

# MODBUS POWER CONTROL LICENSE BLUE'LOG XC



Item no.: 557.008

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

### 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 (for example 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 ( $\cos \varphi$ ) 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 (for example P, Q,  $\cos \varphi$ , f, V, I)

### PREREQUISITES

- + blue'Log XC with firmware  $\geq 10.0.8$
- + Modbus Power Control License\*
- + 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 Pvar Modbus
  - + For reactive power, configuration must be carried out via web frontend to define whether  $\cos \varphi$  or Q will be used for control:
    - + Setting in the **Power Control** menu > **Reactive power**
    - + Setpoint command method: Variable fixed value Qvar Modbus or variable fixed value  $\cos \varphi$ var 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 Vsetpoint 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)

\* The license is linked to a specific device. When ordering, please provide the 14-digit hardware serial number of the data logger.

## MODBUS SPECIFICATION

### Communication parameters

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

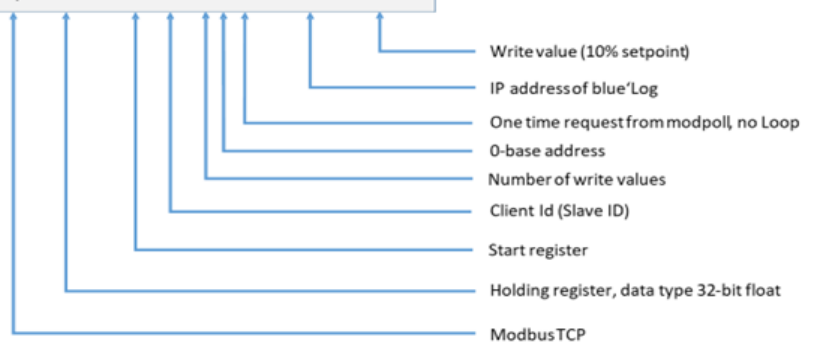
### General register definition

- + 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
```



### Data types

Abbreviation	Description	Missing values
U16	16Bit Unsigned integer	0xFFFF
U32	32Bit Unsigned integer	0xFFFFFFFF
I16	16Bit Signed integer	0x8000
I32	32Bit Signed integer	0x80000000
F32	32Bit Float	0x7FC00000
String	String, ASCII encoding. If the whole length of the field is used, then the end of the string will be filled with 0x00. If a value (for example model name) does not fit in the register, then it will be cut off.	0x00

### WRITE VALUES (Function Code 16)

Register	Abbreviation	Description	Unit	Data type	Range	Comment
5000	PPC_P_SET_GRIDOP_REL	Active power setpoint (grid operator)	%	F32	-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		F32	-0.999 ... 1.000	Negative values = underexcited, positive values = overexcited for example $\cos \varphi = -0.95 = 0.95$ underexcited, $\cos \varphi = 0.95 = 0.95$ overexcited
5004	PPC_Q_SET_REL	Actual valid reactive power setpoint	%	F32	-100.000 ... 100.000 %	Negative values = underexcited, positive values = overexcited for example $Q = -32.868 = 32.868$ underexcited, $Q = 32.868 = 32.868$ overexcited
5006	PPC_P_SET_GRIDOP_ABS	Absolute active power setpoint command (grid operator)	W	F32	unlimited	From Firmware 24.3.12 on
5008	PPC_Q_SET_ABS	Absolute reactive power setpoint command (grid operator)	var	F32	unlimited	From Firmware 24.3.12 on
5010	PPC_P_SET_METHOD	Active power setpoint command method		F32	1: Variable fixed value Pvar fix 2: Variable fixed value Pvar DI 3: Variable fixed value Pvar AI 4: Variable fixed value Pvar Modbus	
