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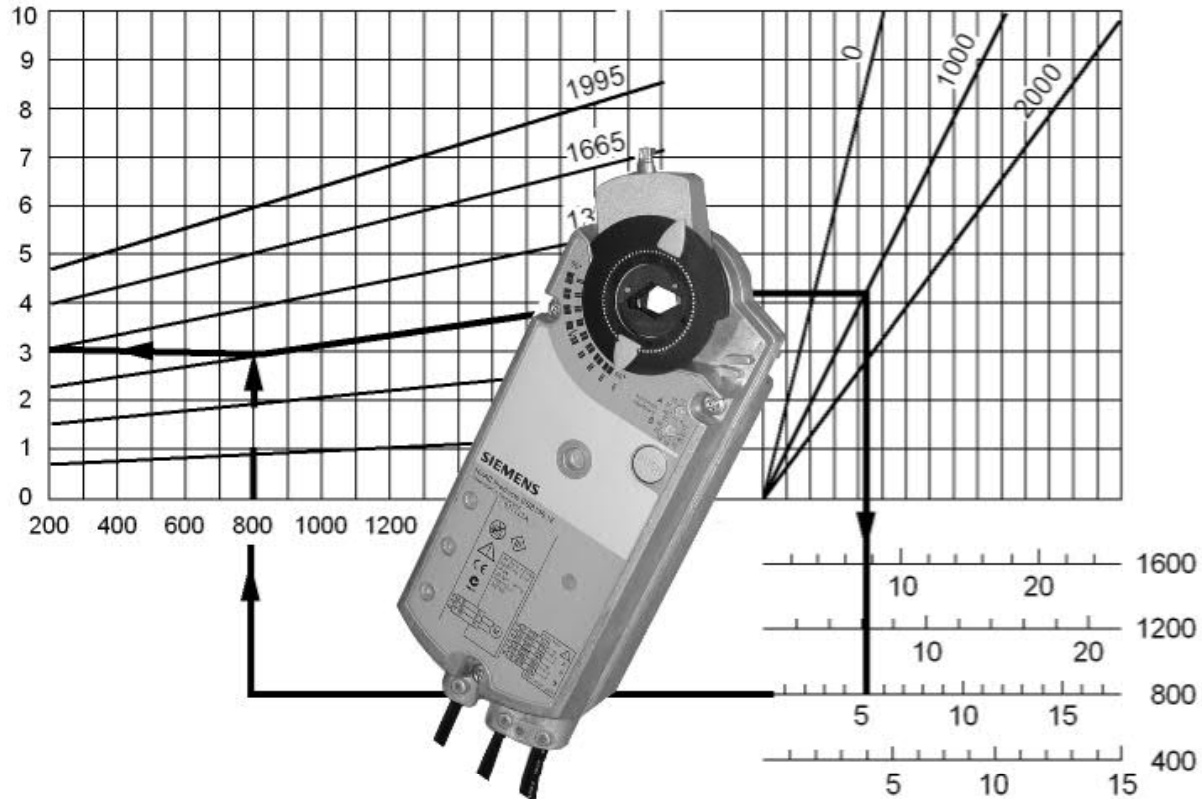

OpenAir™
Rotary actuators without spring return GBB/GIB..1
Technical basics

Edition 2.4
CE1Z4626en
2019-11-28

Smart Infrastructure

Contents

1 Introduction

1.1 Revision history

Changes	Date	Chapter	Pages
Powerpack	03.12.2003	2.2 / 2.3.1	6, 7
Setting and operating elements		2.6	9
Mechanical parallel connection of two actuators		4.2 / 5 / 6.2 / 6.3	15, 18, 21,22
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EU and RCM Conformity	26.02.2016	8	27
European Directive 2012/19/EU		10	31
Added type GIB161.1E/MO	26.05.2017	whole document	
Note on 2-position control	28.11.2019	2.1/2.2/2.3/ 2.4/4.2/6.2	7…10, 18, 25

1.2 About this document

Main audience

This document targets engineering, product management, and commissioning staff in the DUs.

Purpose

This document provides basic knowledge. In addition to background information, it contains general technical fundamentals on the GBB/GIB..1 rotary actuator series. It offers all information on engineering, correct mounting and wiring, commissioning, and service.

Referenced documents

Section 11.2 Referenced documents contains a list of documents on rotary and linear actuators with accessories.

1.3 Document contents

This document contains basic technical information on type series GBB/GIB...1 for:

- Three-position control, and
- Modulating control, and
- Modbus communication

The following topics are discussed:

- Type summary and description of the available options
- Applications and functions
- Actuator design including setting and operating elements
- Adjustable auxiliary switches and characteristic function
- Notes on engineering and safety-specific guidelines and regulations
- Notes on mounting, wiring, and commissioning
- Technical data
- Diagrams
- Environmental compatibility and disposal

2 Non-spring return actuators

Introduction

This chapter provides information on application, functions, and equipment combinations. Furthermore, it contains a type summary and explains the actuator design including setting and operating elements for this family of actuators.

2.1 Application

The actuators are used in ventilation and air conditioning plants to operate air dampers and air throttles:

- For damper areas up to 4 m^2, friction-dependent
- Suitable for modulating controllers (DC 0...10 V) or three-position controllers (e.g. for outside air dampers)
- It is recommended to switch off the power during two-position control when the actuator has reached the open or close position, in order to enhance life span and reduce power consumption.
- For dampers having two actuators on the same damper shaft (tandem-mounted actuators or Powerpack)

2.2 Type summary

The following table shows the options for the actuator types.

GBB/GIB..	131.1E	135.1E	136.1E	331.1E	335.1E	336.1E	161.1E	163.1E	164.1E	166.1E	161.1E/MO
Mode of control	Three-position (see section 2.1 “Application”)						Modulating control				Modbus RTU
Operating voltage AC 24 V	X	X	X				X	X	X	X	X
Operating voltage AC 230 V				X	X	X					
Positioning signal input Y											
DC 0...10 V							X			X	
DC 0...35 V with characteristic function								X	X		
Modbus RTU											X
Position indicator											
U = DC 0...10 V							X	X	X	X	
Modbus RTU											X
Feedback potentiometer 1kΩ		X			X						
Self-adaptation of rotary angle range											X
Auxiliary switches (two)		X	X		X	X			X	X	
Rotary direction switch							X	X	X	X	
Powerpack (two actuators)	X	X	X	X	X	X	X	X	X	X	

Accessories, spare parts For functional enhancements of the actuators, the following accessories are available:

Accessories	External auxiliary switches (1 Switch)	**ASC77.1**
	External auxiliary switches (2 Switches)	**ASC77.2**
	Rotary/linear set for duct mounting	**ASK71.1**
	Rotary/linear set for frame mounting	**ASK71.2**
	Rotary/linear set with lever	**ASK71.3**
	Rotary/linear set with lever and mounting plate	**ASK71.4**
	Universal lever	**ASK71.9**
	Bracket for powerpack	**ASK73.1**
	Self-aligning bracket for powerpack	**ASK73.2**
	Special shaft adapter	**ASK74.1**
	Weather shield for rotary actuator	**ASK75.1**
	Data sheet for accessories and spare parts	**N4699**

2.3 Description of functions

2.3.1 Description of functions for GBB/GIB..1

The functions are listed in a table and are assigned to the respective modes of control.

Type	GBB/GIB13..1 / GBB/GIB33..1	GBB/GIB16..1	GIB161.1E/MO
Mode of control	Three-position (see section 2.1 “Application”)	Modulating	Modbus RTU
Positioning signal with adjustable characteristic function	-	Y = DC 0...35 V with offset Uo = 0...5 V and span ΔU = 2...30 V	-
Rotary movement, direction of rotation	Clockwise or counter-clockwise direction depends:		
	On the mode of control. With no power applied, the actuator remains in the respective position.	• On the position of the rotary direction switch • On the positioning signal The actuator stays in the position reached: • If the positioning signal is maintained at a constant value • If the supply voltage is interrupted	On the setting of the respective parameter
Position indication: Mechanically	Rotary angle position indication by using a position indicator.		
Position indication: Electrically	Connecting the feedback potentiometer to an external voltage source results in voltage supply proportional to the angular rotation.	• Position indicator: Output voltage U = DC 0...10 V is generated proportional to the angular rotation. • The direction of action (inverted or not inverted) of output voltage U depends on the position of the rotary direction switch.	By Modbus register value
Self-adaptation of rotary angle range	-		When self-adaption is active, the actuator automatically detects mechanical end of the rotary angle range.
Auxiliary switches	The switching points for auxiliary switches A and B can be set independent of each other in increments of 5° within 5° to 90°.		
Response on damper blocking	-	The actuator is equipped with an automatic switch-off mechanism.	
Powerpack (two actuators)	Mounting two of the same actuator types on the same damper shaft will result in a double torque.(with accessories ASK73.1)	Mounting two of the same actuator types on the same damper shaft will result in a double torque.(with accessories ASK73.2)	Not permitted.
Manual adjustment	The actuator can be manually adjusted by pressing the gear train disengagement button.		
Limitation of angular rotation	The angular rotation for the shaft adapter can be limited mechanically by inserting the shaft adapter in 5° increments.		

2.3.2 Supplementary information on the description of functions for GBB/GIB16..1

Supplement

The following information applies to **modulating** actuators.

Characteristic function (GBB/GIB163.1, GBB/GIB164.1)

Offset Uo and span ΔU can be adjusted using two potentiometers (see section 3.4 "Adjustable characteristic function"). The maximum permissible input voltage (Uo + ΔU) is DC 35 V.

