



Modbus Interface Description



2-way EPIV

Electronic pressure-independent characterized control valve

Edition 2024-02 / V4.2

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Modbus general notes

General information

Date	06.07.2023
Product Name	2-way EPIV
Product Model Number	EP..R2+BAC
Protocol	Modbus RTU over RS-485

Modbus RTU

Transmission Formats	1-8-N-2, 1-8-N-1, 1-8-E-1, 1-8-O-1 (Default: 1-8-N-2)
Baud Rates	9'600, 19'200, 38'400, 76'800, 115'200 Bd (Default: 38'400)
Address	1...247 (Default: 1)
Number of Nodes	Max. 32 (without repeater)
Terminating Resistor	120 Ω

Parametrisation

Tool	Belimo Assistant App
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Register implementation

All data is arranged in a table and addressed by 1..n (Register No.) 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.

Supported 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 No.) * **16** (Bit) = **1664**

Interpret values in the registers

All values in the register are unsigned integer data types. Exeptions are marked with **). Signed integers are represented as two's complement.

Example unsigned integer:	Example signed integer:
Read (Function 03, 1 Register)	Read (Function 03, 1 Register)
Value Register No. x	Value Register No. x
= 0001 1010 1100 1000 ₂	= 1111 1101 1111 0010 ₂
= 6,856 ₁₀	= -526 ₁₀
Actual value	Actual value
= value * scaling factor * unit	= value * scaling factor * unit
= 6,856 * 0.01 * unit	= -526 * 0.01 * unit
= 68.56 unit	= -5.26 unit

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. x (Value LowWord)	Register No. x + 1 (Value HighWord)
= 14,551 ₁₀	= 19 ₁₀
= 0011 1000 1101 0111 ₂	= 0000 0000 0001 0011 ₂

Value LowWord = 14,551 = 0011 1000 1101 0111 ₂	Value HighWord = 19 = 0000 0000 0001 0011 ₂
--	---

32-bit value
 = 0000 0000 0001 0011 0011 1000 1101 0111₂
 = 1,259,735₁₀
 = **1,259.735 unit**

Math formula:

32-bit value = (Value HighWord * 65,536) + Value LowWord
 32-bit value = (19 * 65,536) + 14,551
 = 1,259,735
 = **1,259.735 unit**

Deactivated registers

If a register is not supported by a device or by a device setting, this is indicated by 65,535 (1111 1111 1111 1111₂).

Modbus register overview

Operation

No.	Address	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	Relative Volumetric Flow [%]	R
8	7	Absolute Volumetric Flow [l/s]	R
9	8	Absolute Volumetric Flow [gpm]	R
10	9	Absolute Flow in selected unit	LowWord
11	10		HighWord
12	11	Analog Setpoint [%]	R
13	12	Sensor Value 1 [mV] [-]	R
..	..	-	-
16	15	SpAbsFlow in [l/s]	R
17	16	SpAbsFlow in [gpm]	-
18	17	SpAbsFlow in selected unit	LowWord
19	18		HighWord
..	..	-	-
22	21	T_C **)	-
23	22	T_F **)	-
..	..	-	-
26	25	Glycol Concentration [%]	-

**) signed integer

Accumulation

No.	Address	Register	Access
60	59	Total Volume m ³	LowWord
61	60		HighWord
62	61	Total Volume gal	LowWord
63	62		HighWord
64	63	Total Volume in selected unit	LowWord
65	64		HighWord

Service

No.	Address	Register	Access
100	99	Bus Termination	R
101	100	Series Number 1 st part	
102	101	Series Number 2 nd part	R
103	102	Series Number 4 th part	
104	103	Firmware Version	–
105	104	Malfunction and Service Information	R
106	105	V' _{min} [%]	R / W
107	106	V' _{max} [%]	R / W
..	..	–	–
109	108	Bus Fail Action	R / W
110	109	Communication Watchdog	R / W
111	110	Nominal Volumetric Flow in l/s	R
112	111	Nominal Volumetric Flow in gpm	R
113	112	Nominal Volumetric Flow in selected unit	LowWord
114	113		HighWord
..	..	–	–
117	116	Control Mode	R / W
..	..	–	–
119	118	Setpoint Source	R / W
..	..	–	–
121	120	Sensor 1 Input Type	R / W
..	..	–	–
130	129	V' _{min} l/s	R / W
131	130	V' _{min} gpm	R / W
132	131	V' _{min} in selected unit	LowWord
133	132		HighWord
134	133	V' _{max} l/s	R / W
135	134	V' _{max} gpm	R / W
136	135	V' _{max} in selected unit	LowWord
137	136		HighWord
..	..	–	–
148	147	Unit Selection Flow	R / W
..	..	–	–
150	149	Unit Selection Volume	R / W
..	..	–	–
201	200	Meter_Serial_No First Part	LowWord
202	201		HighWord
203	202	Meter_Serial_No_Second Part	LowWord
204	203		HighWord



All writeable registers >100 are persistent and are **not** supposed to be written on a regular basis.

