Modbus Interface Description

Modbus

Belimo Sensors
22DTH-..5.., 22UTH-..50X, 22DTM-..5, 22ADP-..5..

Edition 2024-03 / V4.2

BELIMO

Content

Modbus general notes

General information

Sensor Types	22DTH-..5..	22UTH-..50X
	22DTM-..-5	22ADP-..5..
Protocol	Modbus RTU / RS-485	

Modbus RTU

Transmission Formats	1-8-N-2, 1-8-E-1, 1-8-O-1 (Default: 1-8-N-2) E = Even, O = Odd, N = None Bitstructure: Start – Data – Parity – Stop
Baud Rates	9'600, 19'200, 38'400, 57'600 Bd (Default: 9'600)
Address	1...31 0 = Broadcast
Number of Nodes	Max. 32 (without repeater)
Terminating Resistor	120 Ω (can be switched on by a DIP Switch description see page 3)

Parametrisation

Tool	Via DIP switches (setting of baud rate and parity description on page 3)

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 below.

Supported commands

Standard commands:
Read Holding Registers [3]
Write Single Register [6]
Write Multiple Registers [16]

Interpret values in the registers

All values in the register are shown as unsigned (marked T = **u**), signed (marked T = **s**), or float integers (marked T = **f**).
Signed integers are represented as two's complement.

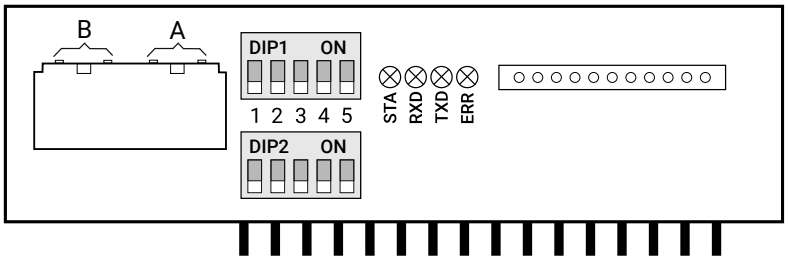
Example unsigned integer:	Example signed integer:
Read (Function 03, 1 Register) Value Register No. x = 0000 0001 0010 1110_2 = 302_{10}	Read (Function 03, 1 Register) Value Register No. x = 1111 1111 0010 0001_2 = -223_{10}
Actual value = value * scaling factor * unit = 302 * 0.01 * unit = **30.2 unit**	Actual value = value * scaling factor * unit = −223 * 0.01 * unit = **−22.3 unit**

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

Operating elements for addressing and parametrisation

RS 485 module

In addition to the basic board, each Modbus sensor is equipped with a RS-485 module.
The Modbus communication lines A (D+) and B (D-) are connected to the module. Furthermore, on the two DIP switches, the Modbus address of the sensor can be selected and the communication parameters can be set.

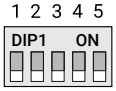


Functions of DIP switch 1 and DIP switch 2

DIP switch **DIP 1** (5-way) is used to set the Modbus address binary coded in a range of 1–31 (address 0 is reserved for broadcast and can't be set).

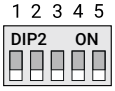
DIP switch **DIP 2** (5-way) is used to parameterise termination (120 Ω), baud rate and parity.

All DIP switches are factory set to the OFF position.



1–5 Address

	2^0 (1)	2^1 (2)	2^2 (4)	2^3 (8)	2^4 (16)	
1	**2**	**3**	**4**	**5**	**Address**
OFF	OFF	OFF	OFF	OFF	**0**
ON	OFF	OFF	OFF	OFF	**1**
OFF	**ON**	OFF	OFF	OFF	**2**
ON	**ON**	OFF	OFF	OFF	**3**
OFF	OFF	**ON**	OFF	OFF	**4**
ON	OFF	**ON**	OFF	OFF	**5**
OFF	**ON**	**ON**	OFF	OFF	**6**
⋮	⋮	⋮	⋮	⋮	⋮
ON	**ON**	**ON**	**ON**	**ON**	**31**



1 = Termination
2, 3 =Baud rate
4,5 = Parity

1	2	3	4	5	Function
OFF					Termination **OFF**
ON					Termination **ON**
	OFF	OFF			Baud rate 9'600
	ON	OFF			Baud rate 19'200
	OFF	**ON**			Baud rate 38'400
	ON	**ON**			Baud rate 57'600
			OFF	OFF	Parity **none** – **2** Stopbits
			ON	OFF	Parity **even** – **1** Stopbit
			OFF	**ON**	Parity **odd** – **1** Stopbit
			ON	**ON**	Parity **none** – **1** Stopbit

LED functions

The four LEDs on the RS-485 module show the actual operating status of the RS-485 module.

