

SIA-C Standard CT's

Self & Dual Powered Overcurrent & Earth Fault Protection Relay



**SELF-POWERED
TECHNOLOGY**



MODBUS RTU PROTOCOL MANUAL

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1. MODBUS RTU PROTOCOL

Communication parameters are:

Modbus RTU:

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

This document describes the steps to follow to read and write data on the SIA-C 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 SIA-C 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 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

CUSTOMER ADDRESS	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.
FUNCTION CODE	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.
DATA	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.
CRC	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.
DEAD TIME	Necessary time to transmit 3,5 Bytes	A frame is terminated when nothing is received for a period of 3,5 bytes. It means: • 15 ms at 2400 bps • 2 ms at 19200 bps • ...etc.

1.2. Function Codes

HEX DEC CODE	MODBUS NAME	DEFINITION	COMMENT
0x03 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 is 60.
0x10 16	Preset Multiple Registers	Script	This function allows writing 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 register 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. 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. 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'. 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. 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 V 4.01	Start address V 4.02	Number of registries	Format	Reference
16	Write index of Event	1	1	1	UINT	
03 & 16	Load Data Profiling	2	2	1		
16	Write the number of the Setting Group	6	6	1	UINT	
03	Read of Model and Version	254	254	44	ASCII88	
16	Write access code (password)	168	175	2	UCHAR4	See Passwords and Access Levels
03 & 16	Date and Time	170 Without password	170 With password	5	FH	
16	Selection of Command	200	200	2	UINT	See Commands map
16	Confirmation of Command	202	202	1	UINT	See Commands map
16	Direct Command	182	182	1	UINT	See Commands map
03 & 16	Counters	500	500	2	CONT	See Counters map
16	Test State	-	288	2	BIT32	See test state map
03	Serial number	252	252	2	LONG	
03	Equipment identifier	102	102	44	ASCII88	
03	One event reading	410	410	11	EVENTO2	See events list
16	Delete All Events	420	420	1		

1.5.1. States Map

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

(*) The available functions depend on the model.

(**) Only in version 4.01.

(***) Added in 4.02 version.

Address	Description	State Bit	Event Number	Status	Associated Measurement	Unit
600	GENERAL	0	1	Trip	IMax	A
		1	2	External Trip	IMax	A
		2	3	Trip Block	IMax	A
		3	4	Local	IMax	A
		4	5	Settings change	-	-
		5	6	Conf. changed	-	-
		6	7	Events Erased	-	-
		7	8	Invalid Authentification (**)		
		8	9	Access Denied (**)		
		9	10	SinglePhaseTrip	-	-
		10	11	SettingsG. 1	-	-
		11	12	SettingsG. 2	-	-
		12	13	SettingsG. 3	-	-
		13	14	TCPConf.changed	-	-
		14	15	S.Conf.changed (***)	-	-
		16	17	Phase A Pickup	IA	A
		17	18	Phase B Pickup	IB	A
		18	19	Phase C Pickup	IC	A
		19	20	Pickup	IMax	A
		20	21	Ground Pickup	IN	A
		24	25	Phase A Trip	IA	A
		25	26	Phase B Trip	IB	A
		26	27	Phase C Trip	IC	A
		27	28	Phase Trip	IMax	A
		28	29	Ground Trip	IN	A
602	MEASUREMENTS	0	1	50 Hz	-	-
604	USB COM	11	12	Access Denied (***)	-	-
		12	13	Invalid Authentification (***)	-	-
		13	14	Set Counter (***)	-	-
		14	15	Identification	-	-
		15	16	Local COM.	-	-
		17	18	Open Breaker	-	-
		18	19	Close Breaker	-	-
		19	20	79 Block	-	-

