

Data sheet

Intelligent electrical actuator AMEi 6 iNET

Description

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AMEi 6 **iNET** actuator for intelligent network balancing, enables remote adjustment of differential pressure (Δp) setting on AFA 2, AFD 2, AFP 2, AFPA 2, AFPB 2, AFPQ 2 and AFQMP 2 controllers, used in District Heating/Cooling systems.

Changing heat consumption requires changes in heat distribution. Therefore the Δp should be optimised at each branch. With **iNET** the Δp can be remotely adjusted. Input for pump optimization.

Features:

- Electrical manual operation
- Position indication, LED signalization
- Adjustable min/max Δp setting by the end switch (adjustable stroke limitation of the pressure actuator)
- Thermal and overload protection
- External reset button
- Easy mounting, pre-fixing with the wire lock
- Anti-rotation strap for preventing actuator from rotating
- Automatic calibration to the pressure actuator stroke-reduced commissioning time
- Maintenance free
- Voltage or current input/output signal Y/X
- Modbus RS485
- Galvanic insulation Y, X
- Equipped with cable glands

Main Data:

- Nominal voltage:
 - 24 V ac/dc, 50/60 Hz
 - 230 V ac, 50/60 Hz
- Control input signal: modulating
- Torque: 7 Nm
- Speed 36 s/turn (18 sec/mm)
- Full stroke time ~30 min

Ordering

Type	Supply voltage (V)	Code No.
AMEi 6 iNET	230 ac	082G4302
AMEi 6 iNET	24 ac/dc	082G4303

Technical data

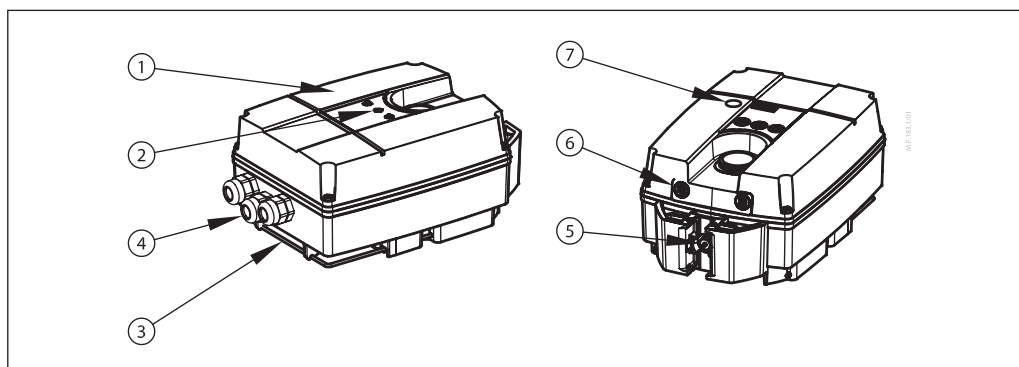


Please check power supply and power consumption prior connection!

Actuator type		AMEi 6 iNET
Power supply	V	24 V ac/dc or 230 V ac; +10...-15%
Power consumption	VA	8 (24V) 16 (230V)
Frequency	Hz	50/60
Control input Y	V	0-10 (2-10) [Ri = 40 kΩ]
	mA	0-20 (4-20) [Ri = 500 Ω]
Control output X	V	0-10 (2-10) [Ri = 10 kΩ]
	mA	0-20 (4-20) [Ri = 510 Ω]
Torque	Nm	7
Speed	s/turn	36
Full stroke time	min	30
Max. medium temperature	°C	Depends on valve type. No limitations for 150 °C
Ambient temperature		0 ... + 55
Storage and transport temperature		- 40... +70 (storing for 3 days)
Humidity		5-95% (no condensing)
Protection class		230V- protection class II 24V- protection class III
Grade of enclosure		IP 54
Weight	kg	2.5
Manual operation		Electrical
Power failure response		Actuator remains in last position
CE - marking in accordance with the standards		Low Voltage Directive (LVD) 2014/35/EU: EN 60730-1, EN 60730-2-14 Electromagnetic Compatibility Directive (EMC) 2014/30/EU: EN 61000-6-2, EN 61000-6-3

Design

1. Service cover
2. Function buttons
3. Wire lock
4. Cable gland
5. End switch
6. LED signalization for actuator operating modes
7. LED signalization for Modbus communication status



