LOGICA Digital

Energy-series DN10-DN80 (DN100 Ultra) Modbus Integration Guide

Application

The LOGICA Digital is a digital actuator designed to optimize energy usage in Heating, Ventilation and Air Conditioning (HVAC) systems.

Paired with an OPTIMA Compact valve it offers intelligent hydronic control and insight.

The actuator simplifies system integration from easy installation to direct communication with the Building Management system (BMS) to selectable control methods to suit different applications.

Built-in energy management algorithms and functions greatly reduce system integration hours.

The actuator can communicate using Modbus RTU or BACnet MS/TP.

This document describes how to integrate the actuators using Modbus RTU.

For actuator installation on the OPTIMA Compact valve and electric wiring, please refer to the LOGICA Digital Energy-series Technote.

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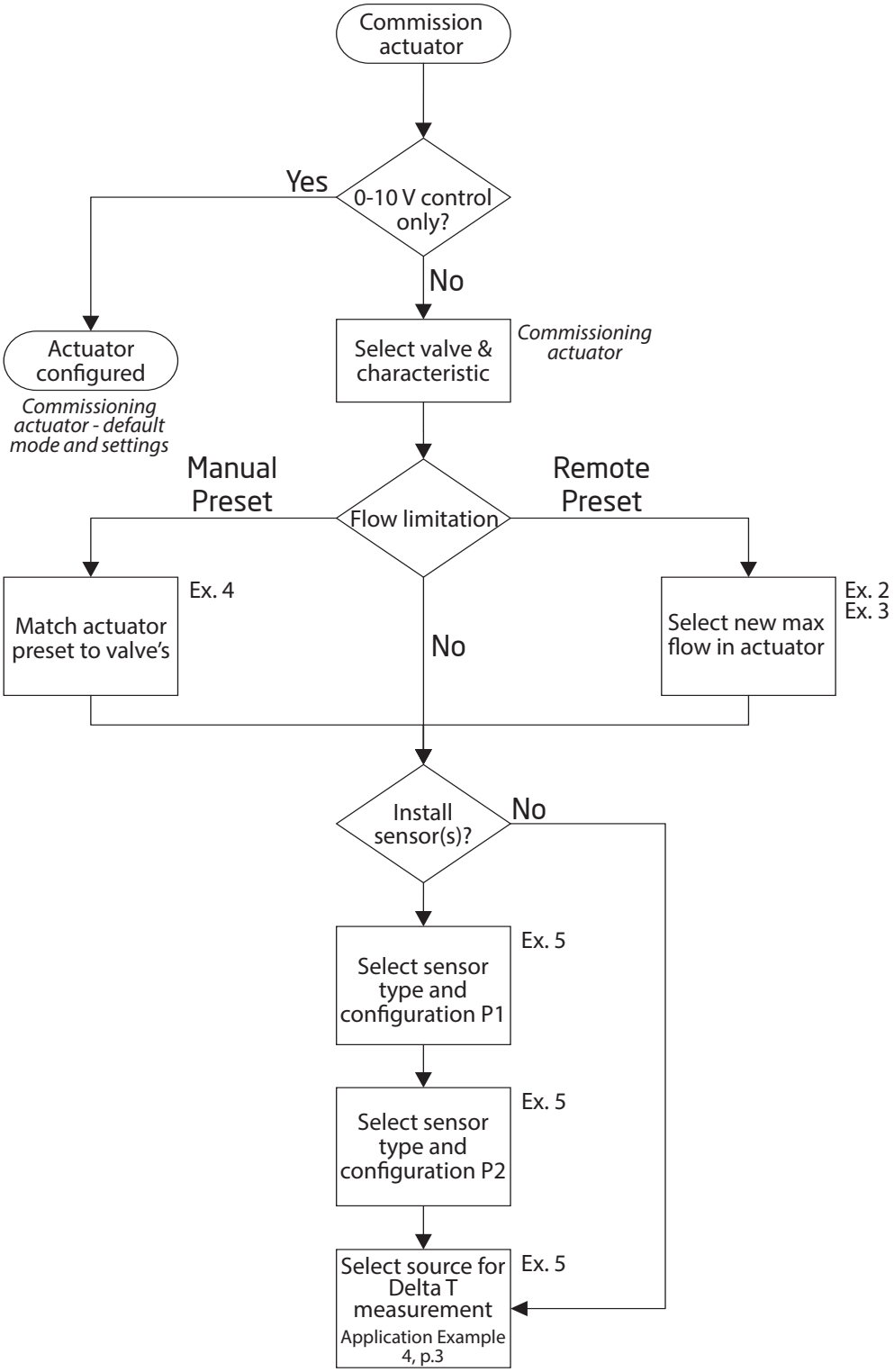
Overview

The flowchart below describes the complete actuator commissioning process. The guide starts by explaining the basic communication settings and valve selection process. Then, an application example is provided for each step of the flowchart and lastly, a complete register list is provided. Beside each step there is a reference such as Ex. 2.
This refers to an application example, so the example given is Application example 2 on page 5.
A basic commissioning can be done very quickly by jumping over the optional steps.



