



## Energy Valve

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## Modbus General Notes

General information	Date	26.01.2018						
	Product Name	Energy valve						
	Actuator type	EV..R+(K)BAC(1), EV..R3+BAC, EV..F+(K)BAC(1)						
	Protocol	Modbus RTU over RS485, Modbus TCP over IP network						
Modbus RTU	Transmission formats	1-8-N-2, 1-8-N-1, 1-8-E-1, 1-8-O-1 (Default: 1-8-N-1)						
	Baud rates	9'600, 19'200, 38'400, 76'800, 115'200 Bd (Default: 38'400 Bd)						
	Address	1...247 (Default: 1)						
	Number of nodes	Max. 32 (without repeater)						
Modbus TCP	Port	open (Default: 502)						
	Parameterisation	Tool through the intergrated webserver						
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.							
Commands	Standard commands: Read Holding Registers [3] Write Single Register [6]							
	Optional commands: 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 → <b>104</b> (Register Address) * <b>16</b> (Bit) = <b>1664</b>							
Interpret values in the registers	All values in the register are unsigned integer datatypes. <b>Exceptions are Register No.17/19. Signed integers are represented as two`s complement.</b>							
	Example unsigned integer	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 * m <sup>3</sup> /h = <b>68.56 m<sup>3</sup>/h</b>						
Example signed integer	Read (Function 03, 1 Register) Value Register No. 17 = 1111'1101'1111'00102 = -52610 Actual Value = Value * Scaling factor * Unit = -526 * 0.01 * °C = <b>-5.26 °C</b>							
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							
	Both registers have to be written at once with function „Write Multiple Registers [16]“. It cannot be written together with other registers.							
Example	Register No. 10 (AbsFlow LowWord) = 14'551 = 0011'1000'1101'0111 <sub>2</sub> Register No. 11 (AbsFlow HighWord) = 19 = 0000'0000'0001'0011 <sub>2</sub>							
	<table border="1"> <thead> <tr> <th>AbsFlow HighWord</th> <th>AbsFlow LowWord</th> </tr> </thead> <tbody> <tr> <td>19</td> <td>14'551</td> </tr> <tr> <td>0000'0000'0001'0011<sub>2</sub></td> <td>0011'1000'1101'0111<sub>2</sub></td> </tr> </tbody> </table>		AbsFlow HighWord	AbsFlow LowWord	19	14'551	0000'0000'0001'0011 <sub>2</sub>	0011'1000'1101'0111 <sub>2</sub>
AbsFlow HighWord	AbsFlow LowWord							
19	14'551							
0000'0000'0001'0011 <sub>2</sub>	0011'1000'1101'0111 <sub>2</sub>							
	AbsFlow = 0000'0000'0001'0011'0011'1000'1101'0111 <sub>2</sub> = 1'259'735 = <b>1259.735 l/h</b>							
	Math formula: AbsFlow = ( AbsFlow HighWord * 65'536 ) + AbsFlow LowWord AbsFlow = ( 19 * 65'536 ) + 14'551 = 1'259'735 = <b>1259.735 l/h</b>							
Deactivated registers	If a register is not supported by a device or by a device setting it is indicated with 65'535 (1111'1111'1111'1111 <sub>2</sub> ).							



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

## Modbus Register Overview

## Operation

No.	Address	Register	Access
1	0	Setpoint [%]	R / W
2	1	Override Control	R / W
3	2	-	-
4	3	Actuator Type	R
5	4	Relative Position [%]	R
6	5	Absolute Position [°] [mm]	R
7	6	Relative Flow [%]	R
8	7	Absolute flow [UnitSel]	LowWord
9	8		HighWord
10	9	Absolute flow [l/s]	LowWord
11	10		HighWord
12	11	Absolute flow [gpm]	LowWord
13	12		HighWord
14	13	Setpoint absolute volumetric flow [UnitSel]	LowWord
15	14		HighWord
16	15	Setpoint Analog [V]	R
17	16	Temperature 1 [°C]	R
18	17	Temperature 1 [°F]	R
19	18	Temperature 2 [°C]	R
20	19	Temperature 2 [°F]	R
21	20	Delta Temperature [K]	R
22	21	Delta Temperature [°F]	R
23	22	Glycol Concentration [%]	R
24	23	Relative Power [%]	R
25	24	Absolute Power [UnitSel]	LowWord
26	25		HighWord
27	26	Absolute Power [kW]	LowWord
28	27		HighWord
29	28	Absolute Power [kBTU/h]	LowWord
30	29		HighWord
31	30	Energy Cooling [UnitSel]	LowWord
32	31		HighWord
33	32	Energy Cooling [kWh]	LowWord
34	33		HighWord
35	34	Energy Cooling [kBTU/h]	LowWord
36	35		HighWord
37	36	Energy Heating [UnitSel]	LowWord
38	37		HighWord
39	38	Energy Heating [kWh]	LowWord
40	39		HighWord
41	40	Energy Heating [kBTU/h]	LowWord
42	41		HighWord

