SIEMENS

OpenAir™

Air Damper Actuator Modbus RTU

G..A151.1E/NI Spring return types

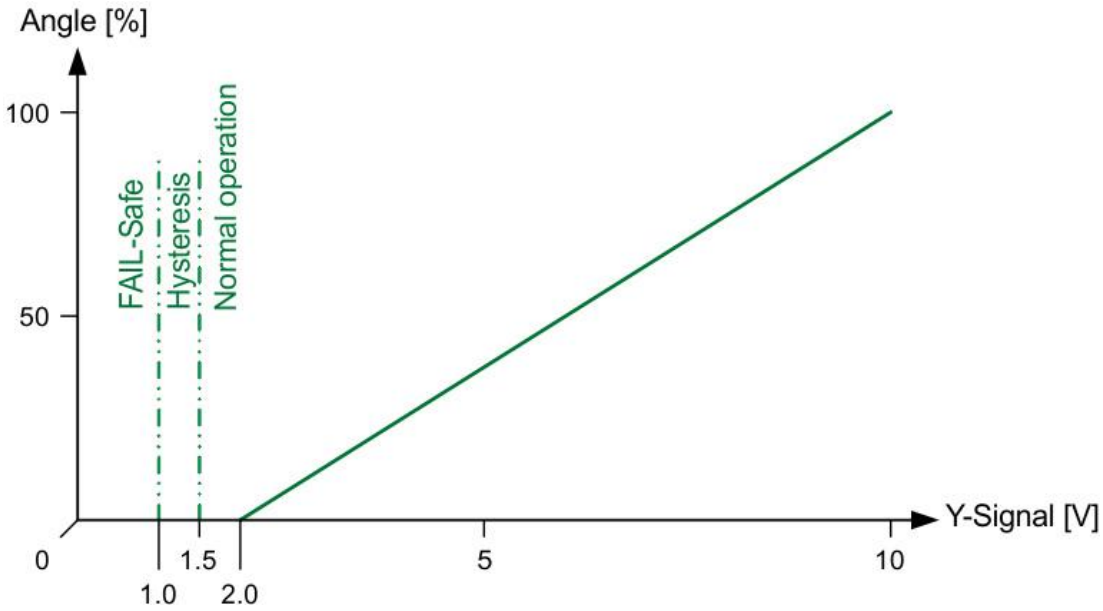
Air Damper actuators 7 Nm / 18 Nm (spring return) with Modbus communication

- GMA.. 7 Nm nominal torque
- GCA.. 18 Nm nominal torque
- Modbus RTU communication
- Operating voltage AC/DC 24 V
- For air-handling units (AHU) and other ventilation applications
- Spring return function

Modbus Functions

Function	Description
Communication	Modbus RTU (RS-485), not galvanically separated
Functions	• Setpoint and actual position 0..100% • Override control Open / Close / Min / Max / Stop • Setpoint monitoring and backup mode
Supported baud rates	9.6 / 19.2 / 38.4 / 57.6 / 78.4 / 115.2 kBaud
Supported transmission formats	1-8-E-1, 1-8-N-1-, 1-8-O-1, 1-8-N-2
Termination	120 Ω electronically switchable

Signal characteristic



To acitivate the FAIL-Safe mode a voltage < 1.0 V will be needed from the actual MCA. On the actuator a special firmware is implemented for this feature. A voltage > 1.5 V will be needed for normal operation of the actuator. The hysteresis is needed to eliminate a swinging actuator! With this Voltage level the actuator works as a standard 2 - 10 V with the same tolerances and step resolution.

Type summary

Product no.	Stock no.	Operating voltage	Positioning signal	Power consumption	Running time	Manual adjuster	Position feedback
GMA151.1E/NI	S55499-D851-A562	AC/DC 24 V	Modbus RTU	AC: 5 VA / 3.5 W max.[1)] DC: 3.5 W max.	90s (15 s spring return)	Yes	Yes
GCA151.1E/NI	S55499-D861-A562			AC: 7VA / 5 W max.[1)] DC: 4 W max.			

