | Led 2  |                     |                     |
|         |             | 02  | -        | Led 3  |                     |                     |
|         |             | 03  | -        | Led 4  |                     |                     |
|         |             | 04  | -        | Led 5  |                     |                     |
|         |             | 05  | -        | Led 6  |                     |                     |
|         |             | 06  | -        | Led 52 |                     |                     |
|         |             | 07  | -        | Led 79 |                     |                     |

| Address | Description | Bit            | Event NO | Status             | SIL-A<br>Adapatation B |
|---------|-------------|----------------|----------|--------------------|------------------------|
| 544     | Logic       | 13             | 18       | 52 a               | ✓                      |
|         |             | 14             | 19       | 52 b               | ✓                      |
|         |             | 15             | 22       | External trip      | ✓                      |
|         |             | 16             | 07       | 50BF Start         | ✓                      |
|         |             | 17             | 08       | DFR Start          | ✓                      |
|         |             | 18             | 20       | 50 Block           | ✓                      |
|         |             | 19             | 21       | 50N/G Block        | ✓                      |
|         |             | 20             | 23       | Reset              | ✓                      |
|         |             | 21             | 24       | Settings group 1   | ✓                      |
|         |             | 22             | 25       | Settings Group 2   | ✓                      |
|         |             | 23             | 06       | 79 Start           | ✓                      |
|         |             | 24             | 26       | 79 Enable          | ✓                      |
|         |             | 25             | 27       | 79 Level Block     | ✓                      |
|         |             | 26             | 28       | 79 Block           | ✓                      |
|         |             | 27             | 29       | 79 Unblock         | ✓                      |
|         |             | 28             | 30       | 74TCS Continuity A | ✓                      |
|         |             | 29             | 31       | 74TCS Continuity B | ✓                      |
|         |             | 30             | -        | Logic signal 1     | ✓                      |
| 31      | -           | Logic signal 2 | ✓        |                    |                        |



| Address | Description | Bit | Event NO | Status           | SIL-A Adapatation C |
|---------|-------------|-----|----------|------------------|---------------------|
| 544     | Logic       | 00  | 18       | 52 a             | ✓                   |
|         |             | 01  | 19       | 52 b             | ✓                   |
|         |             | 02  | 22       | External trip    | ✓                   |
|         |             | 13  | 08       | DFR Start        | ✓                   |
|         |             | 03  | 20       | 50 Block         | ✓                   |
|         |             | 04  | 21       | 50N/G Block      | ✓                   |
|         |             | 07  | 23       | Reset            | ✓                   |
|         |             | 05  | 24       | Settings group 1 | ✓                   |
|         |             | 06  | 25       | Settings Group 2 | ✓                   |
|         |             | 08  | 06       | 79 Start         | ✓                   |
|         |             | 09  | 26       | 79 Enable        | ✓                   |
|         |             | 10  | 27       | 79 Level Block   | ✓                   |
|         |             | 11  | 28       | 79 Block         | ✓                   |
|         |             | 12  | 29       | 79 Unblock       | ✓                   |

| Address | Description | Bit | Event NO | Status              | Associated Measurement | SIL-A Adapatation B | SIL-A Adapatation C |
|---------|-------------|-----|----------|---------------------|------------------------|---------------------|---------------------|
| 546     | 37          | 00  | 1        | 50-2 Phase A Pickup | IA (A)                 | ✓                   |                     |
|         |             | 01  | 2        | 50-2 Phase B Pickup | IB (A)                 |                     |                     |
|         |             | 02  | 3        | 50-2 Phase C Pickup | IC (A)                 |                     |                     |
|         |             | 03  | 4        | 50-2 Pickup         | I <sub>max</sub> (A)   |                     |                     |
|         |             | 08  | 5        | 50-2 Phase A Trip   | IA (A)                 |                     |                     |
|         |             | 09  | 6        | 50-2 Phase B Trip   | IB (A)                 |                     |                     |
|         |             | 10  | 7        | 50-2 Phase C Trip   | IC (A)                 |                     |                     |
|         |             | 11  | 8        | 50-2 Trip           | I <sub>max</sub> (A)   |                     |                     |