STA During normal operation the LED is flashing.
LED is turned ON during sensor initialization after Power ON of the device.

RXD LED is turned ON if bus telegrams are received by the RS-485 module.

TXD LED is turned ON if bus telegrams are sent by the RS-485 module.

ERR LED is turned ON in case of a faulty bus configuration or in case of internal errors.

Modbus register descriptions

Register measured variable

Registers No. 1–54 define the measured variable.
Sensor type detection in Register No. 502.

No.	Address	Register measured variable	Unit		T	Access
1	0	**Temperature** [scaling factor: 0.1] Selection of SI or Imperial units via Register No. 401 (1 = SI, 2 = Imperial)	SI Imperial	°C °F	s	R
2	1	**Relative humidity** [scaling factor: 0.1]	%		s	R
3	2	**Absolute humidity** [scaling factor: 0.01] Selection of SI or Imperial units via Register No. 401 (1 = SI, 2 = Imperial)	SI Imperial	g/m³ gr/ft³	s	R
4	3	**Enthalpy** [scaling factor: 0.1] Selection of SI or Imperial units via Register No. 401 (1 = SI, 2 = Imperial)	SI Imperial	kJ/kg BTU/lb	s	R
5	4	**Dew point** [scaling factor: 0.1] Selection of SI or Imperial units via Register No. 401 (1 = SI, 2 = Imperial)	SI Imperial	°C °F	s	R
6	5	**CO_2** [scaling factor: 1.0]	ppm		s	R
7	6	**VOC** [scaling factor: 0.1]	%		s	R
8	7	**CO_2 VOC Mix** [scaling factor: 0.1]	%		s	R
9	8	**Differential pressure 1** Selection **Pa** via 6th DIP switch (OFF) of sensor main board 22ADP. Value in Pa [scaling factor: 1.0] Value of Register No. 401 is 1 (SI) Selection **InchWC** via 6th DIP switch (ON) of sensor main board 22ADP. Value in InchWC [scaling factor: 0.001] Value of Register No. 401 is 2 (Imperial) **S1** ON 6 Pa (m³/h) ON 6 Inch WC (cfm)	SI Imperial	Pa InchWC	s	R
10	9	**Volumetric flow 1** Selection **(m³/h)** via 6th DIP switch (OFF) of sensor main board 22ADP. Value of Register No. 401 is 1 (SI) If Register No. 405 is set to 0 or 1 register shows a value in m³/h [scaling factor: 100.0] If Register No. 405 is set to 2 register shows a value in m³/s [scaling factor: 0.01] Selection **(cfm)** via 6th DIP switch (ON) of sensor main board (22ADP). Value in cfm [scaling factor: 10.0] Value of Register No. 401 is 2 (Imperial) **S1** ON 6 Pa (m³/h) ON 6 Inch WC (cfm)	SI Imperial	m³/h m³/s cfm	u u	R R
11	10	**Differential pressure 2 (@dual ADP only)** Selection **Pa** via 6th DIP switch (OFF) of sensor main board 22ADP. Value in Pa [scaling factor: 1.0] Value of Register No. 401 is 1 (SI) Selection **InchWC** via 6th DIP switch (ON) of sensor main board 22ADP. Value in InchWC [scaling factor: 0.001] Value of Register No. 401 is 2 (Imperial) **S2** ON 6 Pa (m³/h) ON 6 Inch WC (cfm)	SI Imperial	Pa InchWC	s	R

No.	Address	Register measured variable	Unit		T	Access
12	11	**Volumetric flow 2** (@dual ADP only) Selection **(m³/h)** via 6th DIP switch (OFF) of sensor main board 22ADP. Value of Register No. 401 is 1 (SI) If register 405 is set to 0 or 1 register shows a value in m^3/h [scaling factor: 100.0] If Register No. 405 is set to 2 register shows a value in m^3/s [scaling factor: 0.01] Selection **(cfm)** via 6th DIP switch (ON) of sensor main board (22ADP). Value in cfm [scaling factor: 10.0] Value of Register No. 401 is 2 (Imperial) **S2** ON 6 = Pa (m³/h) ON 6 = Inch WC (cfm)	SI Imperial	m^3/h m^3/s cfm	u	R
..	..	–	–		–	–
51	50	**Volumetric flow 1 (32 Bit)** (if Register Address No. 405 is set to the value 2, the value scales the unit m³/s) Calculation volumetric flow: Value Adr 51 x 65'535 + Value Adr 50. [scaling factor: 1.0]	SI	m^3/h m^3/s	u	R
52	51		Imperial	cfm		
53	52	**Volumetric flow 2 (32 Bit)** (if Register Address No. 405 is set to the value 2, the value scales the unit m³/s) (@dual ADP only) Calculation volumetric flow: Value Adr 53 x 65'535 + Value Adr 52. [scaling factor: 1.0]	SI	m^3/h m^3/s	u	R
54	53		Imperial	cfm		

