



Rotary Actuator PR..-BAC-..

Contents

<u>Modbus General Notes</u>	2
<u>Modbus Register Overview</u>	3
<u>Modbus Register Description</u>	4

Modbus General Notes

General information	Parameterisation:	Belimo App
Modbus RTU	Protocol:	Modbus RTU over RS-485
	Baud rate:	9,600, 19,200, 38,400, 76,800, 115,200 Bd <i>Default: 38,400 Bd</i>
	Number of nodes:	Max. 32 (without repeater)
	Address:	1 ... 247 <i>Default: 1</i>
	Transmission formats:	1-8-N-2, 1-8-N-1, 1-8-E-1, 1-8-O-1 <i>Default: 1-8-N-2</i>
	Terminating resistor:	120 Ω

Quick addressing Actuators support quick addressing via the "Address" and "Adaption" buttons. For detailed, information please product datasheet (chapter Service).

Register implementation All data is arranged in a table and addressed by 1..n (register) or 0..n-1 (address). No distinction is made between data types (Discrete Inputs, Coils, Input Registers and Holding Registers). As a consequence, all data can be accessed with the two commands for Holding Register. The commands for Discrete Inputs and Input Registers can be used as an alternative.

Standard commands

- Read Holding Registers [3]
- Write Single Register [6]
- Read Discrete Inputs [2]
- Read Input Registers [4]
- Write Multiple Registers [16]

Command "Read Discrete Inputs" The command reads one or more bits and can alternatively be used for Register No. 105 (Malfunction and Service information).

Example The start address to be used is 1664 → **104** (Register Address) * **16** (Bit) = **1664**

Interpret values in the registers All values in the register are unsigned integer datatypes.

Example Read (Function 03, 1 Register) Value Register No. 12 = 0001'1010'1100'1000₂ = 6'856₁₀
Actual Value = Value * Scaling factor * Unit = 6'856 * 0.01 * m³/h = **68.56 m³/h**

32-Bit values in two registers Values that exceed 65,535 are stored in two consecutive Registers and have to be interpreted as "little endian" / LSW (Least Significant Word) first

Example Register No. 10 (AbsFlow LowWord) = 14,551₁₀ = 0011'1000'1101'0111₂
Register No. 11 (AbsFlow HighWord) = 19₁₀ = 0000'0000'0001'0011₂

AbsFlow HighWord	AbsFlow LowWord
19	14,551
0000'0000'0001'0011	0011'1000'1101'0111

AbsFlow = 0000'0000'0001'0011'0011'1000'1101'0111₂ = 1,259,735₁₀ = **1259.735 l/h**

Math formula:

AbsFlow = (AbsFlow HighWord * 65,536) + AbsFlow LowWord

AbsFlow = (19 * 65,536) + 14,551 = 1,259,735 = **1259.735 l/h**

Deactivated registers If a register is not supported by a device or by a device setting it is indicated with 65'535 (1111'1111'1111'1111₂).

Modbus Register Overview

Operation

No.	Adr.	Register	Access
1	0	Setpoint [%]	R/W
2	1	Override control	R/W
3	2	Command	R/W
4	3	Actuator type	R
5	4	Relative position [%]	R
6	5	Absolute position [°] [mm]	R
7	6	-	-
8	7	-	-
9	8	Sensor value 1 [mV] [Ω] [-]	R
10	9	Sensor value 2 [mV] [Ω] [-]	R
11	10	-	-
12	11	-	-
13	12	Setpoint Analog [%]	R

Service

No.	Adr.	Register	Access
100	99	Bus termination	R
101	100	Series number 1 st part	R
102	101	Series number 2 nd part	
103	102	Series number 4 th part	
104	103	Firmware version	R
105	104	Malfunction and service information	R
106	105	-	-
107	106	Max [%]	R/W
108	107	Sensor type 1	R/W
109	108	Bus fail position	R/W
110	109	Communication Watchdog	R/W
111	110	-	-
112	111	-	-
113	112	-	-
114	113	-	-
115	114	Sensor type 2	R/W
116	115	-	-
117	116	-	-
118	117	-	-
119	118	Setpoint source	R/W