| Address | Description | Bit | Event NO | Status      | Associated Measurement         | SIL-A Adapatation B | SIL-A Adapatation C |
|---------|-------------|-----|----------|-------------|--------------------------------|---------------------|---------------------|
| 548     | 46BC        | 04  | 01       | 46BC Pickup | I <sub>2</sub> /I <sub>1</sub> | ✓                   | ✓                   |
|         |             | 12  | 02       | 46BC Trip   | I <sub>2</sub> /I <sub>1</sub> |                     |                     |

| Address | Description | Bit | Event NO | Status        | Associated Measurement | SIL-A Adapataion B | SIL-A Adapataion C |
|---------|-------------|-----|----------|---------------|------------------------|--------------------|--------------------|
| 552     | SHB         | 00  | 01       | Phase A Block | -                      |                    | ✓                  |
|         |             | 01  | 02       | Phase B Block | -                      |                    |                    |
|         |             | 02  | 03       | Phase C Block | -                      |                    |                    |
|         |             | 03  | 04       | Phase Block   | -                      |                    |                    |

### 1.5.2. Measurements Map

| Address | Description                            | Format        | SIL-A Adapatation B | SIL-A Adapatation C |
|---------|--|---------------|---------------------|---------------------|
| 300     | Phase A current IA                     | FLOAT INVERSE | ✓                   | ✓                   |
| 302     | Phase B current IB                     |               | ✓                   | ✓                   |
| 304     | Phase C current IC                     |               | ✓                   | ✓                   |
| 306     | Neutral current IN                     |               | ✓                   | ✓                   |
| 308     | Maximum phase current I <sub>MAX</sub> |               | ✓                   | ✓                   |
| 310     | Thermal Image                          |               | ✓                   | ✓                   |
| 312     | Negative sequence current I-2          |               | ✓                   | ✓                   |
| 314     | Positive sequence current I-1          |               | ✓                   |                     |
| 316     | Phase A second harmonic current IA-2H  |               |                     | ✓                   |
| 318     | Phase B second harmonic current IB-2H  |               |                     | ✓                   |
| 320     | Phase C second harmonic current IC-2H  |               |                     | ✓                   |

### 1.5.3. Settings Map

| Settings | Address                | Description             | Format   | Enumeration  | SIL-A Adapatation B          | SIL-A Adapatation C |
|----------|------------------------|-------------------------|--|--|------------------------------|---------------------|
| General  | 600 (*)                | Identification          | ASCII20  | -  | ✓                            | ✓                   |
|          | 800 (**)               |                         |  |  |                              |                     |
|          | 610 (*)                | Frequency               | DENUM  | 0 → 60 Hz<br>1 → 50 Hz                                     | ✓                            | ✓                   |
|          | 810 (**)               |                         |  |  |                              |                     |
|          | 612 (*)                | Serial Number           | LONG   | -  | ✓                            | ✓                   |
|          | 812 (**)               |                         |  |  |                              |                     |
|          | 614 (*)                | Language                | DENUM  | 0 → English<br>1 → Spanish<br>2 → Depends on Relay model   | ✓                            | ✓                   |
|          | 814 (**)               |                         |  |  |                              |                     |
|          | 616 (*)                | Active Setting Group    | LONG   | -  | ✓                            | ✓                   |
|          | 816 (**)               |                         |  |  |                              |                     |
|          | 618 (*)                | Phase Nominal current   | DENUM  | 1 A<br>5A  | ✓                            | ✓                   |
|          | 818 (**)               |                         |  |  |                              |                     |
|          | 620 (*)                | Neutral Nominal Current | DENUM  | 1 A<br>5A  | ✓                            | ✓                   |
|          | 820 (**)               |                         |  |  |                              |                     |
|          | 622 (*)                | CT Phase Ratio          | FLOAT INVERSE  | -  | ✓                            | ✓                   |
|          | 822 (**)               |                         |  |  |                              |                     |
|          | 624 (*)                | CT Neutral ratio        | FLOAT INVERSE  | -  | ✓                            | ✓                   |
|          | 824 (**)               |                         |  |  |                              |                     |
|          | 626 (*)                | Local COM Address       | LONG   | -  | ✓                            | ✓                   |
|          | 826 (**)               |                         |  |  |                              |                     |
|          | 628 (*)                | Remote COM Address      | LONG   |  | ✓                            | ✓                   |
|          | 828 (**)               |                         |  |  |                              |                     |
|          | 630 (*)                | Remote Baudrate         | DENUM  | 0 → 4800 Bd<br>1 → 9600 Bd<br>2 → 19200 Bd<br>3 → 38400 Bd | ✓                            | ✓                   |
|          | 830 (**)               |                         |  |  |                              |                     |
| 760 (*)  | Remote Protocol        | DENUM                   | -  | Depending on model (***)                                   | 0 → ModBus<br>1 → DPN3.0/103 |                     |
| 860 (**) |                        |                         |  |  |                              |                     |
| 776 (*)  | DNP3.0 Master Address  | LONG                    | -  |  | ✓                            |                     |
| 976 (**) |                        |                         |  |  |                              |                     |
| 778 (*)  | DNP3.0 Serial Settings | DENUM                   | 0 → 8-N-1<br>1 → 8-N-2<br>2 → 8-E-1<br>3 → 8-E-2<br>4 → 8-O-1<br>5 → 8-O-2<br>6 → 9-N-1<br>7 → 9-N-2 |  | ✓                            |                     |
| 978 (**) |                        |                         |  |  |                              |                     |