## Modbus Register Overview

## Service

No.	Address	Register	Access
101	100	Series Number 1 <sup>st</sup> part	R
102	101	Series Number 2 <sup>nd</sup> part	R
103	102	Series Number 4 <sup>th</sup> part	R
104	103	Firmware Version	R
105	104	Malfunction and Service Information	R
106	105	Vmax [%]	R / W
107	106	Absolute Vmax [l/s]	LowWord
108	107		HighWord
109	108	Absolute Vmax [gpm]	LowWord
110	109		HighWord
111	110	Nominal volumetric flow [UnitSel]	LowWord
112	111		HighWord
113	112	Nominal volumetric flow [l/s]	LowWord
114	113		HighWord
115	114	Nominal volumetric flow [gpm]	LowWord
116	115		HighWord
117	116	Pmax [%]	R / W
118	117	Absolute Pmax [kW]	LowWord
119	118		HighWord
120	119	Absolute Pmax [kBTU/h]	LowWord
121	120		HighWord
122	121	Nominal power [UnitSel]	LowWord
123	122		HighWord
124	123	Nominal power [kW]	LowWord
125	124		HighWord
126	125	Nominal power [kBTU/h]	LowWord
127	126		HighWord
128	127	-	-
129	128	-	-
130	129	-	-
131	130	DeltaT Limitation [K]	R / W
132	131	DeltaT Manager Status	R
133	132	Setpoint DeltaT [K]	R / W
134	133	Setpoint DeltaT [°F]	R / W
135	134	Setpoint Flow at DeltaT [l/s]	LowWord
136	135		HighWord
137	136	Setpoint Flow at DeltaT [gpm]	LowWord
138	137		HighWord
139	138	-	-
140	139	-	-
141	140	Control Mode	R / W
142	141	Unit Selection Flow	R / W
143	142	Unit Selection Power	R / W
144	143	Unit Selection Energy	R / W
145	144	Setpoint Source	R / W

