MODBUS POWER CONTROL LICENSE BLUE'LOG XC

Item no.: 557.008

Modbus interface for real-time process data exchange with the grid operator

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LICENSE DESCRIPTION

The Modbus Power Control interface is an open Modbus TCP interface. It facilitates the real-time process data exchange with the grid operator. If telecontrol protocols (IEC 60870-5-101 /-104, IEC 61850 or DNP3) are used, the interface is the ideal connection between a protocol converter (e.g. programmable logic controller (PLC)) and the telecontrol system of the grid operator.
The Modbus Power Control license activates this function on the blue'Log XC controller.

FEATURES

+ Modbus TCP interface
+ Setpoint commands given by the grid operator
  (active power curtailment, power factor (cos φ) control, reactive power control)
+ Interface for protocol converter of telecontrol protocols
  (IEC 60870-5-101 /-104, IEC 61850 or DNP3)
+ Switching between different methods for active / reactive power management
+ Setting of reference voltage for parallel shift of the characteristic curve Q (V)
+ Feedback (acknowledgement) of setpoint commands for signal monitoring
+ Feedback of electrical parameters measured at grid connection point
  (e.g. P, Q, cos φ, f, V, I)

PREREQUISITES

+ blue'Log XC with firmware ≥ 10.0.8
+ Modbus Power Control License[1]
+ Configuration is carried out in the **Power Control** menu
  + For active power, the setting must be carried out via the web frontend so that the setpoint command will be transmitted via Modbus:
    - Setting in the **Power Control** menu > **Active power**
    - Setpoint command method: Variable fixed value P_{var} Modbus

  + For reactive power, configuration must be carried out via web frontend to define whether cos φ or Q will be used for control:
    - Setting in the **Power Control** menu > **Reactive power**
    - Setpoint command method: Variable fixed value Q_{var} Modbus or variable fixed value cos φvar Modbus

  + For setting a reference voltage for parallel shift of the characteristic curve Q (V):
    - Setting in the **Power Control** menu > **Reactive power**
    - Setpoint command method: Characteristic curve Q (V)
    - Options for **Characteristic curve Q(V)** menu: Activate **Parallel shift** and **Transmission type** Modbus

  + For setting an absolute voltage setpoint $V_{setpoint}$ and the reference reactive power $Q_{\Delta V0}$, configuration must be carried out via the web frontend in the **Power Control** menu > **Reactive power**:
    - Method Voltage control Q (V droop)

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[1] The license is linked to a specific device. When ordering, please provide the 14-digit hardware serial number of the controller.

MODBUS SPECIFICATION

Communication parameters
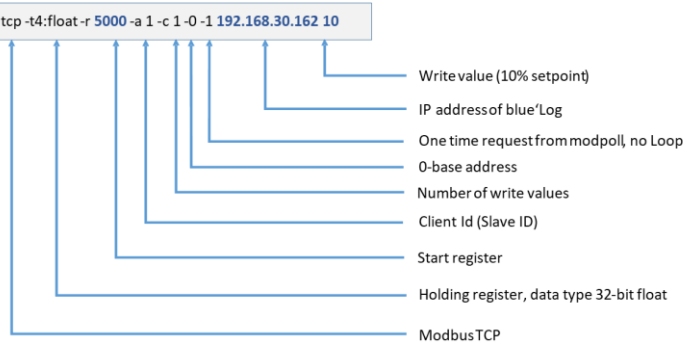+ Slave address (Client ID): 1
+ Port: 502
+ Delay: 1.000 ms

General register defintion
+ Data type: float 32
+ Missing value: 0x7FC00000
+ Read values: Function Code 03 - Read Holding Registers must be used to read the values.
+ Write values: Function Code 16 - Preset Multiple Registers must be used to write the values
+ Register and byte order
  - The word order is LOW register before HIGH register (Little Endian)
  - The byte order is HIGH byte before LOW byte (Big Endian)
    → 0xCCDDAABB

