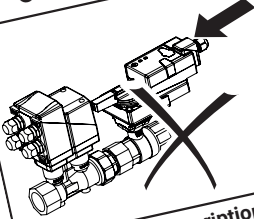
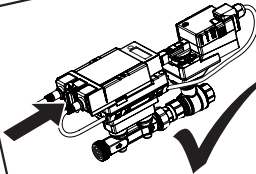
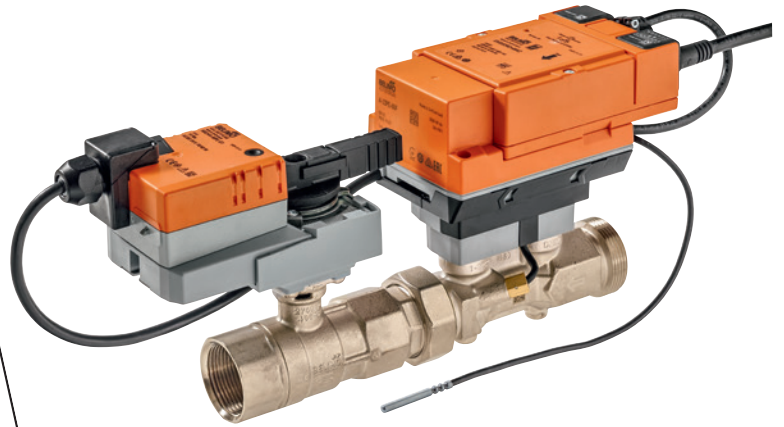


**Where is the Ethernet socket?**

<b>On the actuator</b>	<b>On the flow sensor</b>
	
See „Modbus description Energy Valve (V1, V2 or V3)”	Stay with this document

For guidance in replacing an old EV with EV V4  
-> see "Replacement Guide V1, V2, V3 vs. V4"



## Energy Valve DN 15...50 (Version 4)

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## Modbus General Notes

General information	Date	15.01.2022						
	Product Name	Energy Valve						
	Product Model Number	EV..R2+(K)BAC (Version 4, DN 15...50) EV..R2+MID (Version 4, DN 15...50) EV..R3+BAC (Version 4, DN 15...50)						
Modbus RTU	Protocol	Modbus RTU over RS-485, Modbus TCP over Ethernet						
	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 Bd)						
	Address	1...247 (default: 1)						
Modbus TCP	Number of nodes	Max. 32 (without repeater)						
	Terminating resistor	120 Ω						
	Port	open (default: 502)						
Parameterisation	Tool	Assistant App or through the integrated web server						
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 marked with **. Signed integers are represented as two's complement.</b>							
Example unsigned integer	Read (Function 03, 1 Register) Value Register No. 7 = 0001'1010'1100'1000 <sub>2</sub> = 6'856 <sub>10</sub> Actual Value = Value * Scaling factor * Unit = 6'856 * 0.01 * % = <b>68.56 %</b>							
Example signed integer	Read (Function 03, 1 Register) Value Register No. 20 = 1111'1101'1111'0010 <sub>2</sub> = -526 <sub>10</sub> 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	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] 0...45 l/s (0...45'000)	R
9	8	Absolute volumetric flow [gpm] 0...713 gpm (0...7'130)	R
10	9	Absolute volumetric flow [selected units]	LowWord
11	10		HighWord
12	11	Setpoint analog [%]	R
13	12	Sensor value 1 [mV] [Ω] [-]	R
14	13	Sensor 1 as analog value [°C] **)	R
15	14	Sensor 1 as analog value [°F] **)	R
16	15	SpAbsFlow [l/s]	R
17	16	SpAbsFlow [gpm]	R
18	17	SpAbsFlow [selected units]	LowWord
19	18		HighWord
20	19	Temperature 1 (external) [°C] **)	R
21	20	Temperature 1 (external) [°F] **)	R
22	21	Temperature 2 (integrated) [°C] **)	R
23	22	Temperature 2 (integrated) [°F] **)	R
24	23	Delta temperature [K]	R
25	24	Delta temperature [°F]	R
26	25	Glycol concentration [%]	R
27	26	Relative power [%]	R
28	27	Absolute cooling power [kW]	LowWord
29	28		HighWord
30	29	Absolute cooling power [kBTU/h]	LowWord
31	30		HighWord
32	31	Absolute cooling power [selected units]	LowWord
33	32		HighWord
34	33	Absolute heating power [kW]	LowWord
35	34		HighWord
36	35	Absolute heating power [kBTU/h]	LowWord
37	36		HighWord
38	37	Absolute heating power [selected units]	LowWord
39	38		HighWord
40	39	Setpoint DeltaT [K]	RW
41	40	Setpoint DeltaT [°F]	RW
42	41	Setpoint Absolute Flow DeltaT [l/s]	LowWord
43	42		HighWord
44	43	Setpoint Absolute Flow DeltaT [gpm]	LowWord
45	44		HighWord
46	45	Setpoint Absolute Flow DeltaT [selected units]	LowWord
47	46		HighWord
...	...	-	-
60	59	Total Volume [m3]	LowWord
61	60		HighWord
62	61	Total Volume [gal]	LowWord
63	62		HighWord
64	63	Total Volume [selected units]	LowWord
65	64		HighWord
66	65	Cooling Energy [kWh]	LowWord
67	66		HighWord
68	67	Cooling Energy [kBTU]	LowWord
69	68		HighWord