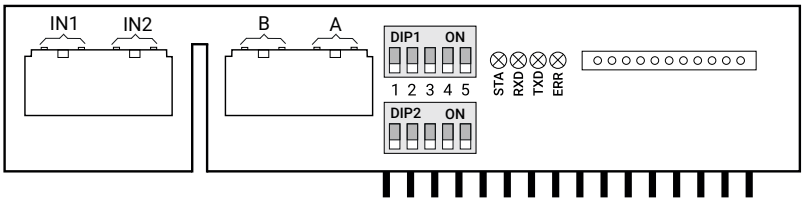
Description Access: R = Read, W = Write

Register measurement values of additional inputs

Registers No. 91–94 show values of additional inputs.

Some device types include an option board with two additional inputs (IN1 and IN2). NTC10k temperature sensors or potential-free switching contacts can be connected to these inputs. The measured values are provided via the Modbus Register No. 91–94. The BETA values of the connected NTC10k sensors can be configured via the Modbus Registers No. 490 amd 491.

For details how to connect the external sensors and contacts, please refer to the product data sheet of the respective device.

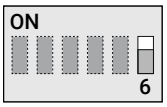
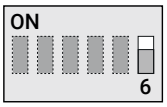
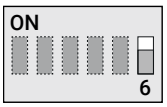
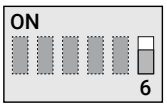


No.	Address	Register measured variable	Unit		T	Access
91	90	**Input 1 – Temperature NTC10k** [scaling factor: 0.1] Selection of SI or Imperial units via Register No. 401 (1 = SI, 2 = Imperial)	SI	°C	s	R
			Imperial	°F		
92	91	**Input 2 – Temperature NTC10k** [scaling factor: 0.01] Selection of SI or Imperial units via register 401 (1 = SI, 2 = Imperial)	SI	°C	s	R
			Imperial	°F		
93	92	**Input 1 – Switch contact**	0	Contact open	s	R
			1	Contact closed		
94	93	**Input 2 – Switch contact**	0	Contact open	s	R
			1	Contact closed		

Description Access: R = Read, W = Write

Register offset and correction values

Registers No. 101–106 define the offset and correction values of the sensor.

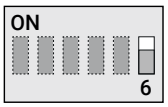
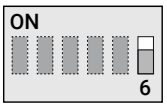
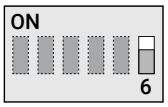
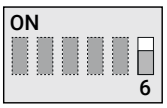
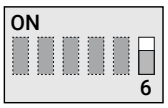
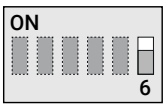
No.	Address	Register offset and correction values		Unit		T	Access
101	100	**Offset temperature** [scaling factor: 0.1] Selection of SI or Imperial units via Register No. 401 (1 = SI, 2 = Imperial)		SI Imperial	°C °F	s	R / W
102	101	**Offset relative humidity** [scaling factor: 1.0]		%		s	R / W
103	102	**Offset CO_2** [scaling factor: 1.0]		ppm		s	R / W
104	103	**Offset VOC** [scaling factor: 1.0]		%		s	R / W
105	104	**Offset differential pressure 1** Selection **Pa** via 6th DIP switch (OFF) of sensor main board 22ADP. Value in Pa [scaling factor: 1.0] Value of Register No. 401 is 1 (SI) Selection **InchWC** via 6th DIP switch (ON) of sensor main board 22ADP. Value in **InchWC** [scaling factor: 0.001] Value of Register No. 401 is 2 (Imperial)	 Pa (m³/h) **S1**  Inch WC (cfm)	SI Imperial	Pa InchWC	s	R / W
106	105	**Differential pressure 2 (@dual ADP only)** Selection **Pa** via 6th DIP switch (OFF) of sensor main board 22ADP. Value in Pa [scaling factor: 1.0] Value of Register No. 401 is 1 (SI) Selection **InchWC** via 6th DIP switch (ON) of sensor main board 22ADP. Value in **InchWC** [scaling factor: 0.001] Value of Register No. 401 is 2 (Imperial)	 Pa (m³/h) **S2**  Inch WC (cfm)	SI Imperial	Pa InchWC	s	R / W

Description Access: R = Read, W = Write

Register upper and lower limit of the sensor scale

Registers No. 201–224 define the upper/lower limit for the sensor output and is used to scale the two DC 0...10 V analog outputs.