[1)] max. = actuator rotates

Accessories / Spare parts

GMA..	Please refer to data sheet N4697
GCA..	Please refer to data sheet N4699

Ordering (Example)

Product no.	Stock no.	Description	Amount
GMA151.1E/NI	S55499-D851-A562	Damper actuator Modbus	1
+ Accessories (shaft inserts, etc.)			

Equipment combinations

Product no.	Stock no.	Doc. type	Doc. number
POL424.50/STD POL424.70/STD	S55394-C245-A100 S55394-C247-A100	Datasheet	Q3973
		Operating manual	P3973
POL635.00/STD	BPZ:POL635.00/STD	Datasheet	Q3230
		Operating manual	P3903
POL638.00/STD POL638.70/STD	BPZ: POL638.00/STD S55396-C387-A100	Datasheet	Q3900
		Operating manual	P3903

Product documentation

Title	Topic	Document ID
Climatix AHU Application	Application description	A3975
Installation Instruction	Installation of types with external Modbus interface	A6V101006034

Related documents such as environmental declarations, CE declarations, etc., can be downloaded at the following Internet address:

http://siemens.com/bt/download

Notes

Safety

⚠ CAUTION	
	**National safety regulations** Failure to comply with national safety regulations may result in personal injury and property damage. ● Observe national provisions and comply with the appropriate safety regulations. ● Use only properly trained technicians for mounting, commissioning, and servicing.

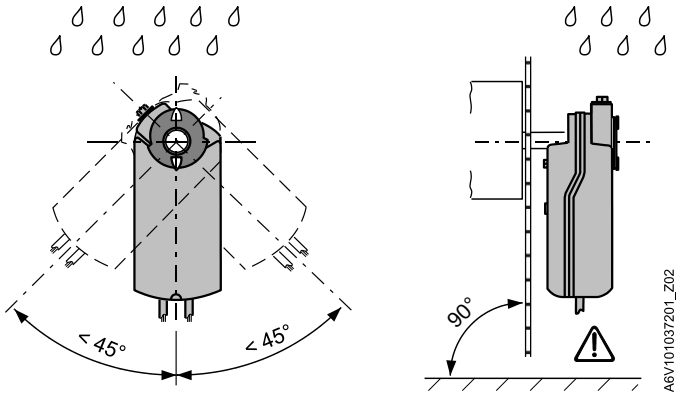
Mounting

Note: Do not open the damper actuators

Mounting positions

IP54 protection in following mounting positions

IP54



Maintenance

The damper actuators are maintenance-free.

Disconnect the electrical connections from the terminals if you want to work at the device.

Disposal

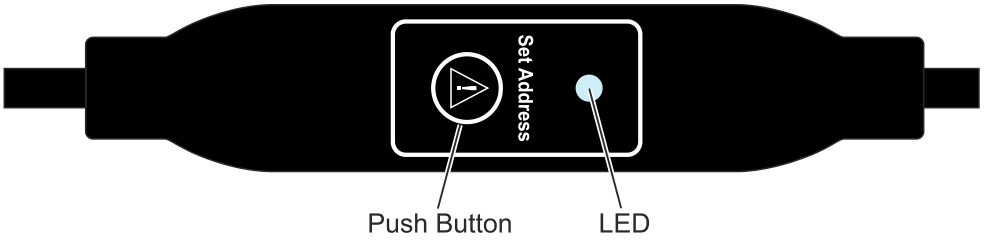
⚠ WARNING	
	**Tensioned return spring** Opening the drive housing can release the highly tensioned return spring, possibly resulting in injury due to flying parts. ● Do not open the drive housing.

	The device is considered an electronic device for disposal in accordance with European guidelines and may not be disposed of as domestic waste. ● Dispose of the device through channels provided for this purpose. ● Comply with all local and currently applicable laws and regulations.

Warranty

Technical data on specific applications are valid only together with Siemens products listed under "Equipment combinations". Siemens rejects any and all warranties in the event that third-party products are used.