5012	PPC_Q_SET_METHOD	Reactive power setpoint command method		F32	1: Variable fixed value $\cos \varphi$ var fix 2: Variable fixed value $\cos \varphi$ var DI 3: Variable fixed value $\cos \varphi$ var AI 4: Variable fixed value $\cos \varphi$ var Modbus 5: Characteristic curve $\cos \varphi$ var (P) 6: Characteristic curve $\cos \varphi$ var (V) 7: Variable fixed value Qvar fix 8: Variable fixed value Qvar DI 9: Variable fixed value Qvar AI 10: Variable fixed value Qvar Modbus 11: Characteristic curve Q (P) 12: Characteristic curve Q (V) 13: Characteristic curve Q ( $\tan \varphi$ ) 14: Voltage control Q (V droop) 15: Characteristic curve Q(V) Modbus 16: Characteristic curve $\cos \varphi$ (P) Modbus	14: From firmware 12.0.2 on 15: From firmware 28.0.2 on 16: From firmware 28.0.2 on

Register	Abbreviation	Description	Unit	Data type	Range	Comment
5014-5015		Reserved. Possible to write / read 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	F32	-16,800.00 ... 24,200.00 V	-16,800.00 ... 24,200.00 V
5018-5019		Reserved. Possible to write / read from firmware 16.0.4 on				The blue'Log ignores the written values. This makes it possible to write several registers in one block.
5020	PPC_V_SET_ABS	Absolute voltage setpoint Vsetpoint	V	F32	Value range depends on the agreed supply voltage Vc and the Vsetpoint,min and Vsetpoint,max settings in method Q (V droop). e.g. Vc = 20 kV, Vsetpoint,min = 0.9 and Vsetpoint,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 QΔV0 for parallel shift of the voltage droop sV		F32	-1,000,000,000.000 ... 1,000,000,000.000 var	From firmware 12.0.2 on Negative values = underexcited, positive values = overexcited for example Q = -1,000.000.000 var = 1.0 Mvar underexcited
5024	PPC_FSM_CMD	FSM on/off signal		F32	0: off 1: on	From firmware 26.0.5 on
5026	PPC_FSM_P_RANGE	FSM active power range	%	F32	0.001...100%	Parameter "active power range" for under- and overfrequency From firmware 33.1.12
5028	PPC_FSM_P_RANGE_U	FSM active power range - underfrequency	%	F32	0,001...100%	Parameter "active power range" for underfrequency of the FSM curve (required if curve is set asymmetrically) From firmware 33.1.12
5030	PPC_FSM_P_RANGE_O	FSM active power range - overfrequency	%	F32	0,001...100%	Parameter "active power range" for overfrequency of the FSM curve (required if curve is set asymmetrically) From firmware 33.1.12
5032-5040		Reserved. Not possible to write / read				
5042	PPC_P_RRL_CMD	Ramp rate limiter on/ off signal		F32	0: off 1: on	From firmware 26.0.5 on
5044	PPC_P_RRL_UP	Ramp rate (ramp-up)	%/s	F32	0.0001 %/s ... 125.000 %/s	From firmware 26.0.5 on
5046	PPC_P_RRL_DOWN	Ramp rate (ramp-down)	&/s	F32	0.0001 %/s ... 125.000 %/s	From firmware 26.0.5 on

Register	Abbreviation	Description	Unit	Data type	Range	Comment
5048	PPC_QV_P_IN	Lock-in active power Plock-in for characteristic curve "Q(V) Modbus"	%	F32	10,000,000 ... 125.000 %	
5050	PPC_QV_P_OUT	Lock-out active power Plock-out for characteristic curve "Q(V) Modbus"	%	F32	10,000,000 ... 125.000 %	
5052	PPC_QV_V1	Reference point voltage 1 for characteristic curve "Q(V) Modbus"	V/V <sub>c</sub>	F32	0.100 ... 1.500	
5054	PPC_QV_V2	Reference point voltage 2 for characteristic curve "Q(V) Modbus"	V/V <sub>c</sub>	F32	0.100 ... 1.500	
5056	PPC_QV_V3	Reference point voltage 3 for characteristic curve "Q(V) Modbus"	V/V <sub>c</sub>	F32	0.100 ... 1.500	
5058	PPC_QV_V4	Reference point voltage 4 for characteristic curve "Q(V) Modbus"	V/V <sub>c</sub>	F32	0.100 ... 1.500	