Modbus Register Description

No.	Adr.	Description Comment	Range / Enumeration	Unit	Scaling	Values Default	Access
1	0	Setpoint Setpoint for actuator between Min (Register 106) and Max (Register 107)	0...10'000	%	0.01	0	R/W
2	1	Override Control Overriding setpoint with defined values	0:None 1:Open 2:Close 3:Min 4:Mid 5:Max	-	-	0	R/W
3	2	Command Initiation of actuator functions for service and test. After command is sent, register returns to None(0). With Reset(4) all Malfunction and Service Information (Register 105) Information can be reset.	0:None 1:- 2:Test 3:Sync 4:Reset	-	-	0	R/W
4	3	Actuator Type	0:Actuator not connected 1:Air/Water 2:VAV / EPIV 3:Fire 4:Energy Valve 5:6way EPIV	-	-	-	R
5	4	Relative Position	0...10'000	%	0.01	-	R
6	5	Absolute Position The unit depends on the device: [°] for actuators with rotary movement	0...max angle	°	1	-	R
7	6	-	-	-	-	-	-
8	7	-	-	-	-	-	-
9	8	Sensor 1 Value Current value of sensor 1, depending on the setting of the Sensor Type (Register 108)	0...65'535	mV Ω 0 / 1 °C °F	1 1 0.1 0.1	-	R
10	9	Sensor 2 Value Current value of sensor 2, depending on the setting of the Sensor Type (Register 115)	0...65'535	mV Ω 0 / 1 °C °F	1 1 0.1 0.1	-	R
11	10	-	-	-	-	-	-
12	11	-	-	-	-	-	-
13	12	Setpoint Analog Shows the setpoint in % if actuator is control by analog signal.	0...10'000	%	0.01	-	R

No.	Adr.	Description Comment	Range / Enumeration	Unit	Scaling	Values Default	Access
100	99	Bus Termination Indicates if bus termination (120Ω) is enabled. Bus termination can be set by configuration tools.	0: inactive 1: active	-	-	0	R
101	100	Series Number 1 st part Each device has an unambiguous series number, which is either impressed on or glued to the housing. The series number consists of 4 segments, although only parts 1, 2 and 4 are displayed on Modbus. Example 00839-31324-064-008 1 st part: 00839 2 nd part: 31324 3 rd part: 008	-	-	-	-	R
102	101	Series Number 2 nd part	-	-	-	-	R
103	102	Series Number 4 th part	-	-	-	-	R
104	103	Firmware Version Firmware version of communication module Example 302 : Version 3.02	-	-	-	-	R
105	104	Malfunction and Service Information Value is bit-coded. More than one bit can be set to 1. Bit3 to Bit4 and Bit10 to Bit15 are not used for this actuator range.	Bit0:Excessive utilization Bit1 :Mech travel increased Bit2:Mechanical overload Bit8:Internal activity Bit9:Gear disengaged Bit10:But watchdog triggered	-	-	-	R
106	105	-	-	-	-	-	-
107	106	Max Max cannot be set lower than Min and/or 20%.	Min...100	%	0.01	100	R/W
108	107	Sensor 1 Type	0:None 1:Active 2:Passive_1K 3:Passive_20K 4:Switch 5:PT1000_C 6:NI1000_C 7:NTC10K_C 8:PT1000_F 9:NI1000_F 10:NTC10K_F	-	-	0	R/W
109	108	Bus Fail Position Modbus communication is not monitored as standard. In the event of a breakdown in communication, the actuator retains the current setpoint. The bus monitoring controls the Modbus communication. If neither the Setpoint (Register1) nor the Override Control (Register 2) is renewed before the Timeout for Bus Watchdog (Register 110; Default:120s), the actuator controls to the Bus Fail Position. Triggered bus monitoring is indicated in the Malfunction and Service Information (Register 105). In Hybrid Mode (SpSource (Register 119) = Analog) bus monitoring is not activated.	0:Last setpoint 1:Fast close 2:Fast open 3:Mid position (parameterized)	-	-	0	R/W

No.	Adr.	Description Comment	Range / Enumeration	Unit	Scaling	Values Default	Access
110	109	Timeout for Bus Watchdog in s Time till Bus Fail will be detected. If Bus Watchdog = 0 then deactivated. If Bus Fail Position (Register 110) different from 0 then Timeout for Bus Watchdog is by default 120s (parameterizable).	0...3600	s	1	0 (120)	R/W
111	110	-	-	-	-	-	-
112	111	-	-	-	-	-	-
113	112	-	-	-	-	-	-
114	113	-	-	-	-	-	-
115	114	Sensor 2 Type	0:None 1:Active 2:Passive_1K 3:Passive_20K 4:Switch 5:PT1000_C 6:NI1000_C 7:NTC10K_C 8:PT1000_F 9:NI1000_F 10:NTC10K_F	-	-	0	R/W
116	115	-	-	-	-	-	-
117	116	-	-	-	-	-	-
118	117	-	-	-	-	-	-
119	118	Setpoint Source Analog: Setpoint from analog signal 0...10V on wire 3 Bus: Setpoint from Modbus (Register 1)	0:Analog 1:Bus	-	-	1	R/W