(\*) Read/Write Address (FC = 03 / 16).

(\*\*) Address for Confirmation (FC = 16)

| Settings | Address  | Description        | Format | Enumeration | SIL-A Adapatation B | SIL-A Adapatation C |
|----------|----------|--------------------|--------|-------------|---------------------|---------------------|
| General  | 780 (*)  | DNP3.0 IB Deadband | LONG   | -           |                     | ✓                   |
|          | 980 (**) |                    |        |             |                     |                     |
|          | 782 (*)  | DNP3.0 IB Deadband | LONG   | -           |                     | ✓                   |
|          | 982 (**) |                    |        |             |                     |                     |
|          | 784 (*)  | DNP3.0 IC Deadband | LONG   | -           |                     | ✓                   |
|          | 984 (**) |                    |        |             |                     |                     |
|          | 786 (*)  | DNP3.0 IN Deadband | LONG   | -           |                     | ✓                   |
|          | 986 (**) |                    |        |             |                     |                     |

(\*\*\*) Depending on model:

SIL-Axxxxx7xxxB: 0 → Modbus RTU / 1→DNP3.0 Serial

SIL-Axxxxx8xxxB: 0 → Modbus TCP/IP / 1→DNP3.0 TCP/IP

| Settings | Address  | Description     | Format        | Enumeration                          | SIL-A Adapatation B     | SIL-A Adapatation C |
|----------|----------|-----------------|---------------|--------------------------------------|-------------------------|---------------------|
| 50-1     | 632 (*)  | Function Enable | DENUM         | 0 → Disable<br>1 → Enable<br>2 → SHB | ✓<br>Without SHB option | ✓                   |
|          | 832 (**) |                 |               |                                      |                         |                     |
|          | 634 (*)  | Tap             | FLOAT INVERSE | -                                    | ✓                       | ✓                   |
|          | 834 (**) |                 |               |                                      |                         |                     |
|          | 636 (*)  | Time Delay      | FLOAT INVERSE | -                                    | ✓                       | ✓                   |
|          | 836 (**) |                 |               |                                      |                         |                     |