Write of 10% setpoint command for active power
The following write command is built with the open source tool modpoll

modpoll -m tcp -t4:float -r 5000 -a 1 -c 1 -0 -1 192.168.30.162 10

- Write value (10% setpoint)
- IP address of blue'Log
- One time request from modpoll, no Loop
- 0-base address
- Number of write values
- Client Id (Slave ID)
- Start register
- Holding register, data type 32-bit float
- Modbus TCP

WRITE VALUES

Address	Designation	Description	Unit	Value range	Comment
5000	PPC_P_SET_GRIDOP_REL	Relative active power setpoint (grid operator)	%	-10,000.000 % ... 125.000 % 125.000 %	From firmware 15.1.8 on: 100.000…125.000 From Firmware 23.2.11 on: -10,000.000 … 0.000
5002	PPC_PF_SET	Power factor setpoint	-	-0.999 … 1.000	Negative values = underexcited, positive values = overexcited e.g. cos φ = -0.95 = 0.95 underexcited, cos φ = 0.95 = 0.95 overexcited
5004	PPC_Q_SET_REL	Actual valid reactive power setpoint	%	-100.000 … 100.000 %	Negative values = underexcited, positive values = overexcited e.g. Q = -32.868 = 32.868 underexcited, Q = 32.868 = 32.868 overexcited
5006	PPC_P_SET_GRIDOP_ABS	Absolute active power setpoint command (grid operator)	W	unlimited	From Firmware 24.3.12 on
5008	PPC_Q_SET_ABS	Absolute reactive power setpoint command (grid operator)	var	unlimited	From Firmware 24.3.12 on
5010	PPC_P_SET_METHOD	Active power setpoint command method	-	1: Variable fixed value P_{var} fix 2: Variable fixed value P_{var} DI 3: Variable fixed value P_{var} AI 4: Variable fixed value P_{var} Modbus	
5012	PPC_Q_SET_METHOD	Reactive power setpoint command method	-	1: Variable fixed value cos φ_{var} fix 2: Variable fixed value cos φ_{var} DI 3: Variable fixed value cos φ_{var} AI 4: Variable fixed value cos φ_{var} Modbus 5: Characteristic curve cos φ_{var} (P) 6: Characteristic curve cos φ_{var} (V) 7: Variable fixed value Q_{var} fix 8: Variable fixed value Q_{var} DI 9: Variable fixed value Q_{var} AI 10: Variable fixed value Q_{var} Modbus 11: Characteristic curve Q (P) 12: Characteristic curve Q (V) 13: Characteristic curve Q (tan φ) 14: Voltage control Q (V droop) 15: Characteristic curve Q(V) Modbus 16: Characteristic curve cos φ (P) Modbus	14: From firmware 12.0.2 on 15: From firmware 28.0.2 on 16: From firmware 28.0.2 on
\Registers 5014 to 5015 are reserved but it is possible to write / read them from firmware 16.0.4 on					The blue'Log ignores the written values. This makes it possible to write several registers in one block.
5016	PPC_V_REF_Q_V_SHIFT	Setting of reference voltage for parallel shift of the characteristic curve Q (V)	V	-16,800.00 … 24,200.00 V	