5060		Reserved for K factor				
5062	PPC_PFP_V_IN	Lock-In voltage Vlock-in for characteristic curve "cos φ (P) Modbus"	V/V <sub>c</sub>	F32	1.00 ... 1.10	
5064	PPC_PFP_V_OUT	Lock-out voltage Vlock-out for characteristic curve "cos φ (P) Modbus"	V/V <sub>c</sub>	F32	0.90 ... 1.00	
5066	PPC_PFP_PF1	Reference point cos φ 1 for characteristic curve "cos φ (P) Modbus"		F32	-0.999 ... 1.000	
5068	PPC_PFP_PF2	Reference point cos φ 2 for characteristic curve "cos φ (P) Modbus"		F32	-0.999 ... 1.000	
5070	PPC_PFP_PF3	Reference point cos φ 3 for characteristic curve "cos φ (P) Modbus"		F32	-0.999 ... 1.000	
5072	PPC_PFP_P1	Reference point P 1 for characteristic curve "cos φ (P) Modbus"	P/P <sub>ref</sub>	F32	0 ... 1	
5074	PPC_PFP_P2	Reference point P 2 for characteristic curve "cos φ (P) Modbus"	P/P <sub>ref</sub>	F32	0 ... 1	
5076	PPC_PFP_P3	Reference point P 3 for characteristic curve "cos φ (P) Modbus"	P/P <sub>ref</sub>	F32	0 ... 1	
5078-5098		Reserved				
5100	PPC_V_SIM_TEST	Simulated test voltage	V	F32	0.000 ... 132,000.000 V	From firmware 12.0.2 on
5102	PPC_F_SIM_TEST	Simulated test frequency	Hz	F32	0.000 ... 70.000 Hz	From firmware 17.1.7 on

### READ VALUES (Function Code 03)

Register	Abbreviation	Description	Unit	Data type	Range	Comment
0	PPC_VENDOR	Vendor		U32		"mc": meteocontrol hex: 0x6D630000 From firmware 33.1.12
2	PPC_MD	Model		U32		"bl": blueLog hex: 0x626C0000 From firmware 33.1.12
4-40		Reserved. Not possible to write / read				
38	PPC_PV_P_CTRL_REL	Active power correction value (PV)	%	F32		From firmware 33.1.12
40	PPC_BAT_P_CTRL_REL	Active power correction value (battery)	%	F32		From firmware 33.1.12
42	PPC_Q_SET_GRIDOP_REL	Reactive power setpoint (grid operator)	%	F32		Reactive power setpoint which is specified by the grid operator. Example: Q (Modbus)
44	PPC_PF_SET_CTRL	Power factor correction value	-	F32		From firmware 19.2.10 on. Negative values = underexcited Positive values = overexcited This value corresponds to the PV correction value.
46	PPC_Q_SET_CTRL_REL	Reactive power correction value	%	F32		From firmware 19.2.10 on. Negative values = underexcited Positive values = overexcited This value corresponds to the PV correction value.
48	PPC_P_SET_CTRL_REL	Active power correction value	%	F32		From firmware 18.3.5 on. From firmware 25.0.13 on. This value corresponds to the PV correction value.
50	PPC_P_SET_GRIDOP_REL	Relative active power setpoint (grid operator)	%	F32		From firmware 23.2.11 on. From firmware 15.1.8 on.
52	PPC_P_SET_ABS	Absolute active power setpoint (grid operator)	W	F32		Negative values = import (demand), positive values = export (generation)
54	PPC_P_SET_RPC_REL	Active power setpoint (3rd party)	%	F32		From firmware 23.2.11 on. From firmware 15.1.8 on.
56	PPC_P_SET_REL	Active power setpoint	%	F32		From firmware 23.2.11 on. From firmware 15.1.8 on.

Register	Abbreviation	Description	Unit	Data type	Range	Comment
