

LamaPLC: S7-1500 and Sicam Q200 Modbus TCP communication

Sicam Q200

The SICAM Q200 device is a multifunctional device with power quality class A and energy class 0.1S certifications.

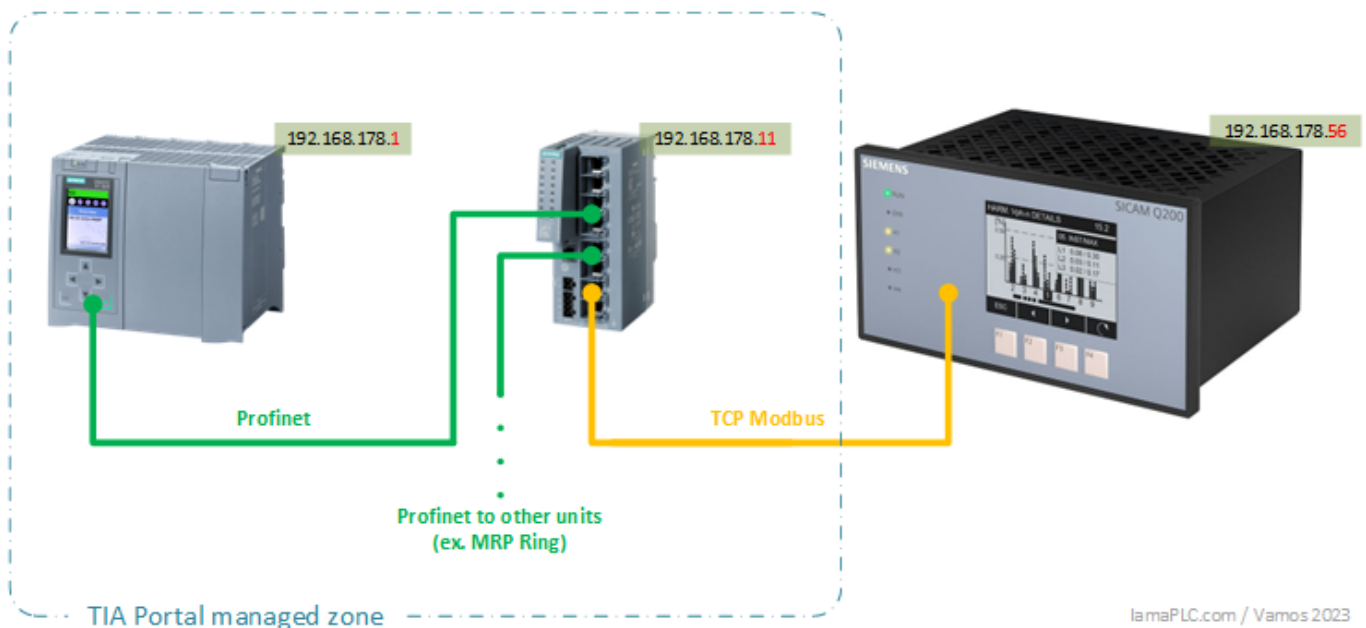
The device measures voltages up to 480 V in 1-phase systems and in 3-wire and 4-wire systems (with neutral phase). The input circuits for voltage measurement can be used in IT, TT and TN networks. To ensure galvanic separation for current measurements, the lines connected to the current measurement inputs are galvanically separated from the current transformers.



If external voltage and current transformers are not used, the device can process rated input alternating voltages of up to $V_{Ph-N} = 230\text{ V}$ (110 V for UL condition), $V_{Ph-Ph} = 400\text{ V}$ (290 V for UL condition) and rated input alternating currents up to 5 A.