Address	Description	State Bit	Event Number	Status	Associated Measurement	Unit
		20	21	79 UnBlock	-	-
		21	22	Local Control	-	-
		22	23	Remote Control	-	-
		23	24	Reset	-	-
		25	26	Reset TI	-	-
606	50-1	0	1	Phase A Pickup	IA	A
		1	2	Phase B Pickup	IB	A
		2	3	Phase C Pickup	IC	A
		3	4	Phase Pickup	IMax	A
		8	9	Phase A Trip	IA	A
		9	10	Phase B Trip	IB	A
		10	11	Phase C Trip	IC	A
		11	12	Phase Trip	IMax	A
608	51	0	1	Phase A Pickup	IA	A
		1	2	Phase B Pickup	IB	A
		2	3	Phase C Pickup	IC	A
		3	4	Phase Pickup	IMax	A
		8	9	Phase A Trip	IA	A
		9	10	Phase B Trip	IB	A
		10	11	Phase C Trip	IC	A
		11	12	Phase Trip	IMax	A
610	50G-1	4	5	Ground Pickup	IN	A
		12	13	Ground Trip	IN	A
612	51G	4	5	Ground Pickup	IN	A
		12	13	Ground Trip	IN	A
614	INPUTS	0	1	Input 1	-	-
		1	2	Input 2	-	-
		2	3	Input 3	-	-
		3	4	Input 4	-	-
		4	5	Input 5	-	-
		5	6	Input 6	-	-
		6	7	Input 7	-	-
		7	8	Input 8	-	-
		8	9	Input 9	-	-
		9	10	Input 10	-	-
616	OUTPUTS	0	1	Trip Out. 1	-	-
		1	2	Trip Out. 2	-	-
		2	3	Trip Out. 3	-	-
		3	4	Output 4	-	-
		4	5	Output 5	-	-
		5	6	Output 6	-	-
		6	7	Output 7	-	-

Address	Description	State Bit	Event Number	Status	Associated Measurement	Unit
		7	8	Output 8	-	-
618	TRIP BLOCK	8	9	Phase A Block	IA	A
		9	10	Phase B Block	IB	A
		10	11	Phase C Block	IC	A
		11	12	Phase Block	IMax	A
620	MODBUS RTU	11	12	Access Denied (***)	-	-
		12	13	Invalid Authentication (***)	-	-
		13	14	Set Counter (***)	-	-
		14	15	Identification (***)	-	-
		15	16	Remote COM.	-	-
		17	18	Open Breaker	-	-
		18	19	Close Breaker	-	-
		19	20	79 Block	-	-
		20	21	79 UnBlock	-	-
		23	24	Reset	-	-
		25	26	Reset TI	-	-
622	49	3	4	Alarm	TI	%
		11	12	Trip	TI	%
624	50BF	0	1	Phase A Pickup	IA	A
		1	2	Phase B Pickup	IB	A
		2	3	Phase C Pickup	IC	A
		8	9	Phase A Trip	IA	A
		9	10	Phase B Trip	IB	A
		10	11	Phase C Trip	IC	A
626	52	0	1	52A Error	IA	A
		1	2	52Aopen	IA	A
		3	4	52Aclosed	IA	A
		5	6	52AopeningAlarm	IA	A
		6	7	52AI2tAlarm	IA	A
		7	8	52AopeningTalarm	IA	A
		8	9	52B Error	IB	A
		9	10	52Bopen	IB	A
		11	12	52Bclosed	IB	A
		13	14	52BopeningAlarm	IB	A
		14	15	52BI2tAlarm	IB	A
		15	16	52BopeningTalarm	IB	A
		16	17	52C Error	IC	A
		17	18	52Copen	IC	A
		19	20	52Cclosed	IC	A
		21	22	52CopeningAlarm	IC	A
		22	23	52CI2tAlarm	IC	A
		23	24	52CopeningTalarm	IC	A

Address	Description	State Bit	Event Number	Status	Associated Measurement	Unit
		25	26	52 Open	IMax	A
		26	27	52 Close	IMax	A
628	50-2	0	1	Phase A Pickup	IA	A
		1	2	Phase B Pickup	IB	A
		2	3	Phase C Pickup	IC	A
		3	4	Phase Pickup	IMax	A
		8	9	Phase A Trip	IA	A
		9	10	Phase B Trip	IB	A
		10	11	Phase C Trip	IC	A
		11	12	Phase Trip	IMax	A
630	50G-2	4	5	Ground Pickup	IN	A
		12	13	Ground Trip	IN	A
632	46	3	4	Pickup	I-2	A
		11	12	Trip	I-2	A
634	CLP	0	1	CLP Disable	-	-
		1	2	52 Close	-	-
		2	3	52 Open	-	-
		3	4	52 Def.Open	-	-
		4	5	Close CLP	-	-
		5	6	Open CLP	-	-
		12	13	CLP	-	-
636	SHB	8	9	Phase A Block	IA-2H	A
		9	10	Phase B Block	IB-2H	A
		10	11	Phase C Block	IC-2H	A
		11	12	Phase Block	IMax	A
638	LEDS	0	1	Led1	-	-
		1	2	Led2	-	-
		2	3	Led3	-	-
		3	4	Led4	-	-
		4	5	Led5	-	-
		5	6	Led6	-	-
		6	7	Led7	-	-
		7	8	Bistable	-	-
640	PGC	0	1	Reset TI	-	-
		1	2	Ext Trip	-	-
		2	3	Settings G1	-	-
		3	4	Settings G2	-	-
		4	5	O/C Block	-	-
		5	6	E/F Block	-	-
		6	7	Logic Sig1	-	-
		7	8	Logic Sig2	-	-
		8	9	52b-A	-	-

