

Modbus Interface Description



ZoneEase VAV VAV zone control actuator

Edition 2024-03 / V1.7

Contents

Modbus general notes

General information	
Modbus RTU	
Parametrisation	
Register implementation	4
Supported commands	
Command "Read Discrete Inputs"	
Interpret values in the registers	
32-bit values in two registers	5

Modbus register overview

Operation	6
Service	7-9

Modbus register descriptions – in numerical order

10-15

Modbus register descriptions – grouped

Application parameters and diagnostics	16-18
Room operating unit values	20-21
VAV values	22-23
Device information	24

Modbus general notes

General information

Date	11.07.2023
Product Name	ZoneEase VAV
Product Model Number	LMV-BAC-001 NMV-BAC-001 LMV-BAC-002 NMV-BAC-002
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 Bd)
Address	1...247 (Default: 1)
Number of Nodes	Max. 32 (without repeater)
Terminating Resistor	120 Ω

Parametrisation

Tool	ZoneEase VAV App (for Android only)
------	-------------------------------------

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

Standard commands:	Optional Commands:
Read Holding Registers [3]	Read Discrete Inputs [2]
Write Single Register [6]	Read Input Registers [4]
	Write Multiple Registers [16]

Interpret values in the registers

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

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



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

Modbus register overview

Operation

No.	Address	Register	Access
2	1	Override Control	R / W
5	4	Relative Damper Position [%]	R
6	5	Absolute Damper Position [°]	R
7	6	Relative Airflow [%] based on V'_{nom}	R
10	9	Absolute Airflow [m ³ /h]	LowWord
11	10		HighWord
12	11	Absolute Airflow in selected unit	LowWord
13	12		HighWord
15	14	Setpoint Absolute Airflow [m ³ /h]	LowWord
16	15		HighWord
17	16	Setpoint Absolute Airflow in selected unit	LowWord
18	17		HighWord
19	18	Relative Damper Position of secondary damper [%]	R
20	19	Relative Airflow [%] of secondary damper	R
21	20	Absolute Airflow [m ³ /h] of secondary damper	LowWord
22	21		HighWord
23	22	Absolute Airflow in selected unit of secondary damper	LowWord
24	23		HighWord
25	24	Setpoint Relative Airflow [%] of secondary damper	R
..	..	-	-
27	26	Operating State of secondary damper	R
..	..	-	-
29	28	Differential Pressure [Pa] **)	R

**) signed integer

Service

No.	Address	Register	Access
101	100	Series Number 1 st part	R
102	101	Series Number 2 nd part	R
103	102	Series Number 4 th part	R
104	103	Firmware Version	R
109	108	Bus Watchdog Fail Action	R / W
110	109	Timeout for Bus Watchdog [s]	R / W
112	111	Nominal Airflow [m ³ /h]	R
113	112	Nominal Airflow in selected unit	R
117	116	Control Mode	R / W
120	119	Nominal Airflow [m ³ /h] of secondary damper	LowWord
121	120		HighWord
122	121	Nominal Airflow in selected unit of secondary damper	LowWord
123	122		HighWord
124	123	Maximum Airflow [m ³ /h] of secondary damper	LowWord
125	124		HighWord
126	125	Maximum Airflow in selected unit of secondary damper	LowWord
127	126		HighWord
128	127	Minimum Airflow [m ³ /h] of secondary damper	LowWord
129	128		HighWord
130	129	Minimum Airflow in selected unit of secondary damper	LowWord
131	130		HighWord
..	..	-	-
136	135	Airflow Gain of secondary damper	R / W
138	137	Status VAV Standalone System	R
139	138	Status Actuator	R
140	139	Status Pressure Sensor and Duct Static	R
141	140	Status MP-Bus and Devices	R
142	141	Frost Mode State	R
143	142	Digital Input Room Operating Unit	R
144	143	High Cut State	R
147	146	Unit Selection (temperature)	R / W
148	147	Unit Selection (airflow)	R / W
150	149	System Mode (off, active, eco, boost)	R / W
151	150	Boost Mode Time [min]	R / W
153	152	BMS Heating/cooling Changeover	R / W
154	153	Select in which mode (heating/cooling) reheat is allowed	R / W
155	154	Maximum Cooling Airflow [m ³ /h]	LowWord
156	155		HighWord
157	156	Maximum Cooling Airflow in selected unit	LowWord
158	157		HighWord
160	159	Minimum Airflow [m ³ /h]	LowWord
161	160		HighWord
162	161	Minimum Airflow in selected unit	LowWord
163	162		HighWord