\*\*) signed integer

## Modbus Register Overview

Operation	Start	End	Description	Format	Access
	70	69	Cooling Energy [selected units]	LowWord	R
	71	70		HighWord	R
	72	71	Heating Energy [kWh]	LowWord	R
	73	72		HighWord	R
	74	73	Heating Energy [kBTU]	LowWord	R
	75	74		HighWord	R
	76	75	Heating Energy [selected units]	LowWord	R
	77	76		HighWord	R

## Modbus Register Overview

## Service

No.	Address	Register	Access
100	99	Bus Termination	R
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	Vmin [%]	R / W
107	106	Vmax [%]	R / W
...	...	-	-
109	108	Bus Fail Setpoint	R / W
110	109	Communication Watch dog	R / W
111	110	Nominal volumetric flow [l/s]	R
112	111	Nominal volumetric flow [gpm]	R
113	112	Nominal volumetric flow [selected units]	LowWord
114	113		HighWord
...	...	-	-
117	116	Control Mode	R / W
118	117	-	-
119	118	Setpoint Source	R / W
120	119	-	-
121	120	Sensor 1 input type	R / W
122	121	Sensor 1 passive sensor Type	R / W
123	122	Sensor 1 as analog value [°C]	R
124	123	Sensor 1 as analog value [°F]	R
...	...	-	-
130	129	Vmin [l/s]	R / W
131	130	Vmin [gpm]	R / W
132	131	Vmin [selected units]	LowWord
133	132		HighWord
134	133	Vmax [l/s]	R / W
135	134	Vmax [gpm]	R / W
136	135	Vmax [selected units]	LowWord
137	136		HighWord
...	...	-	-
148	147	Unit Selection Flow	R / W
149	148	Unit Selection Power	R / W
150	149	Unit Selection Total Flow	R / W
151	150	Unit Selection Energy	R / W
...	...	-	-
160	159	Nominal Power [kW]	LowWord
161	160		HighWord
162	161	Nominal Power [kBTU/h]	LowWord
163	162		HighWord
164	163	Nominal Power [selected units]	LowWord
165	164		HighWord
166	165	Max Power [%]	R / W
167	166	Absolute Pmax [kW]	LowWord
168	167		HighWord
169	168	Absolute Pmax [kBTU/h]	LowWord
170	169		HighWord
171	170	Absolute Pmax [selected units]	LowWord
172	171		HighWord
...	...	-	-
180	179	DeltaT_Limitation	R / W
181	180	DeltaT Manager Status	R / W
...	...	-	-
201	200	Meter_Serial_No First Part	LowWord
202	201		HighWord
203	202	Meter_Serial_No_Second Part	LowWord
204	203		HighWord
205	204	Select Meter Registers	R / W