## Modbus Register Description

No.	Address	Description Comment	Range Enumeration	Unit	Scaling	Access
1	0	Setpoint Position Control: Setpoint 0...100% refers to relative position 0...100% Flow Control: Setpoint 0...100% refers to range 0...Vmax Power Control: Setpoint 0...100% refers to range 0...Pmax	0...10'000	[%]	0.01	R / W
2	1	Override control Override setpoint with defined values. Overrides setpoint with defined valves. It will change back to None (0) after 2 hours.	0: None 1: Close 2: Open 3: Vnom 4: Vmax 5: MotStop 6: Pnom 7: Pmax	-	-	R / W
3	2	-	-	-	-	-
4	3	Actuator type	0: Unknown 1: Air & Water 2: EPIV / VAV 3: Fire 4: <b>EnergyValve</b> 5: 6way EPIV	-	-	R
5	4	Relative position	0...10'000	%	0.01	R
6	5	Absolute position	0...max angle	°	0.01	R
7	6	Relative Flow Relative volumetric flow of active Vmax	0...10'000	%	0.01	R
8	7	Absolute volumetric flow Absolute flow in unit selected (Register No. 142) LowWord Lower 16 bit of 32 bit value	-	UnitSel	0.001	R
9	8	Absolute volumetric flow Absolute flow in unit selected (Register No. 142) HighWord Upper 16 bit of 32 bit value	-	UnitSel	0.001	R
10	9	Absolute volumetric flow Absolute flow in l/s LowWord Lower 16 bit of 32 bit value	-	l/s	0.001	R
11	10	Absolute volumetric flow Absolute flow in l/s HighWord Upper 16 bit of 32 bit value	-	l/s	0.001	R
12	11	Absolute volumetric flow Absolute flow in gpm LowWord Lower 16 bit of 32 bit value	-	gpm	0.001	R
13	12	Absolute volumetric flow Absolute flow in gpm HighWord Upper 16 bit of 32 bit value	-	gpm	0.001	R
14	13	Setpoint absolute volumetric flow Absolute flow in unit selected (Register No. 142) LowWord Lower 16 bit of 32 bit value	-	UnitSel	0.001	R
15	14	Setpoint absolute volumetric flow Absolute flow in unit selected (Register No. 142) HighWord Upper 16 bit of 32 bit value	-	UnitSel	0.001	R
16	15	Setpoint Analog Shows the setpoint in V if actuator is controlled by analog signal (Setpoint Source (Register No. 145) is Analog(0))	0...1'000	V	0.01	R
17	16	Temperature 1 signed value Remote Temperature in hundredths of one degree Celsius	0...12'000	°C	0.01	R
18	17	Temperature 1 Remote Temperature in hundredths of one degree Fahrenheit	1'400...24'800	°F	0.01	R
19	18	Temperature 2 signed value Embedded Temperature in hundredths of one degree Celsius	0...12'000	°C	0.01	R
20	19	Temperature 2 Remote Temperature in hundredths of one degree Fahrenheit	1'400...24'800	°F	0.01	R
21	20	Delta Temperature	0...13'000	K	0.01	R
22	21	Delta Temperature	0...26'600	°F	0.01	R
23	22	Glycol Concentration EV..+BAC: 0 or manual overwritten value from webserver EV..+BAC1: Measured valve or manual overwritten value from webserver	0...10'000	%	0.01	R

## Modbus Register Description

No.	Address	Description Comment	Range Enumeration	Unit	Scaling	Access
24	23	Relative power	0...10'000	%	0.01	R
25	24	Absolute power Absolute power in unit selected (Register No. 143) LowWord Lower 16 bit of 32 bit value	0...2'147'483'647	UnitSel	0.001	R
26	25	Absolute power Absolute power in unit selected (Register No. 143) HighWord Upper 16 bit of 32 bit value				
27	26	Absolute power Absolute power in kW LowWord Lower 16 bit of 32 bit value	0...2'147'483'647	kW	0.001	R
28	27	Absolute power Absolute power in kW HighWord Upper 16 bit of 32 bit value				
29	28	Absolute power Absolute power in kBTU/h LowWord Lower 16 bit of 32 bit value	0...2'147'483'647	kBTU/h	0.001	R
30	29	Absolute power Absolute power in kBTU/h HighWord Upper 16 bit of 32 bit value				
31	30	Energy Cooling Cooling Energy in unit selected (Register No. 144) LowWord Lower 16 bit of 32 bit value	0...2'147'483'647	UnitSel	1	R
32	31	Energy Cooling Cooling Energy in unit selected (Register No. 144) HighWord Upper 16 bit of 32 bit value				
33	32	Energy Cooling Cooling Energy in kWh LowWord Lower 16 bit of 32 bit value	0...2'147'483'647	kWh	1	R
34	33	Energy Cooling Cooling Energy in kWh HighWord Upper 16 bit of 32 bit value				
35	34	Energy Cooling Cooling Energy in kBTU LowWord Lower 16 bit of 32 bit value	0...2'147'483'647	kBTU	1	R
36	35	Energy Cooling Cooling Energy in kBTU HighWord Upper 16 bit of 32 bit value				
37	36	Energy Heating Heating Energy in unit selected (Register No. 144) LowWord Lower 16 bit of 32 bit value	0...2'147'483'647	UnitSel	1	R
38	37	Energy Heating Heating Energy in unit selected (Register No. 144) HighWord Upper 16 bit of 32 bit value				
39	38	Energy Heating Heating Energy in kWh LowWord Lower 16 bit of 32 bit value	0...2'147'483'647	kWh	1	R
40	39	Energy Heating Heating Energy in kWh HighWord Upper 16 bit of 32 bit value				
41	40	Energy Heating Heating Energy in kBTU LowWord Lower 16 bit of 32 bit value	0...2'147'483'647	kBTU	1	R
42	41	Energy Heating Heating Energy in kBTU HighWord Upper 16 bit of 32 bit value				