| Settings | Address  | Description     | Format        | Enumeration  | SIL-A Adapatation B     | SIL-A Adapatation C |
|----------|----------|-----------------|---------------|--|-------------------------|---------------------|
| 51       | 638 (*)  | Function Enable | DENUM         | 0 → Disable<br>1 → Enable<br>2 → SHB   | ✓<br>Without SHB option | ✓                   |
|          | 838 (**) |                 |               |  |                         |                     |
|          | 640 (*)  | Curve Type      | DENUM         | 0 → IEC Inverse<br>1 → IEC Very Inverse<br>2 → IEC Extremely Inverse<br>3 → Defined Time<br>4 → IEEE Inverse<br>5 → IEEE Very Inverse<br>6 → IEEE Extremely Inverse<br>7 → IEC Long Time Inverse | ✓                       | ✓                   |
|          | 840 (**) |                 |               |  |                         |                     |
|          | 642 (*)  |                 |               |  |                         |                     |
|          | 842 (**) | Time Dial (TMS) | FLOAT INVERSE | -  | ✓                       | ✓                   |
|          | 644 (*)  | Tap             | FLOAT INVERSE | -  | ✓                       | ✓                   |
|          | 844 (**) |                 |               |  |                         |                     |
|          | 646 (*)  | Time Delay      | FLOAT INVERSE | -  | ✓                       | ✓                   |
|          | 846 (**) |                 |               |  |                         |                     |

(\*) Read/Write Address (FC = 03 / 16).

(\*\*) Address for Confirmation (FC = 16)

| Settings | Address  | Description     | Format        | Enumeration                          | SIL-A Adaptation B      | SIL-A Adaptation C |
|----------|----------|-----------------|---------------|--------------------------------------|-------------------------|--------------------|
| 50N/G-1  | 648 (*)  | Function Enable | DENUM         | 0 → Disable<br>1 → Enable<br>2 → SHB | ✓<br>Without SHB option | ✓                  |
|          | 848 (**) |                 |               |                                      |                         |                    |
|          | 650 (*)  | Tap             | FLOAT INVERSE | -                                    | ✓                       | ✓                  |
|          | 850 (**) |                 |               |                                      |                         |                    |
|          | 652 (*)  | Time Delay      | FLOAT INVERSE | -                                    | ✓                       | ✓                  |
| 852 (**) |          |                 |               |                                      |                         |                    |

| Settings | Address  | Description     | Format        | Enumeration  | SIL-A Adaptation B      | SIL-A Adaptation C |
|----------|----------|-----------------|---------------|--|-------------------------|--------------------|
| 51N/G    | 654 (*)  | Function Enable | DENUM         | 0 → Disable<br>1 → Enable<br>2 → SHB   | ✓<br>Without SHB option | ✓                  |
|          | 854 (**) |                 |               |  |                         |                    |
|          | 656 (*)  | Curve Type      | DENUM         | 0 → IEC Inverse<br>1 → IEC Very Inverse<br>2 → IEC Extremely Inverse<br>3 → Defined Time<br>4 → IEEE Inverse<br>5 → IEEE Very Inverse<br>6 → IEEE Extremely Inverse<br>7 → IEC Long Time Inverse | ✓                       | ✓                  |
|          | 856 (**) |                 |               |  |                         |                    |
|          | 658 (*)  | Time Dial (TMS) | FLOAT INVERSE | -  | ✓                       | ✓                  |
|          | 858 (**) |                 |               |  |                         |                    |
|          | 660 (*)  | Tap             | FLOAT INVERSE | -  | ✓                       | ✓                  |
|          | 860 (**) |                 |               |  |                         |                    |
|          | 662 (*)  | Time Delay      | FLOAT INVERSE | -  | ✓                       | ✓                  |
| 862 (**) |          |                 |               |  |                         |                    |

| Settings | Address  | Description      | Format        | Enumeration               | SIL-A Adaptation B | SIL-A Adaptation C |
|----------|----------|------------------|---------------|---------------------------|--------------------|--------------------|
| 49       | 664 (*)  | Function Enable  | DENUM         | 0 → Disable<br>1 → Enable | ✓                  | ✓                  |
|          | 864 (**) |                  |               |                           |                    |                    |
|          | 666 (*)  | Tap              | FLOAT INVERSE | -                         | ✓                  | ✓                  |
|          | 866 (**) |                  |               |                           |                    |                    |
|          | 668 (*)  | Heating Constant | LONG          | -                         | ✓                  | ✓                  |
|          | 868 (**) |                  |               |                           |                    |                    |
|          | 670 (*)  | Cooling Constant | LONG          | -                         | ✓                  | ✓                  |
|          | 870 (**) |                  |               |                           |                    |                    |
|          | 672 (*)  | Alarm Level      | LONG          | -                         | ✓                  | ✓                  |
| 872 (**) |          |                  |               |                           |                    |                    |