## 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 Overrides setpoint with defined values.	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	0: None 1: - 2: Sync Default: 0	-	-	R / W
4	3	Actuator type	0: Device not connected 1: Air/Water 2: VAV / EPIV 3: Fire 4: Energy Valve / Flow Meter 5: 6-way EPIV	-	1	R
5	4	Relative position [%]	0...10'000	%	0.01	R
6	5	Absolute position [°] [mm]	0...max angle	°	0.01	R
7	6	Relative volumetric flow [%] relates to Vnom	0...15'000	%	0.01	R
8	7	Absolute volumetric flow [l/s]	0...1.5*Vnom	l/s	0.01	R
9	8	Absolute volumetric flow [gpm]	0...16'000	gpm	0.1	
10	9	Absolute volumetric flow [selected units]				
11	10	Unit can be selected in Register No. 148	0...360'000'000	UnitSel	0.001	R
12	11	Setpoint Analog [%]	0...10'000	%	0.01	R
13	12	Sensor value 1 [mV] [Ω] [-] For Resistance values scaling as follows applies PT1000 / Ni1000 -> 1 NTC10K -> 10	0...65'535	mV Ω	1 1 / 10 0 / 1	R
14	13	Sensor 1 as analog value [°C]	-2'000...12'000	°C	0.01	R
15	14	Sensor 1 as analog value [°F]	-400...24'800	°F	0.01	R
16	15	SpAbsFlow [l/s]	0...10'000	[l/s]	0.01	R
17	16	SpAbsFlow [gpm]	0...16'000	gpm	0.1	R
18	17	SpAbsFlow [selected units]				
19	18	Unit can be selected in Register No. 148	0...360'000'000	UnitSel	0.001	R
20	19	Temperature 1 (external) [°C]	-2'000...12'0000	°C	0.01	R
21	20	Temperature 1 (external) [°F]	-400...24'800	°F	0.01	R
22	21	Temperature 2 (integrated) [°C]	-2'000...12'0000	°C	0.01	R
23	22	Temperature 2 (integrated) [°F]	-400...24'800	°F	0.01	R
24	23	DeltaT_K	0...14'000	K	0.01	R
25	24	DeltaT_F	0...25'200	°F	0.01	R
26	25	Glycol concentration	0...10'000	%	0.01	R
27	26	Relative Power	0...30'000	%	0.01	R
28	27	Absolute Power cooling [kW]				
29	28		0...21'500'000	kW	0.001	R
30	29	Absolute Power cooling [kBtu/h]				
31	30		0...74'150'000	kBTU/h	0.001	R
32	31	Absolute Power cooling [selected units]				
33	32	Unit can be selected in Register No. 149	0...741'500'000	UnitSel	0.1	R
34	33	Absolute Power Heating [kW]				
35	34		0...21'500'000	kW	0.001	R
36	35	Absolute Power Heating [kBtu/h]				
37	36		0...74'150'000	kBTU/h	0.001	R

## Modbus Register Description

No.	Address	Description Comment	Range Enumeration	Unit	Scaling	Access
38	37	Absolute Power Heating [selected units]	0...741'500'000	UnitSel	0.1	R
39	38	Unit can be selected in Register No. 149				
40	39	Setpoint DeltaT [K]	100...5'500	K	0.01	R / W
41	40	Setpoint DeltaT [°F]	180...9'900	°F	0.01	R / W
42	41	Setpoint Absolute Flow DeltaT [l/s]	0...100'000	l/s	0.001	R / W
43	42					
44	43	Setpoint Absolute Flow DeltaT [gpm]	0...160'000	gpm	0.01	R / W
45	44					
46	45	Setpoint Absolute Flow DeltaT [selected units]	0...360'000'000	UnitSel	0.001	R / W
47	46	Unit can be selected in Register No. 148				
60	59	Total Volume [m3]	0...2'147'483'600	m3	0.01	R
61	60					
62	61	Total Volume [gal]	0...2'147'483'647	gal	1	R
63	62					
64	63	Total Volume [selected units]	0...2'147'483'647	UnitSel	1	R
65	64	Unit can be selected in Register No. 150				
66	65	Cooling Energy [kWh]	0...2'147'483'647	kWh	1	R
67	66					
68	67	Cooling Energy [kBTU]	0...2'147'483'647	kBTU	1	R
69	68					
70	69	Cooling Energy [selected units]	0...2'147'483'647	UnitSel	1	R
71	70	Unit can be selected in Register No. 151				
72	71	Heating Energy [kWh]	0...2'147'483'647	kWh	1	R
73	72					
74	73	Heating Energy [kBTU]	0...2'147'483'647	kBTU	1	R
75	74					
76	75	Heating Energy [selected units]	0...2'147'483'647	UnitSel	1	R
77	76	Unit can be selected in Register No. 151				

