LamaPLC: S7-1500 and Sicam Q200 Modbus TCP communication

Sicam Q200

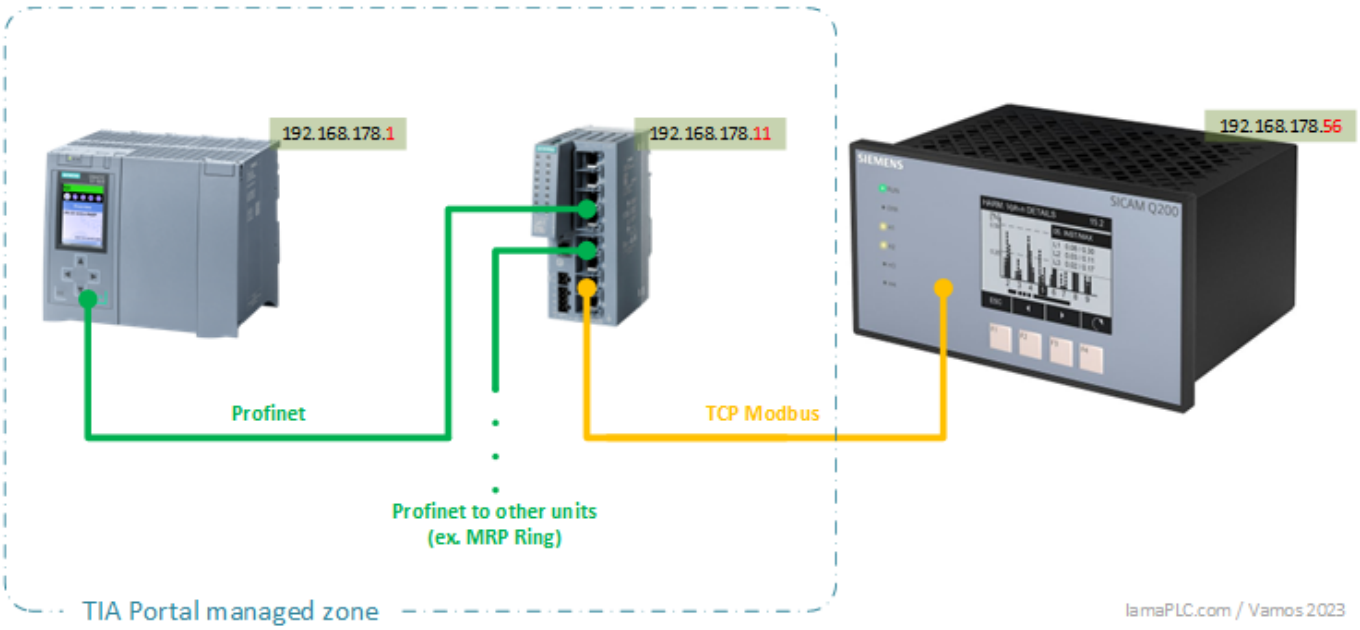
The SICAM Q200 device is a multifunctional device with power quality class A and energy class 0.1S certifications.

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 VPh-N = 230 V (110 V for UL condition), VPh-Ph = 400 V (290 V for UL condition) and rated input alternating currents up to 5 A.

TIA Portal / Simatic S7-1500

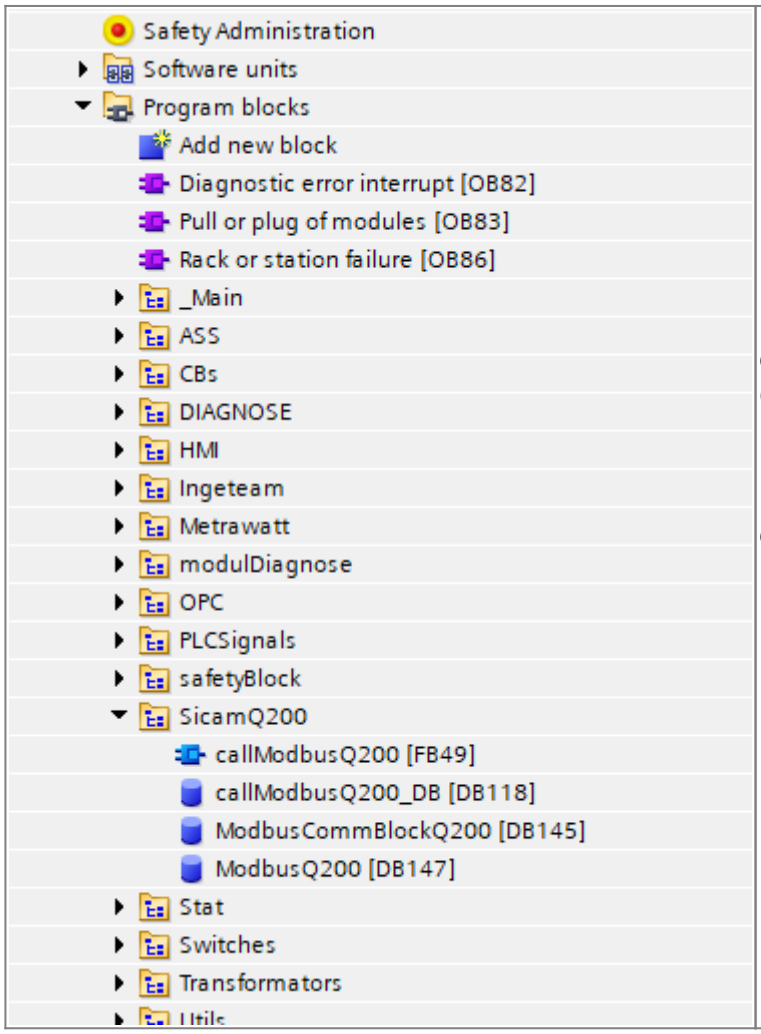
Wiring schema



- 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)



callModbusQ200: main program for communication

ModbusQ200: measurements in real format

callModbusQ200_DB: instant DB from call main prg (automatic generated)

ModbusCommBlockQ200: communication parameters (IP,...)