58	PPC_P_SET_MODUS	Actual active power mode for setpoint setting	-	F32		0: No configuration found 1: Variable fixed value Pvar fix 2: Variable fixed value Pvar DI 3: Variable fixed value Pvar AI 4: Variable fixed value Pvar Modbus 5: Remote Power Control (RPC) 100: LFSM-O 101: LFSM-U 102: FSM 112: RPC (Remote Power Control) & 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)  100: From firmware 19.2.10 on 101: From firmware 19.2.10 on 102: From firmware 28.0.2 on 112: From firmware 33.1.12 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	-	F32		Negative values = underexcited Positive values = overexcited
62	PPC_Q_SET_REL	Reactive power setpoint	%	F32		Negative values = underexcited Positive values = overexcited
64	PPC_Q_SET_ABS	Absolute reactive power setpoint	var	F32		Negative values = underexcited Positive values = overexcited

Register	Abbreviation	Description	Unit	Data type	Range	Comment
66	PPC_Q_SET_MODUS	Actual reactive power mode for setpoint setting	-	F32		0: No configuration found 1: Variable fixed value cos $\varphi$ var fix 2: Variable fixed value cos $\varphi$ var DI 3: Variable fixed value cos $\varphi$ var AI 4: Variable fixed value cos $\varphi$ var Modbus 5: Characteristic curve cos $\varphi$ (P) 6: Characteristic curve cos $\varphi$ (V) 7: Variable fixed value Qvar fix 8: Variable fixed value Qvar DI 9: Variable fixed value Qvar AI 10: Variable fixed value Qvar Modbus 11: Characteristic curve Q (P) 12: Characteristic curve Q (V) 13: Characteristic curve Q (tan $\varphi$ ) 14: Voltage control Q (V droop) 15: Characteristic curve Q(V) Modbus, from firmware 28.0.2 on 16: Characteristic curve cos $\varphi$ (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
68		Reserved. Possible to read.				
70	PPC_V_SET_ABS	Absolute voltage setpoint	V	F32		From firmware 17.1.7 on
72	PPC_P_SET_LFSMO_REL	Active power setpoint (LFSM-O)	%	F32		From firmware 19.2.10 on. If LFSM-O is active, this register contains the actual active power setpoint. If LFSM-O is not active, the register contains the value NaN



Register	Abbreviation	Description	Unit	Data type	Range	Comment
74	PPC_P_REF	Reference active power $P_{ref}$	W	F32		From firmware 19.2.10 on If LFSM-O/LFSM-U/FSM is active, this register contains the currently used reference active power ( $PAV/P_{inst}$ or $P_{mom}$ ). If LFSM-O/LFSM-U/FSM is not active, this register contains the value NaN
76	PPC_P_MOM	Momentary active power $P_{mom}$	W	F32		From firmware 19.2.10 on. If LFSM-O/LFSM-U/FSM is active, this register contains the momentary active power at the time the frequency threshold is exceeded.
78	PPC_P_SET_LFSMU_REL	Active power setpoint (LFSM-U)	-	F32		From firmware 19.2.10 on. If LFSM-U is active, this register contains the current active power setpoint value. If LFSM-U is not active, the register contains the value NaN.
80-89		Reserved. Possible to read.				
90	PPC_P_AC	Actual active power	W	F32		Value from power analyzer. Negative values = import (demand) Positive values = export (generation)
92	PPC_PF	Actual power factor $\cos \varphi$	-	F32		Value from power analyzer. Negative values = underexcited Positive values = overexcited
94	PPC_Q_AC	Actual reactive power	var	F32		Value from power analyzer. Negative values = underexcited Positive values = overexcited
96	PPC_S_AC	Actual apparent power	VA	F32		Value from power analyzer
98	PPC_F_AC	Actual grid frequency	Hz	F32		Value from power analyzer