Application

Actuators featuring this function can be used for the following applications:

- Dampers with a rotary angle limitation, for instance in the 0°...45° range, can be controlled using the full positioning signal range DC 0...10 V.
- As a sequencing actuator in control loops that can only apply a DC 0...10 V positioning signal to control more than one sequence.
- In control systems with a positioning signal deviating from DC 0...10 V such as DC 2...10 V or DC 0…35 V.

Process values and parameters GIB161.1E/MO

All process values (setpoints and actual values) and all parameters are implemented as Modbus RTU registers.

Self-adaption of the rotary angle range GIB161.1E/MO

The actuator automatically determines the effective rotary angle range when the respective parameter is set to “on”. In that case the actuator performs a calibration run at first startup to determine its actual opening range and adjusts the 0..100% feedback signal to this opening range.
The table shows the different effects of the characteristic function’s mapping to the rotary angle range for “inactive self-adaptation” and “active self-adaption”:

Inactive self-adaption	Active self-adaption
• The actuator calibrates the position indication with Actual Position = 0..100% for **rotary angle = 90°**	• The actuator calibrates the position indication with Actual Position = 0..100% for **rotary angle < 90°**

2.4 Controllers

The actuators can be connected to all controllers having the following outputs.
All safety-related requirements must be met (see chapter 4 "Engineering notes").

Actuator type	Mode of control	Controller output
GBB/GIB13..1	Three-position [1)]	AC 24 V
GBB/GIB33..1	Three-position [1)]	AC 230 V
GBB/GIB16..1	Modulating	DC 0...10 V / DC 0...35 V
GIB161.1E/MO	Modbus RTU	Modbus RTU

[1)] See section 2.1 “Application”

2.5 Mechanical design

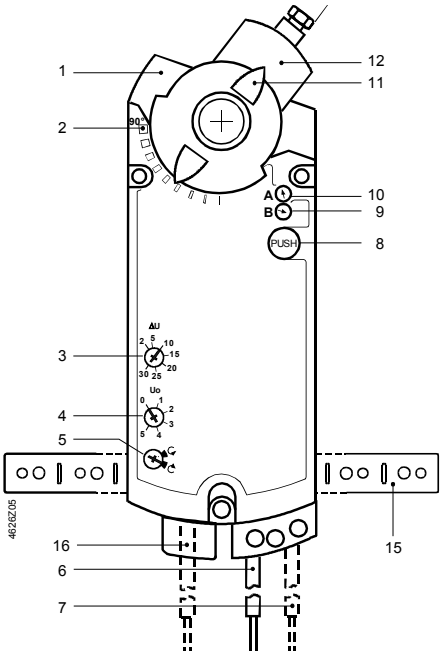
Brief description	The electromotoric GBB/GIB..1 actuators are available for three-position and modulating control, GIB161.1E/MO electronic actuators are available for networked control. The maximum torque is 20/35 Nm. The actuator's connecting cables are prewired.
Housing	Robust, light-weight full metal housing made of die-cast aluminium. The housing guarantees a long actuator life even under harsh environmental conditions.
Gear train	Maintenance-free and noise-free gear train with stall and overload protection for the life of the actuator.
Self-centering shaft adapter	This mounting type allows for securing the actuator to shafts with various diameters and in various shapes (square, round) using just one screw. Insert the shaft adapter from either side into the opening for the shaft adapter. For short shafts, the shaft adapter is on the air duct side. The shaft adapter coupling and the adapter holding are coupled by means of double-sided gearing.
Manual adjustment	When no voltage is supplied, you can manually adjust the actuator or the air damper by pressing the gear train disengagement button.
Mounting bracket	A bolted perforated metal strip is used to attach the actuator.
Electrical connection	All actuators have prewired 0.9 m long connecting cables.

Type-specific elements The actuators can be delivered as a type-specific variant having the following elements:

Auxiliary switch	For auxiliary functions, you can adjust auxiliary switches A and B on the actuator front.
Potentiometer for offset and span	Both potentiometers for the characteristic functions Uo and ∆U are accessible on the front.
Rotary direction switch (only for GBB/GIB16..1)	The rotary direction switch exists only in modulating actuators and is accessible from the front (see section 2.6 Setting and operating elements).
Feedback potentiometer for position indication	The potentiometer is integrated and can be connected by means of a cable.
Push button and LED at external Interface	The HMI of networked types consists of a push button and an LED to allow certain interactions with the actuator or to provide visible feedback from the actuator.

2.6 Setting and operating elements

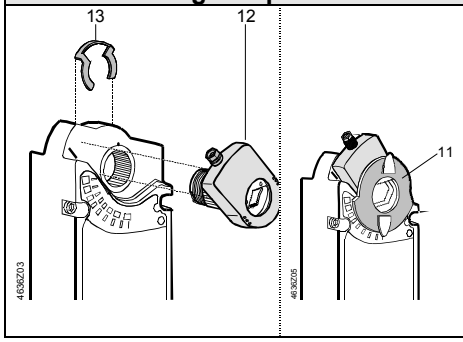
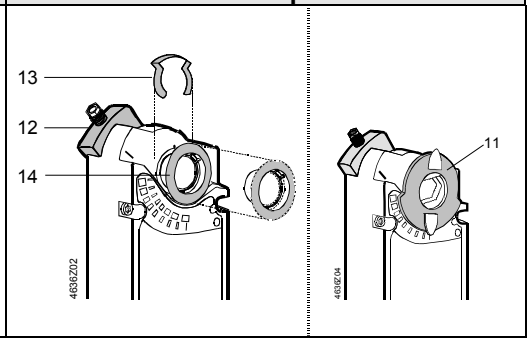
Actuator



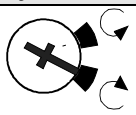
Legend

1	Housing
2	Rotary angle scale 0°...90°
3	Potentiometer to adjust the span
4	Potentiometer to set the offset
5	Rotary direction switch
6	Connecting cable for power and positioning signal
7	Connecting cable for auxiliary switches
8	Gear train disengagement button
9,10	Setting shafts for auxiliary switches A and B
11	Position indicator
12	Self-centering shaft adapter
13	Locking ring for shaft adapter
14	Adapter for position indicator
15	Mounting bracket
16	Connecting cable for feedback potentiometer

Arrangement of shaft adapter

For long damper shafts	For short damper shafts
	

Rotary direction switch
(legend pos. 5)
GBB/GIB16..1

Direction of rotation	Rotary direction switch	Direction of rotation	Function
Counter-clockwise	 4626Z02	Clockwise (factory setting)	**Direction of rotation**

3 Technical design

Introduction

This chapter discusses the following topics:

- Drive motor
- Adjustable auxiliary switches
- Adjustable characteristic function (positioning signal, DC 0...35 V)
- Control characteristics by including the neutral zone

3.1 Drive motor

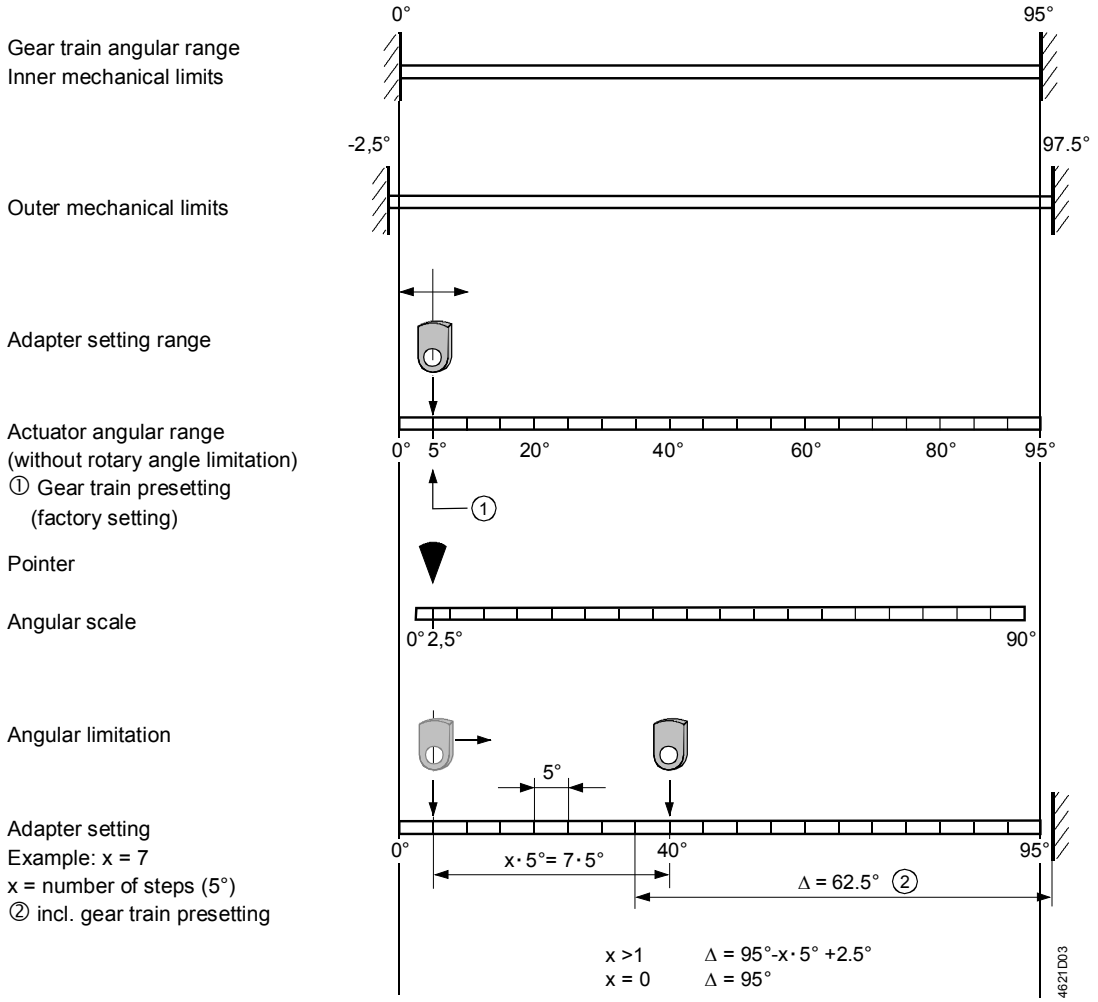
Drive motor

A synchronous motor enables accurate speed control. The magnetic clutch serves as a torque supervision to protect both actuator and damper.