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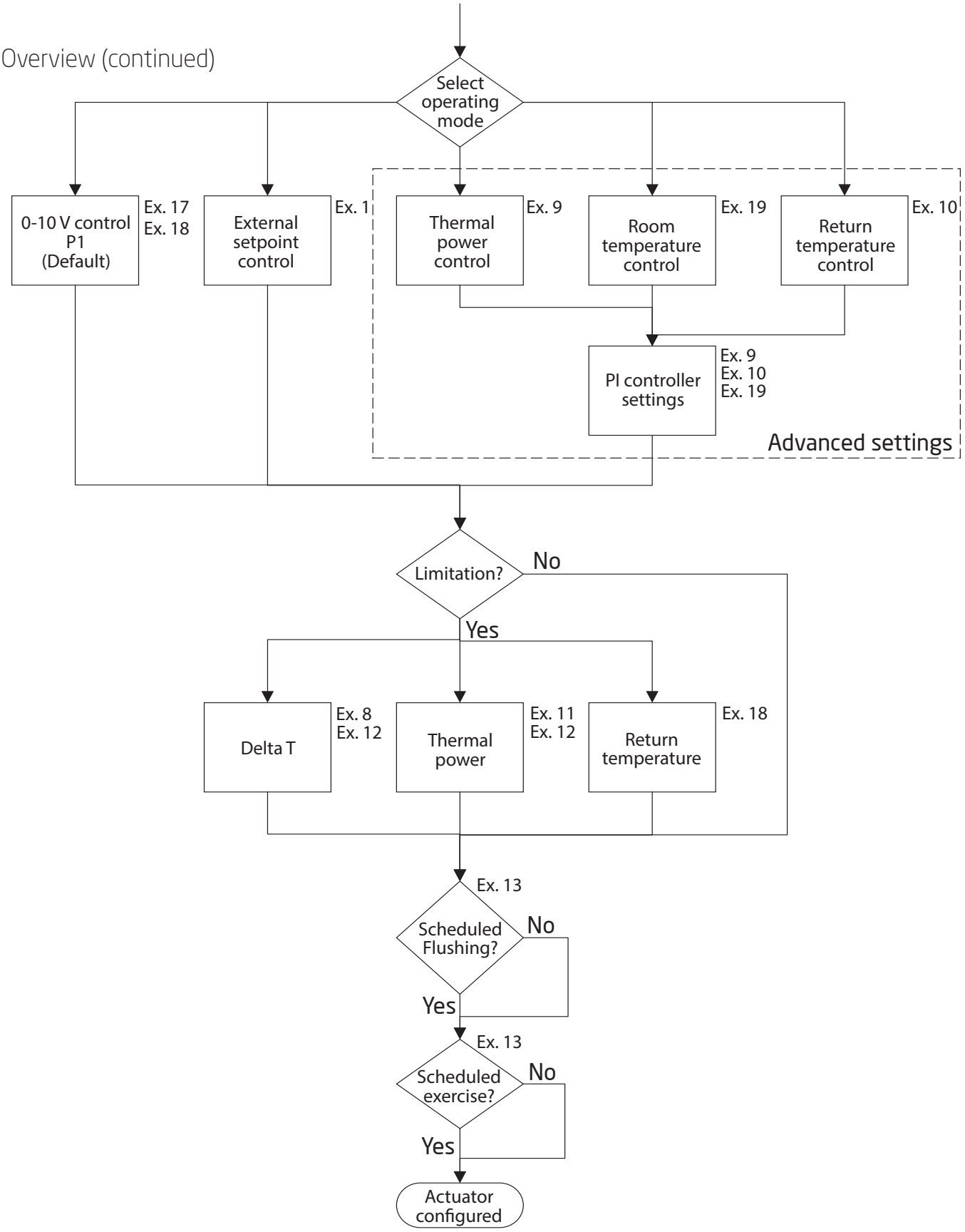
Overview (continued)



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Commissioning actuator - default mode and settings

The LOGICA Digital, Energy-series actuator is factory configured to run in analogue 0-10 V control mode. In this mode a standard 0-10 V control signal from a controller, room thermostat etc can be connected directly to the actuator's P1 input without requiring any further configuration. In this factory configuration, the following parameters are set:

Actuator control curve:	Linear
Valve type:	Default
Valve actuating direction:	Direct (0 V = closed; 10 V = open)
Actuating speed:	22 s/mm
Sensor/output type P2:	Off

These and other parameters can be changed via the Modbus interface using any standard Modbus software.

Hybrid control - analogue 0-10 V control with Modbus RTU communication

The LOGICA Digital, Energy-series can be controlled by a 0-10 V control signal whilst connected to a Modbus RTU control network. This allows for applications such as room thermostat control with 0-10 V output signal and high level status information sent to the Building Management System (BMS) via Modbus. In this hybrid mode, the following limitations will override the 0-10 V control signal if activated:

- Thermal power limitation (Register 314)
- Return temperature limitation (Register 315)
- Delta-T limitation (Register 316)

Application examples 17 and 18 give details of possible configurations.

Digital control via Modbus

The LOGICA Digital, Energy series can also be used digital-only mode. The configuration steps for this are described in the flow chart at the beginning of this document and in application examples 1 - 16.

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Commissioning actuator

This basic setup prepares the valve and actuator to control the flow using algorithms. The actuator should be mounted on a valve before starting this process. Given that the Modbus-address has already been setup using the DIP-switches shown in the LOGICA Digital Technote, these registers are needed to setup the Modbus communication. In registers where "**W**" is shown in the R/W column, values must be written into the registers. By default, the Modbus communication baud rate is 19200, with 8 databits, even parity, and 1 stop bit, shown as 19200 8-E-1.
To configure the communication settings, the following registers must be setup:

Name	Reg. adr. (Hex.)	Reg. adr. (Dec.)	Type	R/W	Values	Unit
RS485 baud rate	0x69	105	Uint16	W	0: default (19200,8,E,1)	-
					1: 9600	-
					2: 19200	-
					3: 38400	-
					4: 57600	-
					5: 76800	-
					6: 115200	-
RS485 stop bits	0x6A	106	Uint16	W	1: stop bit	-
					2: stop bits	-
RS485 parity	0x6B	107	Uint16	W	0: none	-
					1: even	-
					2: odd	-
MAC address*	0x68	104	Uint16	R/(W)	1..247	-
Service command	0x8A	138	Uint16	W	5: bus restart	-

* This register is only writeable if DIP-switch address is set to 63.

Valve selection & characteristic

Name	Reg. adr. (Hex.)	Reg. adr. (Dec.)	Type	R/W	Values	Unit
Valve selection**	0x6E	110	Uint16	W	4: OPTIMA Compact High 5.0 DN15/20 220-1330 l/h	-
Actuating control curve***	0x67	103	Uint16	W	1: Equal Percentage (EQ%)	-
Flow value of the selected valve****	0x71	113	Uint16	W	1330 -> 1000	l/h

** The valve used in this example is an OPTIMA Compact High 5.0 DN15/20.
The complete range of OPTIMA Compact DN10-DN100 Ultra valves are selectable. (See page 16).
*** The selected control characteristic in this example is Equal Percentage (EQ%).
**** Can be changed according to the manual preset of the valve - In the example above Preset 3.0 = 1000 l/h

When the communication commissioning has been done, the examples on the following pages can be performed

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Application Example 1 · Flow control using external (BMS) control signal

Example: Control the flow in the selected valve 0-100 %.
No extra flow limitation algorithm or temperature measurements are used in this simple setup.