## Modbus Register Description

No.	Address	Description Comment	Range Enumeration	Unit	Scaling	Access
101	100	Series Number 1 <sup>st</sup> 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 Modus Example: 00839-31324-064-008 1 <sup>st</sup> part: 00839 2 <sup>nd</sup> part: 31324 4 <sup>th</sup> part: 008	-	-	-	-
102	101	Series Number 2 <sup>nd</sup> part	-	-	-	-
103	102	Series Number 4 <sup>th</sup> part	-	-	-	-
104	103	Firmware Version Firmware version of communication module Example: 302, Version 3.02 for details see Firmware history	-	-	-	-
105	104	Malfunction and Service Information Value is bit-coded. More than one bit can be set to 1 All bits not mentioned in the enumeration are not used for this actuator range Error Sensor T1: Error with remote temperature sensor Error Sensor T2: Error with embedded temperature sensor Error Flow Sensor: Error with the flow sensor Actuator can't move: Mechanical overload due to blocked valve, etc. Flow with closed valve: Flow is measured but position of valve is closed Airbubbles: Air bubbles in the hydronic system Flow not reached: Setpoint cannot be reached within 5 min during flow control Power not realized: Setpoint cannot be reached within 5 min during power control Gear disengagement active: Gear disengaged button is pressed Reverse flow: Reverse flow is detected MP communication faulty: Internal communication between sensor and actuator faulty Freeze warning: Measured temperature & glycol concentration indicate that grease ice can build up	Bit0: Error Sensor T1 Bit1: Error Sensor T2 Bit2: Error Flow Sensor Bit3: Actuator cannot move Bit4: Flow with closed valve Bit5: Air bubbles Bit6: Flow not reached Bit7: Power not realized Bit9: Gear disengagement active Bit11: Reverse flow Bit12: MP communication faulty Bit13: Freeze warning	-	-	-
106	105	Vmax	3'000...10'000	%	0.01	R / W
107	106	Absolute Vmax * Maximum limit of flow in l/s LowWord Lower 16 bit of 32 bit value	30% of Vnom...Vnom	l/s	0.001	R / W
108	107	Absolute Vmax * Maximum limit of flow in l/s HighWord Upper 16 bit of 32 bit value				
109	108	Absolute Vmax * Maximum limit of flow in gpm LowWord Lower 16 bit of 32 bit value	30% of Vnom...Vnom	gpm	0.001	R / W
110	109	Absolute Vmax * Maximum limit of flow in gpm HighWord Upper 16 bit of 32 bit value				
111	110	Nominal volumetric flow Vnom in unit selected (Register No. 142) LowWord Lower 16 bit of 32 bit value	-	UnitSel	0.001	R
112	111	Nominal volumetric flow Vnom in unit selected (Register No. 142) HighWord Upper 16 bit of 32 bit value				
113	112	Nominal volumetric flow Vnom in l/s LowWord Lower 16 bit of 32 bit value	-	l/s	0.001	R
114	113	Nominal volumetric flow Vnom in l/s HighWord Upper 16 bit of 32 bit value				
115	114	Nominal volumetric flow Vnom in gpm LowWord Lower 16 bit of 32 bit value	-	gpm	0.001	R
116	115	Nominal volumetric flow Vnom in gpm HighWord Upper 16 bit of 32 bit value				
117	116	Pmax	50...10'000	%	0.01	R / W