Installation

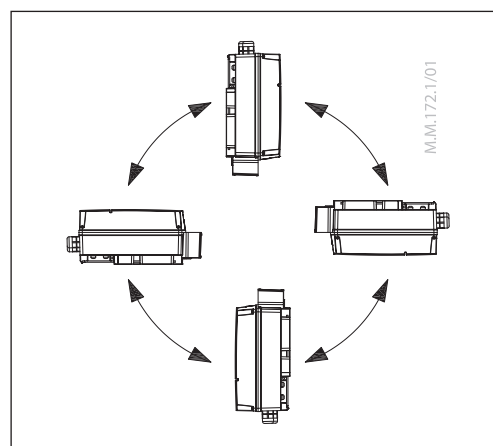
The actuators should be mounted in a dry environment.
In case of outdoor installation, the actuator has to be protected against climatic influences by suitable measures. For exact installation instruction manuals for relevant pressure actuator should be followed.

Mechanical

Please check the allowed installation positions for the valve and actuator. The actuator can be installed in all positions (*see scheme below*). Allow for necessary clearance for maintenance purposes (*see section Dimensions*).

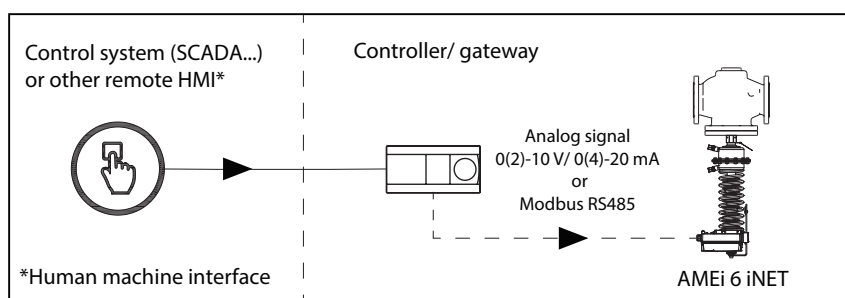
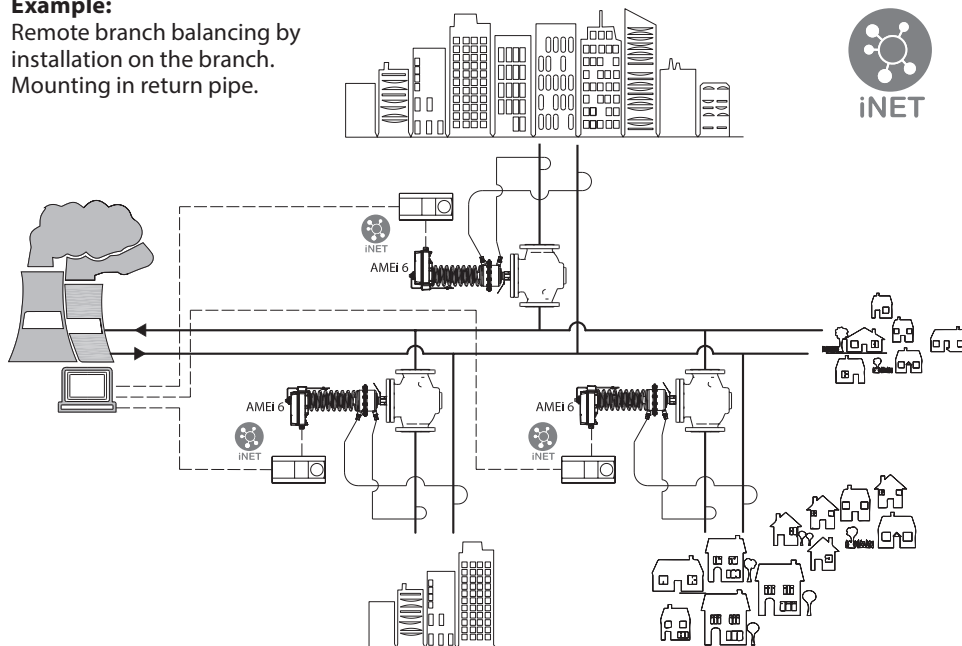
Electrical connection

Electrical connections can be accessed by removing the service cover.



Application principle

Example:
Remote branch balancing by
installation on the branch.
Mounting in return pipe.



Actuator operating modes

LED operating mode indicator

The three-colour (green/yellow/red) LED function indicators are located at the front of actuator top cover. They indicate different operating modes.

