

MODBUS

FOR BUDERUS SSB BOILERS



BOSCH

Installation and Service Instructions for Contractors

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1 Key to symbols and safety instructions

1.1 Key to symbols

Warnings



Warnings in this document are identified by a warning triangle printed against a grey background.

Keywords at the start of a warning indicate the type and seriousness of the ensuing risk if measures to prevent the risk are not taken.

The following keywords are defined and can be used in this document:

- **DANGER** indicates a hazardous situation which, if not avoided, will result in death or serious injury.
- **WARNING** indicates a hazardous situation which, if not avoided, could result in death or serious injury.
- **CAUTION** indicates a hazardous situation which, if not avoided, could result in minor to moderate injury.
- **NOTICE** is used to address practices not related to personal injury.

Important information



This symbol indicates important information where there is no risk to people or property.

2 Connection to the boiler

To connect the **Modbus**, access the internal terminal strip of the boiler as described in the manual and follow the wiring shown in the figure 1.

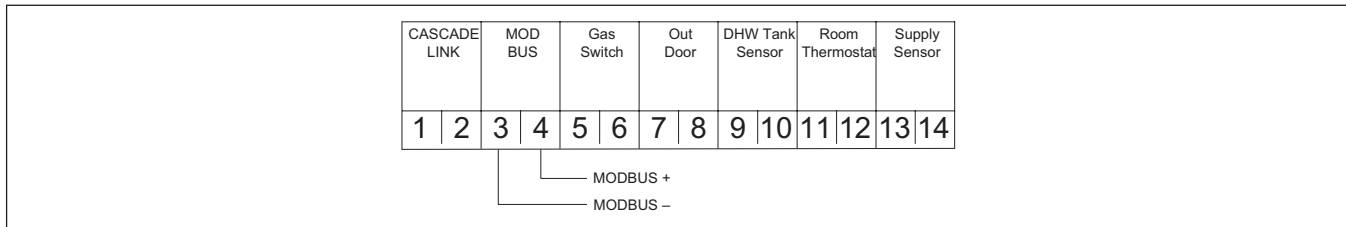


Fig. 1 Wiring diagram

3 Configuration

The table below summarizes the **Modbus** configuration details.

Modbus configuration	
Protocol	Modbus RTU
Default slave address	Configurable with 894PB or LabVision. Default: 1
Supported Modbus commands	Read Holding registers (03). Write single holding register (06). Write multiple holding registers (10)
Baud rate	9600bps
Data Length	8
Parity	None
Stop Bits	1/2, Configurable with 894PB or LabVision. Default: 2 stopbits
Physical layer	RS485 (two wire + optional GND)

Tab. 1 Modbus configuration details

4 Holding register

Depending on the type of **Modbus** software used, the holding register addressing range starts either at 0x0000 or at 0x0001. If your **Modbus** software starts addressing from 0x0000 you can use the holding register addresses shown in the table above. If your **Modbus** software addressing range starts at 0x0001 then add 1 to the holding register addresses listed in the table above. This is also true for the various test tools available for **Modbus**.

Holding registers that support writing can only be written to when writing is enabled. Writing can be enabled by setting the 'Write enable' bit in the 'Control register' for more information see paragraphs 'Control register' and 'Write Enable'.

4.1 Overview

4.1.1 General Modbus Control/Status registers (95 - 99)

Holding register	0062	Access		Description	Automatic Conversion	Range
		R	W			
98	0062	X	X	Unit selection (see paragraph "Unit selection" for more details)		Bit0: °C / °F Bit1: bar / psi
99	0063	X	X	Control register (see paragraph "Control register" for more details)		Bit0: Write Enable. Bit14: Controller reset.