## Modbus Register Description

No.	Address	Description Comment	Range Enumeration	Unit	Scaling	Access
118	117	Absolute Pmax * Maximum limit of power in kW LowWord Lower 16 bit of 32 bit value	0.5% of Pnom...Pnom	kW	0.001	R / W
119	118	Absolute Pmax * Maximum limit of power in kW HighWord Upper 16 bit of 32 bit value				
120	119	Absolute Pmax * Maximum limit of power in kBTU/h LowWord Lower 16 bit of 32 bit value	0.5% of Pnom...Pnom	kBTU/h	0.001	R / W
121	120	Absolute Pmax * Maximum limit of power in kBTU/h HighWord Upper 16 bit of 32 bit value				
122	121	Nominal power Pnom in unit selected (Register No. 143) LowWord Lower 16 bit of 32 bit value	-	UnitSel	0.001	R
123	122	Nominal power Pnom in unit selected (Register No. 143) HighWord Upper 16 bit of 32 bit value				
124	123	Nominal power Pnom in kW LowWord Lower 16 bit of 32 bit value	-	kW	0.001	R
125	124	Nominal power Pnom in kW HighWord Upper 16 bit of 32 bit value				
126	125	Nominal power Pnom in kBTU/h LowWord Lower 16 bit of 32 bit value	-	kBTU/h	0.001	R
127	126	Nominal power Pnom in kBTU/h HighWord Upper 16 bit of 32 bit value				
128	127	-	-	-	-	-
129	128	-	-	-	-	-
130	129	-	-	-	-	-
131	130	DeltaT Limitation Selection of DeltaT activation and operation mode Disabled: dT-Manager not activated dT-Manager: dT-Manager activated with no restriction to flow dT-Manager scaling: dT-Manager activated with restriction of flow → Register No. 135/136 or 137/138	0: Disabled 1: dT-Manager 2: dT-Manager scaling <i>Default: Disabled(0)</i>	-	-	R/W
132	131	DeltaT Manager Status Indicates the status of the dT manager Not selected: dT-Manager deactivated Standby: dT-Manager activated but not active Active: dT-Manager active Scaling standby: dT-Manager active with no limitation to the flow Scaling active: dT-Manager active with limitation to the flow → Register No. 135/136 or 137/138	0: Not selected 1: Standby 2: Active 3: Scaling standby 4: Scaling active <i>Default: Not selected(0)</i>	-	-	R
133	132	Setpoint DeltaT	100...5'500	K	0.01	R / W
134	133	Setpoint DeltaT	200...10'000	°F	0.01	R / W
135	134	Setpoint Flow at DeltaT * Setpoint Flow at DeltaT in l/s LowWord Lower 16 bit of 32 bit value	-	l/s	0.001	R
136	135	Setpoint Flow at DeltaT * Setpoint Flow at DeltaT in l/s HighWord Upper 16 bit of 32 bit value				
137	136	Setpoint Flow at DeltaT * Setpoint Flow at DeltaT in gpm LowWord Lower 16 bit of 32 bit value	-	gpm	0.001	R
138	137	Setpoint Flow at DeltaT * Setpoint Flow at DeltaT in gpm HighWord Upper 16 bit of 32 bit value				
139	138	-	-	-	-	-
140	139	-	-	-	-	-



## Modbus Register Description

No.	Address	Description Comment	Range Enumeration	Unit	Scaling	Access
141	140	Control Mode Control Mode of the EV. This value defines the interpretation of the setpoint → Register No. 1	0: Position Control 1: Flow Control 2: Power Control <i>Default: Flow Control(1)</i>	-	-	R / W
142	141	Unit Selection Flow Selection of Flow Unit defines unit of Register No. 8/9, 14/15, 111/112 (It does not affect the unit displayed on the local webserver)	0: m <sup>3</sup> /s 1: m <sup>3</sup> /h 2: l/s 3: l/min 4: l/h 5: gpm 6: cfm <i>Default: l/min(3)</i>	-	-	R / W
143	142	Unit Selection Power Selection of Power Unit defines unit of Register No. 25/26, 122/123 (It does not affect the unit displayed on the local webserver)	0: W 1: kW 2: BTU/h 3: kBTU/h 4: Tons <i>Default: kW(1)</i>	-	-	R / W
144	143	Unit Selection Energy Selection of Energy Unit defines unit of Register No. 31/32, 37/38 (It does not affect the unit displayed on the local webserver)	0: J 1: kWh 2: MWh 3: kBTU 4: tonh 5: MJ 6: GJ <i>Default: kWh(1)</i>	-	-	R / W
145	144	Setpoint Source Analog: Setpoint from analog signal 0...10V on wire 3 Bus: Setpoint from Modbus → Register No. 1	0: Analog 1: Bus <i>Default: Analog(0)</i>	-	-	R / W

\* Both registers have to be written at once with function „Write Multiple Registers [16]“