RESET button

Actuators AMEi 6 iNET/iSET have external RESET button which is located on top cover of the actuator. With this button you can enter or exit Stand-By mode (press once) or Self positioning mode based on preset end switch positions (press and hold for 5 seconds). See next paragraph for mode details.

LED operating mode indicator

The three-colour (green/yellow/red) LED function indicators are located at the front of actuator top cover. They indicate different operating modes.

Operating modes

• Calibration mode:

For calibration to the desired pressure actuator stroke (min-max spring setting). To start calibration procedure, **press and hold RESET button for 5 seconds** until the green light starts flashing. End positions of the actuator are automatically adopted based on pre-set end switch positions pins. Actuator goes to the stationary mode and starts responding to the control signal.

• Stand-By mode for manual operation

Press the RESET button for 1 sec. to enter Stand-By mode. The actuator stops in current position and stops responding to any control signal. Red light is constantly lit. You can manually operate the actuator **by pressing and holding the SQUEEZE SPRING or STRETCH SPRING button for > 10 sec.** Actuator will start to travel automatically in required direction. To stop it in desired position, **press the SQUEEZE SPRING or STRETCH SPRING button again.**

For fine adjustments press & hold the SQUEEZE SPRING or STRETCH SPRING button for < 10 sec. Actuator will travel in required direction as long as the button is pressed, but no longer than 10 sec. **Stand-by mode** can be very useful during the commissioning, or for service purposes. To exit Stand-By mode press the RESET button again.

• Positioning mode

The actuator is operating automatically, according to the control signal. When positioning is finished the actuator goes to stationary mode.

• Stationary mode

The actuator is operating without errors.

• Error mode

Working temperature is too high - check the ambient temperature.

Actuator is not properly mechanically connected - check the connection. Pressure actuator is blocked.

LED signalling

Indication type			Operating mode
<p>Actuator is squeezing the spring</p>		Constantly lit	Normal mode Actuator is squeezing the spring
<p>Actuator is stretching the spring</p>		Constantly lit	Normal mode Actuator is stretching the spring
<p>Actuator is squeezing the spring</p>		Flashing (1s cycle)	Calibration mode Actuator is squeezing the spring
<p>Actuator is stretching the spring</p>		Flashing (1s cycle)	Calibration mode Actuator is stretching the spring
<p>Actuator has reached the upper end position (squeezed spring)</p>		Constantly lit	Normal mode Actuator stops at the upper end position
<p>Actuator has reached the bottom end position (stretched spring)</p>		Constantly lit	Normal mode Actuator stops at the bottom end position
<p>Y signal is present, actuator reached Set-Point</p>		Flashing	Normal mode Actuator stopped at the position which match Y set-point
<p>Y signal is not connected - (broken wire)</p>		2-fast Flash after 1 s period	Normal mode Y signal is not connected - (broken wire) motor stopped at position when Y was last present
<p>Stand-By mode</p>		Constantly lit	Stand-by mode
<p>Error mode</p>		Flashing	Error mode
<p>Actuator is squeezing the spring</p>		Flashing 1s cycle	Manual mode Button „SQUEEZE SPRING“ >10 sec Actuator is squeezing the spring
		Constantly lit	
<p>Actuator is stretching the spring</p>		Constantly lit	Manual mode Button „STRETCH SPRING“ >10 sec Actuator is stretching the spring
		Flashing 1s cycle	
<p>Actuator is squeezing the spring</p>		Constantly lit	Manual mode Button „SQUEEZE SPRING“ <10 sec Actuator is squeezing the spring
<p>Actuator is stretching the spring</p>		Constantly lit	Manual mode Button „STRETCH SPRING“ <10 sec Actuator is stretching the spring
<p>Motor stopped in the "SQUEEZE SPRING" positioning mode</p>		Constantly lit	Manual mode Motor stopped in the "SQUEEZE SPRING" positioning mode
<p>Motor stopped in the "STRETCH SPRING" positioning mode</p>		Constantly lit	Manual mode Motor stopped in the "STRETCH SPRING" positioning mode

Indication type			Modbus communication status
<p>No power supply</p>		Dark	No communication
		Flashing	RX telegram is for me
			RX activity on BUS
			Error in message interpretation

DIP switch setting

S1/DIP 1

Input signal type selector:

OFF: Input signal Y is set to voltage (V)

ON: Input signal Y is set to current (mA)

S1/DIP 2

Output signal type selector:

OFF: Output signal X is set to voltage (V)

ON: Output signal X is set to current (mA)

S1/DIP 3

Direct or inverse acting selector (Fig. 2):

OFF: Actuator is direct acting to input signal

ON: Actuator is inverse (reverse) acting to control signal (only for AMEI 6 iNET in combination with AFA 2)

S1/DIP 4

Normal or sequential mode selector:

OFF: Actuator is working in range 0(2)-10 V or 0(4)-20 mA.