Register 400: Input signal can vary from 0-100 % by the input signal from the BMS controller.

Name	Reg. adr. (Hex.)	Reg. adr. (Dec.)	Type	R/W	Values	Unit
Operating mode	0xC8	200	Uint16	R/W	0: Control via external control signal	-
Flow setpoint	0x190	400	Uint16	W	0..10000	%*100

Note: Register 401 can be used for estimated flow feedback in l/h or register 402 can be used for flow feedback in percentage.
Following examples uses external setpoint (register 200 = 0) unless otherwise stated.

Application Example 2 · Remote heating flow limitation via stroke limitation

Example: Limit the heating flow remotely by reducing the maximum valve stroke.
Reduce the heating flow to 500 l/h for the selected valve.
Register 201: HVAC mode - Select heating.
Register 114: Limit the heating flow to 500 l/h.
Register 400: Input signal can vary from 0-100 % from the BMS controller.

Name	Reg. Adr. (Hex.)	Reg. Adr. (Dec.)	Type	R/W	Values	Unit
HVAC mode	0xC9	201	Uint16	W	1: Heating	-
Stroke limitation by flow for heating	0x139	114	Uint16	W	500	l/h
Flow setpoint (Actuating signal)	0x190	400	Uint16	W	0..10000 (0-100 %) 100 % : 500 l/h	% * 100

Application Example 3 · Remote cooling flow limitation via stroke limitation

Example: Limit the cooling flow remotely by reducing the maximum valve stroke.
Reduce the cooling flow to 500 l/h for the selected valve.
Register 201: HVAC mode - Select cooling.
Register 115: Limit the cooling flow to 500 l/h.
Register 400: Input signal can vary from 0-100 % from the BMS controller.

Name	Reg. Adr. (Hex.)	Reg. Adr. (Dec.)	Type	R/W	Values	Unit
HVAC mode	0xC9	201	Uint16	W	2: Cooling	-
Stroke limitation by flow for cooling	0x139	115	Uint16	W	500	l/h
Flow setpoint (Actuating signal)	0x190	400	Uint16	W	0..10000 (0-100 %) 100 % : 500 l/h	% * 100

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Application Example 4 · Matching valve's manual preset in actuator

Example: OPTIMA Compact High 5.0 DN15/20 220-1330 l/h. Manual preset 2.8 ≈ 940 l/h. (Please refer to OPTIMA Compact Technote)

Register 110: Select "**4**" : OPTIMA Compact High 5.0 DN15/20 valve.
Register 113: Change maximum flow to match manual preset, e.g. 940 l/h.

Name	Reg. Adr. (Hex.)	Reg. Adr. (Dec.)	Type	R/W	Values	Unit
Select valve type (DN10-32)	0x6E	110	Uint16	W	4: OPTIMA Compact High 5.0 DN15/20 valve	-
Maximum flow	0x71	113	int16	W	940	l/h

Application Example 5 · Installation of temperature sensors for Delta T measurement

Example: Select Pt1000 sensors for measurement of supply and return temperatures.

Register 123: Select "**6**" : Pt1000 as sensor type P1.
Register 126: Select "**6**" : Pt1000 as sensor type P2.
Register 130: Select "**1**" : P1 for the supply temperature and P2 for the return temperature.
Register 406: Read the values for the differential temperature.

Name	Reg. Adr. (Hex.)	Reg. Adr. (Dec.)	Type	R/W	Values	Unit
Sensor type P1	0x7B	123	Uint16	W	6: Pt1000 sensor	-
I/O type P2	0x7E	126	Uint16	W	6: Pt1000 sensor	-
Config. of sources for differential tempera-ture calculation	0x82	130	Uint16	W	1: Supply: P1, Return: P2	-
Differential temperature	0x196	406	int16	R	Example: **150** (Measured 15 °K => Value = 15*10 = **150)**	K*10

Application Example 6 · Read estimated flow

Example: Read the estimated actual flow on the selected valve #4 and control the flow from 0-100 %. Valve is preset to 3.0 providing a maximum flow of approximately 1000 l/h. Please refer to OPTIMA Compact Technote.

Register 113: Change maximum flow to match manual preset. E.g. 1000 l/h.
Register 400: Input signal can vary from 0-100 % by the input from the BMS controller. E.g. 3000 (30 %).
Register 402: Estimated flow from actuator using the maximum flow found in register 113.

Name	Reg. Adr. (Hex.)	Reg. Adr. (Dec.)	Type	R/W	Values	Unit
Maximum flow	0x71	113	int16	W	1000	l/h
Flow setpoint (Actuating signal)	0x190	400	Uint16	W	3000 (Input from BMS controller)	%*100
Actual flow rate	0x192	402	Uint16	R	Example: 300 = 300 l/h	l/h

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Application Example 7 · Read estimated power output

Example: Read the estimated power output delivered at terminal unit. This requires the return and supply temperature readings which, in this case, come from 2 Pt1000 sensors attached to the actuator.

Register 123: Select "**6**" : Pt1000 as sensor type P1.
Register 126: Select "**6**" : Pt1000 as sensor type P2.
Register 130: Select "**1**" : P1 for the supply temperature and P2 for the return temperature.
Register 400: Input signal can vary from 0-100 % by the input from the BMS controller. E.g 6000 (60 %).
Register 410: Actual thermal power, calculated from differential temperature, estimated flow and medium energy constant.
In the example below, the valve #4 is preset to 3.0 ≈ 1000 l/h max, and 15 °K is read across the terminal unit.

Name	Reg. Adr. (Hex.)	Reg. Adr. (Dec.)	Type	R/W	Values	Unit
Sensor type P1	0x7B	123	Uint16	W	6: Pt1000 sensor	-
I/O type P2	0x7E	126	Uint16	W	6: Pt1000 sensor	-
Config. of sources for differential temperature calculation	0x82	130	Uint16	W	1: Supply: P1, Return: P2	-
Flow setpoint (Actuating signal)	0x190	400	Uint16	W	6000	%*100
Actual thermal power	0x19A	410	Uint16	R	Example: 105 = 10.5 kW*	kW*10

* Thermal power: P = 4.2 * (1000 * 0.6 / 3600) * 15 = 10.5 kW

Application Example 8 · Control minimum Delta T

Example: Control minimum differential temperature (Delta T) at the terminal unit.
In this example the actuator will limit the flow if the actual measured Delta T is lower than the designed minimum Delta T setup in register 316. If the actual Delta T is OK then the flow will be fully controlled by register 400 (BMS-value).