Address	Description	State Bit	Event Number	Status	Associated Measurement	Unit
		9	10	52b-B	-	-
		10	11	52b-C	-	-
642	DFR	10	11	New DFR	-	-
		11	12	Reports Erased	-	-
644	LDP	0	1	Reports Erased	-	-
648	79	0	1	79 Standby	-	-
		1	2	79 RecloseTime	-	-
		2	3	79 Is 52 Open?	-	-
		3	4	79 Hold Time	-	-
		4	5	79 Close Time	-	-
		5	6	79 Reset Time	-	-
		6	7	79 Lockout	-	-
		7	8	79 Safe Time	-	-
		8	9	79 Manual Open	-	-
		9	10	79 Enabled	-	-
650	46BC	3	4	Pickup	-	-
		11	12	Trip	-	-
652	60CTS	3	4	Pickup	IMax	A
		11	12	Alarm	IMax	A
654	37	0	1	Phase A Pickup	IA	A
		1	2	Phase B Pickup	IB	A
		2	3	Phase C Pickup	IC	A
		3	4	Phase Pickup	IMax	A
		8	9	Phase A Trip	IA	A
		9	10	Phase B Trip	IB	A
		10	11	Phase C Trip	IC	A
		11	12	Phase Trip	IMax	A
656	SELF DIAGNOSIS	0	1	Ready	-	-
		4	5	TCP Conf. Error	-	-
		5	6	Error Measure	-	-
		6	7	Error NVM	-	-
		7	8	By Default	-	-
		8	9	Error curves	-	-
		9	10	Error SFLASH	-	-
		10	11	Aux. Power	-	-
		11	12	Self-Power	-	-
		12	13	USB Power	-	-
		13	14	Battery Power	-	-
		16	17	Enable LEDS	-	-
		17	18	Enable OUTP4	-	-
		18	19	Enable OUTP5	-	-
		19	20	Enable LCD	-	-

Address	Description	State Bit	Event Number	Status	Associated Measurement	Unit
		20	21	Enable RS485	-	-
		21	22	Enable OUTP678	-	-
658	HMI	11	12	Access Denied (***)	-	-
		12	13	Invalid Authn. (***)	-	-
		13	14	Reset Key	-	-
		14	15	Identification	-	-
		15	16	HMI Activity	-	-
		17	18	Open Breaker	-	-
		18	19	Close Breaker	-	-
		19	20	79 Block	-	-
		20	21	79 Unblock	-	-
		21	22	Local Control	-	-
		22	23	Remote Control	-	-
		23	24	Reset	-	-
		25	26	Reset TI	-	-
660	74TVS	1	2	NO Trip Power	Trip Vol A	V
		2	3	NO Trip Power A	Trip Vol A	V
		3	4	NO Trip Power B	Trip Vol B	V
		4	5	NO Trip Power C	Trip Vol C	V
664	DATE	5	6	Set Date/Time	-	-
666	SOTF	8	9	Phase A Trip	IA	A
		9	10	Phase B Trip	IB	A
		10	11	Phase C Trip	IC	A
		11	12	Phase Trip	IMax	A
670	Rear TCP COM	0	1	No Profile	-	-
		1	2	Config. Error	-	-
		15	16	Alive	-	-
672	Modbus TCP	11	12	Access Denied (***)	-	-
		12	13	Invalid Authn. (***)	-	-
		13	14	Set Counter (***)	-	-
		14	15	Identification (***)	-	-
		15	16	Remote COM.	-	-
		17	18	Open Breaker	-	-
		18	19	Close Breaker	-	-
		19	20	79 Block	-	-
		20	21	79 Unblock	-	-
		23	24	Reset	-	-
		25	26	Reset TI	-	-
674	Web Server	11	12	Access Denied (***)	-	-
		12	13	Invalid Authn. (***)	-	-
		13	14	Set Counter (***)	-	-
		14	15	Identification (***)	-	-