Push-button operation



Activity	Push-button operation	Confirmation
Display current address (starting with lowest address digit)	Push button < 1s	1-digits: red 10-digits: green 100-digits: orange If termination is switched on, LED flashes 1x blue after address display Example: 124 = 4x red, 2x green, 1x orange
Turn bus termination on / off		
Turn on	1. Press 3x	LED flashing and flickering stops (termination mode)
	2. Press 1x shortly	LED flashes 1x blue
	3. Press button until LED shines red	LED shines red (confirmation)
	4. Release button	LED off Address display LED flashes 1x blue after address display Normal operation
Turn off	1. Press 3x	LED flashing and flickering stops (termination mode)
	2. Press button until LED shines red	LED shines red (confirmation)
	3. Release button	Normal operation
Enter Modbus address with push-button	Press button > 1s and < 5s	See chapter ‘Push-button addressing’ below
Enter push-button addressing mode (for use with Climatix™ controllers)	1. Press button > 5s and < 10s 2. Release button	LED shines red and gets dark after 5s LED shines orange
Reset to factory settings	Press button > 10s	LED flashes orange

LED colors and patterns

Color	Pattern	Description
Green	1s on / 5s off	Normal operation (“life pulse”) without bus traffic
	Flashing	Normal operation (“life pulse”) with bus traffic
Orange / green	1s orange / 1s green	Device is in override control
Orange	1s on / 1s off	Bus parameters not yet configured
	1s on / 5s off	Backup mode entered
Red	Steady	Mechanical fault, device jammed or manual override
	1s on / 5s off	Internal error
	0.1s on / 1s off	Invalid configuration, e.g. Min = Max
Blue	Flashes 1x after address display	Bus termination is set active

Resetting the device by push-button

1. Press button for more than 10 seconds.
   ⇨ The LED starts flashing **orange**.
2. Release the button while the LED still flashes.
   ⇨ The LED keeps flashing for 3 seconds.
3. (*Optional*) If the button is pressed within these 3 seconds, the reset is cancelled.
   ⇨ After the 3 seconds, the LED shines **red** (reset).

⇨ The device restarts.

Push-button addressing

Display current address (starting with lowest address digit)

The Modbus address can be set without a separate tool by using the push-button and LED.

To display the current address, press the button <1s.

Colors		
1-digits: red	10-digits: green	100-digits: orange
Example for address 124:		
LED		
Note	The address is entered and shown starting with lowest address digit, see figure above. (124 in the example is starting with 4x red)	

Set new address (starting with lowest address digit)

1. Enter addressing mode: press button > 1s until the LED shines **red** – release button (before LED goes dark).
2. Enter digits: press button n-times.
   ⇨ LED flashes per button press (feedback). Colors: 1-digits: **red** / 10-digits: **green** / 100-digits: **orange**.
3. Store digits: press button until the LED shines in color of following digits – release button.
4. Save address: press button until the LED shines **red** (confirmation) – release button. An address can be stored at any time, i.e. after setting the 1-digits, or after setting the 1- and the 10-digits.

⇨ The entered address is repeated once for confirmation.
Note: If the button is released before the LED shines **red**, the address is discarded.

Examples

Set address “124”:

1. Enter addressing mode.
2. Set 1-digits: Press button 4-times.
   ⇨ The LED flashes **red** per button press.
3. Store 1-digits: Press button until LED shines **green** – release button.
4. Set 10-digits: Press button 2-times.
   ⇨ The LED flashes **green** per button press.
5. Store 10-digits: Press button until LED shines **orange** – release button.
6. Set 100-digits: Press button 1-times.
   ⇨ The LED flashes **orange** per button press.
7. Store address: Press button until LED shines **red** – release button.

⇨ The address is stored and displayed 1x for confirmation.

Set address “50”:

1. Enter addressing mode.
2. Skip 1-digits: Press button until LED shines **green** – release button.
3. Set 10-digits: Press button 5-times.
   ⇨ The LED flashes **green** per button press.
4. Store address (skip 100-digits): Press button until LED shines **red** – release button.

