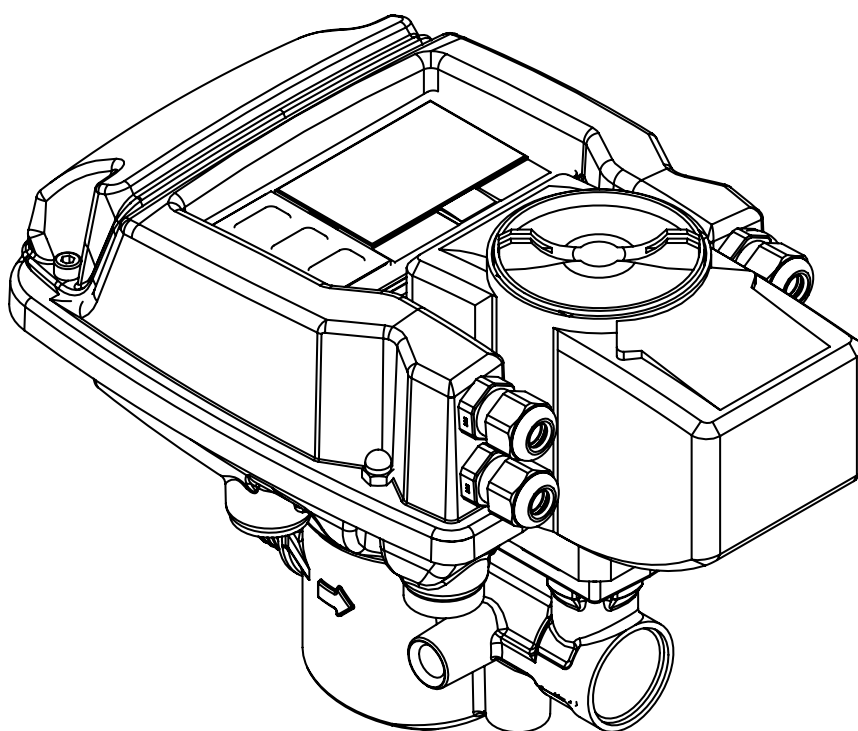




**MODbus RTU & TCP PROTOCOL
User Manual
CS611**



CE

ISOIL 
I N D U S T R I A



Release number: **MAN_CS611_MODBUS_EN_IS_R00_1.00.XXXX -**



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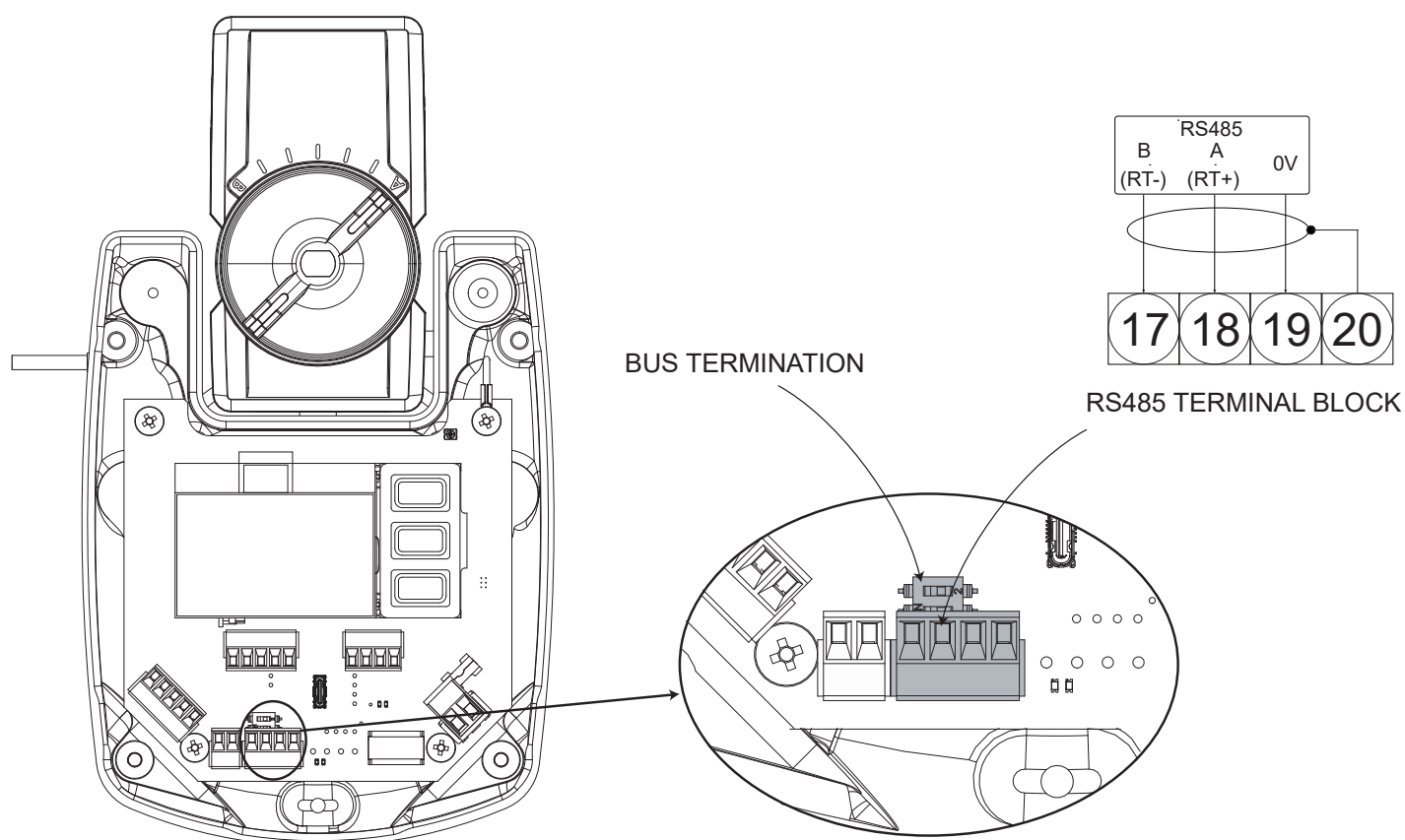
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MODBUS RTU