No.	Address	Register upper and lower limit of the sensor scale	Values	Unit		T	Access
201	200	**Lower limit temperature** [scaling factor: 0.1] Selection of SI or Imperial units via Register No. 401 (1 = SI, 2 = Imperial)	-50...+250°C	SI	°C	s	R / W
			-30...+480°F	Imperial	°F		
202	201	**Upper limit temperature** [scaling factor: 0.1] Selection of SI or Imperial units via Register No. 401	-50...+250°C	SI	°C	s	R / W
			-30...+480°F	Imperial	°F		
203	202	**Lower limit relative humidity** [scaling factor: 1.0]	0...100 % RH	%		s	R / W
204	203	**Upper limit relative humidity** [scaling factor: 1.0]	0...100 % RH	%		s	R / W
205	204	**Lower limit absolute humidity** [scaling factor: 0.1] Selection of SI or Imperial units via Register No. 401 (1 = SI, 2 = Imperial)	0...80 g/m³	SI	g/m³	s	R / W
			0...35 gr/ft	Imperial	gr/ft		
206	205	**Upper limit absolute humidity** [scaling factor: 0.1] Selection of SI or Imperial units via Register No. 401 (1 = SI, 2 = Imperial)	0...80 g/m³	SI	g/m³	s	R / W
			0...35 gr/ft	Imperial	gr/ft		
207	206	**Lower limit enthalpy** [scaling factor: 0.1] Selection of SI or Imperial units via Register No. 401	0...85 KJ/kg	SI	kJ/kg	s	R / W
			0...40 BTU/lb	Imperial	BTU/lb		
208	207	**Upper limit enthalpy** [scaling factor: 0.1] Selection of SI or Imperial units via Register No. 401	0...85 KJ/kg	SI	kJ/kg	s	R / W
			0...40 BTU/lb	Imperial	BTU/lb		
209	208	**Lower limit enthalpy** [scaling factor: 0.1] Selection of SI or Imperial units via Register No. 401	-20...+80°C	SI	°C	s	R / W
			0...+200°F	Imperial	°F		
210	209	**Upper limit enthalpy** [scaling factor: 0.1] Selection of SI or Imperial units via Register No. 401	-20...+80°C	SI	°C	s	R / W
			0...+200°F	Imperial	°F		
211	210	**Lower limit CO_2** [scaling factor: 0.1]	0...5000 ppm	ppm		s	R / W
212	211	**Upper limit CO_2** [scaling factor: 0.1]	0...5000 ppm	ppm		s	R / W
213	212	**Lower limit VOC** [scaling factor: 0.1]	0...100 %	%		s	R / W
214	213	**Upper limit VOC** [scaling factor: 0.1]	0...100 %	%		s	R / W
215	214	**Lower limit CO_2 / VOC mix** [scaling factor: 0.1]	0...100 %	%		s	R / W
216	215	**Upper limit CO_2 / VOC mix** [scaling factor: 0.1]	0...100 %	%		s	R / W

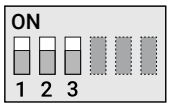
No.	Address	Register upper and lower limit of the sensor scale	Values	Unit		T	Access
217	216	**Lower limit volumetric flow 1** Selection **(m³/h)** via 6th DIP switch (OFF) of sensor main board 22ADP. Value of Register No. 401 is 1 (SI) If Register No. 405 is set to 0 or 1 register shows a value in m³/h [scaling factor: 1.0]. If Register No. 405 is set to 2 register shows a value in m³/s [scaling factor: 1.0]. Selection **(cfm)** via 6th DIP switch (ON) of sensor main board 22ADP. Value of Register No. 401 is 2 (Imperial) Value in **cfm** [scaling factor: 1.0] **Values:** 0...999'999 m³/s / 0...999'999 m³/h / 0...999'999 cfm	 Pa (m³/h) **S1**  Inch WC (cfm)	SI	m³/h m³/s	f	R / W
218	217			Imperial	cfm		
219	218	**Upper limit volumetric flow 1** Selection **(m³/h)** via 6th DIP switch (OFF) of sensor main board 22ADP. Value of Register No. 401 is 1 (SI) If Register No. 405 is set to 0 or 1 register shows a value in m³/h [scaling factor: 1.0]. If Register No. 405 is set to 2 register shows a value in m³/s [scaling factor: 1.0]. Selection **(cfm)** via 6th DIP switch (ON) of sensor main board 22ADP. Value of Register No. 401 is 2 (Imperial) Value in **cfm** [scaling factor: 1.0] **Values:** 0...999'999 m³/s / 0...999'999 m³/h / 0...999'999 cfm	 Pa (m³/h) **S1**  Inch WC (cfm)	SI	m³/h m³/s	f	R / W
220	219			Imperial	cfm		
221	220	**Lower limit volumetric flow 2** (@dual ADP only) Selection **(m³/h)** via 6th DIP switch (OFF) of sensor main board 22ADP. Value of Register No. 401 is 1 (SI) If Register No. 405 is set to 0 or 1 register shows a value in m³/h [scaling factor: 1.0]. If Register No. 405 is set to 2 register shows a value in m³/s [scaling factor: 1.0]. Selection **(cfm)** via 6th DIP switch (ON) of sensor main board 22ADP. Value of Register No. 401 is 2 (Imperial) Value in **cfm** [scaling factor: 1.0] **Values:** 0...999'999 m³/s / 0...999'999 m³/h / 0...999'999 cfm	 Pa (m³/h) **S2**  Inch WC (cfm)	SI	m³/h m³/s	f	R / W
222	221			Imperial	cfm		