3.2 Angular range and mechanical limitation

Mechanical functions

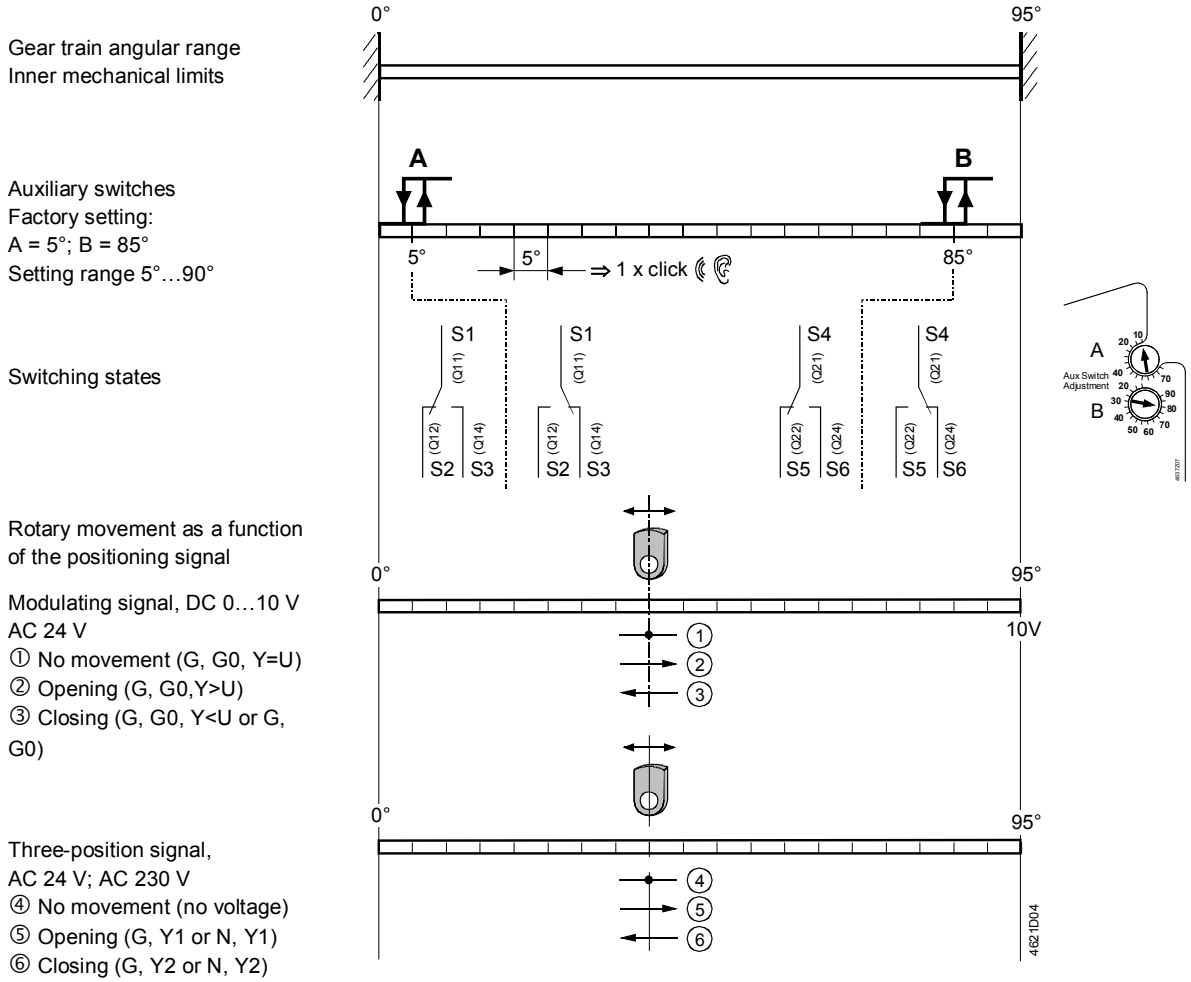
The illustration below shows the relationship between the inner and outer mechanical limitation of the angular range.



3.3 Auxiliary switches and positioning signals

Electrical functions

The illustration below shows the relationship between the angular rotation, the adjustable switching points for auxiliary switches A and B and the positioning signal.



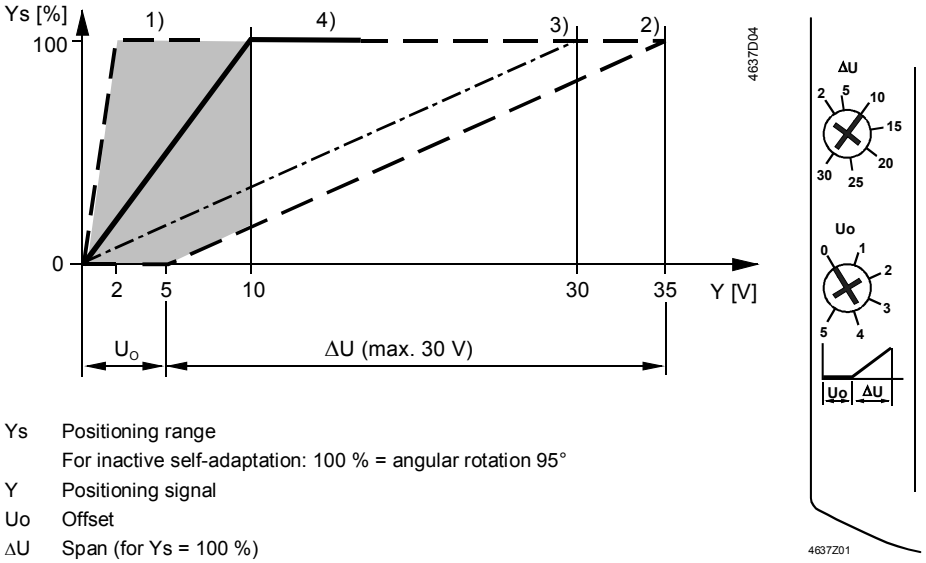
Note

The setting shafts for the auxiliary switches turn together with the adapter. The scales thus only refer to the **inner mechnical 0° limit**.

3.4 Adjustable characteristic function

Actuators
GBB/GIB163.1,
GBB/GIB164.1

A modulating positioning signal DC 0..35 V from a controller drives the actuator. The angular rotation is proportional to the positioning signal. Using potentiometer "Uo", you can set the offset for DC 0...5 V, and with potentiometer "ΔU", you can set the span for DC 2...30 V.



Ys Positioning range
For inactive self-adaptation: 100 % = angular rotation 95°
Y Positioning signal
Uo Offset
ΔU Span (for Ys = 100 %)

Examples as per the diagram

Example	Positioning signal Y	Positioning range Ys	Settings	
			Uo	ΔU
1)	DC 0...2 V	0...100 %	DC 0 V	DC 2 V
2)	DC 5...10 V DC 5...35 V	0...17 % 0...100 %	DC 5 V	DC 30 V
3)	DC 0...10 V DC 0...30 V	0...33 % 0...100 %	DC 0 V	DC 30 V
4)*	DC 0...10 V	0...100 %	DC 0 V	DC 10 V

4)* Characteristic curve for factory setting

Note

- The Y input is limited to max. DC 35 V
- The adjustable span ΔU is max. 30 V

Example

Define the adjustable span ΔU if the actuator is to open from 0...50 % at a positioning signal of Y = DC 2…10 V. The offset Uo thus amounts to 2 V. The angle of rotation is 90°.