TECHNICAL DATA

Device Object Name	CS611
Bus termination	Dip switch
Communication speed	300 bit/sec
	600 bit/sec
	1200 bit/sec
	2400 bit/sec
	4800 bit/sec
	9600 bit/sec
	19200 bit/sec
	38400 bit/sec
	57600 bit/sec
	76800 bit/sec
	115200 bit/sec

ELECTRICAL CONNECTION

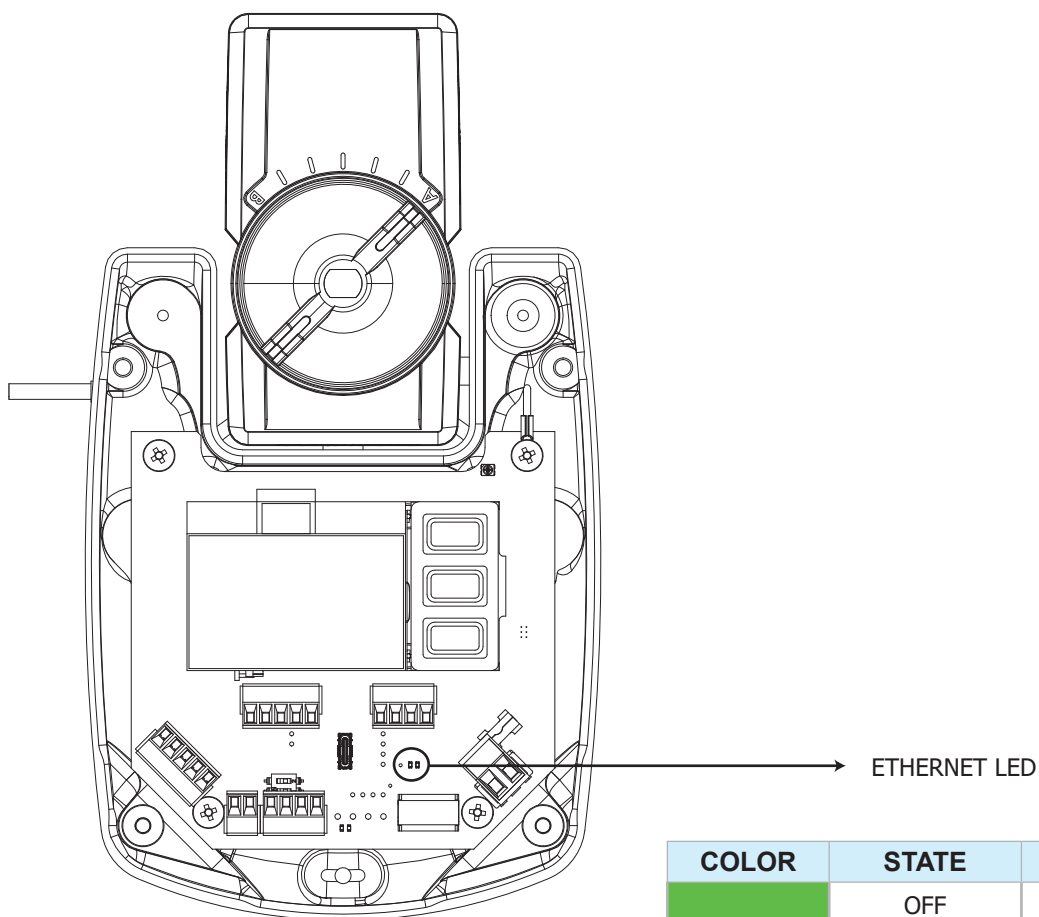


MODBUS TCP

TECHNICAL DATA

Device Object Name	CS611
Port	502
Connector	IDC
Communication Speed	10M
	100M

LED ETHERNET



COLOR	STATE	MEANING
GREEN	OFF	Disconnected
	ON	Connected
	BLINK	Activity
YELLOW	OFF	10M (speed)
	ON	100M (speed)

APPLICATION

MODbus is a widespread and established field bus protocol used within automation.