No.	Address	Register upper and lower limit of the sensor scale	Values	Unit		T	Access
223	222	**Upper limit volumetric flow 2** (@dual ADP only) Selection **(m³/h)** via 6th DIP switch (OFF) of sensor main board 22ADP. Value of Register No. 401 is 1 (SI) If Register No. 405 is set to 0 or 1 register shows a value in m³/h [scaling factor: 1.0]. If Register No. 405 is set to 2 register shows a value in m³/s [scaling factor: 1.0]. Selection **(cfm)** via 6th DIP switch (ON) of sensor main board 22ADP. Value of Register No. 401 is 2 (Imperial) Value in **cfm** [scaling factor: 1.0] **Values:** 0...999'999 m³/s / 0...999'999 m³/h / 0...999'999 cfm	**S2** ON 6 Pa (m³/h) ON 6 Inch WC (cfm)	SI Imperial	m³/h m³/s cfm	f	R / W

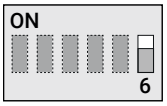
Description Access: R = Read, W = Write

Limit differential pressure

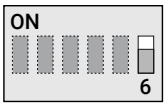
Pressure range can be set with DIP switch 1–3 of sensor main board 22ADP. S1 for differential pressure 1 and S2 for differential pressure 2 (dual ADP only). For the specific values, please refer to the product data sheet of the respective device.



Selection of **Pa** via 6th DIP switch (OFF) of sensor main board 22ADP.



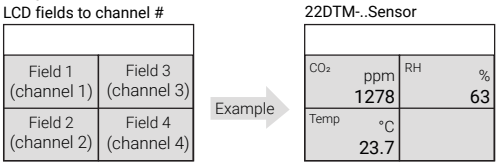
Selection **InchWC** via 6th DIP switch (ON) of sensor main board 22ADP.



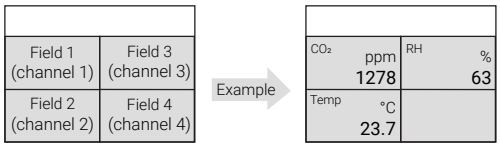
Register channel selection for sensor output and LCD-display

Registers No. 301–310 define the channel selection for the measured variable. This can be used to assign the two analog outputs to the corresponding measured value (channel # 1 = AOU1, channel # 2 = AOU2). In addition, 4 fields of the LCD-display (optional) can be assigned to measured values by using the corresponding channel #.

No.	Address	Channel selection for sensor output		T	Access	Notes
		Channel temperature	**Default value channel #**			
		Sensor 22DTH-..5..	**2 (AOU2)**			
		Sensor 22UTH-..50X	**2 (AOU2)**			
301	300	Sensor 22DTM-..5	**2 (AOU2)**	u	R / W	
		Sensor 22ADP-..5	0			
		Sensor 22ADP-..5	0			
		Channel relative humidity	**Default value channel #**			
		Sensor 22DTH-..5..	**1 (AOU1)**			**Channel Selection #** **Valid values 1, 2, 3 or 4** The channels with channel #1 and #2 are output, both via Modbus Registers No. 1–10 and via the analog outputs AOU1 and AOU2.
302	301	Sensor 22DTH-..5..	**1 (AOU1)**	u	R / W	
		Sensor 22DTM-..5	**3**			**4 fields of the LCD-display** (optional) can be assigned to measured values by using the corresponding channel #.
		Sensor 22ADP-..5	0			
		Channel absolute humidity	**Default value channel #**			Unused channels are set to zero.
		Sensor 22DTH-..5..	0			
303	302	Sensor 22UTH-..50X	0	u	R / W	Assignment: LCD fields to channel #
		Sensor 22DTM-..5	0			
		Sensor 22ADP-..5	0			
		Channel enthalpy	**Default value channel #**			
		Sensor 22DTH-..5..	0			
304	303	Sensor 22UTH-..50X	0	u	R / W	
		Sensor 22DTM-..5	0			
		Sensor 22ADP-..5	0			
		Channel dew point	**Default value channel #**			
		Sensor 22DTH-..5..	0			
305	304	Sensor 22UTH-..50X	0	u	R / W	
		Sensor 22DTM-..5	0			
		Sensor 22ADP-..5	0			
		Channel CO_2	**Default value channel #**			
		Sensor 22DTH-..5..	0			
306	305	Sensor 22UTH-..50X	0	u	R / W	
		Sensor 22DTM-..5	**1 (AOU1)**			
		Sensor 22ADP-..5	0			