(\*) Read/Write Address (FC = 03 / 16).  
(\*\*) Address for Confirmation (FC = 16)

| Settings   | Address  | Description     | Format        | Enumeration               | SIL-A Adapatation B | SIL-A Adapatation C |
|------------|----------|-----------------|---------------|---------------------------|---------------------|---------------------|
| Trip Block | 674 (*)  | Function Enable | DENUM         | 0 → Disable<br>1 → Enable | ✓                   |                     |
|            | 874 (**) |                 |               |                           |                     |                     |
|            | 676 (*)  | Tap             | FLOAT INVERSE | -                         | ✓                   |                     |
|            | 876 (**) |                 |               |                           |                     |                     |

| Settings | Address  | Description     | Format        | Enumeration               | SIL-A Adapatation B | SIL-A Adapatation C |
|----------|----------|-----------------|---------------|---------------------------|---------------------|---------------------|
| 50-2     | 678 (*)  | Function Enable | DENUM         | 0 → Disable<br>1 → Enable | ✓                   |                     |
|          | 878 (**) |                 |               |                           |                     |                     |
|          | 680 (*)  | Tap             | FLOAT INVERSE | -                         | ✓                   |                     |
|          | 880 (**) |                 |               |                           |                     |                     |
|          | 682 (*)  | Time Delay      | FLOAT INVERSE | -                         | ✓                   |                     |
|          | 882 (**) |                 |               |                           |                     |                     |

| Settings | Address  | Description     | Format        | Enumeration                          | SIL-A Adapatation B | SIL-A Adapatation C |
|----------|----------|-----------------|---------------|--------------------------------------|---------------------|---------------------|
| 50N/G-2  | 684 (*)  | Function Enable | DENUM         | 0 → Disable<br>1 → Enable<br>2 → SHB | ✓                   |                     |
|          | 884 (**) |                 |               |                                      |                     |                     |
|          | 686 (*)  | Tap             | FLOAT INVERSE | -                                    | ✓                   |                     |
|          | 886 (**) |                 |               |                                      |                     |                     |
|          | 688 (*)  | Time Delay      | FLOAT INVERSE | -                                    | ✓                   |                     |
|          | 888 (**) |                 |               |                                      |                     |                     |

| Settings | Address  | Description     | Format        | Enumeration  | SIL-A Adapatation B | SIL-A Adapatation C |
|----------|----------|-----------------|---------------|--|---------------------|---------------------|
| 46       | 690 (*)  | Function Enable | DENUM         | 0 → Disable<br>1 → Enable<br>2 → SHB   | ✓                   | ✓                   |
|          | 890 (**) |                 |               |  |                     |                     |
|          | 692 (*)  | Curve Type      | DENUM         | 0 → IEC Inverse<br>1 → IEC Very Inverse<br>2 → IEC Extremely Inverse<br>3 → Defined Time<br>4 → IEEE Inverse<br>5 → IEEE Very Inverse<br>6 → IEEE Extremely Inverse<br>7 → IEC Long Time Inverse | ✓                   | ✓                   |
|          | 892 (**) |                 |               |  |                     |                     |
|          | 694 (*)  | Time Dial (TMS) | FLOAT INVERSE | -  | ✓                   | ✓                   |
|          | 894 (**) |                 |               |  |                     |                     |
|          | 696 (*)  | Tap             | FLOAT INVERSE | -  | ✓                   | ✓                   |
|          | 896 (**) |                 |               |  |                     |                     |
|          | 698 (*)  | Time Delay      | FLOAT INVERSE | -  | ✓                   | ✓                   |
|          | 898 (**) |                 |               |  |                     |                     |