ON: Actuator is working in sequential range; 0-5 V or (0-10 mA) or (5-10 V) or (10-20 mA).

Signal range selector S1/DIP 6 sets the sequential range

S1/DIP 5

0-10 V/2-10 V – Input/output

OFF: 0-10 V; input signal is in the range from 0-10 V (voltage input) or from 0-20 mA (current input)

ON: 2-10 V; input signal is in the range from 2-10 V (voltage input) or from 4-20 mA (current input)

Signal range selector S1/DIP 1 & DIP 2 sets Y and X signal.

S1/DIP 6

Sequential range selector:

OFF: 0-5 V or (0-10 mA)

ON: 5-10 V or (10-20 mA).

[S1/DIP 4 = ON!]

S1/DIP 7

Not used

S1/DIP 8

Not used

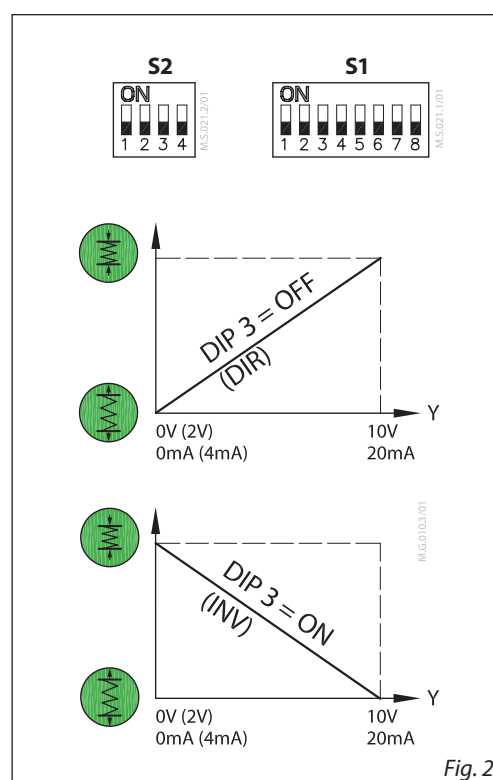


Fig. 2

S2/DIP 1

Not used

S2/DIP 2

Not used

S2/DIP 3

Not used

S2/DIP 4*

OFF: Analog signal (V/mA)

Actuator operates in **analog mode**

ON: MOD BUS

Actuator operates in **digital mode**

*In **analog mode** S2/DIP 4 = OFF, DIP switches S1/DIP 1-7 work as active functions.

In **digital mode** S2/DIP 4 = ON, DIP switches S1/DIP 1-7 work as a digital addresses.

In digital mode Modbus RS485 could be used either for the monitoring purposes or for the AMEI 6 actuator positioning.

Wiring

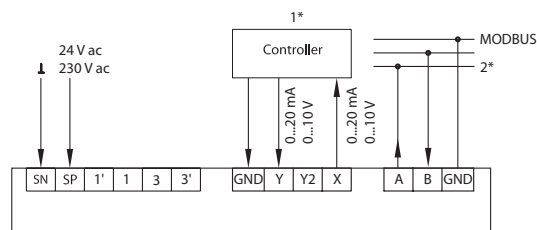
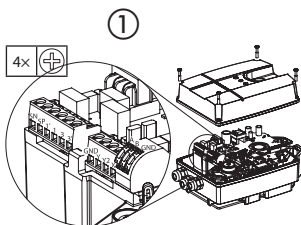


Do not touch anything on the PCB! Do not remove the cover before the power supply is fully switched off.