No.	Address	Channel selection for sensor output		T	Access	Notes
		Channel VOC	**Default value channel #**			
		Sensor 22DTH-..5..	0			
307	306	Sensor 22UTH-..50X	0	u	R / W	
		Sensor 22DTM-..5	0			
		Sensor 22ADP-..5	0			**Channel Selection #** **Valid values 1, 2, 3 or 4** The channels with channel #1 and #2 are output, both via Modbus Registers No. 1–10 and via the analog outputs AOU1 and AOU2. **4 fields of the LCD-display** (optional) can be assigned to measured values by using the corresponding channel #. Unused channels are set to zero. Assignment: LCD fields to channel #
		Channel CO_2 VOC Mix	**Default value channel #**			
		Sensor 22DTH-..5..	0			
308	307	Sensor 22UTH-..50X	0	u	R / W	
		Sensor 22DTM-..5	0			
		Sensor 22ADP-..5	0			
		Channel differential pressure 1	**Default value channel #**			
		Sensor 22DTH-..5..	0			
309	308	Sensor 22UTH-..50X	0	u	R / W	
		Sensor 22DTM-..5	**1 (AOU1)**			
		Sensor 22ADP-..5	**1 (AOU1)**			
		Channel volumetric flow 1	**Default value channel #**			
		Sensor 22DTH-..5..	0			
310	309	Sensor 22UTH-..50X	0	u	R / W	
		Sensor 22DTM-..5	**2 (AOU2)**			
		Sensor 22ADP-..5	**3**			

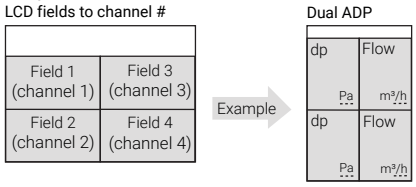


Description Access: R = Read, W = Write

Register channel selection for sensor output and LCD-display for Sensor 22ADP-..5.. (dual ADP)

Registers No. 311–312 define the channel selection for the measured variable. This can be used to assign the two analog outputs to the corresponding measured value (channel # 1 = AOU1, channel # 2 = AOU2). In addition, 4 fields of the LCD-display (optional) can be assigned to measured values by using the corresponding channel #.

No.	Address	Channel selection for sensor output		T	Access	Notes
		Channel differential pressure	**Default value channel #**			
		Sensor 22DTH-..5..	0			
311	310	Sensor 22UTH-..50X	0	u	R / W	Assignment: LCD fields to channel #
		Sensor 22DTM-..5	0			
		Sensor 22ADP-..5	0			
		Sensor 22ADP-..5	**2 (AOU2)**			
		Channel volumetric flow 2	**Default value channel #**			
		Sensor 22DTH-..5..	0			
312	311	Sensor 22DTH-..5..	0	u	R / W	
		Sensor 22DTM-..5	0			
		Sensor 22ADP-..5	**4**			



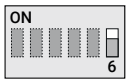
Description Access: R = Read, W = Write

Channel Selection # Valid values 1, 2, 3 or 4

The channels with channel #1 and #2 are output both via Modbus Registers No. 311–312 and via the analog outputs AOU1 and AOU2.
4 fields of the LCD-display (optional) can be assigned to measured values by using the corresponding channel #.

Register sensor units of measurement and constants

Registers No. 401–492 the required unitary system (SI or Imperial) can be selected and further sensor parameters can be chosen.

No.	Address	Register sensor units of measurement and constants	Unit			T	Access
401	400	**Selection of the unitary system** (SI or Imperial) **Note:** For sensors with differential pressure / volumetric flow (22ADP), this value is only readable and is set via the 6th dip switch (ON = Imperial / OFF = SI)  Inch WC (cfm)	SI	°C	value = 1	u	R / W
			Imperial	°F	value = 2		
402	401	**Reserved**	–	–	–	–	–
403	402	**Input height above sea level** [scaling factor: 1.0] Default value = 330 m (input always in m and not in ft)		m		u	R / W
404	403	**Input k-factor volumetric flow 1 according to manufacturer's specification** [scaling factor: 1.0] [Default value = 1.0] Example: k-factor 1500 = 15000_{10}		–		u	R / W
405	404	**Selection off the fan manufacturer, volumetric flow 1** (The fan model has influence on the formula to calculate the volumetric flow) [Default value = 0]	Rosenberg Comefri Gebhart Nicotra		value = 0	u	R / W
			Ziehl-Abegg EBM-Papst AIR-CONCEPTS		value = 1		
			Fläkt-Woods		value = 2		
406	405	**Input k-factor volumetric flow 2 according to manufacturer's specification** [scaling factor: 1.0] [Default value = 1.0] Example: k-factor 1500 = 15000_{10}		–		u	R / W
407	406	**Selection off the fan manufacturer, volumetric flow 2** (@dual ADP only) (The fan model has influence on the formula to calculate the volumetric flow) [Default value = 0]	Rosenberg Comefri Gebhart Nicotra		value = 0	u	R / W
			Ziehl-Abegg EBM-Papst AIR-CONCEPTS		value = 1		
			Fläkt-Woods		value = 2		