Formula

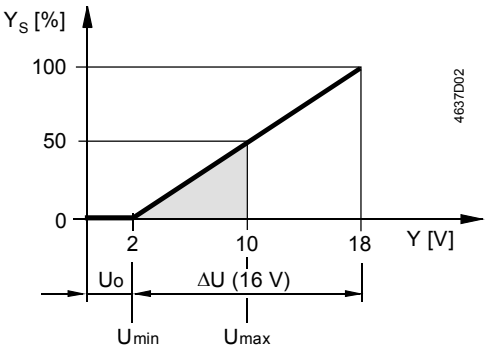
Calculating the setting value for ΔU:

$$\Delta U = \frac{\text{max. positioning range Ys max } [\%]}{\text{span positioning range Ys } [\%]} \cdot (10\,[\text{V}] - \text{Uo}\,[\text{V}]) = \frac{100\ \%}{50\ \%} \cdot (10\ \text{V} - 2\ \text{V}) = 16\ \text{V}$$

Potentiometer settings

Uo = 2 V, ΔU = 16 V

Characteristic function for the example



Max. positioning range Ysmax = 100 % (95°)
Span Ys = 50 % (47.5°)
Offset Uo = **2 V**
Span ΔU = **16 V**

Effective span
ΔUw = Umax – Umin
= 10 V - 2 V = 8 V

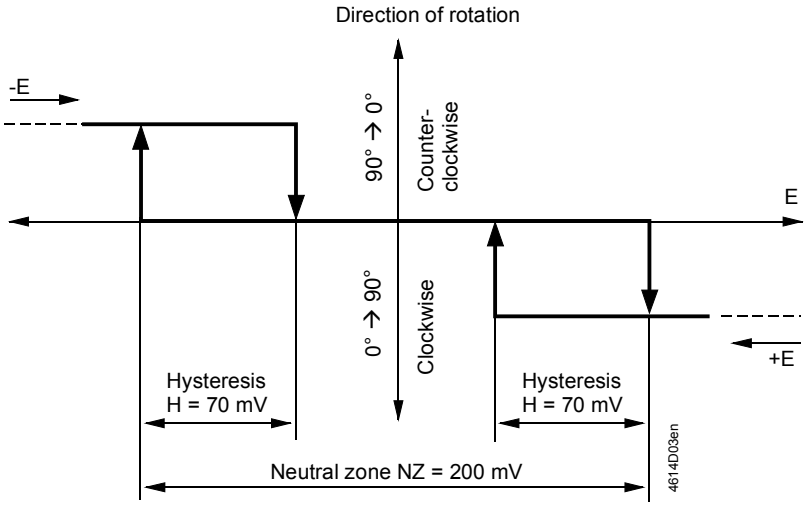
3.5 Neutral zone

Actuators
GBB/GIB16..1
(DC 0...10 V)

For modulating actuators, note the control characteristic for the selected switch-on point of the setpoint. The diagram shows the setting characteristics by including the neutral zone for range DC 0...10 V.

Note

The diagram shows the setting characteristics by including the neutral zone. The values for the neutral zone listed in the diagram apply to DC 0...10 V (**without characteristic function**).



The diagram shows the relationship between the differential voltage E = Y – U (difference between setpoint Y and actual value U) and the direction rotation, including hysteresis and neutral zone.

Actuators
GBB/GIB163.1,
GBB/GIB164.1
(DC 0...35 V)

For DC 0...35 V (**with characteristic function**) the following values apply:
Neutral zone NZ = 2 % of span ΔU
Hysteresis H = 0.7 % of span ΔU

4 Engineering notes

Introduction

Carefully study the basics of the control systems used before proceeding to the sections below, and pay special attention to all safety-related information.

Intended use

Use these actuators in a system only for applications as described in the basic system documentation of the control systems used. Additionally, note the actuator-specific properties and conditions as described in this chapter and in chapter 8 Technical data.

4.1 Safety notes

Please observe the following notes

This chapter explains general and system-specific regulations for mains and operating voltages. It also contains important information regarding your own safety and that of your plant.

Safety note

The warning triangle to the left means that you must observe all respectively listed regulations and notes.
If ignored, injuries and equipment damages can result.

General regulations

Observe the following general regulations during engineering and project execution:

- Electric and high-voltage regulations of the respective country
- Other mandatory country regulations
- House installation regulations of the respective country
- Regulations by the energy supplier
- Diagrams, cable lists, dispositions, specifications, and instructions as per the customer or the engineering company
- Third-party regulations from, e.g., the general contractors or building contractors

Safety

Electrical safety in Siemens building management and control systems primarily depends on **extra-low voltage with safe isolation from mains voltage**.

SELV, PELV

Depending on the earthing of extra-low voltage, SELV or PELV applications as per HD384 "Electrical plants in buildings" result:
Unearthed = **S**afety **E**xtra-**L**ow **V**oltage **SELV**
Grounded = **P**rotective **E**xtra-**L**ow **V**oltage **PELV**

Earthing of G0 (system neutral)

Observe the following for grounding G0:

- As a rule, earthing as well as nonearthing of G0 is permissible for AC 24 V operating voltage. However, observe all local regulations and customary procedures.
- For functional reasons, earthing may be required or not permissible.

Recommendation on earthing G0

- **As a rule, ground AC 24 V systems** if not otherwise indicated by the manufacturer.
- To avoid earth loops, connect systems with **PELV** to the earth at **only one end** in the system, normally at the transformer, unless otherwise specified.

⚠ Operating voltage AC 24 V, AC 230 V

The following regulations apply to these operating voltages:

	Regulation
Operating voltage AC 24 V	The operating voltage must comply with the requirements for SELV or PELV: • Permissible deviation of AC 24 V nominal voltage at the actuators: +/–20 %
Operating voltage AC 230 V	• Permissible deviation of AC 230 V nominal voltage at the actuators: +/–10 %
Specification on AC 24 V transformers	• Safety isolating transformers as per EN 61 558, with double insulation, designed for 100 % duty to supply SELV or PELV circuits • Determine the transformer's power consumption by adding up the power consumption in VA for all actuators used. • The capacity used from the transformer should amount to at least 50 % of the nominal load for efficiency reasons (power efficiency) • The nominal capacity of the transformer must be at least 25 VA. For smaller transformers, the ratio between voltage at idle time to voltage at full load is unsatisfactory (> + 20 %)
Fuse of AC 24 V operating voltage	Transformers, secondary side: • According to the effective load of all connected devices • Line G (system potential) must always be fused. • Where required, line G0 also (system neutral)
Fuse of AC 230 V mains voltage	Transformers, primary side, as per the applicable installation regulations of the respective country

4.2 Device-specific regulations

⚠ Device safety

Safety for the devices is ensured by (among other aspects):
- Supply of AC 24 V extra-low voltage as per **SELV** or **PELV**
- Double insulation between AC 230 V mains voltage and SELV/PELV circuits

Mechanical parallel connection of actuators

- Mount max. two actuators on the same damper shaft. Use the mounting bracket to also secure the second actuator (see powerpack-accessories in section 2.2).

⚠ Auxiliary switches A, B

Apply **only mains voltage** or **only safety extra-low voltage** to the switching outputs of auxiliary switches A and B. Mixed operation is not permissible. Operation using various phases is not permissible.

⚠ Feedback potentiometer for position indication

Consider the potentiometer's electric data to indicate the damper position via the external circuit.

2-position control

It is recommended to switch off the power during two-position control when the actuator has reached the open or close position, in order to enhance life span and reduce power consumption.

Electrical parallel connection of actuators

Same device types with index A can be electrical parallel wired.

Same device types with index B (or higher) can also be electrical parallel wired.

Mix of electrical parallel wiring of device types with index A and B (or higher) is not possible.

Up to 10 actuators of the same device type can be electrical parallel wired. Cable length and cable cross section have to be respected.

See chapter 6 “Wiring notes” for more information.

Caution, maintenance

Do not open the actuator.
The actuator is maintenance-free. Only the manufacturer may conduct any repair work.

4.3 Notes on EMC optimization

Running cables in a duct

Make sure to separate high-interference cables from equipment susceptible to interference.

Cable types

- Cables emitting interference: Motor cables, particularly motors supplied by variable speed drives, energy cables
- Cables susceptible to interference: Control cables, extra-low voltage cables, interface cables, LAN cables, digital and analog signal cables

Cable segregation

- You can run both cable types in the same cable ducting, but in different compartments.
- If ducting with three closed sides and a partition is not available, separate the interference-emitting cables from other cables by a minimum of 150 mm or route in separate ducting.
- Cross high-interference cables with equipment susceptible to interference only at right angles.
- When, as an exception, signal and interference-emitting supply cables are run in parallel, the risk of interference is very high. In this case, limit the cable length of the positioning signal line DC 0...10 V for modulating actuators.

Unshielded cables

We recommend to use unshielded cables. When selecting unshielded cables, follow the manufacturer's installation recommendations. In general, **unshielded twisted-pair** cables have sufficient EMC characteristics for building services (incl. data applications) as well as the advantage that no provision is required for coupling to the surrounding earth.

4.4 Determining the actuator

Required actuator torque

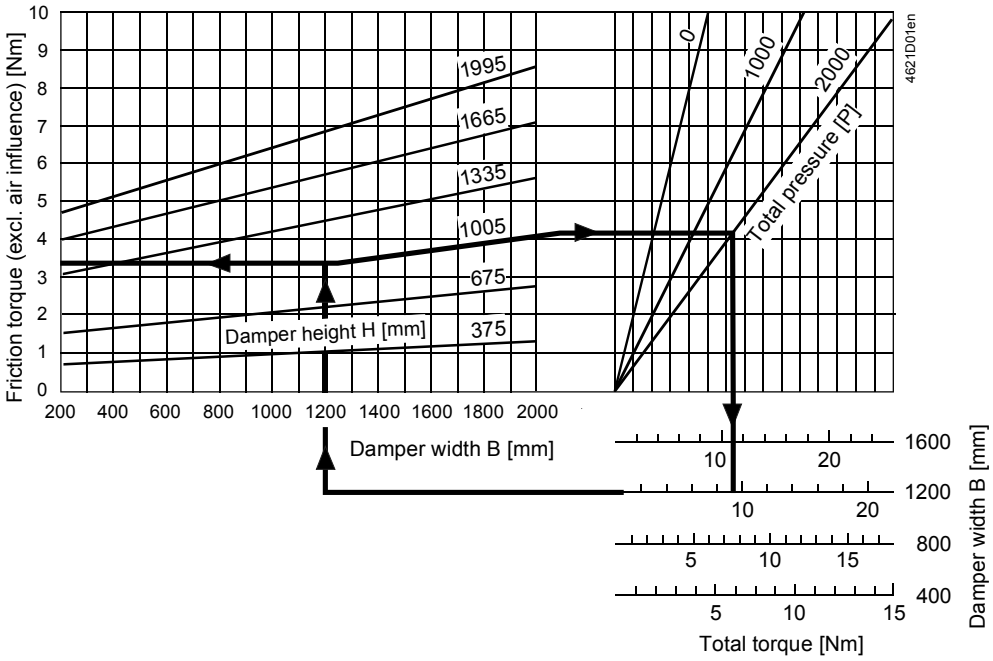
Selection of the actuator depends on several torque factors. After obtaining the damper torque rating [Nm/m^2] from the manufacturer and determining the damper area, calculate the total torque required to move the damper as follows:

Total torque [Nm] = torque rating [Nm/m^2] × damper area [m^2].