FUNCTIONALITY

The CS611 communicates as a slave with MODbus-RTU via RS-485 module and with BACnet IP via Ethernet. The MODbus Protocols transfers a number of both actual data as well as accumulated data.

RELIABILITY

Both RS-485 port module and Ethernet are galvanically separated from the meter's voltage potential thereby improving the security for smooth operations.

At the same time, the risk of influencing the meter due to influences of the RS-485 or Ethernet ports is reduced to a minimum.

MODbus RTU ADDRESSING

The module is slave and can be addressed in a range 1-247.

MODbus TCP ADDRESSING

The module is slave and can be addressed with standard Ethernet addresses; Unit Identifier should be 00h or FFh for compatibility, anyway CS611 replay to every Unit Identifiers.

STATUS

A MODbus RTU and TCP icons with multiple states indicate the health of RTU, Ethernet and TCP communications:

	MODbus-RTU traffic detected.
	MODbus-RTU; CS611 has been accessed via MODbus (White LED Blink if enabled).
	FIELDbus (MODbus-RTU) communication error detected, please check communication settings.
	Ethernet connected at 10M.
	Ethernet connected at 100M.
	alternate MODbus-TCP connected (at least 1 socket open).
	alternate MODbus-TCP; CS611 has been accessed via MODbus.
	alternate MODbus-TCP; Protocol Error.

9.1 Modbus Communication Protocol:

OFF	MODbus disabled
RTU	MODbus-RTU* (over RS485) active.
TCP	MODbus-TCP (over Ethernet) active.
R+T	MODbus-RTU* and MODbus-TCP active.

*Enabling RTU will disable other "uart based" protocols (like BACnet-MSTP, M-Bus, ...).

CONFIGURATION

COMMUNICATION			
Modbus	OFF	9.1	Modbus Communication Protocol
Dev. Address	0	9.2	Device Communication Address
Com.Speed	300	9.3	Communication Speed
Parity	NO 1SB	9.4	Communication Parity Bits
Ans. Delay	(ms)	9.5	Communication Answer Delay
ETH DHCP en.	ON	9.6	Ethernet DHCP enable
ETH dev IP add.	192.168.001.064	9.7	Ethernet device IP address
ETH netw. mask	255.255.255.000	9.8	Ethernet network mask
ETH gateway add	192.168.001.001	9.9	Ethernet gateway address
ETH DNS address	192.168.001.001	9.10	Ethernet DNS address
NTP time server		9.11	NTP time server name / address
Netw. password		9.12	Network access password (web)
Net S.En.	ON+OFF	9.13	Network security (SSL-TLS) enable
MODB_32	AAAA-BBBB	9.14	Modbus 32 bits registers order

MAIN MENU

- 1- Measure
- 2- Alarms
- 3- Inputs
- 4- Outputs
- 5- Communication
- 6- Display
- 7- Functions
- 8- Diagnostic
- 9- System

9.2 Device Communication Address: (MODbus-RTU ONLY)

Is the MODbus-RTU Slave Address Unique Identifier on RTU network; 1-247.

9.3 Communication Speed: (MODbus-RTU ONLY)

Is the MODbus-RTU communication speed.

9.4 Communication Parity Bits: (MODbus-RTU ONLY)

EVEN Even Parity, 1 Stop Bit ; default on MODbus.

ODD Odd Parity, 1 Stop Bit ; allowed on MODbus.

NO 2SP No Parity, 2 Stop Bit ; allowed on MODbus.

NO 1SP No Parity, 1 Stop Bit ; deprecated on MODbus.

9.5 Communication Answer Delay: (MODbus-RTU ONLY)

Is the CS611 minimum answer delay time; for compatibility with slower devices, a milliseconds minimum replay delay can be specified.

Anyway, the CS611 effective replay time can be higher due to:

- The respect of "t3.5" silent time required from RTU standard, which is calculated on Communication Speed.
- The Function processing time.

9.6 Ethernet DHCP enable: (MODbus-TCP ONLY)

Enable automatic ethernet addresses configuration from external DHCP.

Attention: Enabling DHCP make the ethernet address "not fixed" then the CS611 MODbus-TCP Server can be difficult to find from MODbus-TCP clients on the network.

9.7 Ethernet device IP address: (MODbus-TCP ONLY)

Is the CS611 Ethernet unique address used when DHCP is disabled.