					The blue'Log ignores the written values. This makes it possible to write several registers in one block.
Registers 5018 to 5019 are reserved but it is possible to write / read them from firmware 16.0.4 on					
5020	PPC_V_SET_ABS	Absolute voltage setpoint $V_{setpoint}$	V	Value range depends on the agreed supply voltage V_c and the $V_{setpoint,min}$ and $V_{setpoint,max}$ settings in method Q (V droop). e.g. V_c = 20 kV, $V_{setpoint,min}$ = 0.9 and $V_{setpoint,max}$ 1.1: value range is 18,000 ... 22,000 V	From firmware 12.0.2 on
5022	PPC_Q_REF_V_DROOP_SHIFT	Setpoint reference reactive power $Q_{\Delta V0}$ for parallel shift of the voltage droop sV	var	-1,000,000,000.000 ... 1,000,000,000.000 var	From firmware 12.0.2 on Negative values = underexcited, positive values = overexcited e.g. Q = -1,000.000.000 var = 1.0 M_{var} underexcited
5024	PPC_FSM_CMD	FSM on/off signal	-	0: off 1: on	From firmware 26.0.5 on
Registers 5026 to 5041 are reserved and it is not possible to write / read them					
5042	PPC_P_RRL_CMD	Ramp rate limiter on/ off signal	-	0: off 1: on	From firmware 26.0.5 on
5044	PPC_P_RRL_UP	Ramp rate (ramp-up)	%/s	0.0001 %/s ... 125.000 %/s	From firmware 26.0.5 on
5046	PPC_P_RRL_DOWN	Ramp rate (ramp-down)	%/s	0.0001 %/s ... 125.000 %/s	From firmware 26.0.5 on
5048	PPC_QV_P_IN	Lock-in active power $P_{lock-in}$ for characteristic curve "Q(V) Modbus"	%	-10,000,000 ... 125.000 % Not yet implemented	
5050	PPC_QV_P_OUT	Lock-out active power $P_{lock-out}$ for characterisic curve "Q(V) Modbus"	%	-10,000,000 ... 125.000 % Not yet implemented	
5052	PPC_QV_V1	Reference point voltage 1 for characteristic curve "Q(V) Modbus"	V/V_c	0.100 ... 1.500 Not yet implemented	
5054	PPC_QV_V2	Reference point voltage 2 for characteristic curve "Q(V) Modbus"	V/V_c	0.100 ... 1.500 Not yet implemented	
5056	PPC_QV_V3	Reference point voltage 3 for characteristic curve "Q(V) Modbus"	V/V_c	0.100 ... 1.500 Not yet implemented	
5058	PPC_QV_V4	Reference point voltage 4 for characteristic curve "Q(V) Modbus"	V/V_c	0.100 ... 1.500 Not yet implemented	
5062	PPC_PFP_V_IN	Lock-In voltage V_{lock}-in for characteristic curve "cos φ (P) Modbus"	V/V_c	1.00 ... 1.10 Not yet implemented	
5064	PPC_PFP_V_OUT	Lock-out voltage $V_{lock-out\ for\ characteristic\ curve}$ "cos φ (P) Modbus"	V/V_c	0.90 ... 1.00 Not yet implemented	
5066	PPC_PFP_PF1	Reference point cos φ 1 for characteristic curve" cos φ (P) Modbus"	-	-0.999 ... 1.000 Not yet implemented	
5068	PPC_PFP_PF2	Reference point cos φ 2 for characteristic curve" cos φ (P) Modbus"	-	-0.999 ... 1.000 Not yet implemented	
5070	PPC_PFP_PF3	Reference point cos φ 3 for characteristic curve" cos φ (P) Modbus"	-	-0.999 ... 1.000 Not yet implemented	
5072	PPC_PFP_P1	Reference point P 1 for characteristic curve "cos φ (P) Modbus"	P/P_{ref}	0 ... 1 Not yet implemented	
5074	PPC_PFP_P2	Reference point P 2 for characteristic curve "cos φ (P) Modbus"	P/P_{ref}	0 ... 1 Not yet implemented	

5076	PPC_PFP_P3	Reference point P 3 for characteristic curve "cos φ (P) Modbus"	P/P$_{ref}$	0 ... 1 Not yet implemented	
5100	PPC_V_SIM_TEST	Simulated test voltage	V	0.000 ... 132,000.000 V	From firmware 12.0.2 on
5102	PPC_F_SIM_TEST	Simulated test frequency	Hz	0.000 … 70.000 Hz	From firmware 17.1.7 on