TIA Portal / Simatic S7-1500

Wiring schema

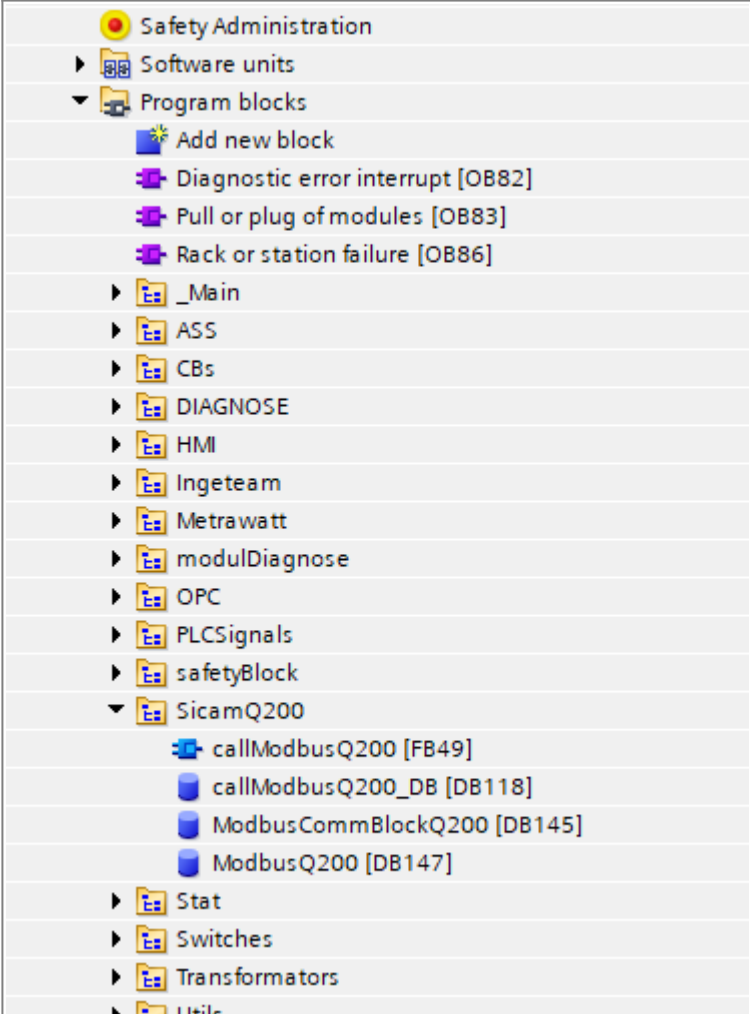


- Modbus communication is usually not part of the managed block of the TIA portal, so these modules do not need to be included in the TIA portal (they are not participants in the *topology- or network view*).
- The communication to the connected switch can even be *Profinet* (or IE), the point is that the

Switch is “visible” from the PLC (it is not necessary to use a managed switch)

- It is important that each unit falls into a class 3 IP address range (the first three identifiers must match, e.g. **192.168.178.nn**)
- Both the PLC and the Modbus partner must be accessible with the **PING** command

Blocks (FBs, DBs)

	<p>callModbusQ200: main program for communication</p> <p>ModbusQ200: measurements in real format</p> <p>callModbusQ200_DB: instant DB from call main prg (automatic generated)</p> <p>ModbusCommBlockQ200: communication parameters (IP,...)</p>
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- The program should be called from OB1 (it has internal timing)
- When calling FB, “callModbusQ200_DB” is the instant DB (recommended only)
- The program does not query all data from Metrawatt (but can be expanded if necessary)
- The Metrawatt modbus register list can be found here (
 here
)
- The program calls up the data slowly, the entire update takes 2 seconds (because that's enough for me). If faster data reading is required, the parameter *t#1s* in line 2 of “callModbusQ200” must be modified.

ModbusQ200 datablock

The figure below shows the values converted to *REAL* form in the ModbusQ200 datablock. The first two lines:

- **comOk** (*bool*) : Communication with the Q200 unit is fine, it works
- **status** (*string*): Textual status indication to the HMI ('OK', 'Battery error', 'SD error', 'device error', 'communication error')

The other lines contain the measured values in REAL form. Their content is updated every 2 seconds. The program does not read all the values from the Q200, only the marked (more important) measurements.

ModbusQ200												
	Name	Data type	Offset	Start value	Monitor value	Retain	Accessi...	Writ...	Visible...	Setpoint	Supervis...	Comment
1	Static											
2	comOk	Bool	0.0	false	TRUE	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		communication ok
3	status	String[24]	2.0	"	'OK'	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		SICAM Q200 status
4	data 1	Real	28.0	0.0	5849.155	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Va - Voltage a-N (V)
5	data 2	Real	32.0	0.0	5883.698	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Vb - Voltage b-N (V)
6	data 3	Real	36.0	0.0	5873.601	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Vc - Voltage c-N (V)
7	data 4	Real	40.0	0.0	10160.31	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Vab - Voltage a-b (V)
8	data 5	Real	44.0	0.0	10194.74	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Vbc - Voltage b-c(V)
9	data 6	Real	48.0	0.0	10140.24	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Vca - Voltage c-a(V)
10	data 7	Real	52.0	0.0	0.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Ia - Current a(A)
11	data 8	Real	56.0	0.0	0.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Ib - Current b(A)
12	data 9	Real	60.0	0.0	0.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Ic - Current c(A)
13	data 10	Real	64.0	0.0	0.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Vn - Voltage neutral conductor(V)
14	data 11	Real	68.0	0.0	5868.819	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Vavg - Mean value of voltage (P-N)(V)
15	data 12	Real	72.0	0.0	0.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		IN - Current neutral conductor(A)
16	data 13	Real	76.0	0.0	0.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Iavg - Mean value of currents(A)
17	data 14	Real	80.0	0.0	0.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Pa - Active power a (W)
18	data 15	Real	84.0	0.0	0.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Pb - Active power b(W)
19	data 16	Real	88.0	0.0	0.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Pc - Active power c(W)
20	data 17	Real	92.0	0.0	0.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		P - Active power(W)
21	data 18	Real	96.0	0.0	0.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Qa - Reactive power a (var)
22	data 19	Real	100.0	0.0	0.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Qb - Reactive power b(var)
23	data 20	Real	104.0	0.0	0.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Qc - Reactive power c(var)
24	data 21	Real	108.0	0.0	0.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Q - Reactive power(var)
25	data 22	Real	112.0	0.0	0.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Sa - Apparent power a(VA)
26	data 23	Real	116.0	0.0	0.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Sb - Apparent power b(VA)
27	data 24	Real	120.0	0.0	0.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Sc - Apparent power c(VA)
28	data 25	Real	124.0	0.0	0.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		S - Apparent power(VA)
29	data 26	Real	128.0	0.0	16#7F80_0001	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		cos phi (a) - Active power factor a(-)
30	data 27	Real	132.0	0.0	16#7F80_0001	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		cos phi (b) - Active power factor b(-)
31	data 28	Real	136.0	0.0	16#7F80_0001	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		cos phi (c) - Active power factor c(-)
32	data 29	Real	140.0	0.0	16#7F80_0001	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		cos phi - Active power factor(-)
33	data 30	Real	144.0	0.0	16#7F80_0001	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		PFa - Power factor a(-)
34	data 31	Real	148.0	0.0	16#7F80_0001	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		PFb - Power factor b(-)
35	data 32	Real	152.0	0.0	16#7F80_0001	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		PFc - Power factor c(-)
36	data 33	Real	156.0	0.0	16#7F80_0001	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		PF - Power factor(-)
37	data 34	Real	160.0	0.0	16#7F80_0001	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		phi a - Phase angle a(°)
38	data 35	Real	164.0	0.0	16#7F80_0001	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		phi b - Phase angle b(°)