Recommended cross-sectional area of the wiring is 1.5 mm²



24V ac/dc,
230V ac



1* - only analog signal

2* - only Modbus signal

1* + 2* - analog signal + Modbus setting and monitoring

* see DIP switch setting

SN	0 V	Neutral
SP	24 V ac/dc, 230 V ac	Power supply
Y	0(2)-10 V 0(4)-20 mA	Input
X	0(2)-10 V 0(4)-20 mA	Output
A	D-	Modbus
B	D+	
GND	Ground	

Modbus registers - Configuration

MODBUS virtual address [hex]	MODBUS virtual address [dec]	Read/Write	Modbus function	Modbus Data Type	Category	Object / Parameter name	Description	Persistent	State Text	Number Of States	Default
0x8000	32768	R/W	3,4 & 6	WORD	Configuration	Direct or Inverse operation Mode	Select here between Direct and Inverse operation mode	N	0 - Direct 1 - inverse	2	Direct
0x8001	32769	R/W	3,4 & 6	WORD	Configuration	Analog Control signal type and range	Used to select the analog control inputs type and range	N	1: 0-5Vdc 2: 0-10Vdc 3: 2-10Vdc 4: 5-10Vdc 5: 2-6Vdc 6: 6-10Vdc 7: 0-20mA 8: 4-20mA	8	0-10Vdc
0x8002	32770	R/W	3,4 & 6	WORD	Configuration	Control mode	Select the actuator application mode	Y	1 - Analog control 2 - Digital control	2	Analog control
0x8010	32784	R/W	3,4 & 6	WORD	Configuration	Endian type	Byte ordering for LONG and FLOAT types	Y	0 - Big Endian 1 - Little Endian	2	0 - Big Endian
0x8011	32785	R/W	3,4 & 6	WORD	Configuration	Baud Rate	Baud Rate used for Modbus communication	Y	1: Auto Baud rate Detection 2: 9600 bps 3: 19200 bps 4: 38400 bps 5: 57600 bps 6: 76800 bps 7: 115200 bps	7	Auto Baud rate Detection
0x8012	32786	R/W	3,4 & 6	WORD	Configuration	UART parity	Select UART parity	Y	1: 1-8-N-2 2: 1-8-O-1 3: 1-8-E-1 4: 1-8-N-1 5: Auto parity	5	Auto parity

MODBUS virtual address [hex]	MODBUS virtual address [dec]	Read/Write	Modbus function	Modbus Data Type	Category	Object / Parameter name	Description	Persistent	Min	Max	Unit	Default
0x8013	32787	R	3,4	WORD	Configuration	MAC Address	MAC Address used for Modbus communication	N	1	127	na	na

Modbus registers - Information

MODBUS virtual address [hex]	MODBUS virtual address [dec]	Read/Write	Modbus function	Modbus Data Type	Category	Object / Parameter name	Description	Persistent	Reliability	Unit
0x8100	33024	R	3&4	FLOAT	Information	Voltage or Current on analog input Y1	Voltage(V) or current (mA) level on the Y1 analog input, measured by the actuator	N	Voltage level measured i.e. 0.000... 10.000 correspond to 0.00... 10.00 V or in mA, i.e. 0.000 ... 20.000 correspond to 0.000 ... 20.000 mA ; -2 indicate broken wire	Volt / mA
0x8102	33026	R	3&4	FLOAT	Information	Analog input Y1 in %	Voltage(V) or current (mA) level on the Y1 analog input, measured by the actuator in %	N	0 - 100 %	%
0x8104	33028	R	3&4	FLOAT	Information	Voltage or Current on analog input Y2	Voltage(V) or current (mA) level on the Y2 analog input, measured by the actuator	N	Voltage level measured i.e. 0.000... 10.000 correspond to 0.00... 10.00 V or in mA, i.e. 0.000 ... 20.000 correspond to 0.000 ... 20.000 mA ; -2 indicate broken wire	Volt / mA
0x8106	33030	R	3&4	FLOAT	Information	Analog input Y2 in %	Voltage(V) or current (mA) level on the Y2 analog input, measured by the actuator in %	N	0 - 100 %	%

Modbus registers - Information (continued)