Address	Description	State Bit	Event Number	Status	Associated Measurement	Unit
		15	16	Remote COM.	-	-
		17	18	Open Breaker	-	-
		18	19	Close Breaker	-	-
		19	20	79 Block	-	-
		20	21	79 UnBlock	-	-
		23	24	Reset	-	-
		25	26	Reset TI	-	-

1.5.2. States identifiers

CRITERIA	IDENTIFIER
GENERAL	51202
MEASUREMENTS	65284
USB COM	63745
50-1	12837
51	13061
50G-1	38434
51G	38661
INPUTS	64770
OUTPUTS	65028
TRIP BLOCK	51713
MODBUS RTU	63746
49	12545
50BF	6145
52	13313
50-2	12869
50G-2	38466
46	11778
CLP	51971

CRITERIA	IDENTIFIER
SHB	51715
LEDS	64260
PGC	64004
DFR	64517
LDP	61185
79	20225
46BC	37377
60CTS	44545
37	9473
SELFDIAGNOSIS	51457
HMI	52481
74TVS	18946
Rear Serial COM	63489
DATE	52737
SOTF	37889
Rear TCP COM	63744
MODBUS TCP	63748
WEB	63750

1.5.3. Measurements Map

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

Number of registries: 2.

Address	Description	Unit	Format
800	Phase A current IA	A	FLOAT
802	Phase B current IB	A	
804	Phase C current IC	A	
806	Neutral current IN	A	
808	Negative Sequence current I-2	A	
810	Positive Sequence current I-1	A	
812	Current 3I0	A	
814	Phase A second harmonic current I-A2H	A	
816	Phase B second harmonic current I-B2H	A	
818	Phase C second harmonic current I-C2H	A	
820	Maximum current I-Max	A	
822	Thermal image	%	
824	Trip Vol A	V	
826	Trip Vol B	V	
828	Trip Vol C	V	

1.5.4. Settings Map

Criteria	Address	Description	Fromat	Enumeration
GENERAL	1002	Language	ENUM4	
	1004	Settings Group	NUM	
	1002	Language	ENUM4	0 → English 1 → Spanish 2 → Depends on Relay model
	1004	Settings Group	NUM	
	1006	Clearing Time	FLOAT	
	1008	Min. Resp. Time	FLOAT	
	1010	Ph. Reset Time	FLOAT	
	1012	N. Reset Time	FLOAT	
MEASUREMENTS	1016	Frequency	ENUM4	0 → 60 Hz 1 → 50 Hz
	1020	N. Nominal Current	ENUM4	0 → 5 A 1 → 1 A
	1022	CT Phase Ratio	FLOAT	
	1024	CT Neutral Ratio	FLOAT	
USB COM	1030	Address	NUM	
50-1	1078	Function Enable	ENUM4	0 → Disable 1 → Alarm 2 → Trip 3 → SHB
	1080	Current Tap	TAP	
	1082	Time Delay	FLOAT	
51	1090	Function Enable	ENUM4	0 → Disable 1 → Alarm 2 → Trip 3 → SHB
	1092	Curve type	ENUM16	0 → Defined Time 1 → IEC Long Time Inverse 2 → IEC Inverse 3 → IEC Very Inverse 4 → IEC Extremely Inverse 5 → IEC Short Time Inverse 6 → IEEE Inverse 7 → IEEE Very Inverse 8 → IEEE Extremely Inverse 9 → C02_P20 10 → C02_P40 11 → C08 12 → Curve 1 13 → Curve 2 14 → Curve 3 15 → Curve 4
	1094	Time Dial (TMS)	FLOAT	
	1096	Current Tap	TAP	
	1098	Time Delay	FLOAT	
50G-1	1100	Function Enable	ENUM4	0 → Disable 1 → Alarm 2 → Trip 3 → SHB
	1102	Current Tap	TAP	
	1104	Time Delay	FLOAT	