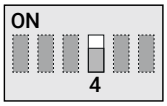
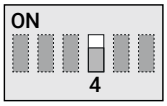
Equations of fan manufacturers

Each fan manufacturer has their own equation; k-factor range and unit of measure (see tables). By selecting, a manufacturer in Register No. 405 and corresponding plant-specific k-factor in Register No. 404, correct settings for each manufacturer will automatically be applied.

Note: If the units of measurement are set to Imperial Register No. 10, output is cfm.

Manufacturer	Equation	Unit	k factor range
Fläkts Woods	$q = \frac{1}{k} \cdot \sqrt{\Delta P}$	m^3/s	0.3...99
Rosenberg	$q = k \cdot \sqrt{\frac{2 \cdot \Delta P}{\rho}}$	m^3/h	37...800
Nicotra-Gebhardt	$q = CPFN \cdot \sqrt{\frac{2 \cdot \Delta P}{\rho}}$	m^3/h	10...1500

Manufacturer	Equation	Unit	k factor range
Ziehl-Abegg	$q = k \cdot \sqrt{\Delta P}$	m^3/h	10...1500
Comefri	$q = k \cdot \sqrt{\frac{2 \cdot \Delta P}{\rho}}$	m^3/h	10...2000
EBM - Papst	$q = k \cdot \sqrt{\Delta P}$	m^3/h	10...1500
Gebhardt	$q = k \cdot \sqrt{\frac{2 \cdot \Delta P}{\rho}}$	m^3/h	50...4700

No.	Address	Register measured variable	Unit	T	Access
408	407	**Response time differential pressure 1** Response time can be set with DIP switch 4 of sensor main board 22ADP. S1 for differential pressure 1.	 4 sec 0,8 sec 1: DIP switch off ➞ 0.8 s 2: DIP switch on ➞ 4.0 s	u	R
409	408	**Response time volumetric flow 1** [scaling factor: 1.0] [Default value = 1.0]	1...30 s	u	R / W
410	409	**Response time differential pressure 2** (@dual ADP only) Response time can be set with DIP switch 4 of sensor main board 22ADP. S2 for differential pressure 2.	 4 sec 0,8 sec 1: DIP switch off ➞ 0.8 s 2: DIP switch on ➞ 4.0 s	u	R
411	410	**Response time volumetric flow 2** (@dual ADP only) [scaling factor: 1.0] [Default value = 1.0]	1...30 s	u	R / W
412	411	**Zeroing differential pressure 1**	0: No zeroing 1: Start zeroing	u	R / W
413	412	**Zeroing differential pressure 2**	0: No zeroing 1: Start zeroing	u	R / W
414	413	**Percentage value of the CO_2 value in the CO_2 VOC Mix Signal**	0...100 % Example: 25% means: CO_2 VOC Mix = 25% CO_2 and 75% VOC	u	R / W
..	..	–	–	–	–
491	490	**BETA-Value NTC 1**	Default (NTC10k2): 3970 NTC10k Carel: 3435 NTC10k Precon: 3690	u	R / W
492	491	**BETA-Value NTC 2**	Default (NTC10k2): 3970 NTC10k Carel: 3435 NTC10k Precon: 3690	u	R / W

Description Access: R = Read, W = Write

Register general device information

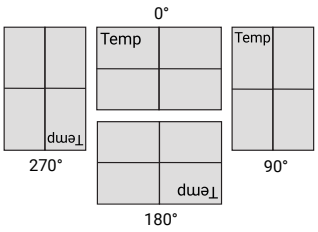
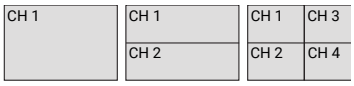
Registers No. 501–513 define general device information.