MODBUS virtual address [hex]	MODBUS virtual address [dec]	Read/Write	Modbus function	Modbus Data Type	Category	Object / Parameter name	Description	Persistent	Min	Max	Unit	Default
0x8108	33032	R	3 & 4	WORD	Information	Number of connected MCVs	Number of connected MCVs	N	0	2	na	0
0x810A	33034	R	3 & 4	WORD	Information	SW version	SW version of the actuator	N	0	0xFFFF	na	0
0x810B	33035	R	3 & 4	WORD	Information	HW version	HW version of the actuator	N	0	0xFFFF	na	0
0x810C	33036	R	3&4	LONG	Information	Production ID	Serial number of the actuator	N	0	0xFFFFFFFF	na	0
0x8120	33056	R/W	3 & 4	STRING	Information	Device name	Ascii coded STRING	Y	-			
0x8140	33088	R	3 & 4	STRING	Information	Model name	AMEi 6, iSET or iNET, 24V or 230V	N				
0x8160	33120	R	3 & 4	STRING	Information	Vendor name	Danfoss A/S	N				
0x8180	33152	R/W	3,4 & 16	STRING	Information	Location name	Ascii coded STRING	Y				
0x81A0	33184	R	3 & 4	STRING	Information	Serial number	Description of this object holds the serial number of the actuator, programmed at the production time.	N				

Modbus registers - Operating

MODBUS virtual address [hex]	MODBUS virtual address [dec]	Read/Write	Modbus function	Modbus Data Type	Category	Object / Parameter name	Description	Persistent	Reliability	Unit	Default
0x8200	33280	R/W	3,4 & 16	FLOAT	Operating	Actuator setpoint	Actuator setpoint in %	N	Setpoint of the actuator, i.e. 0 ...100 correspond to 0 ... 100%. This register is valid only when digital mode is chosen	%	0
0x8202	33282	R	3 & 4	FLOAT	Operating	Actuator feedback	Actuator's position indication in %	N	Actuator's position indication in percent, i.e. 0 ... 100 correspond to 0 ... 100%. This register is valid only when digital mode is chosen.	%	0

MODBUS virtual address [hex]	MODBUS virtual address [dec]	Read/Write	Modbus function	Modbus Data Type	Category	Object / Parameter name	Description	Persistent	State Text	Number Of States	Default
0x8204	33284	R/W	3,4 & 6	WORD	Operating	Actuator Mode and special features	Shows present mode of actuator. Calibration can be started from here	N	1 - No Init mode, 2 - Normal mode, 3 - Calibration mode, 4 - Alarm mode, 5 - Service mode, 6 - Sleep mode,	6	No init mode
0x8205	33285	R/W	3,4 & 6	WORD	Operating	Analog output type	Selecting analog output type	N	0 - X signal (voltage) 1 - X signal (current) 2 - Remote analog output (voltage) 3 - Remote analog output (current)	4	0 - X signal (voltage)

MODBUS virtual address [hex]	MODBUS virtual address [dec]	Read/Write	Modbus function	Modbus Data Type	Category	Object / Parameter name	Description	Persistent	Reliability	Unit	Default
0x8206	33286	R/W	3,4 & 16	FLOAT	Operating	Voltage or current on analog output	Voltage (V) or current (mA) analog output (Feedback signal or remote I/O)	N	Voltage level i.e. 0.000 -10.000 correspond to 0.000 -10.000 V, Current level i.e. 0.000 -20.000 correspond to 0mA - 20mA	Volt / mA	0