## Modbus Register Description

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 with 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 1st part: 00839 2nd part: 31324 4th part: 008	-	-	-	R
102	101	Series Number 2nd part	-	-	-	R
103	102	Series Number 4th part	-	-	-	R
104	103	Firmware Version Firmware version of communication module Example: 400, Version 4.00 for details see Firmware history	-	-	-	R
105	104	Malfunction and Service Information No communication to actuator: Communication with actuator not possible. Gear disengagement: Gear disengaged button is pressed. Actuator cannot move: Mechanical overload due to blocked valve, etc. (only available for EV..R+KBAC) Reverse flow: Reverse flow is detected. Flow setpoint not reached: Setpoint cannot be reached within 15 min during flow control. Actual flow exceeds nominal flow: Actual flow exceeds the designed nominal flow. Flow measurement error: Air in the system, error occurred during flow measurement. External temperature sensor not OK: No connection to the external temperature sensor Integrated temperature sensor not OK: Error with embedded temperature sensor. Communication to sensor interrupted: Internal communication to flow sensor interrupted. Freeze warning: Measured temperature & glycol concentration indicate that grease ice can build up. Glycol detected: Glycol was detected in a MID application. Power setpoint not reached: Setpoint cannot be reached within 15 min during power control.	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: Actual flow exceeds nominal flow 7: Flow measurement error 8: External temperature error 9: Integrated temperature error 10: Communication to sensor interrupted 11: Freeze warning 12: Glycol detected 13: Power setpoint not reached	-	-	R
106	105	Vmin	0...Vmax Default: 0	%	0.01	R / W
107	106	Vmax Vmax cannot be set lower than Vmin or 25%.	2'500...10'000 Default: 10'000	%	0.01	R / W
109	108	Bus Fail Setpoint 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:120 s), the actuator controls to the Bus Fail position. Triggered bus monitoring is indicated in the Malfunction and Service Information (Register 105).	0...10'000 Default: 0	%	0.01	R / W
110	109	Communication Watchdog Time until Bus Fail will be detected. If Bus Watchdog = 0 then deactivated. If Bus Fail setpoint (Register 110) different from 0 then Timeout for Bus Watchdog is by default 120s (parameterizable). Not functional --> reserved for future	0...3'600 Default: 0 (120)	s	1	R / W
111	110	Nominal volumetric flow [l/s] (Vnom)	0...10'000	l/s	0.01	R
112	111	Nominal volumetric flow [gpm] (Vnom)	0...16'000	gpm	0.1	R
113	112	Nominal volumetric flow (qp) [selected units] (Vnom)	0...360'000'000	UnitSel	0.001	R
114	113	Unit can be selected in Register No. 148				