⇨ The address is stored and displayed 1x for confirmation.

Set address “5”:

1. Enter addressing mode.
2. Set 1-digits: Press button 5-times.
   ⇨ The LED flashes **red** per button press.
3. Store address (skip 10- and 100-digits): Press button until LED shines **red** – release button.

⇨ The address is stored and displayed 1x for confirmation.

Commissioning

Workflow 1

The devices are especially designed for using the Climatix push-button configuration as described in document A3975 [1)]. The bus configuration can alternatively be parameterized by the local HMI, cf. page 5.

During commissioning check/set the following:

- Bus configuration (address, baudrate, transmission mode, and optionally termina-tion). The default address 255 allows to mount and power multiple actuators at the same time without interfering with each other.
- Damper actuator parameters (opening direction, position limits, position adaptation etc.) can be checked via the Modbus register.

[1)] The documents can be downloaded from http://siemens.com/bt/download

Workflow 2

The devices can be configured over bus if the pre-commissioning settings allow for a connection between the Modbus master / programming tool and peripheral devices (i.e. non-conflicting addresses and matching baudrate / transmission format).

- Full configuration over bus: If the address is unique per segment when powered up, the device can be accessed by the Modbus master (or programming tool) and the address and other parameters can then be set to the definitive values.
- Partial configuration over bus: If the address is not unique per segment when pow-ered up, each device must get a non-conflicting address before connecting it to the bus, either by using the address input with push button (cf. page 7) or by setting the address to 246 with push button press > 5s und < 10s (cf. page 6). After addressing all devices, the remaining configuration can be done over the bus using the default settings for baudrate (auto-baud) and transmission mode for the Modbus master.
- Overwriting the bus configuration over bus uses a timeout. If „1 = Load“ is not written into Reg 768 within 30 seconds, all values are discarded.

Example: Table shows bus configuration registers before and after changing them over bus.

Reg.	Name	Pre-commissioning	New value (ex.)
764	Modbus Address	246	12
765	Baudrate	0 = Auto	1 = 9600
766	Transmission Format	0 = 1-8-E-1	3 = 1-8-N-2
767	Termination	0 = Off	0 = Off
768	Bus Conf. Command	0 = Ready	1 = Load

Modbus registers

Reg.	Name	R/W	Range / enumeration	Default value
Process values				
1	Setpoint	RW	0..100% = 0..10000	
2	Override control	RW	0 = Off / 1 = Open / 2 = Close / 3 = Stop 4 = GoToMin / 5 = GoToMax	
3	Actual position	R	0..100% = 0..10000	
256	Command	RW	0 = Ready / 1 = Adaption / 2 = Selftest 3 = ReInitDevice / 4 = RemoteFactory Reset	
Parameters				
257	Opening direction	RW	0 = CW / 1 = CCW	0 = CW
258	Adaptive Mode	RW	0 = Off / 1 = On	0 = Off
259	Operating Mode	RW	1 = POS	1 = POS
260	MinPosition	RW	0..100% = 0..10000	0%
261	MaxPosition	RW	0..100% = 0..10000	100%
262	Actuator Running Time	R	90s	90s
513	Backup Mode	RW	0 = Go to BackupPosition 1 = Keep last position 2 = Disabled	2 = Disabled
514	Backup Position	RW	0..100% = 0..10000	0%
515	Backup Timeout	RW	0..65535	900 s
516	Startup Setpoint	RW	0..100% = 0..10000	0%
764	Modbus Address	RW	1..247 / 255 = “unassigned”	255
765	Baudrate	RW	0 = Auto / 1 = 9600 / 2 = 19200 / 3 = 38400 4 = 57600 / 5 = 76800 / 6 = 115200	0 = Auto
766	Transmission Format	RW	0 = 1-8-E-1 / 1 = 1-8-O-1 / 2 = 1-8-N-1 / 3 = 1-8-N-2	0 = 1-8-E-1
767	Bus Termination	RW	0 = Off / 1 = On	0= Off
768	Bus Conf. Command	RW	0 = Ready / 1 = Load / 2 = Discard	0 = Ready
769	Status	R	See below, Register 769 “Status”	