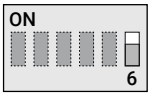
No.	Address	Register general device information	Unit	T	Access	Notes
501	500	**Device detection**	–	u	R	700_{16}
502	501	**Sensor detection** [value 1 = Sensor value available, value 0 = Sensor not available] Bit: 0: Temperature 1: Relative humidity 2: Absolute humidity 3: Enthalpy 4: Dew point 5: CO_2 6: VOC 7: CO_2 VOC Mix 8: Differential pressure 1 9: Volumetric flow 1 10: Differential pressure 2 11: Volumetric flow 2	–	u	R	Example: CO_2 available = 0000 0000 0010 0000 Example: CO_2 and temperature available = 0000 0000 0010 0001
503	502	**Hardware version main circuit board**	–	u	R	Version# is shown as a hexadecimal number Example: V 4.6 → 0406_{16} → $0000\ 0100\ 0000\ 0110_2$
504	503	**Firmware version main circuit board**	–	u	R	
505	504	**Hardware version RS-485 module**	–	u	R	
506	505	**Firmware version RS-485 module**	–	u	R	
507	506	**Reserved**	–	–	–	–
508	507	**Reserved**	–	–	–	–
509	508	**Minimum output voltage** [scaling factor: 1.0] (Value is adjustable 0...9 V, default value = 0 V)	V	u	R / W	–
510	509	**Maximum output voltage** [scaling factor: 1.0] (Value is 5 or 10 V according to pos. of 5th DIP switch of DIP switch on main board 22ADP OFF = 10 V, ON = 5V)	V	u	R	
511	510	**Operating hours counter** [scaling factor: 1.0]	h	u	R	–
512	511	**Countdown for maintenance** [scaling factor: 1.0] [Default value = 17520]	h	u	R / W	Set a maintenance or visual inspection time after which sensor shall be checked. (After countdown time has expired a new countdown value has to be set.)
513	512	**Countdown for visual inspection** [scaling factor: 1.0] [Default value = 17520]				

Description Access: R = Read, W = Write

Register LCD-display configuration

Registers No. 601–617 define display parameters of the optional LCD.

No.	Address	Register LCD-display configuration	Unit	T	Access	Notes
601	600	**Enable LCD** [value 1 = enabled, value 0 = disabled]	–	u	R / W	–
602	601	**Brightness LCD** [scaling factor: 1.0] [0...100%]	%	u	R / W	–
603	602	**Rotation LCD** [value 0 = 0°, value 1 = 90°, value 2 = 180°, value 3 = 270°]	–	u	R / W	
604	603	**Enable traffic light function LCD** [value 0 = disabled, value 1 = enabled]	–	u	R / W	–
605	604	**Enable symbol maintenance on LCD** [value 0 = disabled, value 1 = enabled, default = 1]	–	u	R / W	If the countdown time (set value of Register No. 512 and 513) has expired, the symbol will be shown on the LCD-display.
606	605	**Enable symbol visual inspection on LCD** [value 0 = disabled, value 1 = enabled, default = 1]	–	u	R / W	
607	606	**Reserved**	–	–	–	–
608	607	**Enable LCD channel 1** [value 0 = disabled, value 1 = enabled]	–	u	R / W	According to selection of sensor channels of measuring values Register No. 301–310 
609	608	**Enable LCD channel 2** [value 0 = disabled, value 1 = enabled]	–	u	R / W	
610	609	**Enable LCD channel 3** [value 0 = disabled, value 1 = enabled]	–	u	R / W	
611	610	**Enable LCD channel 4** [value 0 = disabled, value 1 = enabled]	–	u	R / W	
612	611	**Channel assignment for traffic light function**	–	u	R / W	Input Channel Nr. 1–4 from the settings of Register No. 301–310
613	612	**Traffic light function** Definition of color of LCD back lightning range 1	–	u	R / W	0 = Off 1 = Green 2 = Yellow 3 = Red 4 = Blue 5 = Magenta 6 = Cyan 7 = White
614	613	**Traffic light function** Definition of color of LCD back lightning range 2	–	u	R / W	
615	614	**Traffic light function** Definition of color of LCD back lightning range 3	–	u	R / W	

No.	Address	Register LCD-display configuration	Unit	T	Access	Notes
616	615	**Threshold value traffic light function** Range 1 –► range 2	–	s	R / W	Setting for change threshold of LCD back lightning. The value input corresponds to Channel 1, which is set in Register No. 301–310. Examples: Change from blue to green at 20°C Change from green to red at 35°C Range 1 (Register No. 613) set to blue = 410 Range 2 (Register No. 614) set to green = 110 Range 3 (Register No. 615) set to red = 310 Threshold range1 –► 2 (Register No. 616) = 2010 Threshold range 1 –► 3 (Register No. 617) = 3510
617	616	**Threshold value traffic light function** Range 2 –► range 3	–	s	R / W	Exception: If 6th DIP switch of the sensor main board (22ADP) is (ON) set to **InchWC** [scaling factor is 0.001] Value of Register No. 401 is 2 (imperial).  Inch WC (cfm)

Description Access: R = Read, W = Write

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