Address	Designation	Description	Unit	Comment
42	PPC_Q_SET_GRIDOP_REL	Relative reactive power setpoint (grid operator)	%	
44	PPC_PF_SET_CTRL	Power factor control value	-	From firmware 19.2.10 on Negative values = underexcited, positive values = overexcited e.g. cos φ = -0.95 = 0.95 underexcited, cos φ = 0.95 = 0.95 overexcited
46	PPC_Q_SET_CTRL_REL	Relative reactive power control value	%	From firmware 19.2.10 on Negative values = underexcited, positive values = overexcited e.g. Q = -32.868 = 32.868 underexcited, Q = 32.868 = 32.868 overexcited
48	PPC_P_SET_CTRL_REL	Relative active power control value	%	From firmware 18.3.5 on From firmware 25.0.13 on
50	PPC_P_SET_GRIDOP_REL	Relative active power setpoint (grid operator)	%	From firmware 23.2.11 on From firmware 15.1.8 on
52	PPC_P_SET_ABS	Absolute active power setpoint (grid operator)	W	Negative values = import (demand), positive values = export (generation)
54	PPC_P_SET_RPC_REL	Relative active power setpoint (3rd party)	%	From firmware 23.2.11 on From firmware 15.1.8 on
56	PPC_P_SET_REL	Actual valid active power setpoint	%	From firmware 23.2.11 on From firmware 15.1.8 on

58	PPC_P_SET_MODUS	Actual active power mode for setpoint setting	-	0: No configuration found
				1: Variable fixed value P_{var} fix
				2: Variable fixed value P_{var} DI
				3: Variable fixed value P_{var} AI
				4: Variable fixed value P_{var} Modbus
				5: Remote Power Control (RPC)
				100: LFSM-O
				101: LFSM-U
				102: FSM
				200: Fail-safe operation (hold last setpoint)
				201: Fail-safe operation (default setpoint)
				202: Fail-safe operation (system fallback value)
				203: Fail-safe operation (Automatic grid disconnection)
				5: From firmware 12.0.2 on
				100: From firmware 19.2.10 on
				101: From firmware 19.2.10 on
				102: From firmware 28.0.2 on
				200: From firmware 12.0.2 on
				201: From firmware 12.0.2 on
				202: From firmware 12.0.2 on
				203: From firmware 12.0.2 on
60	PPC_PF_SET	Power factor setpoint	-	Negative values = underexcited, positive values = overexcited
				e.g. cos φ = -0.95 = 0.95 underexcited, cos φ = 0.95 = 0.95 overexcited
62	PPC_Q_SET_REL	Actual valid reactive power setpoint	%	Negative values = underexcited, positive values = overexcited
				e.g. Q = -32.868 = 32.868 underexcited, Q = 32.868 = 32.868 overexcited
64	PPC_Q_SET_ABS	Absolute reactive power setpoint	var	Negative values = underexcited, positive values = overexcited
				e.g. Q = -1,000.000.000 var = 1.0 M_{var} underexcited

66	PPC_Q_SET_MODUS	Actual reactive power mode for setpoint setting	-	0: No configuration found
				1: Variable fixed value cos φ_{var} fix
				2: Variable fixed value cos φ_{var} DI
				3: Variable fixed value cos φ_{var} AI
				4: Variable fixed value cos φ_{var} Modbus
				5: Characteristic curve cos φ (P)
				6: Characteristic curve cos φ (V)
				7: Variable fixed value Q_{var} fix
				8: Variable fixed value Q_{var} DI
				9: Variable fixed value Q_{var} AI
				10: Variable fixed value Q_{var} Modbus
				11: Characteristic curve Q (P)
				12: Characteristic curve Q (V)
				13: Characteristic curve Q (tan φ)
				14: Voltage control Q (V droop)
				15: Characteristic curve Q(V) Modbus, from firmware 28.0.2 on
				16: Characteristic curve cos φ (P) Modbus, from firmware 28.0.2 on
				100: Reactive power compensation
				200: Fail-safe operation (hold last setpoint)
				201: Fail-safe operation (default setpoint)
				202: Fail-safe operation (system fallback value)
				14: From firmware 12.0.2 on
				100: From firmware 12.0.2 on
				200: From firmware 12.0.2 on
				201: From firmware 12.0.2 on
				202: From firmware 12.0.2 on
Register 68 is reserved, but it is possible to read it				
70	PPC_V_SET_ABS	Absolute voltage setpoint	V	From firmware17.1.7 on
72	PPC_P_SET_LFSMO_REL	Relative active power setpoint (LFSM-O)	%	From firmware 19.2.10 on
				If the LFSM-O is active, this register contains the actual active power setpoint
				If the LFSM-O is not active, the register contains the value NaN
74	PPC_P_REF	Reference active power P_{ref}	W	From firmware 19.2.10 on
76	PPC_P_MOM	Momentary active power P_{mom}	W	If the LFSM-O/LFSM-U/FSM is active, this register contains the momentary active power at the time the frequency threshold is exceeded.
				If the LFSM-O/LFSM-U/FSM is not active, this register contains the value NaN
				From firmware 19.2.10 on