callModbusQ200 functionsblock

```

20 // no reset function
21 #disc := FALSE;
22
23 // first call: datablock
24 #mbCli(REQ:=#count = 1,
25     DISCONNECT:=#disc,
26     MB_MODE:=0,
27     MB_DATA_ADDR:=410001,
28     MB_DATA_LEN:=122,
29     DONE=>#done1,
30     BUSY=>#busy,
31     ERROR=>#error1,
32     STATUS=>#status,
33     MB_DATA_PTR:=P#DB147.DBX28.0 WORD 122,
34     CONNECT:="ModbusCommBlockQ200".comm_client);
35
36 #status := #status;
37
38 // second call: status
39 #mbCli(REQ := #count = 2,
40     DISCONNECT := #disc,
41     MB_MODE := 0,
42     MB_DATA_ADDR := 400101,
43     MB_DATA_LEN := 1,
44     DONE => #done2,
45     BUSY => #busy,
46     ERROR => #error2,
47     STATUS => #status,
48     MB_DATA_PTR := P#DB147.DBX276.0 WORD 1,
49     CONNECT := "ModbusCommBlockQ200".comm_client);
50
51 #status := #status;
52

```

#disc	FALSE
#count	1
#disc	FALSE
#done1	FALSE
#busy	TRUE
#error1	FALSE
#status	16#7006
#status	16#7006
#count	1
#disc	FALSE
#done2	FALSE
#busy	FALSE
#error2	FALSE
#status	16#7004
#status	16#7004

mbCli is a multiinstant (**MB_CLIENT**) Modbus call. The program calls this twice, with different parameters. If the status stays in the 700x range and changes continuously, then communication is working (You can find more information about [status codes here](#)).

ModbusCommBlockQ200

ModbusCommBlockQ200								
	Name	Data type	Offset	Start value	Retain	Accessible f...	Writa...	Visib
1	Static				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2	comm_client	TCON_IP_v4	0.0		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
3	Interfaceld	HW_ANY	0.0	64	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
4	ID	CONN_OUC	2.0	16#0001	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
5	ConnectionType	Byte	4.0	16#000B	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
6	ActiveEstablished	Bool	5.0	TRUE	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
7	RemoteAddress	IP_V4	6.0		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
8	ADDR	Array[1..4] of Byte	6.0		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
9	ADDR[1]	Byte	6.0	192	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
10	ADDR[2]	Byte	7.0	168	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
11	ADDR[3]	Byte	8.0	178	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
12	ADDR[4]	Byte	9.0	64	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
13	RemotePort	UInt	10.0	502	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
14	LocalPort	UInt	12.0	503	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

The communication parameters of the Modbus connection can be set in the ModbusCommBlockQ200 DB:

Interfaceld: HW identifier of the PLC communication unit. If the PLC is communicating, this is typically **64**.

ID: Number of the communication connection. In the case of several Modbus connections, it is worth paying attention, in the case of a single connection, **1**.

ConnectionType: 11=TCP/IP, 19=UDP (17=TCP/IP), in this case 11 (**B**).

ActiveEstablished: The communication "active" party, i.e. **TRUE**.

ADDR: IP address of the partner (the Q200 unit). This must be set on the Q200, in this case:

192.168.178.64

RemotePort: **502**, default.

LocalPort: **503**, default.

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The SLC code contains all FBs, FCs and DBs required for the operation. The code was developed with TIA version 16. I cannot take responsibility for its use.

This code ensures communication for this equipment only. Good luck with your application! The code contains no restrictions, restrictions, 100% free!

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