9.8 Ethernet network mask: (MODbus-TCP ONLY)

Is the CS611 Ethernet network mask used when DHCP is disabled.

9.9 Ethernet gateway address: (not used by MODbus)

Is the CS611 Ethernet Gateway Address used when DHCP is disabled.

9.10 Ethernet DNS address: (not used by MODbus)

Is the CS611 Ethernet DNS Address used when DHCP is disabled.

9.14 Modbus 32 bits registers order:

Used to set the order of 32 bytes data (float and long) over MODbus registers:

AAAA-BBBB	MSW (higher part) sent first (over lower register number), LSW (lower part) sent second (over higher register number).
BBBB-AAAA	LSW (lower part) sent first (over lower register number), MSW (higher part) sent second (over higher register number).
R=BA T=AB	Means that orders for RTU and TCP protocols are different: RTU = BBBB-AAAA, TCP = AAAA-BBBB.
R=AB T=BA	Means that orders for RTU and TCP protocols are different: RTU = AAAA-BBBB, TCP = BBBB-AAAA.

NOTE: Restart the device after changing Ethernet Settings.

DIAGNOSTIC

MODBus –RTU:

List of Diagnostic Counters (FBCDV function on Diagnostic Menu):

```

FB_PER: 0000000000
FB_FER: 0000000000
FB_OER: 0000000000
MDB_TOTAL: 0
MDB_E_CRC: 0
MDB_E_EXC: 0
MDB_RECUD: 0
MDB_BROAD: 0
MDB_E_OUR: 0

```

MODbus –TCP:

List of Diagnostic Counters (ETHID function on Diagnostic Menu):

```

LINK: UP 100 MB
DHCP: ENABLED
ADDRESS: 192.168.100. 72
MASK: 255.255.255. 0
GATEWAY: 192.168.100. 10
DNS: 192.168. 40. 4
MAC Address: 0022C7.FFFFFFFF
MDB_CONN.: 0
MDB_E_PKT: 0
MDB_E_EXC: 0
MDB_RECUD: 0
MDB_E_OUR: 0

```

STANDARD FUNCTIONS

For the MODBUS protocol, the converter has the function of SLAVE device. The MASTER of the MODBUS network see the Converter as a register set of 1 bit or 16 bit.

The data are supplied with list of fixed address grouped in tables with different length.

Date: 28/12/2023
Vendor Name: ISOIL Industria spa
Product Name: MV610 / MV611
Firmware Revision¹: 1.1.1
Product Description: TBD

The converter CS611-ISONRG is a highly accurate thermal energy measurement in water and water/glycol heating and cooling systems.

HOLDING REGISTERS

FUNCTION 03: READ HOLDING REGISTERS

FUNCTION 06: WRITE SINGLE REGISTER

FUNCTION 16: WRITE MULTIPLE REGISTERS

☐ Return information, process data, accumulators, alarms, ..

☐ Return or Set operational data.

Those command s uses 16 bits registers (Word) used alone or linked to form floating point (float) or 32 bit long-integer long) variables type ; i.e. when "AAAA BBBB" order is selected, the 32 bit are allocated as follow:

Address = 0000	Single Register -> 16 bit (Word)
----------------	----------------------------------

Address = 0000 (lower)	16 bit Most Significant Word (MSW)	Double Register->32 bit (long)
Address = 0001 (higher)	16 bit Least Significant Word (LSW)	

Address = 0000 (lower)	16 bit Most Significant Word (MSW)	Floating Point Register ->32 bit (float)
Address = 0001 (higher)	16 bit Least Significant Word (LSW)	

When "BBBB-AAAA" order is selected, the 32 bit are allocated inverted:

ATTENTION: Reading 32bit data must be done in a single operation; trying to read the single "first" register (16bit) of a 32bit data return the error 03 "ILLEGAL DATA VALUE"; trying to access the single "second" register (16bit) of a 32bit data return the error 02 "ILLEGAL DATA ADDRESS".

NOTES: All following tables refers to "Modbus protocol addresses"; depending on master application used, can be referred as INDEX "0" or Register "40001".

For increased compatibility, the following Device "Holding Registers" (FNC 03) can be read also as "Input Registers" (FNC 04) Register "30001".

1. Referred to MODbus implementation ONLY (will not change for modifies that do not involve MODbus).

SYSTEM INFORMATIONS (READ ONLY)

ADDRESS		ITEM		DESCRIPTION	UNIT
INDEX	REGISTER				
0	40001	WORD	SERIEs (5 -> MV)	Device Model	
1	40002	WORD	MODEL (611)		
2	40003	MSW	Value (long)	Serial Number	
3	40004	LSW			
4	40005	BYTE	Mayor	MODbus Firmware Revision	
5	40006	BYTE	Minor		
6	40007	WORD	Build		
7	40008	BYTE	Mayor	Application Software Version	
8	40009	BYTE	Minor		
9	40010	WORD	Build		
10	40011	MSW	Value (long)	Hardware Configuration	
11	40012	LSW			
12-27	40013-40028	-	"0"	reserved	
28	40029	Year	Date/Time (4 registers)	YYYY (i.e 2019)	
29	40030	Month, Day		MMDD (i.e. 1016 means 16th of October)	
30	40031	DLST, Hour, Minute		DHHMM (i.e. 12336 means DLST=ON, 23:36)	
31	40032	Seconds, TZ		SSTZM (i.e 47114 means 47", Time-Zone=114 *)	

* TimeZone: Is 3 digit; first digit is the TZ sign (0='+', 1='-'); other two digits are TZ time in 15' resolution (i.e. 114 means TZ= -210min = -3h30').