Service

No.	Address	Register	Access
164	163	Maximum Heating Airflow [m ³ /h]	LowWord
165	164		HighWord
166	165	Maximum Heating Airflow in selected unit	LowWord
167	166		HighWord
..	..	-	-
171	170	Display Settings for Room Unit	R / W
172	171	Room Unit Operating Rights	R / W
173	172	Room Temperature Setpoint [°C]	R / W
174	173	Room Temperature Setpoint in selected unit	R / W
175	174	CO ₂ Setpoint [ppm]	R / W
176	175	Room Temperature [°C]	R
177	176	Room Temperature in selected unit	R
178	177	Electrical Heater 1 / on/off Valve State	R
179	178	Electrical Heater 2 State	R
180	179	Relative Position of Reheat Valve [%]	R
181	180	Fan State	R
182	181	CO ₂ Concentration [ppm]	R
183	182	Presence Sensor State	R
184	183	Setpoint in Override Mode	LowWord
185	184		HighWord
186	185	Application Selection	R / W
187	186	Power On Mode	R / W
188	187	Off-Mode Damper Position	R / W
189	188	Enable Occupancy Sensor	R / W
190	189	Position for Sync	R / W
191	190	Start Sync Procedure	R / W
194	193	CO ₂ limit for Moderate Air Quality [ppm]	R / W
195	194	CO ₂ limit for Good Air Quality [ppm]	R / W
196	195	Air Quality Indication	R / W
197	196	Background Color Room Operating Unit Display	R / W
198	197	Room Relative Humidity [%]	R
200	199	Display Sensor Values on Room Operating Unit	R / W

Service

No.	Address	Register	Access
201	200	Deadband Temperature in [°C]	R / W
202	201	Deadband CO ₂ in [ppm]	R / W
203	202	Temperature Controller P-Band	R / W
204	203	Temperature Controller Integral Time in [s]	R / W
205	204	CO ₂ Controller P-Band	R / W
206	205	CO ₂ Controller Integral Time in [s]	R / W
207	206	Hysteresis Aggregate Fan in [%]	R / W
208	207	Hysteresis Aggregate Electrical Heater 1 in [%]	R / W
209	208	Hysteresis Aggregate Electrical Heater 2 in [%]	R / W
210	209	Aggregate Start Value in [%]	R / W
211	210	Enable secondary damper	W
212	211	Eco Mode Cooling Setpoint Shift in [°C]	R / W
213	212	Eco Mode Heating Setpoint Shift in [°C]	R / W
214	213	Enable flow cut off	R / W
215	214	Set flow cut off pressure value	R / W

Definition Access: R = Read, W = Write

Modbus register descriptions – in numerical order

This interface description is arranged in two parts. The first part provides an overview of all supported Modbus registers in numerical order. In the second part, the same Modbus registers are listed in the following groups: "Application parameters and diagnostics", "Room operating unit values", "VAV values" and "Device information".

No.	Address	Description Comment	Range, enumeration	Unit	Scaling	Access
2	1	Override control If an override control setpoint type between 8 and 13 is selected, then the setpoint can be specified with "Setpoint in override mode" (Register Nr. 184).	0: None 1: Open damper 2: Close damper 3: Airflow V'_{max} 4: Airflow V'_{min} 5: Airflow V'_{nom} 6: MotorStop 7: Pos. damper [%] 8: Airflow [%] 9: Airflow [m^3/h] 10: – 11: Temp. SP [$^{\circ}C$] 12: CO ₂ SP [ppm] Default: 0	–	1	R / W
5	4	Relative damper position	0...10'000	%	0.01	–
6	5	Absolute damper position	0...9'500	$^{\circ}$	0.01	–
7	6	Relative airflow based on V'_{nom}	0...10'000	%	0.01	–
10	9	Absolute airflow	0...9'999'900	m^3/h	0.01	R
11	10					
12	11	Absolute airflow in selected unit	Actual range determined by selected unit	m^3/h	0.01	R
13	12	→ based on selection in Register No. 148		l/s cfm		
15	14	Setpoint absolute airflow	0...9'999'900	m^3/h	0.01	R / W
16	15	Available for application #9 in Register No. 185	Default: 1			
17	16	Setpoint absolute airflow in selected unit	Actual range determined by selected unit	m^3/h	0.01	R / W
18	17	Available for application #9 in Register No. 185 → based on selection in Register No. 148		l/s cfm		
19	18	Relative damper position of secondary damper	0...10'000	%	0.01	R
20	19	Relative airflow of secondary damper	0...10'000	%	0.01	R
21	20	Absolute airflow of secondary damper	0...9'999'900	m^3/h	0.01	R
22	21					
23	22	Absolute airflow in selected unit of secondary damper	Actual range determined by selected unit	m^3/h	0.01	R
24	23	→ based on selection in Register No. 148		l/s cfm		
25	24	Setpoint relative airflow of secondary damper	0...100	%	0.01	R
..	..	–	–	–	–	–
27	26	Operating state of secondary damper Shows if setpoint of the secondary damper has been reached	0: Setpoint not reached 1: Setpoint reached	–	1	R
..	..	–	–	–	–	–
29	28	Differential pressure	-20...5'000	Pa	0.1	R
..	..	–	–	–	–	–
101	100	Series number – 1st part	–	–	1	R
102	101	Series number – 2nd part	–	–	1	R
103	102	Series number – 4th part	–	–	1	R
104	103	Firmware version	0...65'535	–	1	R
109	108	Bus Watchdog 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	–	1	R / W
110	109	Timeout for Bus 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