Instead of the torque rating, the total torque can also be determined from the manufacturer's sizing charts.

Sizing chart

The following chart (example EMCO) allows for determining the total torque for this air damper type.



Example

Damper for blinds:

Width	= 1200 mm
Height	= 1005 mm
Total pressure	= 2000 Pa

The total torque of about **10 Nm** results from the chart.

Determining the actuator type

Determine your type of actuator from the table below:

If $\frac{\text{total torque [Nm]}}{SF^{1}}$	**then use type**
≤ 15 Nm	GEB..1 (15 Nm)
≤ 25 Nm	GBB..1 (25 Nm) [2]
≤ 30 Nm	2 x GEB..1 (2 x 15 Nm) [3]
≤ 35 Nm	GIB..1 (35 Nm) [4]
≤ 70 Nm	2 x GIB..1 (2 x 35 Nm) [5]

Notes

[1] Safety Factor SF:
When calculating the number of actuators, remember to include nondefinable variables such as slight misalignment, damper age, etc., as a safety factor. We recommend a total safety factor of 0.8.
Apply the same factor when calculating the actuator torque by the torque rating.

If the required actuator torque is greater than 15 Nm, you can use the following:

[2] One actuator of type series GBB..1, or

[3] Two actuators (tandem-mounted powerpack) of type series GEB13..1, GEB33..1, or

[4] One actuator of type series GIB..1 .

[5] If the actuator torque is greater than 35 Nm, two actuators of type series GIB..1 can mechanically be connected and mounted on the damper shaft.
(See data sheets N4621, N4626, and N4699).

5 Mounting notes

Mounting instructions	All information and steps to properly prepare and mount the actuator are available in the mounting instructions 4 319 2685 0 (M4626) delivered with the actuator. The shaft adapter as well as all other individual parts are not premounted, as the actuator components are put together differently depending on damper shaft length. Refer to section 2.5 “Mechanical design".
Mounting position	Choose the actuator's mounting position so that you can easily access the cables as well as the setting elements on the front of the actuator. Refer to section 11.1 "Dimensions".
Device protection	To satisfy the IP54 protection class requirements, the following conditions must be fulfilled: • The actuators are equipped only for vertical mounting (cable entries at bottom) with air dampers having a horizontal shaft. • The actuator mounted on the damper shaft may be mounted by max. +/– 45° to the vertical line: • Use the weather shield ASK75.1 for any mounting position.
Mounting bracket	The mounting bracket (see dimensions) is required for mounting on the damper shaft. The insertion depth for the bolt into the housing must be sufficient and guaranteed.
Factory setting	The actuator comes with a factory setting of +2.5° which ensures a tight close-off for the air dampers.
Manual adjustment	The actuator can be manually adjusted by pressing the gear train disengagement button. To ensure a tight close-off function for the dampers and the exact switching position for switches A and B, adjust the actuator only if the **shaft adapter and the position indicator are mounted** in accordance with the mounting instructions.
Mechanical limitation of angular rotation	If necessary, you can limit the angular rotation at increments of 5° for the entire span by positioning the shaft adapter in the respective position.
Damper shafts	Refer to chapter 8 Technical data for information on minimum length and diameter of the damper shafts.
Use of rotary/linear sets	Mount the mounting sets for converting a rotary movement to linear movement (section 2.2 Type summary) as per the separate mounting instructions.
Tandem (powerpack) mounting	When mounting two actuators on the same damper shaft (for GBBGIB13..1 and GBB/GIB33..1), use the ASK73.1 mounting bracket. For GBB/GIB16.. use the ASK73.2 mounting bracket.

6 Wiring notes

Introduction

Prior to wiring, study all information in the following sections:

- "Safety notes" in section 4.1
- "Device-specific regulations" in section 4.2
- "Notes on EMC optimization" in section 4.3
- "Connection Diagrams" in chapter 9, and the
- HVAC plant diagram.

6.1 Permissible line lengths and cross sectional area

The permissible line lengths and cross-sectional areas depend on the actuators' power consumption and the voltage drop of the connection lines to the controller. Determine the necessary line length from the following diagram and the formulas.

Note

To determine the line length and cross-sectional area, adhere to the permissible operating voltage tolerance at the actuator (see chapter 8 Technical data) in addition to the permissible voltage drop between the signal and supply lines (see table below).

Permissible voltage drop

The line sizing between the controller and the actuators depends on the actuator type used and is determined on the following basis.

Type	Operating voltage	Line	Max. permissible voltage drop
GBB/GIB13..1	AC 24 V	G, Y1, Y2	4 % each (tot. 8 %) of AC 24 V
GBB/GIB16..1 GIB161.1E/MO	AC 24 V	G0, G G0, Y, U	4 % each (tot. 8 %) of AC 24 V 1 % of DC 10 V
GBB/GIB33..1	AC 230 V	L, N	2 % each (tot. 4 %) of AC 230 V

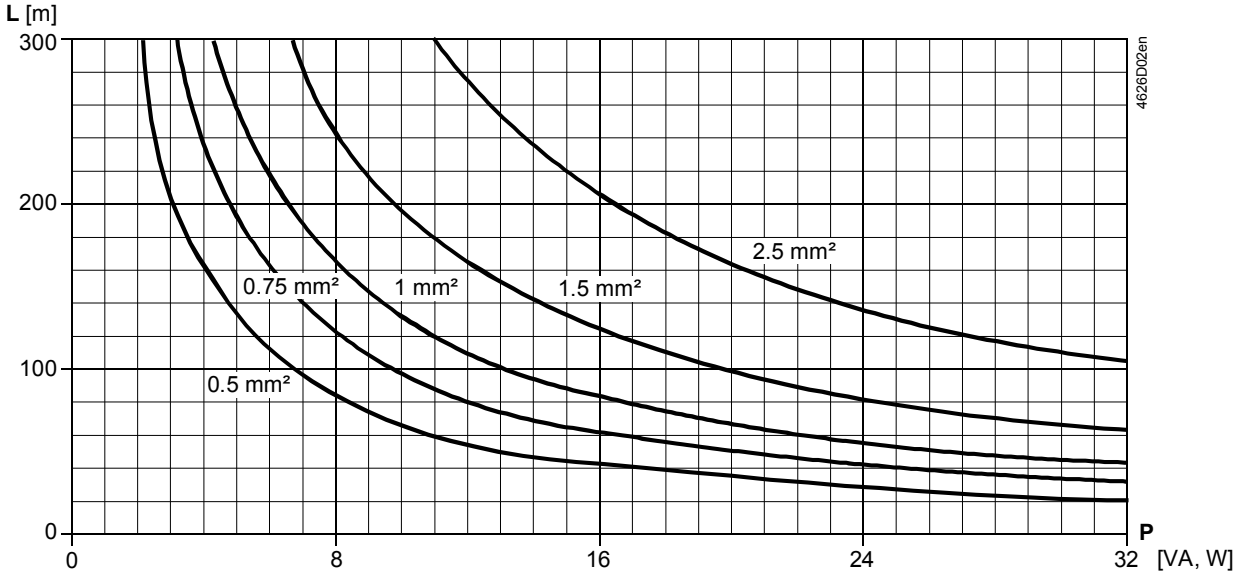
Notes on the G0 line (GEB16..1)

Consider the following criteria:

- For modulating control:
  The permissible positioning signal error caused by a voltage drop in the line current on the G0 line must not exceed 1%.
- The G0 line's voltage drop caused by surges in the DC circuit in the actuator may not exceed 2 Vpp.
- In the case of improper sizing of the G0 line, actuator load changes may cause natural oscillation due to a change in the DC voltage drop.
- The supply voltage loss at AC 24 V may not exceed 8 % (4 % across G0 line).
- **DC voltage drop across the G0 line** is caused as follows:
  - Asymmetrically in the internal actuator supply (approx. DC 8 mA)
  - Positioning signal current DC 0.1 mA (from Y = DC 0...10 V)
  - Positioning signal current DC 1 mA (from U = DC 0...10 V).
- **It can be ignored for the following aspects.**

Line length/ consumption AC 24 V

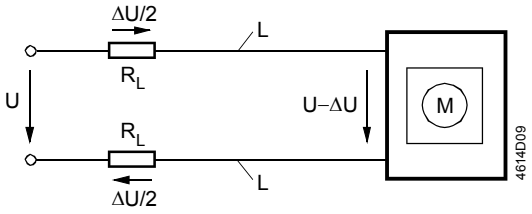
The diagram applies to AC 24 V and shows the permissible line length **L** as a function of consumption **P** and as a parameter of the cross-sectional area.