Modbus register description

No.	Address	Description Comment	Range, enumeration	Unit	Scaling	Access
1	0	Setpoint	0...10'000 Default: 0	%	0.01	R / W
2	1	Override control Override the setpoint with defined values Override minimum and maximum flow correspond to Position or Flow Control Mode. → based on selection in Register No. 117	0: None 1: Open valve 2: Close valve 3: Minimum flow 4: - 5: Maximum flow 6: Nominal flow 7: - 8: - 9: - 10: Motor stop Default: 0	-	1	R / W
3	2	Command Will be set to "None" after completion of "Sync"	0: None 1: - 2: Sync Default: 0	-	1	R / W
4	3	Device type	0: Device not connected 1: Air / Water 2: VAV / EPIV / Flow Meter 3: Fire 4: Energy Valve / Energy Meter 5: 6way EPIV	-	1	R
5	4	Relative position	0...10'000	%	0.01	R
6	5	Absolute position	0...max angle	°	0.01	R
7	6	Relative volumetric flow Related to V'_{max} "Maximal Flow Limit" (Register No. 107)	0...15'000	%	0.01	R
8	7	Absolute volumetric flow	0...150 * V'_{nom}	l/s	0.01	R
9	8	Absolute volumetric flow	0...16'000	gpm	0.1	R
10	9	Absolute volumetric flow	0...360'000'000	UnitSel	0.001	R
11	10	→ based on selection in Register No. 148 Actual range determined by selected unit				
12	11	Analog setpoint	0...10'000	%	0.01	R
13	12	Sensor value 1	0...65'535	mV	1 0 / 1	R
..	..	-	-	-	-	-
16	15	SpAbsFlow Setpoint absolut volumetric flow	0...10'000	l/s	0.01	R
17	16	SpAbsFlow Setpoint absolut volumetric flow	0...16'000	gpm	0.1	R
18	17	SpAbsFlow Setpoint absolut volumetric flow	0...360'000'000	UnitSel	0.001	R
19	18	→ based on selection in Register No. 148 Actual range determined by selected unit				
..	..	-	-	-	-	-
22	21	T_C	-2'000...12'000	°C	0.01	R
23	22	T_F	-400...24'800	°F	0.01	R
..	..	-	-	-	-	-
26	25	Glycol concentration	0...6'000	%	0.01	R
..	..	-	-	-	-	-
60	59	Total volume	0...2'147'483'600	m ³	0.01	R
61	60					
62	61	Total volume	0...2'147'483'647	gal	1	R
63	62					
64	63	Total volume	0...2'147'483'647	UnitSel	1	R
65	64	→ based on selection in Register No. 148 Actual range determined by selected unit				

No.	Address	Description Comment	Range, enumeration	Unit	Scaling	Access
100	99	Bus termination Indicates if bus termination (120 Ω) is enabled. Bus termination can be set by configuration tools.	0: Disabled 1: Enabled Default: 0	–	–	R
101	100	Series Number 1st 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 4 th part: 008	–	–	–	R
102	101	Series number 2nd part	–	–	–	R
103	102	Series number 4th part	–	–	–	R
104	103	Firmware version	–	–	–	R
105	104	Malfunction and service information Value is bit-coded. More than one bit can be set to 1. Not all bits mentioned in the enumeration are used for this product range.	Bitmask = 0: No communication to actuator 1: Gear disengaged 2: Actuator cannot move 3: Reverse flow 4: Flow setpoint not reached 5: Flow with closed valve 6: Flow actual exceeds flow nominal 7: Flow measurement error 8: – 9: Flowbody temperature error 10: Communication to sensor interrupted 11: Freeze warning 12: Glycol detected 13: – 14: – 15: Bus watchdog triggered	–	–	R
106	105	V'_{min} Minimum Flow limitation can be set from 2.5% of V' _{nom} to V' _{max} . Minimum Flow limit deactivated if V' _{min} = 0	0..V' _{max} Default: 0	%	0.01	R / W
107	106	V'_{max} Maximum Flow Limit in % between 25% and 100% of V' _{nom} . Values below 25% will be adjusted to 25%. The Maximum Flow setpoint is related to V' _{nom} "Nominal Volumetric Flow" (Register No. 111,112, 113/114)) and is considered when Control Mode (Register No. 117) = Flow Control.	2'500..10'000 Default: 10'000	%	0.01	R / W
..	..	–	–	–	–	–