No.	Address	Description Comment	Range, enumeration	Unit	Scaling	Access
112	111	Nominal airflow	0...999'999	m ³ /h	0.1	R
113	112	Nominal airflow in selected unit → based on selection in Register No. 148	Actual range determined by selected unit	m ³ /h l/s cfm	0.1	R
117	116	Control mode This value defines the setpoint	0: Temp. only 1: Temp. and CO ₂ Analog Input 2: Temp. and CO ₂ ROU Default: 0	–	1	R / W
120	119	Nominal airflow of secondary damper	0...999'990	m ³ /h	0.1	R
121	120					
122	121	Nominal airflow in selected unit of secondary damper	Actual range determined by selected unit	m ³ /h l/s cfm	0.1	R
123	122	→ based on selection in Register No. 148				
124	123	Maximum airflow of secondary damper	0...999'990	m ³ /h	0.1	R
125	124					
126	125	Maximum airflow in selected unit of secondary damper	Actual range determined by selected unit	m ³ /h l/s cfm	0.1	R
127	126	→ based on selection in Register No. 148				
..	..	–	–	–	–	–
128	127	Minimum airflow of secondary damper	0...999'990	m ³ /h	0.1	R
129	128					
130	129	Minimum airflow in selected unit of secondary damper	Actual range determined by selected unit	m ³ /h l/s cfm	0.1	R
131	130	→ based on selection in Register No. 148				
..	..	–	–	–	–	–
136	135	Airflow gain of secondary damper Balancing of under- and overpressure between supply and secondary air damper	0...200 Default: 100	–	0.01	R / W
138	137	Status VAV standalone system Information about the health state of the system	0: System OK 1: Invalid application 2: Room temperature sensor broken 3: Room temperature out of range 4: Deadband temperature not reached 5: AI sensor error 6: AI sensor value out of range 7: Deadband CO ₂ not reached 8: V _{min} invalid 9: Control mode not supported	–	1	R
139	138	Status actuator	0: Actuator OK 1: Adaptation in progress 2: Sync. in progress 3: Motor stop 4: Actuator setpoint position cannot be reached (error) 5: Flow with closed damper position 6: Actuator setpoint position cannot be reached (warning)	–	1	R

No.	Address	Description Comment	Range, enumeration	Unit	Scaling	Access
140	139	Status pressure sensor and duct static	0: Pressure OK 1: dP sensor broken 2: dP sensor out of range 3: dP sensor connected incorrectly / back flow detected 4: Not enough pressure from AHU 5: Not enough pressure from AHU for L-/NMV-D3-MP Compact	–	1	R
141	140	Status MP-Bus and devices	0: MP-Bus OK 1: MP-Bus not alive 2: MP-Bus room unit/ceiling unit not alive 3: MP-Bus I/O module not alive 4: MP-Bus reheat valve not alive 5: MP-Bus secondary damper not alive	–	1	R
142	141	Frost mode state	0: Inactive 1: Active	–	1	R
143	142	Digital Input room operating unit Status of the digital input of the room operating unit	0: Inactive 1: Active	–	1	R
144	143	High cut state In activated state, the connected reheat aggregate inside the VAV box will be monitored in terms of safety function. 1: Digital input at room unit shows reheat state 2: Analog input at ZoneEase VAV actuator, used as digital input (normally closed) supervises reheat aggregate emergency switch-off	0: Inactive 1: Active Default: 0	–	1	R
147	146	Unit selection (temperature)	0: K 1: °C 2: °F Default: 1	–	1	R / W
148	147	Unit selection (airflow)	0: m³/h 1: l/s 2: cfm Default: 0	–	1	R / W
150	149	System mode Four system/operating modes are supported: 0. Off: An energy saving mode, e.g. during holidays 1. Active: Standard operating mode 2. Eco: An energy saving mode, e.g. room is unoccupied, at night time or weekends 3. Boost: Mode to quickly reach the target room temperature	0: Off 1: Active 2: Eco 3: Boost Default: 1	–	1	R / W
151	150	Boost mode time Automatically disabled if the target value is reached sooner than in 10 minutes.	0...3'000 Default: 100	min	0.1	R / W
153	152	BMS heating/cooling changeover Information from BMS if warm or cold air is supplied by the ventilation system Available for all applications, except for applications #1, #7 and #8 in Register No. 185	0: Cooling 1: Heating Default: 0	–	1	R / W