(\*) Read/Write Address (FC = 03 / 16).  
(\*\*) Address for Confirmation (FC = 16)

| Settings | Address  | Description     | Format        | Enumeration               | SIL-A Adapatation B | SIL-A Adapatation C |
|----------|----------|-----------------|---------------|---------------------------|---------------------|---------------------|
| 37       | 700 (*)  | Function Enable | DENUM         | 0 → Disable<br>1 → Enable | ✓                   |                     |
|          | 900 (**) |                 |               |                           |                     |                     |
|          | 702 (*)  | Tap             | FLOAT INVERSE | -                         | ✓                   |                     |
|          | 902 (**) |                 |               |                           |                     |                     |
|          | 704 (*)  | Time Delay      | FLOAT INVERSE | -                         | ✓                   |                     |
|          | 904 (**) |                 |               |                           |                     |                     |
|          | 768 (*)  | Death tap       | FLOAT INVERSE | -                         | ✓                   |                     |
|          | 968 (**) |                 |               |                           |                     |                     |

| Settings | Address  | Description     | Format        | Enumeration               | SIL-A Adapatation B | SIL-A Adapatation C |
|----------|----------|-----------------|---------------|---------------------------|---------------------|---------------------|
| 50BF     | 706 (*)  | Function Enable | DENUM         | 0 → Disable<br>1 → Enable | ✓                   |                     |
|          | 906 (**) |                 |               |                           |                     |                     |
|          | 708 (*)  | Time Delay      | FLOAT INVERSE | -                         | ✓                   |                     |
|          | 908 (**) |                 |               |                           |                     |                     |

| Settings | Address  | Description                   | Format        | Enumeration | SIL-A Adapatation B | SIL-A Adapatation C |
|----------|----------|-------------------------------|---------------|-------------|---------------------|---------------------|
| 52       | 710 (*)  | Max Number of Openings        | LONG          | -           | ✓                   | ✓                   |
|          | 910 (**) |                               |               |             |                     |                     |
|          | 712 (*)  | Max Accumulated Amperes       | LONG          | -           | ✓                   | ✓                   |
|          | 912 (**) |                               |               |             |                     |                     |
|          | 714 (*)  | Opening Time                  | FLOAT INVERSE | -           | ✓                   | ✓                   |
|          | 914 (**) |                               |               |             |                     |                     |
|          | 716 (*)  | Closing Time                  | FLOAT INVERSE | -           | ✓                   | ✓                   |
|          | 916 (**) |                               |               |             |                     |                     |
|          | 718 (*)  | Excessive Repetitive Openings | LONG          | -           | ✓                   | ✓                   |
|          | 918 (**) |                               |               |             |                     |                     |
|          | 720 (*)  | Repetitive Openings/Time      | FLOAT INVERSE | -           | ✓                   | ✓                   |
|          | 920 (**) |                               |               |             |                     |                     |

(\*) Read/Write Address (FC = 03 / 16).  
 (\*\*) Address for Confirmation (FC = 16)



| Settings | Address    | Description          | Format        | Enumeration               | SIL-A Adapatation B | SIL-A Adapatation C |
|----------|------------|----------------------|---------------|---------------------------|---------------------|---------------------|
| 79       | 722 (*)    | Function Enable      | DENUM         | 0 → Disable<br>1 → Enable | ✓                   | ✓                   |
|          | 922 (**)   |                      |               |                           |                     |                     |
|          | 724 (*)    | Hold Enable          | DENUM         | 0 → Disable<br>1 → Enable | ✓                   | ✓                   |
|          | 924 (**)   |                      |               |                           |                     |                     |
|          | 726 (*)    | Number of reclosings | FLOAT INVERSE | -                         | ✓                   | ✓                   |
|          | 926 (**)   |                      |               |                           |                     |                     |
|          | 728 (*)    | Reclosing time 1     | FLOAT INVERSE | -                         | ✓                   | ✓                   |
|          | 928 (**)   |                      |               |                           |                     |                     |
|          | 730 (*)    | Reclosing time 2     | FLOAT INVERSE | -                         | ✓                   | ✓                   |
|          | 930 (**)   |                      |               |                           |                     |                     |
|          | 732 (*)    | Reclosing time 3     | FLOAT INVERSE | -                         | ✓                   | ✓                   |
|          | 932 (**)   |                      |               |                           |                     |                     |
|          | 734 (*)    | Reclosing time 4     | FLOAT INVERSE | -                         | ✓                   | ✓                   |
|          | 934 (**)   |                      |               |                           |                     |                     |
|          | 736 (*)    | Reclosing time 5     | FLOAT INVERSE | -                         | ✓                   | ✓                   |
|          | 936 (**)   |                      |               |                           |                     |                     |
|          | 738 (*)    | Hold time            | FLOAT INVERSE | -                         | ✓                   | ✓                   |
| 938 (**) |            |                      |               |                           |                     |                     |
| 740 (*)  | Reset Time | FLOAT INVERSE        | -             | ✓                         | ✓                   |                     |
| 940 (**) |            |                      |               |                           |                     |                     |
| 742 (*)  | Safe time  | FLOAT INVERSE        | -             | ✓                         | ✓                   |                     |
| 942 (**) |            |                      |               |                           |                     |                     |