SYSTEM STATUS & ALARMS (READ ONLY)

ADDRESS		ITEM		DESCRIPTION	UNIT
INDEX	REGISTER				
32	40033	Bits 0-15	Flags	Global Alarm & Supply Errors	
33	40034	Bits 0-15	Flags	Faults (Analog In., Temp. Sens., Pulse)	
34	40035	-	"0"	Reserved	
35	40036	Bits 0-15		Measure Errors	
36	40037	-	"0"	Reserved	
37	40038	Bits 0-15	Flags	Alarms Limits (T.P., V.F.F.R., T1, T2, Delta)	
38-39	40039-40040	-	"0"	Reserved	
40	40041	signed WORD	Value x 10	Sensor Temperature	0.1 °C
41-47	40042-40043	-	"0"	Reserved	
48	40049	LSB, Bits 8-15	Value, Flags	Plant Type (Control, Status, Fault)	
49-63	40050-40064	-		Reserved	

Global Alarm & Supply Errors		
BITS	DESCRIPTION	GROUP
0	Internal Power Error	Power Supply
1	Power Supply Error	
2-13	Reserved	
14	Secondary Alarm	Global Alarm
15	Main Alarm	

Faults (Analog In., Temp. Sens., Pulse)		
BITS	DESCRIPTION	GROUP
0-2	Reserved	Analog Input
3	Disconnected	Temperature Sensor
4	RTD1 Limit	
5	RTD2 Limit	
6	Reserved	
7	Ref Error	
8-9	Reserved	
10	Disconnected / Error	Analog Input 0
11	OverRange	
12	Reserved	Reserved
13	Reserved	
14	Disconnected / Error	Analog Input 2
15	OverRange	

Measure Errors		
BITS	DESCRIPTION	GROUP
0	Power Measure Overflow	Power Measurement
1	Vector Fluid Overflow	Flow Measurement
2	Temperature T1 Overflow	Temperature Measurement
3	Temperature T2 Overflow	
4	Temperature Delta Overflow	
5-7	Reserved	
8	Output Max Set Point Loop Error	Output Regulation
9	Output Max Positioning Error	Output Regulation
10-13	Reserved	
14	Pulse Input 1 Overflow	
15	Pulse Output 1 Overflow	

Alarms Limits (T.P., V.F.F.R., T1, T2, Delta)		
BITS	DESCRIPTION	GROUP
0	Min Value Alarm	Thermal Power
1	Max Value Alarm	
2-3	Reserved	
4	Min Value Alarm	V.F. Flow Rate
5	Max Value Alarm	
6-7	Reserved	
8	Min Value Alarm	Temperature T1
9	Max Value Alarm	
10	Min Value Alarm	Temperature T2
11	Max Value Alarm	
12	Min Value Alarm	Temperature Delta
13	Max Value Alarm	
14-15	Reserved	

Plant type (Control, Status, Fault)		
BITS	DESCRIPTION	GROUP
0-7	Control (setting)	0: Auto (by Power Sign) 1: Local (by IN4) 2: Remote (by Com. Protocol)
8	Detected (by Power Sign)	0: Heating 1: Cooling
9	Selected (by Control) ²	
10	Incoherence (Det./Sel.) Fault	
11-15	reserved	

² Can be writable as a Coil, depends on local Device settings

PROCESS DATA IN “DEVICE” TECHNICAL UNITS (READ ONLY)