No.	Address	Description Comment	Range, enumeration	Unit	Scaling	Access
154	153	Select in which mode (heating/cooling) reheat is allowed	0: Always allowed 1: Allowed in heating mode only 2: Allowed in cooling mode only 3: Never allowed Default: 2	–	1	R / W
155	154	Maximum cooling airflow	0...999'990	m ³ /h	0.1	R / W
156	155		Default: 1'000			
157	156	Maximum cooling airflow in selected unit → based on selection in Register No. 148	Actual range determined by selected unit	m ³ /h l/s cfm	0.1	R / W
158	157					
160	159	Minimum airflow	0...999'990	m ³ /h	0.1	R / W
161	160		Default: 1'000			
162	161	Minimum airflow in selected unit → based on selection in Register No. 148	Actual range determined by selected unit	m ³ /h l/s cfm	0.1	R / W
163	162					
164	163	Maximum heating airflow	0...999'990	m ³ /h	0.1	R / W
165	164		Default: 1'000			
..	..	–	–	–	–	–
166	165	Maximum heating airflow in selected unit → based on selection in Register No. 148	Actual range determined by selected unit	m ³ /h l/s cfm	0.1	R / W
167	166					
171	170	Display settings for room unit Relevant for room units type 22RT-A00.. Register No. 200 for other room unit types	0: Room temp. and setpoint display 1: Setpoint display only 2: Room temperature only Default: 0	–	1	R / W
172	171	Room unit operating rights	0: Room unit access disabled 1: Room unit access enabled Default: 1	–	1	R / W
173	172	Room temperature setpoint	– Default: 22	°C	0.1	R / W
174	173	Room temperature setpoint in selected unit → based on selection in Register No. 147	Actual range determined by selected unit	°C K °F	0.1	R / W
175	174	CO₂ setpoint	0...2'000 Default: 1'000	ppm	1	R / W
176	175	Room temperature	0...400	°C	0.1	R
177	176	Room temperature in selected unit → based on selection in Register No. 147	Actual range determined by selected unit	°C K °F	0.1	R
178	177	Electrical heater 1 / on-off valve state	0: Off 1: On	–	1	R
179	178	Electrical heater 2 state	0: Off 1: On	–	1	R
180	179	Relative position of reheat valve	0...10'000	%	0.01	R

No.	Address	Description Comment	Range, enumeration	Unit	Scaling	Access
181	180	Fan state	0: Off 1: On	–	1	R
182	181	CO₂ concentration	0..9'000	ppm	1	R
183	182	Presence sensor state	0: Not occupied 1: Occupied	–	1	R
184	183	Setpoint in override mode If override control (Register No. 2) is set to an override setpoint type between 8 and 13 is selected, then the setpoint is defined with this register.	0..999'990 Default: 0	none	0.1	R / W
185	184					
186	185	Application selection VAV zone control applications Appl. No.: 1 = none Room temperature control Appl. No. 2: Cooling only Appl. No. 3: Cooling or heating (changeover) Appl. No. 4: Cooling + 1-stage electric reheat Appl. No. 5: Cooling + 2-stage electric reheat Appl. No. 6: Cooling + on/off hydronic reheat Appl. No. 7: Cooling + modulating hydronic reheat Basic applications Appl. No. 8: Indoor air quality control Appl. No. 9: Air volume flow control Parallel fan and room temperature control Appl. No. 10: Cooling only Appl. No. 11: Cooling + 1-stage electric reheat Appl. No. 12: Cooling + 2-stage electric reheat Appl. No. 13: Cooling + on/off hydronic reheat Appl. No. 14: Cooling + modulating hydronic reheat Series fan and temperature control Appl. No. 15: Cooling only Appl. No. 16: Cooling or heating (changeover) Appl. No. 17: Cooling + 1-stage electric reheat Appl. No. 18: Cooling + 2-stage electric reheat Appl. No. 19: Cooling + on/off hydronic reheat Appl. No. 20: Cooling + modulating hydronic reheat	Modbus enum.: 0 = none Modbus enum. 1: c Modbus enum. 2: c/h Modbus enum. 3: c+el-rh1 Modbus enum. 4: c+el-rh2 Modbus enum. 5: c+on/off-rh Modbus enum. 6: c+mod-rh Modbus enum. 7: CO ₂ Modbus enum. 8: VAV Modbus enum. 9: c+p-f Modbus enum. 10: c+p-f+el-rh1 Modbus enum. 11: c+p-f+el-rh2 Modbus enum. 12: c+p-f+on/off-rh Modbus enum. 13: c+p-f+mod-rh Modbus enum. 14: c+s-f Modbus enum. 15: c/h+s-f Modbus enum. 16: c+s-f+el-rh1 Modbus enum. 17: c+s-f+el-rh2 Modbus enum. 18: c+s-f+on/off-rh Modbus enum. 19: c+s-f+mod-rh Default: 0	–	1	R / W
187	186	Power on mode	1: No action 2: Synchronization 3: Adaptation Default: 2	–	1	R / W
188	187	Off-mode damper position	0: Damper closed 1: Damper controlled to V' _{min} Default: 1	–	1	R / W
189	188	Enable occupancy sensor	0: Disabled 1: Enabled Default: 0	–	1	R / W
190	189	Position for sync.	0: 0% (damper closed) 1: 100% (damper open) Default: 1	–	1	R / W
191	190	Start sync. procedure	0: No sync. 1: Start sync. Default: 0	–	1	R / W