Notes on diagram

- The values in [VA, W] on the P-axis are allocated to the permissible voltage drops (ΔU/2U = 4 %) on line L as per the above table and to the P&I diagram.
- P is the primary power consumption for all actuators connected in parallel.

P&I diagram: Voltage drop on the supply lines



Formula for line length

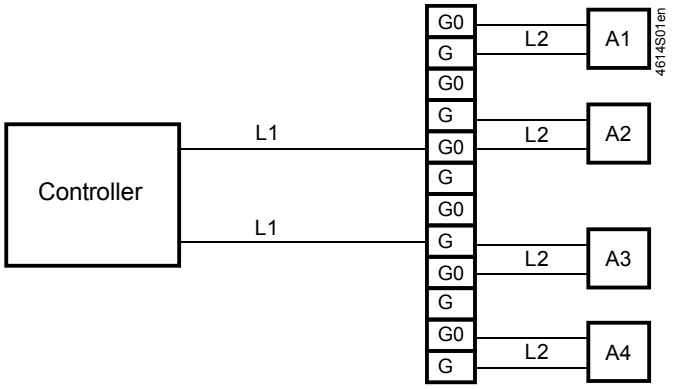
The maximum line length can be calculated using the following formula.

Operating voltage	Perm. voltage drop / line	Formula for line length
AC 24 V	4 % of AC 24 V	$L = \frac{1313 \bullet A}{P}$ [m]
	1 % of DC 10 V	$L = \frac{5.47 \bullet A}{I(DC)}$ [m]
AC 230 V	2 % of AC 230 V	$L = 46 \bullet \frac{1313 \bullet A}{P}$ [m]

A Cross-sectional area in [mm²]
L Permissible line length in [m]
P Power consumption in [VA] or [W];
the value is printed on the actuator's type field
I(DC) DC current portion in line G0 in [A]

Line length for actuators connected in parallel

The following sections show how to determine the permissible line length and cross-sectional areas for the various actuators based on examples.
The examples for actuators connected in parallel apply to the following arrangement:



Assumption

The line resistances of L2 are equal and can be ignored for L1. Separately calculate the permissible line lengths L2 for other connections (ring, star-like).

6.2 Actuator wiring (three-position)

Actuators with three-position control
GBB13..1

With three-position actuators, only the situation as presented under **AC 24 V** is important. Sizing takes place via lines 1 (G), 6 (Y1), and 7 (Y2).

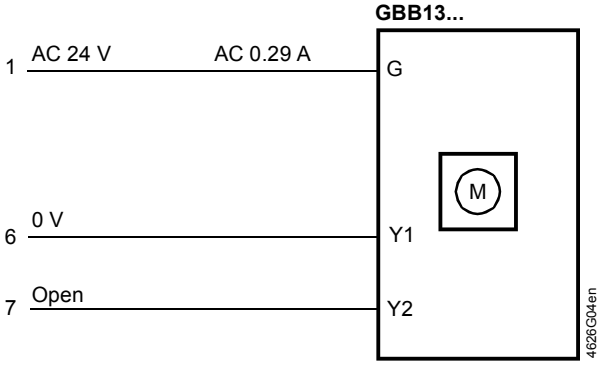
Power consumption and perm. voltage drop with one actuator

The table shows the power consumption of an actuator as well as the permissible voltage drop.

Operating voltage/pos. signal	Power consumption	Perm. voltage drop for line 1 (G), 6 (Y1), 7 (Y2)
AC 24 V	7 VA	∆U/U = max. 8 % (4 % each per line)

P&I diagram:
Currents at AC 24 V

The diagram shows the currents in the connecting lines for **one actuator**.



Example:
Parallel connection of two actuators

Determining the line lengths for two actuators GBB/GIB13..1 and AC 24 V supply.
Only the currents in line 1 (G) and 6 (Y1) or 7 (Y2) determine the line sizing.
Max. permissible voltage drop = **4 % per line** (total 8 %).

- Consumption = 2 x 7 VA = 14 VA
- Line current = 2 x 0.29 A = 0.58 A

Max. permissible single line length: 140 m at 1.5 mm^2 cross-sectional area.

Note:
2-position control

It is recommended to switch off the power during two-position control when the actuator has reached the open or close position, in order to enhance life span and reduce power consumption.

6.3 Actuator wiring (modulating)

Modulating actuators
GBB/GIB16..1

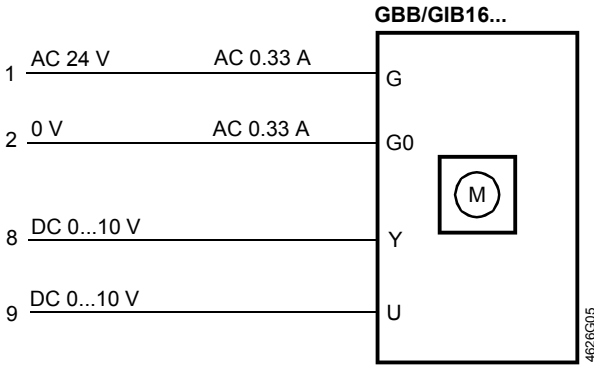
With AC supply, the G0 line has a AC 0.33 A supply current and a DC 0.1 mA positioning signal current (from Y = DC 0...10 V). The AC voltage drop on the G0 line does not impact the positioning signal Y.

Power consumption and perm. voltage drop with one actuator

Operating voltage	Power consumption	Perm. voltage drop for line 1 (G)2 (G0)
AC 24 V	8 VA	4 % of AC 24 V

P&I diagram:
Currents

The diagram shows the currents in the connecting lines for **one actuator**.



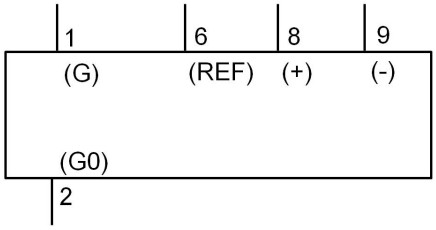
Example:
Parallel connection of four actuators

Determining the line lengths for four actuators GBB/GIB16..1 and AC 24 V supply. Only the AC currents in line 1 (G) and 2 (G0) determine the line sizing.
Max. permissible voltage drop = **4 % per line**.

- Consumption = 4 x 8 VA = 32 VA
- Line current = 4 x 0.33 A = 1.32 A
- **Permissible single line length for G, G0:**
  61 m at 1.5 mm^2 cross-sectional area, or
  102 m at 2.5 mm^2 cross-sectional area

6.4 Actuator wiring (Modbus RTU)

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



Strand code	Strand color	Terminal code	Description
1	red (RD)	G	System potential AC 24 V
2	black (BK)	G0	System neutral AC 24 V
6	violet (VT)	REF	Reference (Modbus RTU)
8	grey (GY)	+	Bus + (Modbus RTU)
9	pink (PK)	-	Bus - (Modbus RTU)

Note

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.

7 Commissioning notes

References

All information necessary for commissioning is contained in the following:

- This document ("Technical basics" Z4626en)
- Mounting instructions 4 319 2685 0 (M4626)
- HVAC plant diagram

7.1 General checks

Environmental conditions

Check to ensure that all permissible values as contained in chapter 8 Technical data are observed.

Mechanical check

- Check for proper mounting and to ensure that all mechanical settings correspond to the plant-specific requirements. Additionally, ensure that the dampers are shut tight when in the fully closed position.
- Fasten the actuator securely to avoid side load.
- Rotary movement check: Manually change the damper setting by pressing the gear train disengagement button and turn the adapter (only if no voltage is applied).

Electrical check

- Check to ensure that the cables are connected in accordance with the plant wiring diagram.
- The operating voltage AC 24 V (SELV/PELV) or AC 230 V must be within the tolerance values.

7.2 Electrical functional check

Rotary movement: Three-position control
GBB/GIB13..1,
GBB/GIB33..1

Check the actuator operating states as follows (also refer to section 9.3 "Connection diagrams (three-position control)".

Wire connections		Direction of rotation
AC 24 V	**AC 230 V**	
1 – 6	4 – 6	Clockwise
1 – 7	4 – 7	Counter-clockwise
1 – 6 / 1 – 7 open	4 – 6 / 4 – 7 open	Actuator stays in position reached

Rotary movement: Modulating control
GBB/GIB16..1

Check the actuator operating states as follows (see also section 9.4 "Connection diagrams (modulating)"):

- When applying input signal Y = DC 10 V, the actuator turns (clockwise or counter-clockwise as per the rotary direction switch setting).
- The direction of rotation set at the rotary direction switch must match the desired damper movement direction.
- After interrupting the AC 24 V operating voltage, the actuator stops.
- After interrupting positioning signal Y, but while operating voltage is still supplied, the actuator returns to the zero position.

Characteristic function for the positioning signal
GBB/GIB163.1,
GBB/GIB164.1

Factory setting: The potentiometers for setting the offset Uo and span ∆U are set to the following values: Uo = 0 V, ∆U = 10 V.

Note

Specify the values set for Uo and ∆U in the plant papers.

Position indicator

Check of output voltage U:

- U = DC 0...10 V for **angular rotation 90°**.

Feedback potentiometer

Measures resistance changes while the actuator turns from 0 to 90°.

Auxiliary switches A and B

- Switchover of the auxiliary switch contacts "A" and "B" as soon as the actuator reaches the respective switching positions.
- Set the setting shafts (part of the delivery) to the desired value by means of a screwdriver (see section 3.2 "Angular range and mechanical limitation").