100	PPC_V_PHASE_AB	Actual phase voltage $V_{PhA-PhB}$	V	F32		Value from power analyzer
102	PPC_V_PHASE_BC	Actual phase voltage $V_{PhB-PhC}$	V	F32		Value from power analyzer
104	PPC_V_PHASE_CA	Actual phase voltage $V_{PhC-PhA}$	V	F32		Value from power analyzer
106	PPC_I_PHASE_A	Actual current $I_{PhA}$	A	F32		Value from power analyzer
108	PPC_I_PHASE_B	Actual current $I_{PhB}$	A	F32		Value from power analyzer
110	PPC_I_PHASE_C	Actual current $I_{PhC}$	A	F32		Value from power analyzer

Register	Abbreviation	Description	Unit	Data type	Range	Comment
112	PPC_V_PHASE_AN	Line-to-neutral voltage $V_{PhA-N}$	V	F32		Value from power analyzer. From firmware 17.1.7 on
114	PPC_V_PHASE_BN	Line-to-neutral voltage $V_{PhB-N}$	V	F32		Value from power analyzer. From firmware 17.1.7 on
116	PPC_V_PHASE_CN	Line-to-neutral voltage $V_{PhC-N}$	V	F32		Value from power analyzer. From firmware 17.1.7 on
118-198		Reserved. Possible to read.				
200	PPC_GHI	Actual global irradiation	W/m <sup>2</sup>	F32		Value of a connected sensor. From firmware 23.0.8 on
202	PPC_T_AMBIENT	Actual ambient temperature	°C	F32		Value of a connected sensor. From firmware 23.0.8 on
204-252		Reserved. Possible to read.				
254	PPC_P_AC_INV	Inverter active power	W	F32		Value calculated by blue'Log. From firmware 17.1.7 on
256	PPC_Q_AC_INV	Inverter reactive power	var	F32		Value calculated by blue'Log. From firmware 19.2.10 on
258	PPC_P_AC_AVAIL	Available theoretical active power	W	F32		Value calculated by blue'Log. From firmware 25.0.13
260	PPC_Q_AC_AVAIL	Available theoretical reactive power	var	F32		Value calculated by blue'Log. From firmware 25.0.13
262	PPC_INV_INST	Number of installed inverters	-	F32		Sum of all active inverters connected to the blue'Log (Master+Slave). From firmware 29.0.9
264	PPC_INV_AVAIL	Number of active inverters	-	F32		Sum of all inverters connected to the blue'Log (Master+Slave). From firmware 29.0.9
266		Reserved. Possible to read.				
268	PPC_Q_V_LIMIT	Q (V) Lower / upper limit reached		F32		From firmware 18.3.5 on. 0: Q (V) limit not reached. 1: Q (V) lower limit reached. 2: Q (V) upper limit reached
270	PPC_BAT_P_AC_INV	Sum of inverter active power (battery)	W	F32		From firmware 33.1.12 This value corresponds to the sum of all inverters connected to the master and slave device.
272	PPC_PV_P_AC_INV	Sum of inverter active power (PV)	W	F32		From firmware 33.1.12 This value corresponds to the sum of all inverters connected to the master and slave device.

Register	Abbreviation	Description	Unit	Data type	Range	Comment
274	PPC_BAT_Q_AC_INV	Sum of inverter reactive power (battery)	var	F32		From firmware 33.1.12 This value corresponds to the sum of all inverters connected to the master and slave device.
276	PPC_PV_Q_AC_INV	Sum of inverter reactive power (PV)	var	F32		From firmware 33.1.12 This value corresponds to the sum of all inverters connected to the master and slave device.
278	PPC_BAT_SOC	State of charge relative	%	F32		From firmware 33.1.12
280	PPC_BAT_SOC_ABS	State of charge absolute	Wh	F32		From firmware 33.1.12
282	PPC_BAT_CAP	Battery capacity	Wh	F32		From firmware 33.1.12
284-298		Reserved.				