Modbus registers - Alarms & warnings

MODBUS virtual address [hex]	MODBUS virtual address [dec]	Read/Write	Modbus function	Modbus Data Type	Category	Object / Parameter name	Description	Persistent	Min	Max	Unit	Default
0x8300	33536	R	3&4	WORD	Alarms & warnings	Alarm: Error during calibration	There was an error during calibration of actuator	N	ON	OFF	na	Bit 0: na
0x8300	33536	R	3&4	WORD	Alarms & warnings	Alarm: Error in calibration, stroke too high	There has been an error in calibration, stroke too high	N	ON	OFF	na	Bit 1: na
0x8300	33536	R	3&4	WORD	Alarms & warnings	Alarm: Error in calibration, stroke too low	There has been an error in calibration, stroke too low	N	ON	OFF	na	Bit 2: na
0x8300	33536	R	3&4	WORD	Alarms & warnings	Alarm: Temperature of actuator is too high	The Temperature inside the Actuator is too high	N	ON	OFF	na	Bit 3: na
0x8300	33536	R	3&4	WORD	Alarms & warnings	Alarm: Voltage of power supply is too low	Voltage of power supply is measured to be too low	N	ON	OFF	na	Bit 4: na
0x8300	33536	R	3&4	WORD	Alarms & warnings	Alarm: Unexpected switch state	Switch is active outside of defined parameters (in wrong state)	N	ON	OFF	na	Bit 5: na
0x8300	33536	R	3&4	LONG	Alarms & warnings	Alarm: Internal Error, replace actuator	An internal error that cannot be corrected was found, replace the actuator	N	ON	OFF	na	Bit 15: na
0x8301	33537	R	3&4	WORD	Alarms & warnings	Warning: Voltage of power supply is high	Voltage of power supply is measured to be high	N	ON	OFF	na	Bit 0: na
0x8301	33537	R	3&4	WORD	Alarms & warnings	Warning: Voltage of power supply is low	Voltage of power supply is measured to be low	N	ON	OFF	na	Bit 1: na
0x8301	33537	R	3&4	WORD	Alarms & warnings	Warning: Unexpected stall	Actuator has detected unexpected stall	N	ON	OFF	na	Bit 2: na
0x8301	33537	R	3&4	WORD	Alarms & warnings	Warning: Motor speed too low	Actuator motor does not reach the desired speed	N	ON	OFF	na	Bit 3: na
0x8301	33537	R	3&4	WORD	Alarms & warnings	Warning: No Control Signal	The actuator has detected that is has no control signal in	N	ON	OFF	na	Bit 4: na
0x8301	33537	R	3&4	WORD	Alarms & warnings	Warning: Actuator position overrange stretch	The actuator position is overrange in the direction stretch	N	ON	OFF	na	Bit 5: na
0x8301	33537	R	3&4	WORD	Alarms & warnings	Warning: Actuator position overrange compress	The actuator position is overrange in the direction compress	N	ON	OFF	na	Bit 6: na
0x8301	33537	R	3&4	WORD	Alarms & warnings	Warning: Invalid DIP switch setting	MAC address assignment was set with DIP-switches, but is incorrectly set to 0	N	ON	OFF	na	Bit 7: na

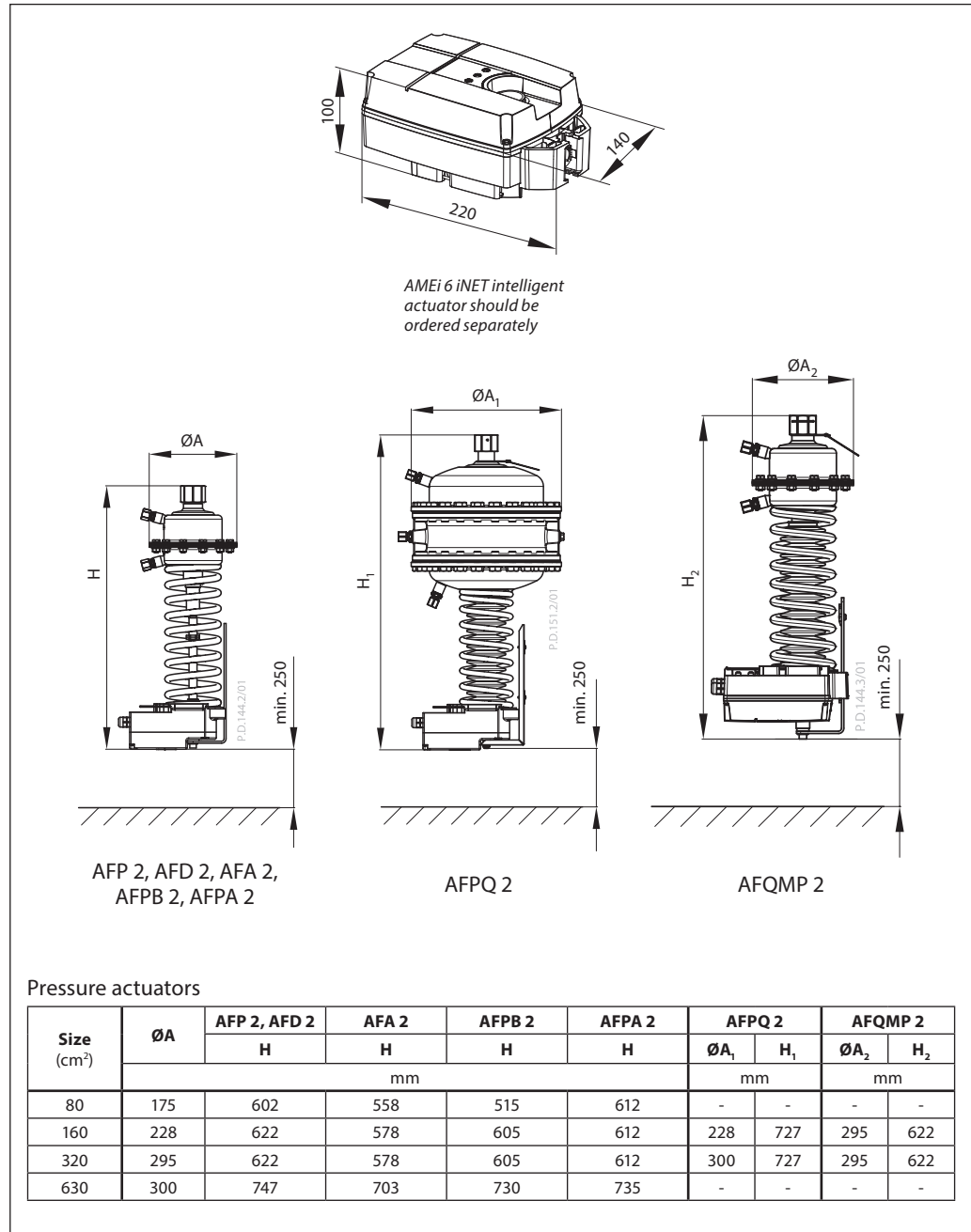
Modbus registers - Troubleshooting & service