				If the LFSM-O/LFSM-U/FSM is active, this register contains the currently used reference active power (PAV/P_{inst} or P_{mom})
				If the LFSM-O/LFSM-U/FSM is not active, this register contains the value NaN

78	PPC_P_SET_LFSMU_REL	Relative active power setpoint (LFSM-U)		From firmware 19.2.10 on
				If the LFSM-U is active, this register contains the actual active power setpoint
				If the LFSM-U is not active, the register contains the value NaN
Registers 80 to 89 are reserved, but it is possible to read them
90	PPC_P_AC	Actual active power	W	Value from power analyzer
				Negative values = import (demand), positive values = export (generation)
92	PPC_PF	Actual power factor cos φ	-	Value from power analyzer
				Negative values = underexcited, positive values = overexcited
				e.g. cos φ = -0.95 = 0.95 underexcited, cos φ = 0.95 = 0.95 overexcited
94	PPC_Q_AC	Actual reactive power	var	Value from power analyzer
				Negative values = underexcited, positive values = overexcited
				e.g. Q = -1,000.000.000 var = 1.0 M_{var} underexcited
96	PPC_S_AC	Actual apparent power	VA	Value from power analyzer
98	PPC_F_AC	Actual grid frequency	Hz	Value from power analyzer
100	PPC_V_PHASE_AB	Actual phase voltage $V_{PhA-PhB}$	V	Value from power analyzer
102	PPC_V_PHASE_BC	Actual phase voltage $V_{PhB-PhC}$	V	Value from power analyzer
104	PPC_V_PHASE_CA	Actual phase voltage $V_{PhC-PhA}$	V	Value from power analyzer
106	PPC_I_PHASE_A	Actual current I_{PhA}	A	Value from power analyzer
108	PPC_I_PHASE_B	Actual current I_{PhB}	A	Value from power analyzer
110	PPC_I_PHASE_C	Actual current I_{PhC}	A	Value from power analyzer
112	PPC_V_PHASE_AN	Line-to-neutral voltage V_{PhA-N}	V	Value from power analyzer
				From firmware17.1.7 on
114	PPC_V_PHASE_BN	Line-to-neutral voltage V_{PhB-N}	V	Value from power analyzer
				From firmware17.1.7 on
116	PPC_V_PHASE_CN	Line-to-neutral voltage V_{PhC-N}	V	Value from power analyzer
				From firmware17.1.7 on
Registers 118 to 198 are reserved but it is possible to read them
200	PPC_GHI	Actual global irradiation	W/m²	Value of a connected sensor
				From firmware 23.0.8 on
202	PPC_T_AMBIENT	Actual ambient temperature	°C	Value of a connected sensor
				From firmware 23.0.8 on
Register 204 to 252 are reserved but it is possible to read them