300	PPC_FSM_STATUS	Status of Frequency Sensitive Mode (FSM)		F32	0: off 1: on	From firmware 25.0.13. "If "Activation FSM via Modbus" is activated this values corresponds to the value set via Modbus. If "Activation via Modbus" is not activated, this value correponds to the FSM activation toggle in ther user interface.
302	PPC_P_SET_FSM_REL	Relative active power setpoint (FSM)	%	F32		From firmware 25.0.13
304	PPC_DELTA_P_U_FSM	Active power range $ \Delta P_1 /P_{max}$ - underfrequency	%	F32		From firmware 25.0.13
306	PPC_DELTA_P_O_FSM	Active power range $ \Delta P_1 /P_{max}$ - overfrequency	%	F32		From firmware 25.0.13
308	PPC_DROOP_U_FSM	Frequency threshold $s_f$ - underfrequency	%	F32		From firmware 25.0.13
310	PPC_DROOP_O_FSM	Frequency threshold $s_i$ - overfrequency	%	F32		From firmware 25.0.13
312	PPC_DB_U_FSM	Dead band $\Delta f_{DB}$ - underfrequency	Hz	F32		From firmware 25.0.13
314	PPC_DB_O_FSM	Dead band $\Delta f_{DB}$ - overfrequency	Hz	F32		From firmware 25.0.13
316	PPC_FSM_DELTA_P	Active power change calculated by FSM curve	%	F32		From firmware 33.1.12 Hybrid EMS only
318-322		Reserved				
324	PPC_P_RRL_STATUS	Ramp rate limiter status (current status of the control core)			0: off 1: on	From firmware 26.0.5.
326	PPC_P_RRL_UP	Ramp rate (ramp-up)	%/s	F32		From firmware 26.0.5
328	PPC_P_RRL_DOWN	Ramp rate (ramp-down)	%/s	F32		From firmware 26.0.5
330	PPC_QV_P_IN	Lock-in active power $P_{lock-in}$ for characteristic curve "Q(V) Modbus"	%	F32		From firmware 28.0.2 on

Register	Abbreviation	Description	Unit	Data type	Range	Comment
332	PPC_QV_P_OUT	Lock-out active power $P_{lock-out}$ for characteristic curve "Q(V) Modbus"	%	F32		From firmware 28.0.2 on
334	PPC_QV_V1	Reference point voltage 1 for characteristic curve "Q(V) Modbus"	V/V <sub>c</sub>	F32		From firmware 28.0.2 on
336	PPC_QV_V2	Reference point voltage 2 for characteristic curve "Q(V) Modbus"	V/V <sub>c</sub>	F32		From firmware 28.0.2 on
338	PPC_QV_V3	Reference point voltage 3 for characteristic curve "Q(V) Modbus"	V/V <sub>c</sub>	F32		From firmware 28.0.2 on
340	PPC_QV_V4	Reference point voltage 4 for characteristic curve "Q(V) Modbus"	V/V <sub>c</sub>	F32		From firmware 28.0.2 on
342	PPC_QV_STAT	Status Q(V) control		F32	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 <sub>c</sub>	F32		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 <sub>c</sub>	F32		From firmware 28.0.2 on
350	PPC_PFP_PF1	Reference point cos φ 1 for characteristic curve "cos φ (P) Modbus"		F32		From firmware 28.0.2 on
352	PPC_PFP_PF2	Reference point cos φ 2 for characteristic curve "cos φ (P) Modbus"		F32		From firmware 28.0.2 on
354	PPC_PFP_PF3	Reference point cos φ 3 for characteristic curve "cos φ (P) Modbus"		F32		From firmware 28.0.2 on
356	PPC_PFP_P1	Reference point P 1 for characteristic curve "cos φ (P) Modbus"	P/P <sub>ref</sub>	F32		From firmware 28.0.2 on
358	PPC_PFP_P2	Reference point P 2 for characteristic curve "cos φ (P) Modbus"	P/P <sub>ref</sub>	F32		From firmware 28.0.2 on
360	PPC_PFP_P3	Reference point P 3 for characteristic curve "cos φ (P) Modbus"	P/P <sub>ref</sub>	F32		From firmware 28.0.2 on
362	PPC_PFP_STAT	Status cos φ (P) control			0: off 1: on 2: act	From firmware 28.0.2 on.