| Settings | Address  | Description           | Format        | Enumeration               | SIL-A Adapatation B | SIL-A Adapatation C |
|----------|----------|-----------------------|---------------|---------------------------|---------------------|---------------------|
| CLP      | 744 (*)  | Function Enable       | DENUM         | 0 → Disable<br>1 → Enable | ✓                   | ✓                   |
|          | 944 (**) |                       |               |                           |                     |                     |
|          | 746 (*)  | Active Settings Group | LONG          | -                         | ✓                   | ✓                   |
|          | 946 (**) |                       |               |                           |                     |                     |
|          | 748 (*)  | No Load Time          | FLOAT INVERSE | -                         | ✓                   | ✓                   |
|          | 948 (**) |                       |               |                           |                     |                     |
|          | 750 (*)  | Cold Load Time        | FLOAT INVERSE | -                         | ✓                   | ✓                   |
| 950 (**) |          |                       |               |                           |                     |                     |

| Settings | Address  | Description     | Format        | Enumeration               | SIL-A Adapatation B | SIL-A Adapatation C |
|----------|----------|-----------------|---------------|---------------------------|---------------------|---------------------|
| 74TCS    | 752 (*)  | Function Enable | DENUM         | 0 → Disable<br>1 → Enable | ✓                   | ✓                   |
|          | 952 (**) |                 |               |                           |                     |                     |
|          | 754 (*)  | Time Delay      | FLOAT INVERSE | -                         | ✓                   | ✓                   |
|          | 954 (**) |                 |               |                           |                     |                     |

(\*) Read/Write Address (FC = 03 / 16).  
 (\*\*) Address for Confirmation (FC = 16)

| Settings | Address  | Description     | Format           | Enumeration               | SIL-A Adapatation B | SIL-A Adapatation C |
|----------|----------|-----------------|------------------|---------------------------|---------------------|---------------------|
| 74CT     | 756 (*)  | Function Enable | DENUM            | 0 → Disable<br>1 → Enable | ✓                   |                     |
|          | 956 (**) |                 |                  |                           |                     |                     |
|          | 758 (*)  | Time Delay      | FLOAT<br>INVERSE | -                         | ✓                   |                     |
|          | 958 (**) |                 |                  |                           |                     |                     |

| Settings | Address  | Description     | Format           | Enumeration               | SIL-A Adapatation B | SIL-A Adapatation C |
|----------|----------|-----------------|------------------|---------------------------|---------------------|---------------------|
| 46BC     | 762 (*)  | Function Enable | DENUM            | 0 → Disable<br>1 → Enable | ✓                   | ✓                   |
|          | 962 (**) |                 |                  |                           |                     |                     |
|          | 764 (*)  | Tap             | FLOAT<br>INVERSE | -                         | ✓                   | ✓                   |
|          | 964 (**) |                 |                  |                           |                     |                     |
|          | 766 (*)  | Time Delay      | FLOAT<br>INVERSE | -                         | ✓                   | ✓                   |
|          | 966 (**) |                 |                  |                           |                     |                     |