Important

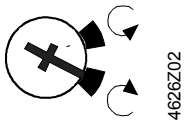
The angle values are valid only for the **zero** position of the actuator (clockwise direction).

Factory setting

The auxiliary switches have the following factory settings:

- Switch A: Switchover point at 5°
- Switch B: Switchover point at 85°

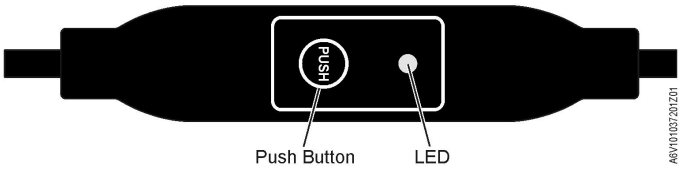
Rotary direction switch
for GBB/GIB16..1



The set direction of rotation must agree with the required direction of rotation of the air damper..
Factory setting: ↻
For the special diagrams according to section 9.4.2, the operating states must also be checked.

7.3 Modbus

7.3.1 HMI – Human-machine interface



Push button operation

Activity	Push-button operation	Confirmation
Display current address (starting with lowest address digit)	Press 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

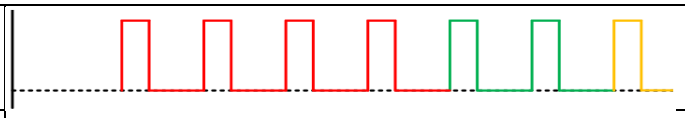
1. Press button for >10s → LED starts flashing **orange**.
2. Release button while LED still flashes → LED keeps flashing for 3s.
3. If the button is pressed within these 3s, the reset is cancelled.
4. After those 3s → LED shines **red** (reset), then the device restarts.

7.3.2 Push button addressing

The Modbus address can be set without a separate tool by using push-button and LED.
To display the current address, press button <1s.

Display current address (starting with lowest address digit)

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 LED shines **red**, then release button (before LED gets 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 LED shines in color of next digits → release button,
4. **Save address**: press button until 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.
5. Entered address is repeated one times for confirmation.

Note

If button is released before LED shines red, the address is discarded.

Examples

Set address “124”:

1. Enter addressing mode
2. Set 1-digits: Press button 4-times → 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 → 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 → LED flashes **orange** per button press
7. Store address: press button until LED shines **red** – release button
   → address is stored and displayed 1x for confirmation

Set address “50”:

1. Enter addressing mode
2. Skip 1-digits: Hold button pressed until LED shines **green** – release button
3. Set 10-digits: Press button 5-times → LED flashes **green** per button press
4. Store address (skip 100-digits): hold button pressed until LED shines **red** – release button
   → address is stored and displayed 1x for confirmation

Set address “5”:

1. Enter addressing mode
2. Set 1- digit: Press button 5-times → LED flashes **green** per button press
   Store address: press button until LED shines **red**
   → address is stored and displayed 1x for confirmation

7.3.3 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 29.

During commissioning check/set the following:

- Bus configuration (address, baudrate, transmission mode, and optionally termination). 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 powered 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 30) or by setting the address to 246 with push button press > 5s und < 10s (cf. page 29). 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

7.3.4 Modbus registers

Reg.	Name	R/W	Unit	Scaling	Range / enumeration
Process Values					
1	Setpoint	RW	%	0.01	0..100
2	Override control	RW	--	--	0 = Off / 1 = Open / 2 = Close 3 = Stop / 4 = GoToMin / 5 = GoToMax
3	Actual position	R	%	0.01	0..100
256	Command	RW	--		0 = Ready / 1 = Adaption / 2 = Selftest 3 = ReInitDevice / 4 = RemoteFactory Reset
Parameters					
257	Opening direction	RW	--	--	0 = CW / 1 = CCW
258	Adaptive Mode	RW	--	--	0 = Off / 1 = On
259	Operating Mode	RW	--	--	1 = POS
260	MinPosition	RW	%	0.01	0..100
261	MaxPosition	RW	%	0.01	0..100
262	Actuator Running Time	R	s	1	150
513	Backup Mode	RW	--	--	0 = Go to BackupPosition 1 = Keep last position 2 = Disabled
514	Backup Position	RW	%	0.01	0..100
515	Backup Timeout	RW	s	1	0..65535
516	Startup Setpoint	RW	%	0.01	0..100
764	Modbus Address	RW	--	--	1..247 / 255 = “unassigned”
765	Baudrate	RW	--	--	0 = auto / 1 = 9600 / 2 = 19200 3 = 38400 / 4 = 57600 / 5 = 76800 6 = 115200
766	Transmission Format	RW	--	--	0 = 1-8-E-1 / 1 = 1-8-O-1 2 = 1-8-N-1 / 3 = 1-8-N-2
767	Bus Termination	RW	--	--	0 = Off / 1 = On
768	Bus Conf. Command	RW	--	--	0 = Ready / 1 = Load / 2 = Discard
769	Status	R	--	--	See below, Register 769 “Status”

Reg.	Name	R/W	Value	Example
Device information				
1281	Factory Index	R	Two bytes, each coding an ASCII char.	00 5A → 00 “Z” Device is of Series “Z”
1282	Factory Date HWord	R	Two bytes, the lower coding the Year (hex)	Read 1282 → 000F Read 1283 → 0418
1283	Factory Date LWord	R	High byte: coding the month (hex) Low byte: coding the day (hex)	**HWord** / **LWord** -- / YY / MM / DD Hex: 00 / 0F / 04 / 18 Dec: 00 / 15 / 04 / 24 → Device was manufactured 24 April, 2015
1284	Factory SeqNo HWord	R	Hword + LWord = HEX-representation of Sequence number:	Read 1284 → 000A Read 1285 → A206 AA206(hex) → 696838 (dec) → Device has sequence number 696838
1285	Factory SeqNo LWord	R		
1409	ASN [Char_16..15]	R	Each register: Two bytes, each coding an ASCII char. ASN is coded beginning with reg. 1409	Example: 0x47 44 = GD 0x42 31 = B1 0x38 31 = 81 0x2E 31 = .1 0x45 2F = E/ 0x4D 4F= MO → ASN is GDB181.1E/MO
1410	ASN [Char_14..13]	R		
1411	ASN [Char_12..11]	R		
1412	ASN [Char_10..9]	R		
1413	ASN [Char_8..7]	R		
1414	ASN [Char_6..5]	R		
1415	ASN [Char_4..3]	R		Reserve
1416	ASN [Char_2..1]	R		

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 Registers
04 (0x04)	Read Input Registers
06 (0x06)	Write Single Register
16 (0x10)	Write Multiple Registers (Limitation: Max. 120 registers within one message)

7.3.5 Parameter and function description

Function	Reg.	Description
Override control	2	The actuator can be operated in override control for commissioning / maintenance purposes or system-wide functions (e.g. night-cooling). • Manual override: When the gear disengagement is used to freely adjust the damper position, a mechanical jam will be detected if a mismatch between setpoint and actual position persists for more than 10s. • Remote override: The actuator enters this state when an override command is sent over the bus. • Available commands: o Open / Close (depends on opening direction) o Min / Max (depends on Min/Max settings) o Stop
Adaptive positioning	258	• For air dampers where the opening range is smaller than the nominal opening range 0...90°, the feedback signal can be adapted to have the actual opening range represented as 0...100%. • Using adaptive positioning makes the actuator driving to its end positions at the first startup after activating the adaptive positioning. • To trigger the adaptation again after the first startup, either the command “CalibrateAdaption” (Write “1” into register no. 256), or the adaptive positioning can be turned off and on again.
Backup mode	513, 514, 515	• In case the communication to the controller is lost, the device can be configured to go into a defined state. • Default setting mode is “keep last setpoint”, i.e. in case of communication loss, the device controls to the last received setpoint. • If the backup mode is enabled, it can be configured as follows: o go to a predefined backup position o keep current position
Restarting the device	256	Restarting is possible by: • Power-reset (turning operating voltage off and on) or • by “ReInitDevice” command. → Device re-initializes and sets all process values to defaults.
Reset		The actuator supports the following re-initialization / reset behaviour: • Local reset by push-button • Remote reset: Using “RemoteFactoryReset” command. Effect of reset: Process values: set to ex-works default values. • Parameters: o Application and actuator parameters are set to factory defaults, o Network parameters are reset only in case of local reset, not by remote reset (otherwise loss of communication). • Not reset are: Counters, status flags, device info, and factory data.
Self test	256	When triggered, the self test drives the actuator to the detected limits and sets the flags in register 769 according to the result (bit 09 = 1→”failed” or bit 10 = 1 → “passed”). The self test is not passed when the limits were not reached from the lower end (results in jam). If the Min/Max limits can be exceeded, the self test is not evaluated as failed.