Device information			
1281	Factory Index	R	Cf. product documentation Z4613; Z4614 [1)]
1282-83	Factory date	R	
1284-85	Factory SeqNo	R	
1409-16	TypeASN [Char_16..1]	R	

[1)] The documents can be downloaded from http://siemens.com/bt/download

Register 769 “Status”

Status			
Bit 00	1 = Reserved	Bit 06	1 = Adaption done
Bit 01	1 = Backup mode active	Bit 07	1 = Adaption in progress
Bit 02	1 = Reserved	Bit 08	1 = Adaption error
Bit 03	1 = Reserved	Bit 09	1 = Selftest failed
Bit 04	1 = Mechanical fault, device jammed or manual override	Bit 10	1 = Selftest passed
Bit 05	1 = Nom. lifetime exceeded	Bit 11	1 = Invalid configuration

Supported function codes

Function codes	
03 (0x03)	Read holding register
04 (0x04)	Read input registers
06 (0x06)	Write single register
16 (0x10)	Write multiple registers (Limitation: Max. 120 registers within one message)

Technical data

Power supply		
Operating voltage	G..A151.1E/NI	AC 24 V ± 20 % (SELV) DC 24 V ± 20 % (SELV) or AC 24 V class 2 (US)
Frequency		50/60 Hz
Power consumption	at 50 Hz	
Actuator holds	GMA151.1E/NI GCA151.1E/NI	AC / DC: 2.5W AC: 5 VA / 3 W // DC: 3 W
Actuator rotates	GMA151.1E/NI GCA151.1E/NI	AC: 5 VA / 3.5 W // DC: 3.5W AC: 7 VA / 5 W // DC: 4 W

Function data		
Running time for rotary angle 90°(motor operation)	G..A151.1E/NI	90 s
Closing time with return spring (power failure)	G..A151.1E/NI	15 s
Nominal torque	GMA151.1E/NI	7 Nm
	GCA151.1E/NI	18 Nm
Maximum torque (blocked)	GMA151.1E/NI	< 21 Nm
	GCA151.1E/NI	< 50 Nm
Nominal / maximum rotation angle		90° / 95° ± 2°
Direction of rotation	Adjustable over bus	Clockwise (CW) / Counter-clockwise

Communication		
Communication protocol	Modbus RTU	RS-485, not galvanically separated
	Number of nodes	Max. 32
	Address range	1...247 / 255 Default: 255
	Transmission formats	1-8-E-1 / 1-8-O-1 / 1-8-N-1 / 1-8-N-2 Default: 1-8-E-1
	Baudrates (kBaud)	Auto / 9.6 / 19.2 / 38.4 / 57.6 / 76.8 / 115.2 Default: Auto
	Termination	120 Ω electronically switchable Default: Off

Connection cables		
Cable length		0.8 m
Power supply / Communication	Number of cores and cross-sectional area	5 x 0.75 mm^2

Degree of protection		
Degree of protection	Degree of protection acc. to EN 60529 (see also chapter ‘Mounting’ above)	IP54
Safety class	Safety class acc. to EN 60730	III

Environmental conditions		
Applicable standard		IEC 60721-3-x
Operation	Climatic conditions	Class 3K5
	Mounting location	Indoors
	Temperature general	-32…55 °C
	Humidity (non condensing)	< 95 % r. h.
Transport	Climatic conditions	Class 2K3
	Temperature	-32…70 °C
	Humidity	< 95 % r. h.
Storage	Climatic conditions	Class 1K3
	Temperature	-5…45 °C
	Humidity	< 95 % r. h.