Criteria	Address	Description	Format	Enumeration
51G	1112	Function Enable	ENUM4	0 → Disable 1 → Alarm 2 → Trip 3 → SHB
	1114	Curve type	ENUM16	0 → Defined Time 1 → IEC Long Time Inverse 2 → IEC Inverse 3 → IEC Very Inverse 4 → IEC Extremely Inverse 5 → IEC Short Time Inverse 6 → IEEE Inverse 7 → IEEE Very Inverse 8 → IEEE Extremely Inverse 9 → C02_P20 10 → C02_P40 11 → C08 12 → Curve 1 13 → Curve 2 14 → Curve 3 15 → Curve 4
	1116	Time Dial (TMS)	FLOAT	
	1118	Current Tap	TAP	
	1120	Time Delay	FLOAT	
INPUTS	1070	Debounce Time	NUM	
TRIP BLOCK	1186	Function Enable	ENUM4	0 → No 1 → Yes
	1188	Current Tap	TAP	
MODBUS RTU	1032	Address	NUM	
49	1176	Function Enable	ENUM4	0 → Disable 1 → Alarm 2 → Trip
	1178	Current Tap	TAP	
	1180	Heating constant	NUM	
	1182	Cooling constant	NUM	
	1184	Alarm Level	NUM	
50BF	1138	Function Enable	ENUM4	0 → No 1 → Yes
	1140	Time Delay	FLOAT	
52	1058	Max Num. Openings	NUM	
	1060	Max Accumulated Amp	NUM	
	1064	Max. Close Time	FLOAT	
	1066	Repetitive Open Num	NUM	
	1068	Repetitive Open Time	NUM	
50-2	1084	Function Enable	ENUM4	0 → Disable 1 → Alarm 2 → Trip 3 → SHB
	1086	Current Tap	TAP	
	1088	Time Delay	FLOAT	
50G-2	1106	Function Enable	ENUM4	0 → Disable 1 → Alarm 2 → Trip 3 → SHB
	1108	Current Tap	TAP	
	1110	Time Delay	FLOAT	

Criteria	Address	Description	Format	Enumeration
46	1122	Function Enable	ENUM4	0 → Disable 1 → Alarm 2 → Trip 3 → SHB
	1124	Curve type	ENUM16	0 → Defined Time 1 → IEC Long Time Inverse 2 → IEC Inverse 3 → IEC Very Inverse 4 → IEC Extremely Inverse 5 → IEC Short Time Inverse 6 → IEEE Inverse 7 → IEEE Very Inverse 8 → IEEE Extremely Inverse 9 → C02_P20 10 → C02_P40 11 → C08 12 → Curve 1 13 → Curve 2 14 → Curve 3 15 → Curve 4
	1126	Time Dial (TMS)	FLOAT	
	1128	Current Tap	TAP	
	1130	Time Delay	FLOAT	
CLP	1050	Function Enable	ENUM4	0 → No 1 → Yes
	1052	Settings Group	NUM	
	1054	No Load Time	FLOAT	
	1056	Cold Load Time	FLOAT	
SHB	1142	Function Enable	ENUM4	0 → No 1 → Yes
	1144	Current Tap	NUM	
	1146	Reset Time	FLOAT	
	1148	Block Threshold	TAP	
LDP	1046	Current Tap	TAP	
	1048	Time Delay	NUM	
79	1150	Function Enable	ENUM4	0 → No 1 → Yes
	1152	Hold Enable	ENUM4	0 → No 1 → Yes 2 → No Time
	1154	Reclose Number	NUM	
	1156	Reclose 1 Time	FLOAT	
	1158	Reclose 2 Time	FLOAT	
	1160	Reclose 3 Time	FLOAT	
	1162	Reclose 4 Time	FLOAT	
	1164	Reclose 5 Time	FLOAT	
	1166	Hold Time	FLOAT	
	1168	Reset Time	FLOAT	
	1170	Safe Time	FLOAT	
46BC	1132	Function Enable	ENUM4	0 → Disable 1 → Alarm 2 → Trip
	1134	Current Tap	NUM	
	1136	Time Delay	FLOAT	