Register 123: Select "**6**" : Pt1000 as sensor type P1.
Register 126: Select "**6**" : Pt1000 as sensor type P2.
Register 130: Select "**1**" : P1 for the supply temperature and P2 for the return temperature.
Register 316: Minimum differential temperature.
Register 400: Input signal can vary from 0-100 % from the BMS controller. E.g 6000 (60 %).

Name	Reg. Adr. (Hex.)	Reg. Adr. (Dec.)	Type	R/W	Values	Unit
Sensor type P1	0x7B	123	Uint16	W	6: Pt1000 sensor	-
I/O type P2	0x7E	126	Uint16	W	6: Pt1000 sensor	-
Config. of sources for differential temperature calculation	0x82	130	Uint16	W	1: Supply: P1, Return: P2	-
Minimum differential temperature limitation value	0x13C	316	Uint16	W	Example: 40 = 4.0 °K	K*10
Flow setpoint (Actuating signal)	0x190	400	Uint16	R/W	6000	%*100

Please note: If the minimum Delta T setpoint is set too high, the system can go into a deadlock. A minimum flow is recommended when the Delta T algorithm is active. Please define minimum flow in register 312 E.g. 2000 (Minimum flow 20 %)

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Application Example 9 · Operating mode: Control by thermal power

Example: Using a thermal power setpoint and the controller's built-in PI-controller.

Register 200: Select "**7**" : Control by thermal power.
Register 301: Set "**65**" : Thermal power setpoint. E.g. 65 (6.5 kW).
Register 310: Set "**135**" : Gain constant of actuator's PI-controller. E.g. 135 (13.5).
Register 311: Set "**600**" : Time constant of actuator's PI-controller. E.g. 600 (60 s).
Register 410: Read current thermal power.

Name	Reg. Adr. (Hex.)	Reg. Adr. (Dec.)	Type	R/W	Values	Unit
Operating mode	0xC8	200	Uint16	W	7: Control by thermal power	-
Thermal power setpoint	0x12D	301	Uint16	W	65	kW*10
Xp PI controller	0x136	310	Uint16	W	135	Xp*10
Tn PI controller	0x137	311	Uint16	W	600	s*10
Actual value of thermal power	0x19A	410	Uint16	R	Example 58 = 5.8 kW	kW*10

Application Example 10 · Operating mode: Control by return temperature

Example: Using a return temperature setpoint and the controller's built-in PI-controller, with 1 Pt1000 sensor.

Register 123: Select "**6**" : Pt1000 sensor as sensor type P1.
Register 130: Select "**5**" : P1 for the return temperature.
Register 200: Select "**8**" : Control by return temperature.
Register 302: Set "**350**" : Return temperature setpoint. E.g. 350 (35 °C).
Register 310: Set "**135**" : Gain constant of actuator's PI-controller. E.g. 135 (13.5).
Register 311: Set "**600**" : Time constant of actuator's PI-controller. E.g. 600 (60 s).
Register 405: Read current return temperature.

Name	Reg. Adr. (Hex.)	Reg. Adr. (Dec.)	Type	R/W	Values	Unit
Sensor type P1	0x7B	123	Uint16	W	6: Pt1000 sensor	-
Source for supply and return temperature	0x82	130	Uint16	W	5: P1 for the return temperatur	-
Operating Mode	0xC8	200	Uint16	W	8: Control by return temperature	-
Return temperature setpoint	0x12E	302	Uint16	W	350	°C*10
Xp PI controller	0x136	310	Uint16	W	135	Xp*10
Tn PI controller	0x137	311	Uint16	W	600	s*10
Return temperature actual value	0x195	405	Uint16	R	Example: 320 = 32 °C	°C*10

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Application Example 11 · Limit power output

Example: Limiting the maximum thermal power output in the terminal unit.

Register 123: Select "**6**" : Pt1000 as sensor type P1.
Register 126: Select "**6**" : Pt1000 as sensor type P2.
Register 130: Select "**1**" : P1 for the supply temperature and P2 for the return temperature.
Register 314: Set "**85**" : Maximum thermal power limitation value. 0 in this register disables the function. E.g. 85 (8.5 kW).
Register 400: Input signal can vary from 0-100 % by the input from the BMS controller. E.g. 6000 (60 %).

Name	Reg. Adr. (Hex.)	Reg. Adr. (Dec.)	Type	R/W	Values	Unit
Sensor type P1	0x7B	123	Uint16	W	6: Pt1000 sensor	-
I/O type P2	0x7E	126	Uint16	W	6: Pt1000 sensor	-
Config. of sources for differential temperature calculation	0x82	130	Uint16	W	1: Supply: P1, Return: P2	-
Maximum thermal power limitation value	0x13A	314	Uint16	W	85	kW*10
Flow setpoint (Actuating signal)	0x190	400	Uint16	W	6000	%*100

Application Example 12 · Control minimum Delta T and limit power output

Example: Control minimum DT and limit energy output at the terminal unit.
Please note: Advanced setup - be carefully not to generate deadlocks.

Register 123: Select "**6**" : Pt1000 as sensor type P1.
Register 126: Select "**6**" : Pt1000 as sensor type P2.
Register 130: Select "**1**" : P1 for the supply temperature and P2 for the return temperature.
Register 316: Set "**40**" : Minimum differential temperature. E.g. 40. (4.0 °K).
Register 314: Set "**85**" : Maximum thermal power limitation value. 0 in this register disables the function. E.g. 85 (8.5 kW).
Register 400: Input signal can vary from 0-100 % by the input from the BMS controller. E.g. 6000 (60 %).