ADDRESS		ITEM		DESCRIPTION	UNIT
INDEX	REGISTER				
64	40065	MSW	Totalizer (long)	Total Heating Thermal Energy	By Device (see [1])
65	40066	LSW			
66	40067	MSW	Totalizer (long)	Partial Heating Thermal Energy	By Device (see [1])
67	40068	LSW			
68	40069	MSW	Totalizer (long)	Total Cooling Thermal Energy	By Device (see [1])
69	40070	LSW			
70	40071	MSW	Totalizer (long)	Partial Cooling Thermal Energy	By Device (see [1])
71	40072	LSW			
72	40073	BYTE / bits	Unit / Decimals [1]	Thermal Energy Unit and Decimals	
73	40074	-	“0”	Reserved	
74	40075	MSW	Totalizer (long)	Total Positive Volume Conveying Liquid	By Device (see [2])
75	40076	LSW			
76	40077	MSW	Totalizer (long)	Partial Positive Volume Conveying Liquid	By Device (see [2])
77	40078	LSW			
78	40079	MSW	Totalizer (long)	Total Negative Volume Conveying Liquid	By Device (see [2])
79	40080	LSW			
80	40081	MSW	Totalizer (long)	Partial Negative Volume Conveying Liquid	By Device (see [2])
81	40082	LSW			
82	40083	MSW	Totalizer (long)	Reserved	By Device (see [2])
83	40084	LSW			
84	40085	MSW	Totalizer (long)	Reserved	By Device (see [2])
85	40086	LSW			
86	40087	MSW	Totalizer (long)	Reserved	By Device (see [2])
87	40088	LSW			
88	40089	MSW	Totalizer (long)	Reserved	By Device (see [2])
89	40090	LSW			
90	40091	BYTE / bits	Unit / Decimals [2]	Volume Conveying Liquid Unit and Decimals	
91	40092	BYTE / bits	Unit / Decimals [2]	Volume Hot Water Unit and Decimals	
92	40093	BYTE / bits	Unit / Decimals [2]	Volume Cold Water Unit and Decimals	
93	40094	BYTE / bits	Unit / Decimals [2]	Aux Input Unit and Decimals	
94-103	40095-40104	-	“0”	reserved	
104	40105	MSW	Value (float)	Thermal Power	By Device (see [3])
105	40106	LSW			
106	40107	MSW	Value (float)	Vector Fluid Flow Rate	By Device (see [4])
107	40108				
108	40109	BYTE / bits	Unit [3]	Thermal Power Unit of Measure	
109	40110	BYTE / bits	Unit [4]	Vector Fluid Flow Rate Unit of Measure	
110	40111	MSW	Value (float)	T1 Inlet Temperature	By Device (see [5])
111	40112	LSW			
112	40113	MSW	Value (float)	T2 Outlet Temperature	By Device (see [5])
113	40114	LSW			

ADDRESS		ITEM		DESCRIPTION	UNIT
INDEX	REGISTER				
114	40115	MSW	Value (float)	Delta Temperature	By Device (see [5])
115	40116	LSW			
116	40117	BYTE / bits	Unit [5]	Temperatures Unit of Measure	
117-127	40118-40128	-	"0"	reserved	
128	40129	MSW	CountTime (long)	Totalizers Unlocked Counting Time	ms
129	40130	LSW			
130	40131	WORD	Value x 100	Analog Input 0 Percent	0.00%
131-135	40132-40136	-	-	Reserved	
136	40137	Reserved	Reserved	Reserved	Reserved
137-139	40138-40140	Reserved	Reserved	Reserved	
140	40141	Reserved	Reserved	Reserved	Reserved
141	40142	Reserved			
142	40143	WORD	Value x 100	Analog Input 2 Percent	0.00%
143-145	40144-40146	STRING	Text	Analog Input 2 Text Unit of Measure	
146	40147	MSW	Value (float)	Analog Input 2 Scaled Value	See Text Field
147	40148	LSW			

[1] Thermal Energy Unit and Decimals

BITS	DESCRIPTION	LIST	
0-7	Unit of Measure	METRIC UNITS:	
		0	Joule J
		1	KiloJoule kJ
		2	WattHour Wh
		3	MegaJoule MJ
		4	KiloWattHour kWh
		5	GigaJoule GJ
		6	MegaWattHour MWh
		7	GigaWattHour GWh
		NON METRIC UNITS:	
		32	BritishThermalUnit BTU
		33	KiloBritishThermalUnit kBT
		34	MegaBritishThermalUnit MBT
8-11	Number of Decimal	0...8	
12-15	Reserved		

[2] Volumes/Gas/Electrical Energy Units and Decimals

BITS	DESCRIPTION	LIST	
0-7	Unit of Measure	METRIC VOLUMES UNITS:	
		0	MilliLiter ml
		1	Cubic Centimeter cm^3
		2	Liter l
		3	Cubic Decimeter dm^3
		4	DecaLitre dal
		5	HectoLitre hl
		6	Cubic Meter m^3
		7	MegaLitre MI
		NON METRIC VOLUMES UNITS:	
		32	Cubic Inch in^3
		33	US Gallon Gal
		34	UK Gallon IGL
		35	Cubic Foot ft^3
		36	Standard Barrel bbl
		37	Oil Barrel BBL
		38	Hundred Cubic Feet hf^3
		39	Kilo US Gallon KGL
		40	Kilo UK Gallon IKG
		41	Kilo Cubic Feet kf^3
		42	Ten Thousand Gallon ttG
		43	Acre Foot Aft
		44	Mega US Gallon MGL
		45	Mega UK Gallon IMG
		GAS VOLUME UNITS:	
		64	Standard Cubic Meter Sm^3
		65	Normal Cubic Meter Nm^3
		ELECTRICAL ENERGY UNITS:	
		96	WattHour Wh
		97	KiloWattHour kWh
		98	MegaWattHour MWh
		99	GigaWattHour GWh
8-11	Number of Decimals	0...8	
12-15	reserved		