No.	Address	Description Comment	Range, enumeration	Unit	Scaling	Access
194	193	CO₂ limit for moderate air quality CO ₂ limit for moderate air quality for LED indicator of the room operating unit	1'250...2'000 Default: 1'500	ppm	1	R / W
195	194	CO₂ limit for good air quality CO ₂ limit for good air quality for LED indicator of the room operating unit	600...1'249 Default: 1'000	ppm	1	R / W
196	195	Air quality indication	0: Disabled 1: Enabled Default: 1	–	1	R / W
197	196	Background color room operating unit display Sets the display background color of room operating unit to white or black.	0: White 1: Black Default: 0	–	1	R / W
198	197	Room relative humidity	0...10'000	%	0.01	R
200	199	Display sensor values on room operating unit Shows values of available sensors on room operating unit	0: Do not display sensor values 1: Display sensor values Default: 1	–	1	R / W
201	200	Deadband temperature Deadband of the temperature control loop	0.1...50	°C	0.1	R / W
202	201	Deadband CO₂ Deadband of the CO ₂ control loop	0...500	ppm	1	R / W
203	202	Temperature controller P-Band Proportional gain of the temperature control loop	0...10'000	–	0.01	R / W
204	203	Temperature controller integral time Integral time Ki of the temperature control loop	0...3'600	s	1	R / W
205	204	CO₂ controller P-Band Proportional gain of the CO ₂ control loop	0...1'000	ppm	1	R / W
206	205	CO₂ controller integral time Integral time Ki of the CO ₂ control loop	0...3'600	s	1	R / W
207	206	Hysteresis aggregate fan Hysteresis of the parallel fan	5...3'000	%	0.01	R / W
208	207	Hysteresis aggregate electrical heater 1 Hysteresis of the electrical reheat aggregate 1	0...2'000	%	0.01	R / W
209	208	Hysteresis aggregate electrical heater 2 Hysteresis of the electrical reheat aggregate 2	0...2'000	%	0.01	R / W
210	209	Aggregate start value Start value of the electrical reheat aggregate	0...2'000	%	0.01	R / W
211	210	Enable secondary damper	0: Disabled 1: Enabled Default: 0	–	1	W
212	211	Eco mode cooling setpoint shift	0...80	°C	0.1	R / W
213	212	Eco mode heating setpoint shift	0...80	°C	0.1	R / W
214	213	Enable flow cut off If enabled, the unit will suppress airflow feedback in closed damper condition (creep flow suppression).	0: Disabled 1: Enabled Default: 0	–	1	R / W
215	214	Set flow cut off pressure value Differential pressure zero-point cut off value	1...50 Default: 10	Pa	0.1	R / W

Definition Access: R = Read, W = Write

Subject to technical modifications

Modbus register descriptions – grouped

Application parameters and diagnostics

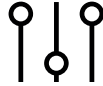


No.	Address	Description Comment	Range, enumeration	Unit	Scaling	Access
117	116	Control mode This value defines the setpoint	0: Temp. only 1: Temp. and CO ₂ Analog Input 2: Temp. and CO ₂ ROU Default: 0	–	1	R / W
136	135	Airflow gain of secondary damper Balancing of under- and overpressure between supply and secondary air damper	0..200 Default: 100	–	0.01	R / W
142	141	Frost mode state	0: Inactive 1: Active	–	1	R
144	143	High cut state In activated state, the connected reheat aggregate inside the VAV box will be monitored in terms of safety function. 1: Digital input at room unit shows reheat state 2: Analog input at ZoneEase VAV actuator, used as digital input (normally closed) supervises reheat aggregate emergency switch-off	0: Inactive 1: Active Default: 0	–	1	R
147	146	Unit selection (temperature)	0: K 1: °C 2: °F Default: 1	–	1	R / W
148	147	Unit selection (airflow)	0: m ³ /h 1: l/s 2: cfm Default: 0	–	1	R / W
153	152	BMS heating/cooling changeover Information from BMS if warm or cold air is supplied by the ventilation system Available for all applications, except for applications #1, #7 and #8 in Register No. 185	0: Cooling 1: Heating Default: 0	–	1	R / W
154	153	Select in which mode (heating / cooling) reheat is allowed	0: Always allowed 1: Allowed in heating mode only 2: Allowed in cooling mode only 3: Never allowed Default: 2	–	1	R / W
178	177	Electrical heater 1 / on-off valve state	0: Off 1: On	–	1	R
179	178	Electrical heater 2 state	0: Off 1: On	–	1	R
181	180	Fan state	0: Off 1: On	–	1	R