254	PPC_P_AC_INV	Sum of inverter actual active power	W	Value calculated by blue'Log From firmware17.1.7 on
256	PPC_Q_AC_INV	Sum of inverter actual reactive power	var	Value calculated by blue'Log From firmware 19.2.10 on
258	PPC_P_AC_AVAIL	Available theoretical active power	W	Value calculated by blue'Log From firmware 25.0.13
260	PPC_Q_AC_AVAIL	Available theoretical reactive power	var	Value calculated by blue'Log From firmware 25.0.13
262	PPC_INV_INST	Number of installed inverters	-	Sum of all inverters connected to the blue'Log (Master+Slave) From firmware 29.0.9
264	PPC_INV_AVAIL	Number of active inverters	-	Sum of all inverters connected to the blue'Log (Master+Slave) From firmware 29.0.9
Register 266 to 267 are reserved but it is possible to read them				
268	PPC_Q_V_LIMIT	Q (V) Lower / upper limit reached	-	From firmware 18.3.5 on 0: Q (V) limit not reached 1: Q (V) lower limit reached 2: Q (V) upper limit reached
300	PPC_FSM_STATUS	Status of Frequency Limited Mode (FSM)	-	From firmware 25.0.13 0: off 1: on
302	PPC_P_SET_FSM_REL	Relative active power setpoint (FSM)	%	From firmware 25.0.13
304	PPC_DELTA_P_U_FSM	Active power range $|\Delta P_1|$/Pmax - underfrequency	%	From firmware 25.0.13
306	PPC_DELTA_P_O_FSM	Active power range $|\Delta P_1|$/Pmax - overfrequency	%	From firmware 25.0.13
308	PPC_DROOP_U_FSM	Frequency threshold sf - underfrequency	%	From firmware 25.0.13
310	PPC_DROOP_O_FSM	Frequency threshold s_f - overfrequency	%	From firmware 25.0.13
312	PPC_DB_U_FSM	Dead band Δf_{DB} - underfrequency	Hz	From firmware 25.0.13
314	PPC_DB_O_FSM	Dead band Δf_{DB} - overfrequency	Hz	From firmware 25.0.13
324	PPC_P_RRL_STATUS	Ramp rate limiter status (current status of the control core)	-	From firmware 26.0.5 0: off 1: on

326	PPC_P_RRL_UP	Ramp rate (ramp-up)	%/s	From firmware 26.0.5
328	PPC_P_RRL_DOWN	Ramp rate (ramp-down)	%/s	From firmware 26.0.5
330	PPC_QV_P_IN	Lock-in active power $P_{lock-in}$ for characterisic curve "Q(V) Modbus"	%	From firmware 28.0.2 on
332	PPC_QV_P_OUT	Lock-out active power $P_{lock-out}$ for characterisic curve "Q(V) Modbus"	%	From firmware 28.0.2 on
334	PPC_QV_V1	Reference point voltage 1 for characteristic curve "Q(V) Modbus"	V/V_c	From firmware 28.0.2 on
336	PPC_QV_V2	Reference point voltage 2 for characteristic curve "Q(V) Modbus"	V/V_c	From firmware 28.0.2 on
338	PPC_QV_V3	Reference point voltage 3 for characteristic curve "Q(V) Modbus"	V/V_c	From firmware 28.0.2 on
340	PPC_QV_V4	Reference point voltage 4 for characteristic curve "Q(V) Modbus"	V/V_c	From firmware 28.0.2 on
342	PPC_QV_STAT	Status Q(V) control	-	0: off 1: on 2: act
346	PPC_PFP_V_IN	Lock-in voltage $V_{lock-in}$ for characteristic curve "cos φ (P) Modbus"	V/V_c	From firmware 28.0.2 on
348	PPC_PFP_V_OUT	Lock-out voltage $V_{lock-out}$ for characteristic curve "cos φ (P) Modbus"	V/V_c	From firmware 28.0.2 on

350	PPC_PFP_PF1	Reference point cos φ 1 for characteristic curve"cos φ (P) Modbus"	-	From firmware 28.0.2 on
352	PPC_PFP_PF2	Reference point cos φ 2 for characteristic curve"cos φ (P) Modbus"	-	From firmware 28.0.2 on
354	PPC_PFP_PF3	Reference point cos φ 3 for characteristic curve "cos φ (P) Modbus"	-	From firmware 28.0.2 on
356	PPC_PFP_P1	Reference point P 1 for characteristic curve "cos φ (P) Modbus"	P/P_{ref}	From firmware 28.0.2 on
358	PPC_PFP_P2	Reference point P 2 for characteristic curve "cos φ (P) Modbus"	P/P_{ref}	From firmware 28.0.2 on
360	PPC_PFP_P3	Reference point P 3 for characteristic curve "cos φ (P) Modbus"	P/P_{ref}	From firmware 28.0.2 on
362	PPC_PFP_STAT	Status cos φ (P)l control	-	From firmware 28.0.2 on 0: off 1: on 2: act