Name	Reg. Adr. (Hex.)	Reg. Adr. (Dec.)	Type	R/W	Values	Unit
Sensor type P1	0x7B	123	Uint16	W	6: Pt1000 sensor	-
I/O type P2	0x7E	126	Uint16	W	6: Pt1000 sensor	-
Config. of sources for differential temperature calculation	0x82	130	Uint16	W	1: Supply: P1, Return: P2	-
Minimum differential temperature limitation value	0x13C	316	Uint16	W	40	K*10
Maximum thermal power limitation value	0x13A	314	Uint16	W	85	kW*10
Flow setpoint (Actuating signal)	0x190	400	Uint16	W	6000	%*100

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Application Example 13 · Full flow flushing

Example: Full flow flushing for 60 minutes, occurring every 14 days.
In this example the valve will be 100 % open when flushing for the time defined in register 137 and the flushing will be repeated by the hours defined in register 132.

Register 132: Set "**336**" : Flushing interval in hours.
Register 137: Set "**60**" : The amount of time the valve is fully open in minutes.
Register 319: Remaining time until flushing (in hours) or end of current flushing in minutes.

Name	Reg. Adr. (Hex.)	Reg. Adr. (Dec.)	Type	R/W	Values	Unit
Flush timer	0x84	132	Uint16	W	336	Hours
Flush function open timer	0x89	137	Uint16	W	60	Minutes
Flush timer actual value	0x13F	319	Uint16	R	Example: 253 = 253 hours	-

Application Example 14 · Energy counter

Example: Count the energy consumption

Register 123: Select "**6**" : Pt1000 as sensor type P1.
Register 126: Select "**6**" : Pt1000 as sensor type P2.
Register 130: Select "**1**" : P1 for the supply temperature and P2 for the return temperature.
Register 101: RTC Time (No battery-buffer) in hours. E.g. 10 (10 hours).
Register 102: RTC Time (No battery-buffer) in minutes. E.g. 00 (00 minutes).
Register 325: Energy counter duration in hours since last reset / overflow.
Register 411: Energy consumption since 00:00 - RTC must be setup for readout to match.
Register 412: Energy consumption in the last 24 hours.
Register 416: Continous energy counter. Write 0 to reset counter.

Name	Reg. Adr. (Hex.)	Reg. Adr. (Dec.)	Type	R/W	Values	Unit
Sensor type P1	0x7B	123	Uint16	W	6: Pt1000 sensor	-
I/O type P2	0x7E	126	Uint16	W	6: Pt1000 sensor	-
Config. of sources for differential temperature calculation	0x82	130	Uint16	W	1: Supply: P1, Return: P2	-
RTC Time (hour)	0x65	101	Uint16	W	Example: 10	-
RTC Time (minute)	0x66	102	Uint16	W	Example: 39	-
Energy counter duration	0x145	325	Uint16	R	Example: 575	Hours
Energy since 00:00	0x19B	411	Uint16	R	Example: 745 = 74.5 kWh	kWh*10
Energy in the last 24 hours	0x19C	412	Uint16	R	Example: 1481 = 148.1 kWh	kWh*10
Continous energy counter	0x1A0	416	Uint16	R	Example: 34053 = 34053 kWh	kWh

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Application Example 15 · Status registers

Example: Monitoring system status registers.

Modbus register 318 returns a masked HEX value, depending on the status.

Name	Reg. adr. (Hex.)	Reg. adr. (Dec.)	Type	R/W	Values	Unit
Operating status	0x13E	318	Uint16	R	0x0000: Normal operation	-
					0x0001: Hardware fault	-
					0x0002: Hardware fault	-
					0x0004: Error during valve adaptation	-
					0x0008: Hardware fault	-
					0x0010: P1 range overrun	-
					0x0020: P2 range overrun	-
					0x0040: Calculation/control function malfunction	-
					0x0080: Fault - Actuator seized	-
					0x0100: Actuator is busy	-
					0x0200: Power limitation active	-
					0x0400: Return temperature limitation active	-
					0x0800: Delta-T limitation active	-
					0x1000: Flushing mode active	-
					0x4000: Fault - Valve blocked*	-

* Please check valve manually. The warning bit can be reset by e.g. a power cycle.

Application Example 16 · HVAC mode

Example: Heating, cooling or auto-select can be selected in register .

Register 201: Change the HVAC mode to Cooling
Auto-select can be chosen to allow the actuator to detect if cooling or heating is in effect.
The auto-select point is 25 °C for supply. Above 25 °C the actuator is in heating mode, and below 25 °C the actuator is in cooling mode.

Name	Reg. adr. (Hex.)	Reg. adr. (Dec.)	Type	R/W	Values	Unit
HVAC mode	0xC9	201	Uint16	W	2: Cooling	-

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Application Example 17 · Analogue 0-10 V control, with DT measurement

Example: Using P1 for analogue 0-10 V control and Modbus for status information to the BMS.
By default factory setting the Actuator is set up for analogue control via the analogue input P1.
Eg. 10 V at P1 gives 100 % open valve
Register 123: Set "**2**" : Gives 0-10 V input
Register 200: Set "**10**" : Control by 0-10 V P1.
Register 130: Set "**6**" : Supply: Bus-value, Return: P2"

Name	Reg. Adr. (Hex.)	Reg. Adr. (Dec.)	Type	R/W	Values	Unit
Sensortype P1	0x7B	123	Uint16	W	2: 0-10 V input	-
Operation Mode	0xC8	200	Uint16	W	10: Control by 0-10 V P1	-
Config of sources for differential temperature calculation	0x82	130	Uint16	W	"6: Supply: Bus-value, Return: P2"	-

Application Example 18 · Analogue 0-10 V control & Return temperature limitation

Example: Using P1 for analogue 0-10V control P2 for return temperature measurement and Modbus for status information to the BMS.