No.	Address	Description Comment	Range, enumeration	Unit	Scaling	Access
186	185	Application selection VAV zone control applications Appl. No.: 1 = none Room temperature control Appl. No. 2: Cooling only Appl. No. 3: Cooling or heating (changeover) Appl. No. 4: Cooling + 1-stage electric reheat Appl. No. 5: Cooling + 2-stage electric reheat Appl. No. 6: Cooling + on/off hydronic reheat Appl. No. 7: Cooling + modulating hydronic reheat Basic applications Appl. No. 8: Indoor air quality control Appl. No. 9: Air volume flow control Parallel fan and room temperature control Appl. No. 10: Cooling only Appl. No. 11: Cooling + 1-stage electric reheat Appl. No. 12: Cooling + 2-stage electric reheat Appl. No. 13: Cooling + on/off hydronic reheat Appl. No. 14: Cooling + modulating hydronic reheat Series fan and temperature control Appl. No. 15: Cooling only Appl. No. 16: Cooling or heating (changeover) Appl. No. 17: Cooling + 1-stage electric reheat Appl. No. 18: Cooling + 2-stage electric reheat Appl. No. 19: Cooling + on/off hydronic reheat Appl. No. 20: Cooling + modulating hydronic reheat Default: 0	Modbus enum.: 0 = none Modbus enum. 1: c Modbus enum. 2: c/h Modbus enum. 3: c+el-rh1 Modbus enum. 4: c+el-rh2 Modbus enum. 5: c+on/off-rh Modbus enum. 6: c+mod-rh Modbus enum. 7: CO ₂ Modbus enum. 8: VAV Modbus enum. 9: c+p-f Modbus enum. 10: c+p-f+el-rh1 Modbus enum. 11: c+p-f+el-rh2 Modbus enum. 12: c+p-f+on/off-rh Modbus enum. 13: c+p-f+mod-rh Modbus enum. 14: c+s-f Modbus enum. 15: c/h+s-f Modbus enum. 16: c+s-f+el-rh1 Modbus enum. 17: c+s-f+el-rh2 Modbus enum. 18: c+s-f+on/off-rh Modbus enum. 19: c+s-f+mod-rh	-	1	R / W
187	186	Power on mode	1: No action 2: Synchronization 3: Adaptation Default: 2	-	1	R / W
190	189	Position for sync.	0: 0% (damper closed) 1: 100% (damper open) Default: 1	-	1	R / W
191	190	Start sync. procedure	0: No sync. 1: Start sync. Default: 0	-	1	R / W
201	200	Deadband temperature Deadband of the temperature control loop	0.1...50	°C	0.1	R / W
202	201	Deadband CO₂ Deadband of the CO ₂ control loop	0...500	ppm	1	R / W
203	202	Temperature controller P-Band Proportional gain of the temperature control loop	0...10'000	-	0.01	R / W
204	203	Temperature controller integral time Integral time Ki of the temperature control loop	0...3'600	s	1	R / W

No.	Address	Description Comment	Range, enumeration	Unit	Scaling	Access
205	204	CO₂ controller P-Band Proportional gain of the CO ₂ control loop	0...1'000	ppm	1	R / W
206	205	CO₂ controller integral time Integral time Ki of the CO ₂ control loop	0...3'600	s	1	R / W
207	206	Hysteresis aggregate fan Hysteresis of the parallel fan	5...3'000	%	0.01	R / W
208	207	Hysteresis aggregate electrical heater 1 Hysteresis of the electrical reheat aggregate 1	0...2'000	%	0.01	R / W
209	208	Hysteresis aggregate electrical heater 2 Hysteresis of the electrical reheat aggregate 2	0...2'000	%	0.01	R / W
210	209	Aggregate start value Start value of the electrical reheat aggregate	0...2'000	%	0.01	R / W
212	211	Eco mode cooling setpoint shift	0...80	°C	0.1	R / W
213	212	Eco mode heating setpoint shift	0...80	°C	0.1	R / W
214	213	Enable flow cut off If enabled, the unit will suppress airflow feedback in closed damper condition (creep flow suppression).	0: Disabled 1: Enabled Default: 0	–	1	R / W