MODBUS virtual address [hex]	MODBUS virtual address [dec]	Read/Write	Modbus function	Modbus Data Type	Category	Object / Parameter name	Description	Persistent	Min	Max	Unit	Default
0x8400	33792	R	3 & 4	LONG	Troubleshooting & service	Calibration cnt	Number of actuator calibration	Y	0	MAX	na	na
0x8402	33794	R	3 & 4	LONG	Troubleshooting & service	Fully stretched cnt	Number of how many times actuator was fully stretched	Y	0	MAX	na	na
0x8404	33796	R	3 & 4	LONG	Troubleshooting & service	Fully compressed cnt	Number of how many times actuator was fully compressed	Y	0	MAX	na	na
0x8406	33798	R	3 & 4	LONG	Troubleshooting & service	Total Operating Hours	Total Operating Hours of the actuator	Y	0	MAX	Hours	na
0x8408	33800	R	3 & 4	LONG	Troubleshooting & service	Total steps taken by the actuator	Total steps taken by the actuator since first ON	Y	0	MAX	na	na
0x840A	33802	R	3 & 4	LONG	Troubleshooting & service	Minutes since power up	Minutes since actuator was last power on	N	0	MAX	Minutes	na
0x840C	33804	R	3 & 4	LONG	Troubleshooting & service	Power up cnt	Number of actuator power ups	Y	0	MAX	na	na
0x840E	33806	R	3 & 4	LONG	Troubleshooting & service	Operating high voltage cnt	Number of high voltage power supply events	Y	0	MAX	na	na
0x8410	33808	R	3 & 4	LONG	Troubleshooting & service	Operating high voltage minutes	Number of minutes actuator was on high voltage supply voltage	Y	0	MAX	Minutes	na
0x8412	33810	R	3 & 4	LONG	Troubleshooting & service	Operating low voltage cnt	Number of low voltage power supply events	Y	0	MAX	na	na
0x8414	33812	R	3 & 4	LONG	Troubleshooting & service	Operating low voltage minutes	Number of minutes actuator was on low voltage supply voltage	Y	0	MAX	Minutes	na
0x8416	33814	R	3 & 4	LONG	Troubleshooting & service	iSET detected cnt	Number of times oscilations were detected	Y	0	MAX	na	na

Modbus registers - Configuration

MODBUS virtual address [hex]	MODBUS virtual address [dec]	Read/Write	Modbus function	Modbus Data Type	Category	Object / Parameter name	Description	Persistent	State Text	Number Of States	Default State
0x8500	34048	W	6	WORD	Special	Reset	Warm or Cold reset	-	0x5741 - Warm, 0x434F-Cold	2	
0x8501	34049	R/W	3, 4 & 6	WORD	Special	Update state	-	N	1 - Default, 2 - Preparing, 3 - Ready, 4 - Error, 5 - Received, 6 - Perform update	6	-

Dimensions



Danfoss A/S

Climate Solutions • danfoss.com • +45 7488 2222

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