Directives and Standards		
Product standard	EN60730-x	
Electromagnetic compatibility (Application)	For residential, commercial and industrial environments	
EU conformity (CE)	**GMA151.1E/NI**	**GCA151.1E/NI**
	8000081792 [1)]	A5W00004370 [1)]
RCM conformity	8000081793 [1)]	A5W00004371 [1)]
UKCA conformity	A5W00198017A [1)]	A5W00198156A [1)]
EAC conformity	Eurasia conformity for all G..A variants	
UL, cUL	UL 873 http://ul.com/database	

Environmental compatibility
The product environmental declarations CE1E4613en [1)], CE1E4614en [1)] and A6V101083254en [1)] contain data on environmentally compatible product design and assessments (RoHS compliance, materials composition, packaging, environmental benefit, disposal).

Dimensions / Weight		
Weight (w/o packaging)	GMA151.1E/NI	1.4 kg
	GCA151.1E/NI	2.3 kg
Dimensions WxHxD (w/o bus module)	GMA151.1E/NI	81 x 192 x 63 mm
	GCA151.1E/NI	100 x 300 x 67.5 mm
Suitable drive shafts	GMA151.1E/NI (round / square shaft)	6.4…20.5 mm / 6.4...13 mm
	GCA151.1E/NI (round / square shaft)	8.0…25.6 mm / 6.0...18 mm
	Min. drive shaft length	20 mm

[1)] The documents can be downloaded from http://siemens.com/bt/download

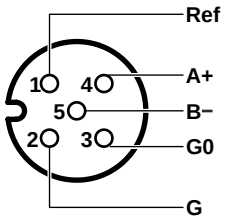
Diagrams

Internal Diagram

The damper actuators are supplied with a prewired connecting and communication cable. All interconnected devices must be connected to the same G0.

Terminal	Description	M12 pin
24 V ≂ / G	Power AC 24 V / DC 24 V	2
⊥ / G0	GND	3
REF	Modbus, RS485 NOTE: Not galvanically separated	1
A+		4
B-		5

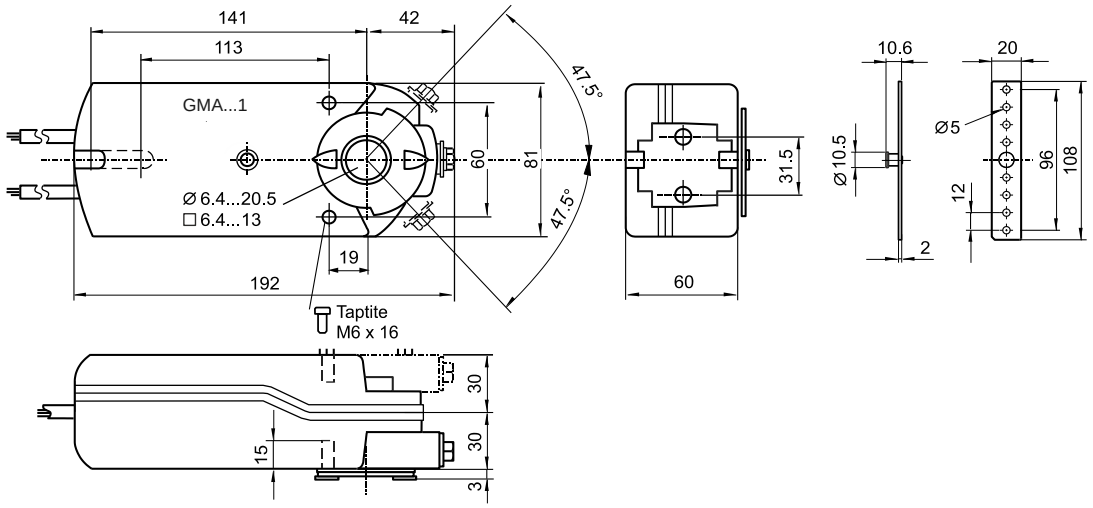
M12 connector: Connector type code A, 5-pole



The operating voltage at terminals G and G0 must comply with the requirements under SELV or PELV. Safety transformers with twofold insulation as per EN 61558 required; they must be designed to be on 100 % of the time.