Criteria	Address	Description	Fromat	Enumeration
60CTS	1172	Function Enable	ENUM4	0 → No 1 → Yes
	1174	Time Delay	FLOAT	
37	1190	Function Enable	ENUM4	0 → Disable 1 → Alarm 2 → Trip
	1192	Current Tap	TAP	
	1194	Time Delay	FLOAT	
	1196	Dead Tap	TAP	
74TVS	1014	Trip Vol	ENUM4	0 → 12 VDC 1 → 17 VDC 2 → 22 VDC 3 → 24 VDC
REAR SERIAL COM	1034	BaudRate	ENUM8	0 → 4800 Bd 1 → 9600 Bd 2 → 19200 Bd 3 → 38400 Bd 4 → 57600 Bd 5 → 115200 Bd
	1036	Parity	ENUM8	0 → 8-N-1 1 → 8-N-2 2 → 8-E-1 3 → 8-E-2 4 → 8-O-1 5 → 8-O-2 6 → 9-N-1 7 → 9-N-2
	1038	Protocol	ENUM4	0 → Modbus RTU
SOTF	1072	Function Enable	ENUM4	0 → No 1 → Yes
	1074	Current Tap	TAP	
	1076	Safe Time	FLOAT	
REAR TCP COM	1198	Protocol	ENUM4	0 → Modbus TCP
MODBUS TCP	1200	Address	NUM	

1.6. Counters Map

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

The function code implemented to State writing is 0x16 (Write Holding Registers).

Number of registries: 2.

Function	Description	Unit	Start address	Number of registries	Format
03 & 16	Openings Number phase A	-	500	2	FLOAT
03 & 16	Accumulated Amps A	k(A2)	502	2	
03 & 16	Openings Number phase B	-	504	2	
03 & 16	Accumulated Amps B	k(A2)	506	2	
03 & 16	Openings Number phase C	-	508	2	
03 & 16	Accumulated Amps C	k(A2)	510	2	

1.7. Commands Map

The function code implemented to State writing is 0x16 (Write Holding Registers).

Number of registries: 2.

To carry out commands through the remote port the relay must be in Remote Mode". The mode can be checked from "General" criteria, in "Local mode" state.

4 ways to execute commands are given:

- **Direct operate, without password, same address:**

Direct operate commands

There is no need to start the session

Same address for all the commands, different enumeration

Address	Description	Number of registries	Enumeration	Format
198	Open Breaker	2	1	UINT32
	Close Breaker	2	2	UINT32
	79 Block	2	3	UINT32
	79 Unblock	2	4	UINT32
	Local Control	2	5	UINT32
	Remote Control	2	6	UINT32
	Reset	2	7	UINT32
	Reset Thermal Image	2	9	UINT32

- **Direct operate, with password, same address:**

Direct operate commands

Start of the session is needed, by sending the password to the access address previous to executing the command.

Same address for all the commands, different enumeration:

Address	Description	Number of registries	Enumeration	Format
182	Open Breaker	2	1	UINT32
	Close Breaker	2	2	UINT32
	79 Block	2	3	UINT32
	79 Unblock	2	4	UINT32
	Local Control	2	5	UINT32
	Remote Control	2	6	UINT32
	Reset	2	7	UINT32
	Reset Thermal Image	2	9	UINT32

- **Direct operate, without password, different command addresses:**

There is no need to start the session

Direct operate commands

Different address for each command

Address	Description	Number of registries	Enumeration	Format
220	Open Breaker	2	0x00010000	UINT32
	Close Breaker	2	0x00000000	UINT32
222	79 Block	2	0x00010000	UINT32
	79 Unblock	2	0x00000000	UINT32
224	Local Control	2	0x00010000	UINT32
	Remote Control	2	0x00000000	UINT32
226	Reset	2	0x00010000	UINT32
228	Reset Thermal Image	2	0x00010000	UINT32

- **Select before operate command:**

Start of the session is needed, by sending the password to the access address previous to the selection of the command.

Function	Description	Start address	Number of registries	Format	Value
16	Selection of Command	200	1	UINT	See command enumeration
16	Confirmation of Command	202	1	UINT	See command enumeration

Description	Enumeration
Open Breaker	1
Close Breaker	2
79 Block	3
79 Unblock	4
Local Control	5
Remote Control	6
Reset	7
Reset Thermal Image	9

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. By default:

ACCESS LEVEL	PASSWORD	Read-only permission: Status and measurements Settings Configuration Events/DFR	Permission to: Change settings	Permission to: Execute Commands Set Counters Delete Events Delete DFR	Permission to: Change user's Configuration	Permission to: Read and change access levels
0	Fanox/0000	YES	NO	NO	NO	NO
1	Fanox/1111	YES	NO	YES	NO	NO
2	Fanox/2222	YES	YES	NO	YES	NO
3	Fanox/3333	YES	YES	YES	YES	NO
4	Fanox/4444	YES	YES	YES	YES	YES
5	Fanox/5555	YES	YES	YES	YES	YES



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