Room operating unit values



No.	Address	Description Comment	Range, enumeration	Unit	Scaling	Access
143	142	Digital input room operating unit Status of the digital input of the room operating unit	0: Inactive 1: Active	–	1	R
150	149	System mode Four system/operating modes are supported: 0. Off: An energy saving mode, e.g. during holidays 1. Active: Standard operating mode 2. Eco: An energy saving mode, e.g. room is unoccupied, at night time or weekends 3. Boost: Mode to quickly reach the target room temperature	0: Off 1: Active 2: Eco 3: Boost Default: 1	–	1	R / W
151	150	Boost mode time Automatically disabled if the target value is reached sooner than in 10 minutes	0...3'000 Default: 100	min	0.1	R / W
171	170	Display settings for room unit Relevant for room units type 22RT-A00.. Register No. 200 for other room unit types	0: Room temp. and setpoint display 1: Setpoint display only 2: Room temperature only Default: 0	–	1	R / W
172	171	Room unit operating rights	0: Room unit access disabled 1: Room unit access enabled Default: 1	–	1	R / W
173	172	Room temperature setpoint	– Default: 22	°C	0.1	R / W
174	173	Room temperature setpoint in selected unit → based on selection in Register No. 147	Actual range determined by selected unit	°C K °F	0.1	R / W
175	174	CO₂ setpoint	0...2'000 Default: 1'000	ppm	1	R / W
176	175	Room temperature	0...400	°C	0.1	R
177	176	Room temperature in selected unit → based on selection in Register No. 147	Actual range determined by selected unit	°C K °F	0.1	R
182	181	CO₂ concentration	0...9'000	ppm	1	R
183	182	Presence sensor state	0: Not occupied 1: Occupied	–	1	R
189	188	Enable occupancy sensor	0: Disabled 1: Enabled Default: 0	–	1	R / W
194	193	CO₂ limit for moderate air quality CO ₂ limit for moderate air quality for LED indicator of the room operating unit	1'250...2'000 Default: 1'500	ppm	1	R / W
195	194	CO₂ limit for good air quality CO ₂ limit for good air quality for LED indicator of the room operating unit	600...1'249 Default: 1'000	ppm	1	R / W

No.	Address	Description Comment	Range, enumeration	Unit	Scaling	Access
196	195	Air quality indication	0: Disabled 1: Enabled Default: 1	–	1	R / W
197	196	Background color room operating unit display Sets the display background color of room operating unit to white or black.	0: White 1: Black Default: 0	–	1	R / W
198	197	Room relative humidity	0...10'000	%	0.01	R
200	199	Display sensor values on room operating unit Shows values of available sensors on room operating unit	0: Do not display sensor values 1: Display sensor values Default: 1	–	1	R / W

VAV values



No.	Address	Description Comment	Range, enumeration	Unit	Scaling	Access
2	1	Override control If an override control setpoint type between 8 and 13 is selected, then the setpoint can be specified with "Setpoint in override mode" (Register Nr. 184).	0: None 1: Open damper 2: Close damper 3: Airflow V'_{max} 4: Airflow V'_{min} 5: Airflow V'_{nom} 6: MotorStop 7: Pos. damper [%] 8: Airflow [%] 9: Airflow [m^3/h] 10: – 11: Temp. SP [$^{\circ}C$] 12: CO ₂ SP [ppm] Default: 0	–	1	R / W
5	4	Relative damper position	0...10'000	%	0.01	–
6	5	Absolute damper position	0...9'500	$^{\circ}$	0.01	–
7	6	Relative airflow based on V'_{nom}	0...10'000	%	0.01	–
10	9	Absolute airflow	0...9'999'900	m^3/h	0.01	R
11	10					
12	11	Absolute airflow in selected unit → based on selection in Register No. 148	Actual range determined by selected unit	m^3/h l/s cfm	0.01	R
13	12					
15	14	Setpoint absolute airflow Available for application #9 in Register No. 185	0...9'999'900 Default: 1	m^3/h	0.01	R / W
16	15					
17	16	Setpoint absolute airflow in selected unit Available for application #9 in Register No. 185 → based on selection in Register No. 148	Actual range determined by selected unit	m^3/h l/s cfm	0.01	R / W
18	17					
19	18	Relative damper position of secondary damper	0...10'000	%	0.01	R
20	19	Relative airflow of secondary damper	0...10'000	%	0.01	R
21	20					
22	21	Absolute airflow of secondary damper	0...9'999'900	m^3/h	0.01	R
23	22	Absolute airflow in selected unit of secondary damper → based on selection in Register No. 148	Actual range determined by selected unit	m^3/h l/s cfm	0.01	R
24	23					
25	24	Setpoint relative airflow in [%] of secondary damper	0...100	%	0.01	R
..	..	–	–	–	–	–
27	26	Operating state of secondary damper Shows if setpoint of the secondary damper has been reached	0: Setpoint not reached 1: Setpoint reached	–	1	R
..	..	–	–	–	–	–
29	28	Differential pressure	-20...5'000	Pa	0.1	R
109	108	Bus Watchdog 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	–	1	R / W
110	109	Timeout for Bus 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
112	111	Nominal airflow	0...999'999	m^3/h	0.1	R