By default factory setting the Actuator is set up for analogue control via the analogue input P1.
Eg. 10 V at P1 gives 100 % open valve
Register 123: Set "**2**" : Gives 0-10 V input
Register 126: Select "**6**" : Pt1000 as sensor type P2
Register 200: Set "**10**" : Control by 0-10 V P1.
Register 130: Set "**6**" : Supply: Bus-value, Return: P2"
Register 302: Set "**300**" : Limits the return temperature to a fixed value of 30.0 °C

Name	Reg. Adr. (Hex.)	Reg. Adr. (Dec.)	Type	R/W	Values	Unit
Sensortype P1	0x7B	123	Uint16	W	2: 0-10 V input	-
I/O type P2	0x7E	126	Uint16	W	6: PT1000 sensor	-
Operation Mode	0xC8	200	Uint16	W	10: Control by 0-10 V P1	-
Config of sources for differential temperature calculation	0x82	130	Uint16	W	"6: Supply: Bus-value, Return: P2"	-
Return temperature limiting value	0x12E	315	Uint16	W	"Example: 300 = 30.0 °C"	C*10

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Application Example 19 · Room temperature control via Modbus with DT limitation

Example: Controlling room temperature with Modbus and limiting DT.
Using P1 and P2 to measure DT temperature and Modbus to control the room temperature
Register 123: Select "**6**" : Pt1000 as sensor type P1.
Register 126: Select "**6**" : Pt1000 as sensor type P2.
Register 200: Set "**10**" : Control by Room temperature.
Register 131: Set "**0**" : Room temperature source"
Register 403: Actual room temperature
Register 300: Set "**250**" : Sets the room tempereature to 25.0 °C
Register 130: Set "**6**" : Supply: Bus-value, Return: P2"
Register 316: Set "**200**" : Sets the minimum differential temperature to 20.0 °C

Name	Reg. Adr. (Hex.)	Reg. Adr. (Dec.)	Type	R/W	Values	Unit
Sensortype P1	0x7B	123	Uint16	W	6: PT1000 sensor	-
I/O type P2	0x7E	126	Uint16	W	6: PT1000 sensor	-
Operation Mode	0xC8	200	Uint16	W	6: Control by Room temperature	-
Select source of room temperature	0x83	131	Uint16	W	0: Write to register 403	-
Room temperature Actual	0x193	403	Int 16	R	"Example: 240 = 24.0 °C"	°C*10
Room temperature Setpoint	0x12C	300	Uint16	W	"Example: 250 = 25.0 °C"	°C*10
Config of sources for differential temperature calculation	0x82	130	Uint16	W	"6: Supply: Bus-value, Return: P2"	-
"Minimum differential temperature limitation value"	0x13C	316	Uint16	W	"Example: 200 = 20.0°K"	K*10

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Register List - (Default values are marked in **BOLD**)

Name	Description	Reg. adr. (Hex.)	Reg. adr. (Dec.)	Type	R/W	Values	Unit
Software version	Software version	0x1	1	Uint16	R	202	--
HW version	Hardware version:	0x2	2	Uint16	R	241 = LOGICA Digital DN10-32 497 = LOGICA Digital DN40-50	--
SerNum1	Serial number = [SerNum1] [SerNum2] [SerNum3]	0x3	3	Uint16	R	0 - 65535	--
SerNum2		0x4	4	Uint16	R	0 - 65535	--
SerNum3		0x5	5	Uint16	R	0 - 65535	--
Time (hour)	RTC time hours (No battery-buffer)	0x65	101	Uint16	R	0 - 23	--
Time (minute)	RTC time minutes (No battery-buffer)	0x66	102	Uint16	R	0 - 59	--
Actuating control curve	**Linear**	0x67	103	Uint16	R/W	**0**	--
	Equal percentage (EQ %)					1	--
MAC Address	Address for the actuator	0x68	104	Uint16	R/(W)	1 - 247	--
	Writeable if DIP-switch is set to 63						
RS485 Baud Rate	Default 19200	0x69	105	Uint16	R/W	0	--
	9600					1	
	19200					**2**	
	38400					3	
	57600					4	
	76800					5	
	115200					6	
RS485 stop bits	**1 stop bit**	0x6A	106	Uint16	R/W	**1**	--
	2 stop bits					2	

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Register List - (Default values are marked in **BOLD**)

Name	Description	Reg. adr. (Hex.)	Reg. adr. (Dec.)	Type	R/W	Values	Unit
RS485 parity	**None**	0x6B	107	Uint16	R/W	**0**	--
	Even					1	
	Odd					2	
Close when adjusting range	Region of control signal where the end positions in which the actuator stays in position	0x6D	109	Uint16	R/W	0 - 500 (30 Default)	%*100
Select valve type (DN10-32)	**Linear (Default)**	0x6E	110	Uint16	R/W	**0**	--
	OPTIMA Compact Low 2.5 DN10/15 30-200 l/h					1	
	OPTIMA Compact Low 5.0 DN10/15 65-370 l/h					2	
	OPTIMA Compact High 2.5 DN15/20 100-575 l/h					3	
	OPTIMA Compact High 5.0 DN15/20 220-1330 l/h					4	
	OPTIMA Compact High 5.5 DN20 300-1800 l/h					5	
	OPTIMA Compact low 5.5 DN25 280-1800 l/h					6	
	OPTIMA Compact High 5.5 DN25L 600-3609 l/h					7	
	OPTIMA Compact 5.5 DN32 550-4001 l/h					8	
Select valve type (DN40-50) (DN50-80 flanged) (DN50-100 Ultra)	**Linear (Default)**	0x6E	110	Uint16	R/W	**0**	--
	OPTIMA Compact DN40 1370-9500 l/h					1	
	OPTIMA Compact DN50 1400-11500 l/h					2	
	OPTIMA Compact DN50 flanged LF 2.5-15.0 m3/h					3	
	OPTIMA Compact DN50 flanged HF 3.9-24.0 m3/h					4	
	OPTIMA Compact DN65 flanged LF 4.4-25.0 m3/h					5	
	OPTIMA Compact DN65 flanged HF 5.9-35.0 m3/h					6	
	OPTIMA Compact DN80 flanged LF 5.3-34.0 m3/h					7	
	OPTIMA Compact DN80 flanged HF 7.0-43.0 m3/h					8	
	OPTIMA Compact DN50 Ultra HF 1.4-11.5 m3/h					9	
	OPTIMA Compact DN65 Ultra LF 3.0-16.0 m3/h					10	
	OPTIMA Compact DN65 Ultra HF 4.2-24.0 m3/h					11	
	OPTIMA Compact DN80 Ultra LF 4.4-25.0 m3/h					12	
	OPTIMA Compact DN80 Ultra HF 6.0-35.0 m3/h					13	
	OPTIMA Compact DN100 Ultra LF 5.3-34.0 m3/h					14	
	OPTIMA Compact DN100 Ultra HF 7.0-43.0 m3/h					15	