Tab. 2 Modbus Control/Status registers configuration details

4.1.2 Status Information (100 - 199)

Holding register	0064	Access		Description	Automatic Conversion	Range
		R	W			
Status Information						
100	0064	X		State		See state table
101	0065	X		Status		See status table
102	0066	X		Error Code		See error list
110		X		CH pump	Yes	0/100 or 0..100%
111		X		DHW pump	Yes	0/100 or 0..100%
112		X		General pump	Yes	0/100 or 0..100%
Sensor / Feedback information						
120		X		Supply temperature	Yes	Depending on units °C / °F
121		X		Return temperature	Yes	Depending on units °C / °F
122		X		DHW temperature	Yes	Depending on units °C / °F
123		X		Flue gas temperature	Yes	Depending on units °C / °F
124		X		System (Heat exchanger) temperature (if available)	Yes	Depending on units °C / °F
125		X		Outside temperature (if available)	Yes	Depending on units °C / °F
140		X		Firing Rate (power output)	Yes	0..100%
142		X		Flame (ionization) current	Yes	0..x µA

Tab. 3 Status Information

4.1.3 History information (200 – 299)

Holding register	200	Access		Description	Automatic Conversion	Range
		R	W			
(History) Counters						
200	200	X		Successful ignition counter		0..65536, resolution 16
201	201	X		Failed ignition counter		0..65536, resolution 1
202	202	X		Flame failure counter		0..65536, resolution 1
203	203	X		Burn hours CH		0..65536 hours
204	204	X		Burn hours DHW		0..65536 hours
Lockout Error History						
220	220	X		First Lockout in history		See Error list
221	221	X		Second Lockout in history		See Error list
222	222	X		Third Lockout in history		See Error list
223	223	X		4th Lockout in history		See Error list
224	224	X		5th Lockout in history		See Error list
225	225	X		6th Lockout in history		See Error list
226	226	X		7th Lockout in history		See Error list
227	227	X		8th Lockout in history		See Error list
228	228	X		9th Lockout in history		See Error list
229	229	X		10th Lockout in history		See Error list
230	230	X		11th Lockout in history		See Error list
231	231	X		12th Lockout in history		See Error list
232	232	X		13th Lockout in history		See Error list
233	233	X		14th Lockout in history		See Error list

Tab. 4 History information

Holding register	Access		Description	Automatic Conversion	Range
	R	W			
234	X		15th Lockout in history		See Error list
235	X		16th Lockout in history		See Error list
236	X		Time after First Lockout	Yes	Hours
237	X		Time after Second Lockout	Yes	Hours
238	X		Time after Third Lockout	Yes	Hours
239	X		Time after 4th Lockout	Yes	Hours
240	X		Time after 5th Lockout	Yes	Hours
241	X		Time after 6th Lockout	Yes	Hours
242	X		Time after 7th Lockout	Yes	Hours
243	X		Time after 8th Lockout	Yes	Hours
244	X		Time after 9th Lockout	Yes	Hours
245	X		Time after 10th Lockout	Yes	Hours
246	X		Time after 11th Lockout	Yes	Hours
247	X		Time after 12th Lockout	Yes	Hours
248	X		Time after 13th Lockout	Yes	Hours
249	X		Time after 14th Lockout	Yes	Hours
250	X		Time after 15th Lockout	Yes	Hours
251	X		Time after 16th Lockout	Yes	Hours
Blocking Error History					
260	X		First Blocking in history		See Error list
261	X		Second Blocking in history		See Error list
262	X		Third Blocking in history		See Error list
263	X		4th Blocking in history		See Error list
264	X		5th Blocking in history		See Error list
265	X		6th Blocking in history		See Error list
266	X		7th Blocking in history		See Error list
267	X		8th Blocking in history		See Error list
268	X		9th Blocking in history		See Error list
269	X		10th Blocking in history		See Error list
270	X		11th Blocking in history		See Error list
271	X		12th Blocking in history		See Error list
272	X		13th Blocking in history		See Error list
273	X		14th Blocking in history		See Error list
274	X		15th Blocking in history		See Error list
275	X		16th Blocking in history		See Error list
276	X		Time after First Blocking	Yes	Hours
277	X		Time after Second Blocking	Yes	Hours
278	X		Time after Third Blocking	Yes	Hours
279	X		Time after 4th Blocking	Yes	Hours
280	X		Time after 5th Blocking	Yes	Hours
281	X		Time after 6th Blocking	Yes	Hours
282	X		Time after 7th Blocking	Yes	Hours
283	X		Time after 8th Blocking	Yes	Hours
284	X		Time after 9th Blocking	Yes	Hours
285	X		Time after 10th Blocking	Yes	Hours
286	X		Time after 11th Blocking	Yes	Hours
287	X		Time after 12th Blocking	Yes	Hours
288	X		Time after 13th Blocking	Yes	Hours
289	X		Time after 14th Blocking	Yes	Hours
290	X		Time after 15th Blocking	Yes	Hours
291	X		Time after 16th Blocking	Yes	Hours