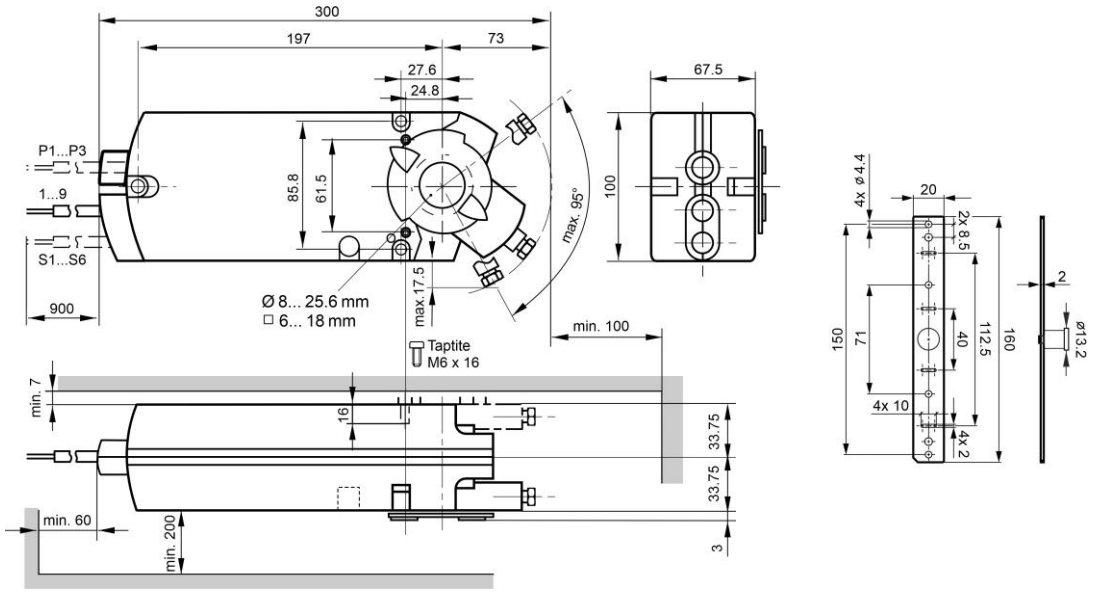
Dimensions

GMA151.1E/NI



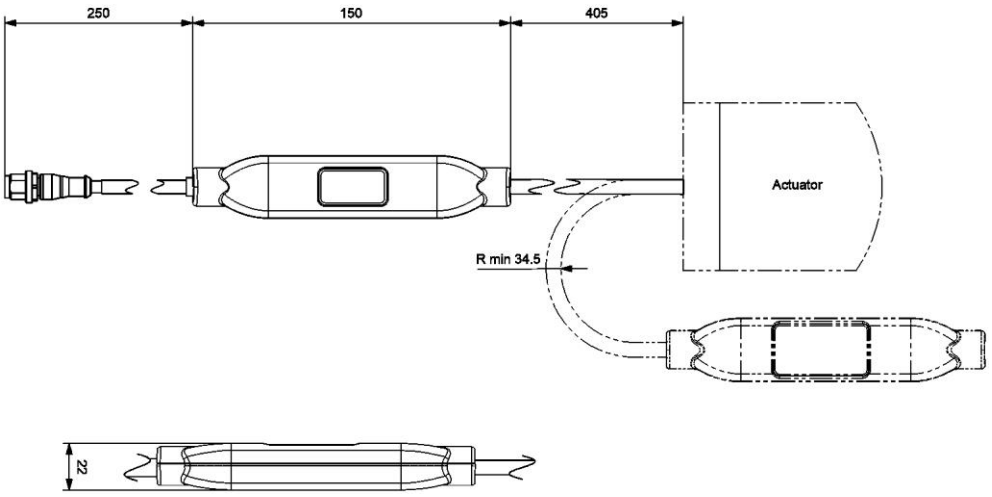
Dimensions in mm

GCA151.1E/NI



Dimensions in mm

External Modbus Interface



Dimensions in mm

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