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Register List - (Default values are marked in **BOLD**)

Name	Description	Reg. adr. (Hex.)	Reg. adr. (Dec.)	Type	R/W	Values	Unit
Valve stroke	Valve stroke of the selected valve Valid for DN10-32	0x6F	111	Uint16	R/W	5 - 90	mm*10
Maximum flow	Maximum flow of the selected valve	0x71	113	Uint16	R/W	10 - 50000	l/h
Stroke limitation by flow for heating	Range between min/max of the selected valve	0x72	114	Uint16	R/W	10 - 50000	l/h
Stroke limitation by flow for cooling	Range between min/max of the selected valve	0x73	115	Uint16	R/W	10 - 50000	l/h
Initial control signal	Valve position on power up before bus communication established	0x76	118	Uint16	R/W	0 - 10000	%*100
Medium energy constant	Default value (Water = 4183 J/(kg*K)	0x77	119	Uint16	R/W	180 - 18000	J/(kg*K)
Inversion of the valve actuating direction	**Direct**	0x78	120	Uint16	R/W	**0**	--
	Inverted					1	
LED mode	LED off	0x79	121	Uint16	R/W	0	--
	Device status without bus					1	
	Device status with bus					**2**	
Actuating speed	**Normal: 22 s/mm**	0x7A	122	Uint16	R/W	**0**	--
	Slow: 28 s/mm					1	
	Fast: 16 s/mm					2	

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Register List - (Default values are marked in **BOLD**)

Name	Description	Reg. adr. (Hex.)	Reg. adr. (Dec.)	Type	R/W	Values	Unit
Sensor type P1	Off	0x7B	123	Uint16	R/W	0	--
	Binary input					1	
	0-10 V input					**2**	
	Pt1000					6	
P1 inversion (Binary input)	**Direct**	0x7C	124	Uint16	R/W	**0**	--
	Inverted					1	
Correction value P1	Offset of sensor value P1	0x7D	125	Int16	R/W	-50 to +50	°K*10
Sensor/output type P2	**Off**	0x7E	126	Uint16	R/W	**0**	--
	Binary input					1	
	0-10 V input					2	
	Pt1000					6	
	0-10 V output register 126					8	
	0-10 V Y position feedback register 401					9	
P2 inversion (Binary input)	**Direct**	0x7F	127	Uint16	R/W	**0**	--
	Inverted					1	
Correction value P2	Offset of sensor value P2	0x80	128	Int16	R/W	-50 to +50	°K*10
P2 inversion (Analog output)	**Direct**	0x81	129	Uint16	R/W	**0**	--
	Inverted					1	

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Register List - (Default values are marked in **BOLD**)

Name	Description	Reg. adr. (Hex.)	Reg. adr. (Dec.)	Type	R/W	Values	Unit
Source for supply and return temperature	**Bus values via register 404 and 405**	0x82	130	Uint16	R/W	**0**	--
	Supply: P1, return: P2					1	
	Supply: P2, return: P1					2	
	Supply: P1, return: Bus value					3	
	Supply: P2, return: Bus value					4	
	Supply: Bus value, return: P1					5	
	Supply: Bus value, return: P2					6	
Room temperature source	0	0x83	131	Uint16	R/W	Bus via register 403	--
	1					P1	
	2					P2	
Flush timer	Configuration of timer value. Function inactive if timer = "0"	0x84	132	Uint16	R/W	0 - 4320	Hours
Communication failure mode	**No change**	0x85	133	Uint16	R/W	**0**	--
	Closed (0 %) when time is exceeded (120 s)					1	
	Open (100 %) when time is exceeded (120 s)					2	
	Emergency position (Register 134) when time is exceeded (120 s)					3	
Emergency position	Position in case of bus communication failure or invalid control function. Default = 30 %	0x86	134	Uint16	R/W	0 - 10000	%*100
Valve exercise timer	Configuration of timer value. Function inactive with timer value "0"	0x88	136	Uint16	R/W	0 - 4320	Hours
Flush function open timer	Duration the actuator stays at 100 % open during flushing event	0x89	137	Uint16	R/W	0 - 600	Minutes
Service command	**Normal operation**	0x8A	138	Uint16	R/W	**0**	--
	Valve adaption					1	
	Flush valve					2	
	Synchronize valve					3	
	Reset error messages					4	
	Bus restart					5	
	Reset to factory settings					6	

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Register List - (Default values are marked in **BOLD**)

Name	Description	Reg. adr. (Hex.)	Reg. adr. (Dec.)	Type	R/W	Values	Unit
Operating mode	Control via external control signal (Register 400)	0xC8	200	Uint16	R/W	0	--
	Open (100 %)					1	
	Closed (0 %)					2	
	Min. Pos (Register 312)					3	
	Reserved					4	
	Max. Pos (Register 313)					5	
	Control by room temperature (Register 403 and 300)					6	
	Control by thermal power (Register 410 and 301)					7	
	Control by return temperature (Register 405 and 302)					8	
	Reserved					9	
	Control by Y-in 0..10 V (P1)					**10**	
Choose HVAC mode (Changeover)	Shut-off	0xC9	201	Uint16	R/W	0	--
	Heating					**1**	
	Cooling					2	
	Automatic via supply temperature (No activation of Change Over output signal (P2))					3	
Room temperature setpoint	Room temperature setpoint	0x12C	300	Uint16	R/W	0 - 500	°C*10
Thermal power setpoint	Thermal power setpoint. Positive values for both heating and cooling.	0x12D	301	Uint16	R/W	0 - 50000	kW*10
Return temperature setpoint	Return temperature setpoint	0x12E	302	Uint16	R/W	0 - 1200	°C*10
Xp thermal power limitation	Gain constant for power limitation	0x130	304	Uint16	R/W	20 - 60000	Xp*10
Xp return temperature limitation	Gain constant for return temperature limitation	0x131	305	Uint16	R/W	20 - 60000	Xp*10
Xp dT limitation	Gain constant delta T limitation	0x132	306	Uint16	R/W	20 - 60000	Xp*10
Xp PI controller	Proportional gain constant of PI controller	0x136	310	Uint16	R/W	20 - 60000	Xp*10
Tn PI controller	Time constant of PI controller	0x137	311	Uint16	R/W	0 - 7200	s*10
Minimum control signal	Lower limit of permissible control signal	0x138	312	Uint16	R/W	0 - 10000	%*100
Maximum control signal	Upper limit of permissible control signal	0x139	313	Uint16	R/W	0 - 10000	%*100
Maximum thermal power limiting value	Permissible maximum value for thermal power. Positive values for heating and cooling. Value 0 = Inactive	0x13A	314	Uint16	R/W	0 - 50000	kW*10
Return temperature limiting value	Permissible maximum value for return temperature. (max/min depending of heating/cooling mode) Value 0 = Inactive	0x13B	315	Uint16	R/W	0 - 1200	°C*10
Differential temperature limiting value	Permissible maximum value for diffrential temperature. Positive values for heating and cooling. Value 0 = Inactive	0x13C	316	Uint16	R/W	0 - 1000	°C*10