Tab. 4 History information



The error history is not in sequence of error occurrences. It is a representation of the internal error history.

4.1.4 Dependent Information (300 - 399)

Holding register	Access		Description	Automatic Conversion	Range
	R	W			
Dependent 01					
300			State		See state table
302			Error Code		See error list
303			Firing Rate (power output)	Yes	0..100%
Dependent 02					
306			State		See state table
308			Error Code		See error list
309			Firing Rate (power output)	Yes	0..100%
Dependent 03					
312			State		See state table
314			Error Code		See error list
315			Firing Rate (power output)	Yes	0..100%
Dependent 04					
318			State		See state table
320			Error Code		See error list
321			Firing Rate (power output)	Yes	0..100%
Dependent 05					
324			State		See state table
326			Error Code		See error list
327			Firing Rate (power output)	Yes	0..100%
Dependent 06					
330			State		See state table
332			Error Code		See error list
333			Firing Rate (power output)	Yes	0..100%
Dependent 07					
336			State		See state table
338			Error Code		See error list
339			Firing Rate (power output)	Yes	0..100%

Tab. 5 Dependent Information

4.1.5 Settings / Parameters (500 - 599)

Holding register	Access		Description	Automatic Conversion	Range
	R	W			
Settings / Parameters					
500	X	X	CH mode		0..x
501	X	X	DHW mode		0..x
502	X	X	CH set-point	Yes	Depending on units °C / °F
503	X	X	DHW set-point	Yes	Depending on units °C / °F
504	X	X	Reset Curve Boiler Design	Yes	Depending on units °C / °F
505	X	X	Reset Curve Boiler Mild Weather	Yes	Depending on units °C / °F
506	X	X	Reset Curve Outdoor Mild Weather	Yes	Depending on units °C / °F
507	X	X	Reset Curve Outdoor Design	Yes	Depending on units °C / °F
508	X	X	Warm Weather Shutdown	Yes	Depending on units °C / °F
509	X	X	Reset Curve Boiler Maximum	Yes	Depending on units °C / °F
510	X	X	Reset Curve Boiler Minimum	Yes	Depending on units °C / °F
511	X	X	Night Setback	Yes	Depending on units °C / °F

Tab. 6 Settings / Parameters

4.2 Control register

The control register can be used to gain access to special functions (like writing or controller reset).

Holding register	Access		Description	Automatic Conversion	Range
	R	W			
99	0063	X	X	Control register	Bit0: Write Enable. Bit14: Controller reset.

Tab. 7 Control register

When no **Modbus** communication (reading or writing) is sensed for more than 4,0 Seconds the control register will be reset/cleared. The bits will also be reset when undefined bits (i.e. other than bits 0 and 14) are set.

4.2.1 Write Enable

The 'Write enable' bit controls if writing to Holding registers is allowed.

'Write enable' = 0: holding registers cannot be written.

'Write enable' = 1: holding registers (that support writing) can be written.

After a write sequence is completed the 'Write enable' bit will be automatically cleared.

So before each new write action the 'Write enable' bit must be set again.

After setting the 'Write enable' bit, a write action must be done within max 4 seconds, otherwise the bit is cleared and writing is disabled.

NOTICE: Only enable writing when initiating a write command to a holding register. Do not send this command when no write is needed to prevent holding registers from being corrupted.