[3] Thermal Power Unit of Measure

BITS	DESCRIPTION	LIST		
0-7	Unit of Measure	0	Watt	W
		1	KiloWatt	kW
		2	MegaWatt	MW
		3	GigaWatt	GW
8-15	reserved			

[4] Vector Fluid Flow Rate Unit of Measure

BITS	DESCRIPTION	LIST		
		METRIC UNITS:		
0-7	Unit of Measure	0	MilliLiter	ml
		1	Cubic Centimeter	cm ³
		2	Liter	l
		3	Cubic Decimeter	dm ³
		4	DecaLitre	dal
		5	HectoLitre	hl
		6	Cubic Meter	m ³
		7	MegaLitre	MI
		NON METRIC UNITS:		
		32	Cubic Inch	in ³
		33	US Gallon	Gal
		34	UK Gallon	IGL
		35	Cubic Foot	ft ³
		36	Standard Barrel	bbl
		37	Oil Barrel	BBL
		38	Hundred Cubic Feet	hf ³
		39	Kilo US Gallon	KGL
		40	Kilo UK Gallon	IKG
		41	Kilo Cubic Feet	kf ³
		42	Ten Thousand Gallon	ttG
		43	Acre Foot	Aft
		44	Mega US Gallon	MGL
		45	Mega UK Gallon	IMG
8-13	reserved			
14-15	Time Unit of Measure	0	/Day	/d
		1	/Hour	/h
		2	/Minute	/m
		3	/Second	/s

[5] Temperatures Unit of Measure

BITS	DESCRIPTION	LIST		
0-7	Unit of Measure	0	Celsius	°C
		1	Fahrenheit	°F
8-15	reserved			

PROCESS DATA-OUTPUT CONTROL (READABLE AND WRITABLE)

ADDRESS		ITEM			DESCRIPTION	UNIT
INDEX	REGISTER					
150	40151	WORD	R	Read Position	Out. Read Position [ORRPV]	100 x %
151	40152	WORD	R/(W) ³	Command Position	Out. Command Position [ORCPV, ORMSP]	100 x %
152	40153	WORD	R/W	Channel	Input Regulation Channel [ORCCS]	
153	40154	-	-	"0"	Reserved	
154	40155	MSW	R/(W) ⁴	Set-Point (float) ⁵	Set-Point for Channel Regulation [ORCSV]	Related Device Unit
155	40156	LSW				
156-171	40157-40172	-	-	"0"	Reserved	
172	40173	BYTE	R/W	Disabled Position	Out. Disabled Position [ORDSV]	%
173	40174	-	-	"0"	Reserved	
174	40175	BYTE	R/W	Max Position	Out. Max Position [ORMXV]	%
175	40176	BYTE	R/W	Min Position	Out. Min Position [ORMNV]	%
176-183	40177-40184	-	-	"0"	Reserved	
184	40185	SWORD	R/W	Heating Gain Ch 1	Heating Gain Coefficients for Ch1 [ORHKL]	Pol II PP
185	40186	SWORD	R/W	Heating Gain Ch 2	Heating Gain Coefficients for Ch2 [ORHKL]	Pol II PP
186	40187	SWORD	R/W	Heating Gain Ch 3	Heating Gain Coefficients for Ch3 [ORHKL]	Pol II PP
187	40188	SWORD	R/W	Heating Gain Ch 4	Heating Gain Coefficients for Ch4 [ORHKL]	Pol II PP
188	40189	SWORD	R/W	Heating Gain Ch 5	Heating Gain Coefficients for Ch5 [ORHKL]	Pol II PP
189-191	40190-40192	-	-	"0"	Reserved	
192	40193	SWORD	R/W	Cooling Gain Ch 1	Cooling Gain Coefficients for Ch1 [ORCKL]	Pol II PP
193	40194	SWORD	R/W	Cooling Gain Ch 2	Cooling Gain Coefficients for Ch2 [ORCKL]	Pol II PP
194	40195	SWORD	R/W	Cooling Gain Ch 3	Cooling Gain Coefficients for Ch3 [ORCKL]	Pol II PP
195	40196	SWORD	R/W	Cooling Gain Ch 4	Cooling Gain Coefficients for Ch4 [ORCKL]	Pol II PP
196	40197	SWORD	R/W	Cooling Gain Ch 5	Cooling Gain Coefficients for Ch5 [ORCKL]	Pol II PP
197-199	40198-40200	-	-	"0"	Reserved	