No.	Address	Description Comment	Range, enumeration	Unit	Scaling	Access
113	112	Nominal airflow in selected unit → based on selection in Register No. 148	Actual range determined by selected unit	m ³ /h l/s cfm	0.1	R
120	119	Nominal airflow of secondary damper	0...999'990	m ³ /h	0.1	R
121	120					
122	121	Nominal airflow in selected unit of secondary damper → based on selection in Register No. 148	Actual range determined by selected unit	m ³ /h l/s cfm	0.1	R
123	122					
124	123	Maximum airflow of secondary damper	0...999'990	m ³ /h	0.1	R
125	124					
126	125	Maximum airflow in selected unit of secondary damper → based on selection in Register No. 148	Actual range determined by selected unit	m ³ /h l/s cfm	0.1	R
127	126					
128	127	Minimum airflow of secondary damper	0..999'990	m ³ /h	0.1	R
129	128					
155	154	Maximum cooling airflow	0...999'990 Default: 1'000	m ³ /h	0.1	R / W
156	155					
157	156	Maximum cooling airflow in selected unit → based on selection in Register No. 148	Actual range determined by selected unit	m ³ /h l/s cfm	0.1	R / W
158	157					
160	159	Minimum airflow	0...999'990 Default: 1'000	m ³ /h	0.1	R / W
161	160					
162	161	Minimum airflow in selected unit → based on selection in Register No. 148	Actual range determined by selected unit	m ³ /h l/s cfm	0.1	R / W
163	162					
164	163	Maximum heating airflow	0...999'990 Default: 1'000	m ³ /h	0.1	R / W
165	164					
166	165	Maximum heating airflow in selected unit → based on selection in Register No. 148	Actual range determined by selected unit	m ³ /h l/s cfm	0.1	R / W
167	166					
180	179	Relative position of reheat valve	0...10'000	%	0.01	R
184	183	Setpoint in override mode If override control (Register No. 2) is set to an override setpoint type between 8 and 13 is selected,	0...999'990 Default: 0	none	0.1	R / W
185	184	then the setpoint is defined with this register.				
188	187	Off-mode damper position	0: Damper closed 1: Damper controlled to V' _{min} Default: 1	–	1	R / W
211	210	Enable secondary damper	0: Disabled 1: Enabled Default: 0	–	1	W
215	214	Set flow cut off pressure value Differential pressure zero-point cut off value	1...50 Default: 10	Pa	0.1	R / W

Device information



No.	Address	Description Comment	Range, enumeration	Unit	Scaling	Access
101	100	Series number – 1st part	–	–	1	R
102	101	Series number – 2nd part	–	–	1	R
103	102	Series number – 4th part	–	–	1	R
104	103	Firmware version	0...65'535	–	1	R
138	137	Status VAV standalone system Information about the health state of the system.	0: System OK 1: No valid application selected 2: Room temperature sensor broken 3: Room temperature out of range 4: Dead band temperature not reached within defined time 5: AI sensor error 6: AI sensor value out of range 7: Deadband CO ₂ not reached within defined time 8: V _{min} invalid 9: SetControlMode not supported	–	1	R
139	138	Status actuator	0: Actuator OK 1: Adaptation in progress 2: Sync. in progress 3: Motor stop 4: Actuator setpoint position cannot be reached (error) 5: Flow with closed damper position 6: Actuator setpoint position cannot be reached (warning)	–	1	R
140	139	Status pressure sensor and duct static	0: Pressure OK 1: dP sensor broken 2: dP sensor out of range 3: dP sensor connected incorrectly / back flow detected 4: Not enough pressure from AHU 5: Not enough pressure from AHU for L-/NMV-D3-MP Compact	–	1	R
141	140	Status MP-Bus and devices	0: MP-Bus OK 1: MP-Bus not alive 2: MP-Bus room unit/ceiling unit not alive 3: MP-Bus I/O module not alive 4: MP-Bus reheat valve not alive 5: MP-Bus secondary damper not alive	–	1	R

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.

The "small" Belimo devices have a big impact on comfort, energy efficiency, safety, installation and maintenance.

In short: Small devices, big impact.



5-year warranty



On site around the globe



Complete product range



Tested quality



Short delivery times



Comprehensive support



BELIMO Automation AG

Brunnenbachstrasse 1, 8340 Hinwil, Switzerland
+41 43 843 61 11, info@belimo.ch, www.belimo.com

BELIMO[®]