4.2.2 Controller reset

A controller can only be reset when it is in Lockout (lockout error is set). When the controller is in lockout, it can be reset by setting bit 14 in the control holding register. Once the reset is executed the bit will automatically be cleared.

4.3 Unit selection

For easier handling of holding registers, the data format can be changed. The data format that is selected will apply for both reading and writing of data.

Holding register	Access		Description	Automatic Conversion	Range
	R	W			
98	0062	X	X	Unit selection	Bit0: °C / °F. Bit1: Bar / PSI.

Tab. 8 Unit selection

Before you can change the unit selection, you must first enable writing (by setting the 'Write enabled' bit in the 'Control register').

After this you can set the appropriate bits in the 'Unit selection' register.

4.4 Data types

Modbus communicates using words (the contents of 16bit holding registers). So data will be received/sent as 16-bit data for each holding register.

Some data types require a higher precision than a whole number (integer), these data types will be multiplied with a factor so the precision is not lost.

When the value for that data type is read it must be divided by the same factor to get the real value. This also applies to writing the value, then the value must first be multiplied by the factor before writing it to the Holding register.

Data type	Resolution	Factor	Unit
Temperature	xxx.x	10	Degrees Celsius / Fahrenheit (°C / °F)
Voltage	xxx.x	10	Volt
Pressure	xxx.x	10	Bar / PSI
Flame current (micro amps)	xxx.x	10	µA
Percentage	xxx.x	10	%

Tab. 9 Data types

5 Tables

5.1 State table

#	Name	Description
0	RESET_0	Initialization variables for reset (start-up) state
1	RESET_1	Reset (start-up) state
2	STANDBY_0	Standby / System idle
3	PRE_PURGE	Initialization variables for pre purging
4	PRE_PURGE_1	Pre purging
5	SAFETY_ON	Test safety relay on
6	SAFETY_OFF	Test safety relay off
7	IGNIT_0	Ignition
8	IGNIT_1	Ignition
9	BURN_0	System is burning
10	SHUT_DOWN_RELAY_TEST_0	Initialization variables for test safety and gas valve relays
11	SHUT_DOWN_RELAY_TEST_1	Test safety and gas valve relays
12	POST_PURGE_0	Initialization variables for post purging
13	POST_PURGE_1	Post purging
14	PUMP_CH_0	Initialization variables for pumping for Central Heating (CH)
15	PUMP_CH_1	Pumping for Central Heating (CH)
16	PUMP_HW_0	Initialization variables for pumping for Domestic Hot Water (DHW)
17	PUMP_HW_1	Pumping for Domestic Hot Water (DHW)
18	ALARM_1	Lockout state (lockout error is present)
19	ERROR_CHECK	Blocking state (blocking error is present)
20	BURNER_BOOT	Rebooting controller
21	CLEAR_E2PROM_ERROR	Clear error space in e2prom
22	STORE_BLOCK_ERROR	Store blocking error
23	WAIT_A_SECOND	Wait a moment before entering another state.

Tab. 10 State table

5.2 Status table

#	Name	Description
0	STANDBY	Standby / System idle
10	ALARM	Lockout (by lockout error)
14	BLOCK	Blocked (by blocking error)
15	FROST_PROTECT	Frost protection active
16	CH_DEMAND	Demand for Central Heating
17	RESET_STATE	Resetting
18	STORAGE_DEMAND	Demand for Storage Heating
19	DHW_TAP_DEMAND	Tap detected. Demand for Domestic Hot Water (DHW)
20	DHW_PRE_HEAT	Demand for pre-heat
21	STORE_HOLD_WARM	Keep the Storage on the desired temperature
22	GENERAL_PUMPING	Pumping with general pump