3. Writable only when "Manual" channel is selected.

4. Writable only when a channel other than "Manual" is selected

5. Only Set Point of selected channel can be read / modified in this register.

PROCESS DATA IN “FIXED” STANDARD UNITS (READ ONLY)

ADDRESS		ITEM		DESCRIPTION	UNIT
INDEX	REGISTER				
200	40201	MSW	Totalizer (float)	Total Heating Thermal Energy	Joule
201	40202	LSW			
202	40203	MSW	Totalizer (float)	Partial Heating Thermal Energy	Joule
203	40204	LSW			
204	40205	MSW	Totalizer (float)	Total Cooling Thermal Energy	Joule
205	40206	LSW			
206	40207	MSW	Totalizer (float)	Partial Cooling Thermal Energy	Joule
207	40208	LSW			
208	40209	MSW	Totalizer (float)	Total Volume Conveying Liquid	dm ³
209	40210	LSW			
210	40211	MSW	Totalizer (float)	Partial Volume Conveying Liquid	dm ³
211	40212	LSW			
212	40213	MSW	Totalizer (float)	Total Negative Volume Conveying Liquid	dm ³
213	40214	LSW			
214	40215	MSW	Totalizer (float)	Partial Negative Volume Conveying Liquid	dm ³
215	40216	LSW			
216	40217	MSW	Totalizer (float)	Reserved	dm ³
217	40218	LSW			
218	40219	MSW	Totalizer (float)	Reserved	dm ³
219	40220	LSW			
220	40221	MSW	Totalizer (float)	Reserved	dm ³
221	40222	LSW			Sm ³
					Wh
222	40223	MSW	Totalizer (float)	Reserved	dm ³
223	40224	LSW			Sm ³
					Wh
224-233	40225-40234	-	“0”	Reserved	
234	40235	MSW	Value (float)	Thermal Power	Watt
235	40236	LSW			(J/s)
236	40237	MSW	Value (float)	Vector Fluid Flow Rate	dm ³ /s
237	40238	LSW			
238	40239	MSW	Value (float)	T1 Inlet Temperature	°C
239	40240	LSW			
240	40241	MSW	Value (float)	T2 Outlet Temperature	°C
241	40242	LSW			
242	40243	MSW	Value (float)	Delta Temperature	°C
243	40244	LSW			

COILS

FUNCTION 01: READ COIL S

FUNCTION 05: WRITE SINGLE COIL

Those commands read states, set/reset a bit or execute a function; (some bit set are accessible also via Holding Register Words).

Send **“FF00”** to set (ON) the bit coil or execute the function; send **“0000”** to reset (**OFF**) the bit coil.

ATTENTION:

All following tables refers to “Modbus protocol addresses”; ADDRESS “0”, depending on master application used, can be also expressed as Register Offset “1”, Register “00001” (also if named address, but can start only from “1”, is a register

Counters Reset & Plant Type Selection

ADDRESS		TYPE			DESCRIPTION	NOTE	Holding Register
DEC	HEX						
0	00001	FUNCTION ⁶			Reset Selected Counters	0: do nothing 1: Reset	-
1	00002	BIT ⁷			Plant Type Selected (by Control)	0: Heating 1: Cooling	Plant Type (Control, Status, Fault)
2-9	00003-000010	-	-		Reserved		
10	00011	BIT ⁸	R/(W)	Enable Regulation	Out. Enable Regulation [ORCEN]		

DIAGNOSTICS

Function 08

This command is for Diagnostic functionality; Sub-function parameter and Data allow different test/query execution. See MODbus specification for details.

SUB-FUNCTION		DATA SENT (hex)	DATA RETURNED (hex)	DESCRIPTION
DEC	HEX			
0	00	Any	Echo	Return Query Data
1	01	0000 or FF00	0000 or FF00	Restart Communications Option
4	04	0000	No response !	Force Listen Only Mode
10	0A	0000	0000	Clear Counters and Diagnostic Register
11	0B	0000	Counter	Return Bus Message Count
12	0C	0000	Counter	Return Bus Communication Error Count
13	0D	0000	Counter	Return Bus Exception Error Count
14	0E	0000	Counter	Return Server Message Count
15	0F	0000	Counter	Return Server No Response Count
16	10	0000	Counter	Return Server NAK Count
17	11	0000	Counter	Return Server Busy Count
18	12	0000	Counter	Return Bus Character Overrun Count

6. Writing “ON” (0xFF00) cause counters reset; the function is “strobing”, then there is no needs to write the Coil “OFF” (0x0000), this operation do nothing.

7. Can be writable as a Coil when Control is set to “Remote”.

8. NOT Writable when “IN-4” is selected for enable.



HISTORY OF MODBUS REVISIONS

Firmware Revision	Date	Summary of Changes
1.1.1	28/12/2023	Added Analog Input Addresses.
1.1.0	10/09/2023	Changed Regulation Output Addresses.
1.0.0	03/07/2023	-

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