## Modbus Register Description

No.	Address	Description Comment	Range Enumeration	Unit	Scaling	Access
117	116	Control Mode	0: Position control 1: Flow control 2: Power control <i>Default: 1</i>	-	-	R / W
119	118	Setpoint Source Analog: Setpoint from analog signal 0.5...10V on wire 3 Bus: Setpoint from Modbus (Register 1)	0: Analog 1: Bus <i>Default: 1</i>	-	-	R / W
121	120	Sensor 1 Type Additional sensor input Only selectable if SpSource (Register No. 119) is set to bus.	0: None 1: Active 2: - 3: Passive 4: Switch <i>Default: 0</i>	-	-	R / W
122	121	Sensor 1 passive sensor Type	0: Resistance Measurement 1: PT1000 2: Ni1000 3: - 4: - 5: - 6: - 7: NTC10k2 8: NTC10k3 <i>Default: 0</i>	-	-	R / W
123	124	Sensor 1 as analog value [°C]	-10° C to 120° C	°C	-	R
124	125	Sensor 1 as analog value [°F]	14° F to 248° F	°F	-	R
130	129	Vmin [l/s]	0...Vmax	l/s	0.01	R / W
131	130	Vmin [gpm]	0...Vmax	gpm	0.1	R / W
132	131	Minimal volumetric flow [selected units]	0...Vmax	UnitSel	0.001	R / W
133	132	Unit can be selected in Register No. 148				
134	133	Vmax [l/s]	25% of Vnom...Vnom	l/s	0.01	R / W
135	134	Vmax [gpm]	25% of Vnom...Vnom	gpm	0.1	R / W
136	135	Maximal volumetric flow [selected units]	25% of Vnom...Vnom	UnitSel	0.001-	R / W
137	136	Unit can be selected in Register No. 148				
148	147	Unit Selection Flow	0: m3/s 1: m3/h 2: l/s 3: l/min 4: l/h 5: gpm 6: cfm <i>Default: 4</i>	-	-	R / W
149	148	Unit Selection Power	0: W 1: kW 2: MW 3: BTU/h 4: kBTU/h 5: ton <i>Default: 1</i>	-	-	R / W
150	149	Unit Selection Volume	0: m3 1: Litre 2: Gallon 3: cf <i>Default: 0</i>	-	-	R / W
151	150	Unit Selection Energy	0: J 1: kJ 2: MJ 3: GJ 4: Wh 5: kWh 6: MWh 7: BTU 8: kBTU 9: ton <i>Default: 5</i>			
160	159	Nominal Power [kW]	0...21'500'000	kW	0.001	R
161	160					
162	161	Nominal Power [kBTU/h]	0...74'150'000	kBTU/h	0.001	R
163	162					

## Modbus Register Description

No.	Address	Description Comment	Range Enumeration	Unit	Scaling	Access
164	163	Nominal Power [selected units]	0...741'500'000	UnitSel	0.1	R
165	164	Unit can be selected in Register No. 149				
166	165	Max Power [%]	0.5...100 %	%	0.01	R / W
167	166	Absolute Pmax [kW]	0.5 % of Pnom...Pnom	kW	0.001	R / W
168	167					
169	168	Absolute Pmax [kBTU/h]	0.5 % of Pnom...Pnom	kBTU/h	0.001	R / W
170	169					
171	170	Absolute Pmax [selected units]	0.5 % of Pnom...Pnom	UnitSel	0.1	R / W
172	171	Unit can be selected in Register No. 149				
180	179	DeltaT_Limitation	0: Disabled 1: dT-Manager 2: dT-Manager scaling Default: 0	-	-	R / W
181	180	DeltaT Manager Status	0: Not selected 1: Standby 2: Active 3: Scaling standby 4: Scaling active	-	-	R
201	200	Sensor Serial Number First Part	-	-	1	R
202	201	ProductionOrderNumber				
203	202	Sensor Serial Number Second Part	-	-	1	R
204	203	ProductionSequenceNumber				
205	204	Select Meter Register Value 0 only available for models with MID certification: EV..R2+MID. For non MID certified models value 1 is defined as default. Select between certified meter register and lifetime register. The certified meter register will be reset when the sensor module is replaced. The lifetime register is compensated for glycol (if applicable). Avoid toggling between the two registers as this will affect data logging. Following registers depend on the selected meter register: Register No. 60/61 Register No. 62/63 Register No. 64/65 Register No. 66/67 Register No. 68/69 Register No. 70/71 Register No. 72/73 Register No. 74/75 Register No. 76/77	0: Certified meter register 1: Lifetime meter register Default: 0	-	-	R / W

## Note:

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