| Settings | Address  | Description        | Format           | Enumeration               | SIL-A Adapatation B | SIL-A Adapatation C |
|----------|----------|--------------------|------------------|---------------------------|---------------------|---------------------|
| SHB      | 770 (*)  | Function Enable    | DENUM            | 0 → Disable<br>1 → Enable |                     | ✓                   |
|          | 970 (**) |                    |                  |                           |                     |                     |
|          | 772 (*)  | Current Tap        | FLOAT<br>INVERSE | -                         |                     | ✓                   |
|          | 972 (**) |                    |                  |                           |                     |                     |
|          | 774 (*)  | Reset Time         | FLOAT<br>INVERSE | -                         |                     | ✓                   |
|          | 974 (**) |                    |                  |                           |                     |                     |
|          | 788 (*)  | Block<br>Threshold | FLOAT<br>INVERSE |                           |                     | ✓                   |
|          | 988 (**) |                    |                  |                           |                     |                     |

(\*) Read/Write Address (FC = 03 / 16).  
 (\*\*) Address for Confirmation (FC = 16)

## 1.6. Command List

| Index | Format | Description         | SIL-A Adapatation B | SIL-A Adapatation C |
|-------|--------|---------------------|---------------------|---------------------|
| 2     | UINT16 | Open Breaker        | ✓                   | ✓                   |
| 3     | UINT16 | Close Breaker       | ✓                   | ✓                   |
| 4     | UINT16 | 79 Block            | ✓                   | ✓                   |
| 5     | UINT16 | 79 Unblock          | ✓                   | ✓                   |
| 6     | UINT16 | Local Control       | ✓                   | ✓                   |
| 7     | UINT16 | Remote Control      | ✓                   | ✓                   |
| 8     | UINT16 | Reset               | ✓                   | ✓                   |
| 10    | UINT16 | Reset Thermal Image | ✓                   | ✓                   |

## 1.7. Setting-up the session: Password and access levels

The relay is provided with different passwords associated to access levels allowing the user to carry out different actions depending on the selected password:

| ACCESS LEVEL | Read-only Function Enable:<br>Status and measurements<br>Settings<br>Configuration<br>Events/DFR | Function Enable to:<br>Change settings | Function Enable to:<br>Delete Events<br>Delete DFR | Function Enable to:<br>Execute Commands | Function Enable to:<br>Change Configuration | Function Enable to:<br>Change Protected Settings |
|--------------|--|--|--|---|---|--|
| 2            | YES  | YES                                    | YES  | NO                                      | NO  | NO   |
| 3            | YES  | NO                                     | NO   | YES                                     | NO  | NO   |
| 4            | YES  | YES                                    | YES  | YES                                     | NO  | NO   |
| 5            | YES  | YES                                    | YES  | YES                                     | YES   | NO   |

Four passwords and their associated levels of access are set up when the relay is configured using the Slcom program. The password must be made up of 4 characters (passwords with more or less characters will not be accepted). By default, the relay is programmed with the following passwords and their associated levels:

| PASSWORD | ACCESS LEVEL |
|----------|--------------|
| 2222     | 2            |
| 3333     | 3            |
| 4444     | 4            |
| 5555     | 5            |

## 1.8. Example of Modbus Frames

Writing the access password "5555" to equipment no. 1

| Address | Function | H Pickup Address | L Pickup Address | Number of H Registers | Number of L Registers | Number of Bytes | Password                     | Checksum H | Checksum L |
|---------|----------|------------------|------------------|-----------------------|-----------------------|-----------------|------------------------------|------------|------------|
| 0x01    | 0x10     | 0x00             | 0xA8             | 0x00                  | 0x02                  | 0x04            | 0x35<br>0x35<br>0x35<br>0x35 | 0x30       | 0xF4       |

And the SIL-A will reply OK:

| Address | Function | H Pickup Address | L Pickup Address | Number of H Registers | Number of L Registers | Checksum H | Checksum L |
|---------|----------|------------------|------------------|-----------------------|-----------------------|------------|------------|
| 0x01    | 0x10     | 0x00             | 0xA8             | 0x00                  | 0x02                  | 0xC0       | 0x28       |



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