No.	Address	Description Comment	Range, enumeration	Unit	Scaling	Access
109	108	Bus fail action In the event of a breakdown in communication, the actuator enables the bus fail action.	0: None 1: Open 2: Close 3: Max 4: Min 5: – 6: Stop Default: 0	–	–	R / W
110	109	Communication watchdog If no write request is received within the timeout, the device will execute the action defined in Register No. 109 (Bus watchdog fail action).	5...3'600 Default: 120	s	1	R / W
111	110	Nominal volumetric flow	0...10'000	l/s	0.01	R
112	111	Nominal volumetric flow	0...16'000	gpm	0.1	R
113	112	Nominal volumetric flow	0...360'000'000	UnitSel	0.001	R
114	113	→ based on selection in Register No. 148 Actual range determined by selected unit				
..	..	–	–	–	–	–
117	116	Control mode	0: Position Control 1: Flow Control Default: 1	–	–	R / W
..	..	–	–	–	–	–
119	118	Setpoint source Analog: Setpoint from analog signal on wire 3. Bus: Setpoint from Modbus (→ based on selection in Register No. 1)	0: Analog 1: Bus Default: 0	–	–	R / W
..	..	–	–	–	–	–
121	120	Sensor 1 type Additional sensor input Only selectable if SpSource (→ based on selection in Register No. 119) is set to bus.	0: None 1: Active 2: – 3: – 4: Switch Default: 0	–	–	R / W
..	..	–	–	–	–	–
130	129	V'_{min} Minimum Flow limitation can be set from 2.5% of V' _{nom} to V' _{max} . Minimum Flow limit deactivated if V' _{min} = 0	0...V' _{max}	l/s	0.01	R / W
131	130	V'_{min} Minimum Flow limitation can be set from 2.5% of V' _{nom} to V' _{max} . Minimum Flow limit deactivated if V' _{min} = 0	0...V' _{max}	gpm	0.1	R / W
132	131	Minimal volumetric flow in selected unit → based on selection in Register No. 148 Minimum Flow limitation can be set from 2.5% of V' _{nom} to V' _{max} . Minimum Flow limit deactivated if V' _{min} = 0.	0...V' _{max} Actual range determined by selected unit	UnitSel	0.001	R / W
133	132					
134	133	V'_{max}	25% of V' _{nom} ...V' _{nom}	l/s	0.01	R / W
135	134	V'_{max}	25% of V' _{nom} ...V' _{nom}	gpm	0.1	R / W

No.	Address	Description Comment	Range, enumeration	Unit	Scaling	Access
136	135	Maximal volumetric flow in selected unit → based on selection in Register No. 148	25 % of V'_{nom} ... V'_{nom} Actual range determined by selected unit	UnitSel	0.001	R / W
137	136					
..	..	-	-	-	-	-
148	147	Unit selection flow	0: m ³ /s 1: m ³ /h 2: l/s 3: l/min 4: l/h 5: gpm 6: cfm Default: 4	-	-	R / W
..	..	-	-	-	-	-
150	149	Unit selection volume	0: m ³ 1: Litre 2: Gallon 3: cf Default: 0	-	-	R / W
..	..	-	-	-	-	-
201	200	Meter serial number 1st part	-	-	1	R
202	201	ProductionOrderNumber	-	-	1	R
203	202	Meter serial number 2nd part	-	-	1	R
204	203	ProductionSequenceNumber	-	-	1	R

Definition Access: R = Read, W = Write

Note: According to the present configuration settings of the EPIV (e.g. DN size) the HVAC application may perform a size limitation within the indicated Modbus value range. Each EPIV may have different HVAC value size limitations.

All inclusive.

Belimo as a global market leader develops innovative solutions for the controlling of heating, ventilation and air-conditioning systems. Damper actuators, control valves, sensors and meters represent our core business.

Always focusing on customer value, we deliver more than only products. We offer you the complete product range for the regulation and control of HVAC systems from a single source. At the same time, we rely on tested Swiss quality with a five-year warranty. Our worldwide representatives in over 80 countries guarantee short delivery times and comprehensive support through the entire product life. Belimo does indeed include everything.

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5-year warranty



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Complete product range



Tested quality



Short delivery times



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