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Register List - (Default values are marked in **BOLD**)

Name	Description	Reg. adr. (Hex.)	Reg. adr. (Dec.)	Type	R/W	Values	Unit
Operating status/error	**Normal operation**	0x13E	318	Uint16	R	**0x0000**	--
	Hardware fault					0x0001	
	Hardware fault					0x0002	
	Error during valve adaptation					0x0004	
	Hardware fault					0x0008	
	P1 range overrun					0x0010	
	P2 range overrun					0x0020	
	Calculation/control function malfunction					0x0040	
	Actuator unable to open or close					0x0080	
	Actuator is busy					0x0100	
	Power limitation active					0x0200	
	Return temperature limitation					0x0400	
	Delta-T limitation active					0x0800	
	Flushing mode active					0x1000	
	Reserved					0x2000	
	Valve blockage*					0x4000	
	Reserved					0x8000	
Flush timer actual value	Remaining time until start of flushing (Hours)	0x13F	319	Uint16	R	0 - 4320	Hours
	Remaining time until until end of flushing (Minutes)					0 - 600	Minutes
Valve exercise	Remaining time until valve exercise	0x140	320	Uint16	R	0 - 4320	Hours
Operating hours	Total operating time of the actuator	0x141	321	Uint32	R	0 - 4294967295	Seconds
Distance counter	Overall distance covered by the actuator since manufacturing	0x143	323	Uint32	R	0 - 4294967295	mm*10

* Check valve and actuator for a mechanical fault.

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Register List - (Default values are marked in **BOLD**)

Name	Description	Reg. adr. (Hex.)	Reg. adr. (Dec.)	Type	R/W	Values	Unit
Energy counter duration	Time since last reset/ overflow of continous energy counter	0x145	325	Uint16	R	0 - 65500	Hours
External control signal	External control signal for relative flow rate	0x190	400	Uint16	R/W	0 - 10000	%*100
Actual value control signal	Actual value relative flow rate in percent	0x191	401	Uint16	R	0 - 10000	%*100
Actual flow rate	Actual value flow rate calculated from valve parameters	0x192	402	Uint16	R	0 - 65535	l/h
Room temperature actual value	Room temperature actual value (write protected when source P1 or P2 is assigned)	0x193	403	Int16	R/(W)	0 - 1500	°C*10
Supply temperature actual value	Supply temperature actual value (write protected when source P1 or P2 is assigned)	0x194	404	Int16	R/(W)	-500 to +1500	°C*10
Return temperature actual value	Return temperature actual value (Write protected when source P1 or P2 is assigned)	0x195	405	Int16	R/(W)	-500 to +1500	°C*10
Differential temperature actual value	Calculated from supply/ return temperature	0x196	406	Int16	R	-2000 to +2000	°K*10
Warning: Leak detected	**No warning**	0x197	407	Uint16	R	**0**	--
	Leak detected Differential temperature over 8 °K while valve is closed for over 6 hours					1	
Binary input P1	**Off**	0x198	408	Uint16	R	**0**	--
	On					1	
Binary input P2	**Off**	0x199	409	Uint16	R	**0**	--
	On					1	
Actual value of thermal power	Current thermal power calculated	0x19A	410	Uint16	R	0 - 65535	kW*10
Energy since 00:00	Thermal power since midnight (Based on the internal RTC time)	0x19B	411	Uint16	R	0 - 65535	kWh*10
Energy in the last 24 h	Energy in the last 24 hours	0x19C	412	Uint16	R	0 - 65535	kWh*10
Status HVAC mode (Changeover)	Off (shut-off)	0x19D	413	Uint16	R	0	--
	Heating					**1**	
	Cooling					2	
Actual flow rate limitation	Current active limitation, dependent on heating or cooling mode	0x19E	414	Uint16	R	50 - 50000	l/h
PI controller output value	PI controller output	0x19F	415	Uint16	R	0 - 100	%
Continuous energy counter	Calculated value of energy (Write 0 to reset)	0x1A0	416	Uint16	R/W	0 - 65500	kWh*10
Target position	Current target in mm for the stem	0x1A2	418	Uint16	R	0 - 150	mm*10
Actual position	Actual position of the stem	0x1A3	419	Uint16	R	0 - 150	mm*10

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Register List - (Default values are marked in **BOLD**)

Name	Description	Reg. adr. (Hex.)	Reg. adr. (Dec.)	Type	R/W	Values	Unit
Overall stroke	Stroke between upper position of actuator and fully closed (Only DN40 - DN80)	0x1A4	420	Uint16	R	215	mm*10
Analog Input P1	Measured value at input P1. Unit dependent on selected sensor type	0x1A8	424	Int16	R	0 / 1	0/1
						0 - 1000	%*10
						-500 to +1500	°C*10
						-2000 to +2000	°K*10
Analog Input P2	Measured value at input P2. Unit dependent on selected sensor type	0x1A9	425	Int16	R	0 / 1	0/1
						0 - 1000	%*10
						-500 to +1500	°C*10
						-2000 to +2000	°K*10
Analog Output P2	Value at the output P2 (For configuration of Sensor/Output type P2 = 0 - 10 V output)	0x1AA	426	Uint16	R/W	0 - 1000	%*10

Frese A/S
Tel: +45 58 56 00 00
info@frese.dk
www.frese.eu