Tab. 11 Status table

5.3 Error table

#	Name	Description
Lockout errors		
1	"Ignit Error"	Three unsuccessful ignition attempts in a row
2	"Gv Relay Error"	Failure detected in the GV (gas valve) Relay
3	"Gv Relay Not Open"	Failure detected in the GV (gas valve) Relay
4	"Gv Relay Not Close"	Failure detected in the GV (gas valve) Relay
5	"Safety Relay Error"	Failure detected in the Safety Relay
6	"Safety Relay Open"	Failure detected in the Safety Relay
7	"Safety Relay Closed"	Failure detected in the Safety Relay
11	"Blocking Too Long Error"	Control had a blocking error for more than 20 hours in a row
12	"Fan Error"	Fan MF deviation for more than 60 sec
13	"Ram Error"	Internal software error
14	"Wrong E2prom Signature"	Contents of E2prom is not up-to-date
15	"X Ram Error"	Internal software error
16	"E2Prom Error"	No communication with E2prom
17	"E2Prom Error C"	Wrong safety parameters in E2prom
18	"E2Prom Error Cal Table"	Wrong calibration table parameters
19	"State Error"	Internal software error
20	"Rom Error"	Internal software error
21	"Rom Error C"	Internal software error
22	"Air Sw Not Open"	Air pressure switch not working
23	"15Ms Xrl Error"	Internal software error
24	"Air Sw Not Closed"	Air pressure switch not working
25	"T Max Lock Error"	The external overheat protection is activated
26	"Stack Error"	Internal error
27	"Flame Out Too Late Error"	Flame still present 10 sec. after closing the gas valve
28	"Flame Error 1"	Flame is detected before ignition
29	"20Ms Xrl Error"	Internal software error
30	"41Ms Error"	Internal software error
31	"Too Many Flame Failures"	Three times flame lost during one demand
32	"Flow Switch Not Closed Error"	Flow switch not working / No flow
33	"Flow Switch Not Open Error"	Flow switch not working / No flow
34	"Flag Byte Integrity Error"	Internal software error
35	"Ad Hi Cpl Error"	Internal software error
36	"Ad Lo Cpl Error"	Internal software error
37	"Register Error"	Internal software error
Blocking errors		
45	"WD Error Ram"	Internal software error
46	"WD Error Rom"	Internal software error
47	"WD Error Stack"	Internal software error
48	"WD Error Register"	Internal software error
49	"WD Error Xrl"	Internal software error
50	"Rephi Too Lo Error"	Internal software error
51	"Rephi Too Hi Error"	Internal software error
52	"Reflo Too Lo Error"	Internal software error
53	"Reflo Too Hi Error"	Internal software error
54	"Flame Error 2"	Flame is detected in a state in which no flame is allowed to be seen
55	"Water Level Detect"	Low water level detected
56	"Water Level Meas"	Low water level measurement error
57	"Low Water Cutoff Error"	Low water sensor error
58	"Low Water Pressure Error"	Low water pressure error
59	"Low Water Pressure Sensor"	Low water pressure
60	"Flue Gas Error"	Flue gas pressure error
61	"Return Temp Error"	Return temperature is higher than stay burning temperature
62	"Blocked Drain Error"	Block drain switch is active
64	"Wd Freq Error"	Incorrect Frequency signal or no communication with the WD
65	"Phase Error"	Hot neutral reversed
66	"Net Freq Error"	Net freq. error detected in the main

Tab. 12 Error table

#	Name	Description
67	"Faulty Earth Error"	Faulty ground connection
68	"WD Communication Error"	Watchdog communication error
70	"Overheat Error"	Supply temp exceed the limit
72	"T Supply Open"	Supply sensor open
73	"T Return Open"	Return sensor open
76	"T Dhw Out Open"	DHW sensor open
80	"T Supply Shorted"	Supply sensor shorted
81	"T Return Shorted"	Return sensor shorted
84	"T Dhw Out Shorted"	DHW sensor shorted
86	"T Flue Shorted"	Flue sensor shorted
87	"Reset Button Error"	Reset button error
93	"Appliance Selection"	Appliance selection error
107	"Gas Pressure Error"	Gas pressure too low
108	"Flue Press Error"	Flue gas pressure error

Tab. 12 Error table



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