- 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		☑	☑	☑			communication ok
3	status	String[24]	2.0	''	'OK'		☑	☑	☑			SICAM Q200 status
4	data1	Real	28.0	0.0	5849.155		☑	☑	☑			Va - Voltage a-N (V)
5	data2	Real	32.0	0.0	5883.698		☑	☑	☑			Vb - Voltage b-N (V)
6	data3	Real	36.0	0.0	5873.601		☑	☑	☑			Vc - Voltage c-N (V)
7	data4	Real	40.0	0.0	10160.31		☑	☑	☑			Vab - Voltage a-b (V)
8	data5	Real	44.0	0.0	10194.74		☑	☑	☑			Vbc - Voltage b-c(V)
9	data6	Real	48.0	0.0	10140.24		☑	☑	☑			Vca - Voltage c-a(V)
10	data7	Real	52.0	0.0	0.0		☑	☑	☑			Ia - Current a(A)
11	data8	Real	56.0	0.0	0.0		☑	☑	☑			Ib - Current b(A)
12	data9	Real	60.0	0.0	0.0		☑	☑	☑			Ic - Current c(A)
13	data10	Real	64.0	0.0	0.0		☑	☑	☑			Vn - Voltage neutral conductor(V)
14	data11	Real	68.0	0.0	5868.819		☑	☑	☑			Vavg - Mean value of voltage (P-N)(V)
15	data12	Real	72.0	0.0	0.0		☑	☑	☑			IN - Current neutral conductor(A)
16	data13	Real	76.0	0.0	0.0		☑	☑	☑			Iavg - Mean value of currents(A)
17	data14	Real	80.0	0.0	0.0		☑	☑	☑			Pa - Active power a(W)
18	data15	Real	84.0	0.0	0.0		☑	☑	☑			Pb - Active power b(W)
19	data16	Real	88.0	0.0	0.0		☑	☑	☑			Pc - Active power c(W)
20	data17	Real	92.0	0.0	0.0		☑	☑	☑			P - Active power(W)
21	data18	Real	96.0	0.0	0.0		☑	☑	☑			Qa - Reactive power a(var)
22	data19	Real	100.0	0.0	0.0		☑	☑	☑			Qb - Reactive power b(var)
23	data20	Real	104.0	0.0	0.0		☑	☑	☑			Qc - Reactive power c(var)
24	data21	Real	108.0	0.0	0.0		☑	☑	☑			Q - Reactive power(var)
25	data22	Real	112.0	0.0	0.0		☑	☑	☑			Sa - Apparent power a(VA)
26	data23	Real	116.0	0.0	0.0		☑	☑	☑			Sb - Apparent power b(VA)
27	data24	Real	120.0	0.0	0.0		☑	☑	☑			Sc - Apparent power c(VA)
28	data25	Real	124.0	0.0	0.0		☑	☑	☑			S - Apparent power(VA)
29	data26	Real	128.0	0.0	16#7F80_0001		☑	☑	☑			cos phi (a) - Active power factor a(-)
30	data27	Real	132.0	0.0	16#7F80_0001		☑	☑	☑			cos phi (b) - Active power factor b(-)
31	data28	Real	136.0	0.0	16#7F80_0001		☑	☑	☑			cos phi (c) - Active power factor c(-)
32	data29	Real	140.0	0.0	16#7F80_0001		☑	☑	☑			cos phi - Active power factor(-)
33	data30	Real	144.0	0.0	16#7F80_0001		☑	☑	☑			PFa - Power factor a(-)
34	data31	Real	148.0	0.0	16#7F80_0001		☑	☑	☑			PFb - Power factor b(-)
35	data32	Real	152.0	0.0	16#7F80_0001		☑	☑	☑			PFc - Power factor c(-)
36	data33	Real	156.0	0.0	16#7F80_0001		☑	☑	☑			PF - Power factor(-)
37	data34	Real	160.0	0.0	16#7F80_0001		☑	☑	☑			phi a - Phase angle a(°)
38	data35	Real	164.0	0.0	16#7F80_0001		☑	☑	☑			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;
```

#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				☐	☐	☐	
2	comm_client	TCON_IP_v4	0.0		☑	☑	☑	
3	InterfaceId	HW_ANY	0.0	64	☑	☑	☑	
4	ID	CONN_OUC	2.0	16#0001	☑	☑	☑	
5	ConnectionType	Byte	4.0	16#000B	☑	☑	☑	
6	ActiveEstablished	Bool	5.0	TRUE	☑	☑	☑	
7	RemoteAddress	IP_V4	6.0		☑	☑	☑	
8	ADDR	Array[1..4] of Byte	6.0		☑	☑	☑	
9	ADDR[1]	Byte	6.0	192	☑	☑	☑	
10	ADDR[2]	Byte	7.0	168	☑	☑	☑	
11	ADDR[3]	Byte	8.0	178	☑	☑	☑	
12	ADDR[4]	Byte	9.0	64	☑	☑	☑	
13	RemotePort	UInt	10.0	502	☑	☑	☑	
14	LocalPort	UInt	12.0	503	☑	☑	☑	

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

DB:

InterfaceId: 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.

Download

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!

If you need a modified or different code, find me here!

If you just want to throw me a coffee tip, you can do it here:

If you are a manufacturer and would like an example program similar to your product, you can find me here!

Download code here
simatic, s7, modbus, TIA portal, communication, Sicam, Q200, Sicam Q200, source code, SCL, class A