8 Technical data

⚠ AC 24 V supply (SELV/PELV)

Operating voltage		AC 24 V ± 20 % or AC 24 V class 2 (US)
Frequency		50/60 Hz
Safety extra-low voltage (SELV) or		
Protective extra-low voltage (PELV) as per		HD 384
Requirements for external safety isolating transformer (100 % duty)		as per EN 61 558
Supply line fuse		max. 10 A
Power consumption	GBB/GIB13..1: Running	7 VA, 7 W
	GBB16.1/GIB16..1..: Running	8 VA, 8 W
	GBB/GIB16..1: Holding	1.1 W

⚠ AC 230 V power supply

Operating voltage		AC 230 V ± 10 %
Frequency		50/60 Hz
Supply line fuse		max. 10 A
Power consumption:	GBB/GIB33..1: Running	5 VA, 5 W

Functional data

Nominal torque		25 Nm GBB 35 Nm GIB
Maximum torque (blocked)		50 Nm GBB 75 Nm GIB
Nominal rotary angle / max. rotary angle		90 ° / 95° ± 2°
Runtime for 90° rotary angle		150 s (50 Hz) / 125 s (60 Hz)
Mechanical life		10^5 cycles

⚠ Inputs

Positioning signal *for GBB/GIB13..1*	Operating voltage AC 24 V	(wires 1-6)	clockwise
		(wires 1-7)	Counter-clockwise
Positioning signal *for GBB/GIB33..1*	Operating voltage AC 230 V	(wires 4-6)	clockwise
		(wires 4-7)	Counter-clockwise

Positioning signal *for GBB16..1/GIB16..1..*	Input voltage (wires 8-2)	DC 0...10 V
	Current consumption	0.1 mA
	Input resistance	> 100 kΩ
	Max. permissible input voltage	DC 35 V
	Protected against faulty wiring	max. AC 24 V
	Neutral zone for nonadjustable characteristic function	200 mV
	Neutral zone for adjustable characteristic function	2 % of ΔU
	Hysteresis for nonadjustable characteristic function	70 mV
	Hysteresis for adjustable characteristic function	0.7 % of ΔU

Communication

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 el. Switchable Default: Off

Adjustable characteristic function *for GBB/GIB163.1, GBB/GIB164.1*	Adjustable with 2 potentiometers:	
	Offset Uo	DC 0...5 V
	Span ΔU	DC 2...30 V
	Max. input voltage	DC 35 V
	Protected against faulty wiring	max. AC 24 V

⚠ Outputs

Position indicator *for GBB/GIB16..1*	Output signal (wires 9-2)	
	Output voltage U	DC 0...10 V
	Max. output current	DC ± 1 mA
	Protected against faulty wiring	max. AC 24 V

Feedback potentiometer *for GBB/GIB135.1, GBB/GIB335.1*	Change of resistance (wires P1-P2)	0...1000 Ω
	Load	< 1 W
	Max. sliding contact current	< 10 mA

	Permissible voltage at potentiometer (SELV/PELV)		AC 24 V
	Insulation resistance between potentiometer and housing		AC 500 V
⚠ Auxiliary switches *for GBB/GIB136.1, GBB/GIB336.1 GBB/GIB164.1, GBB/GIB166.1*	Contact rating		6 A res., 2 A ind.
	Life:	6 A res., 2 A ind.	10^4 cycles
		5 A res., 1 A ind.	5 x 10^4 cycles
		without load	10^6 cycles
	Switching voltage		AC 24...230 V
	Nominal current resistive/inductive		6 A / 2 A
	Electric strength auxiliary switch against housing		AC 4 kV
	Switching range for auxiliary switches		5°...90°
	Setting increments		5°
	Switching hysteresis		2°
	Factory switch setting		
	Switch A		5°
	Switch B		85°
Connection cables	Cross section of prewired connection cables		0.75 mm^2
	Standard cable length		0.9 m
	Permissible length for signal lines (non-communicative types)		300 m (see chapter 6)
Degree of protection of housing	Degree of protection as per EN 60 529		IP 54
Protection class	Insulation class		as per EN 60 730
	AC 24 V		III
	AC 230 V		II
	Feedback potentiometer		III
	Auxiliary switches		II
Environmental conditions	Operation		IEC 721-3-3
	Climatic conditions		class 3K5
	Mounting location		interior, weather-protected
	Temperature		–32....+55 °C
	Humidity (noncondensing)		< 95 % r. h.
	Transport		IEC 721-3-2
	Climatic conditions		class 2K2
	Temperature		–32...+70 °C
	Humidity (noncondensing)		< 95 % r. h.
	Mechanical conditions		class 2M3
Standards and directives	Product safety		
	Automatic electrical controls for household and similar use		EN 60 730-2-14 (type 1)
	Electromagnetic compatibility (Application)		For residential, commercial and industrial environments
		GBB..1:	GIB..1:
	EU Conformity (CE)	A5W00004366 [1]	A5W00004368 [1]
		GBB..1:	GIB..1:
	RCM Conformity	A5W00004367 [1]	A5W00004369 [1]
	EAC Conformity		Eurasia conformity for all G..B.. variants
	UL, cUL		UL 873 http://ul.com/database
	Product environmental declaration [2]		CE1E4626en [1] and A6V101083254en [1]
Dimensions	Actuator W x H x D (see "Dimensions")		100 x 300 x 67.5 mm
	Damper shaft		
	Round		8...25.6 mm
	Square		6...18 mm
	Min. length		20 mm
	Max. shaft hardness		< 400 HV
Weight	Without packaging		
	GBB/GIB..		2 kg
	GIB161.1E/MO		2.2 kg

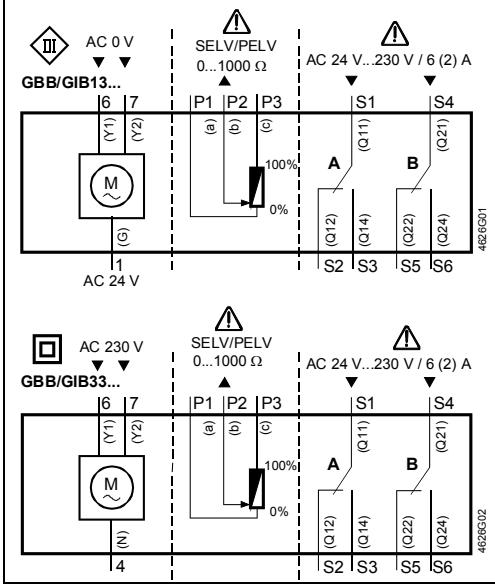
[1] The documents can be downloaded from http://siemens.com/bt/download

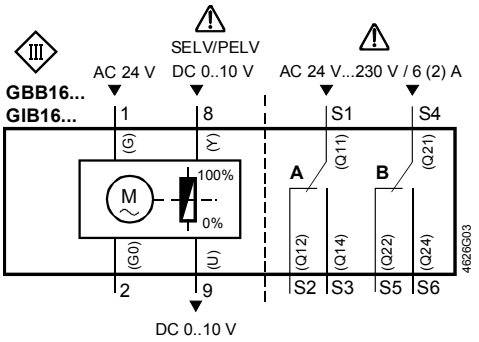
[2] The product environmental declaration contains data on environmentally compatible product design and assessments (RoHS compliance, materials composition, packaging, environmental benefit, disposal).

9 Diagrams

9.1 Internal diagrams

GBB/GIB13..1 / GBB/GIB33..1	GBB/GIB16..1
Three-position control	**Modulating control** **DC 0...10 V / 0...35 V**





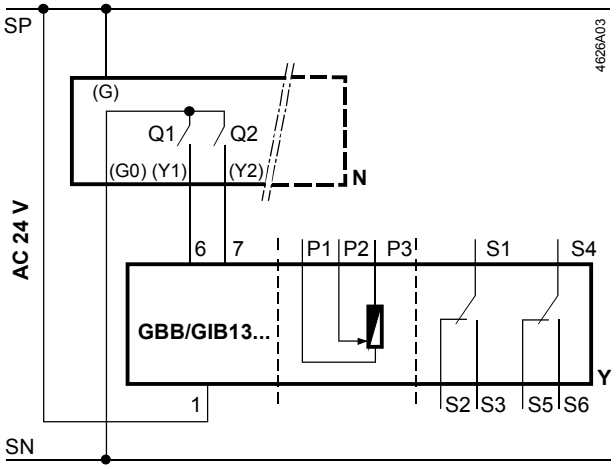
9.2 Cable labeling

All wires are color-coded and labeled.

Pin	Cable				Meaning
	Code	No.	Color Abbreviation		
Actuators AC 24V	G	1	red	RD	System potential AC 24 V
	G0	2	black	BK	System neutral
	Y1	6	purple	VT	Pos. signal AC 0 V, "clockwise"
	Y2	7	orange	OG	Pos. signal AC 0 V, "counter-clockwise"
	Y	8	grey	GY	Pos. signal DC 0...10 V, 0...35 V
	U	9	pink	PK	Position indication DC 0...10 V
Modbus types	REF	6	violet	VT	Reference (Modbus RTU)
	+	8	gray	GY	Bus + (Modbus RTU)
	-	9	pink	PK	Bus - (Modbus RTU)
Actuators AC 230V	N	4	blue	BU	Neutral
	Y1	6	black	BK	Pos. signal AC 230 V, "clockwise"
	Y2	7	white	WH	Pos. signal AC 230 V, "counter-clockwise"
Auxiliary switches	Q11	S1	grey/red	GY RD	Switch A input
	Q12	S2	grey/blue	GY BU	Switch A normally-closed contact
	Q14	S3	grey/pink	GY PK	Switch A normally-open contact
	Q21	S4	black/red	BK RD	Switch B input
	Q22	S5	black/blue	BK BU	Switch B normally-closed contact
	Q24	S6	black/pink	BK PK	Switch B normally-open contact
Feedback potentiometer	a	P1	white/red	WH RD	Potentiometer 0...100 % (P1-P2)
	b	P2	white/blue	WH BU	Potentiometer pick-off
	c	P3	white/pink	WH PK	Potentiometer 100...0 % (P3-P2)

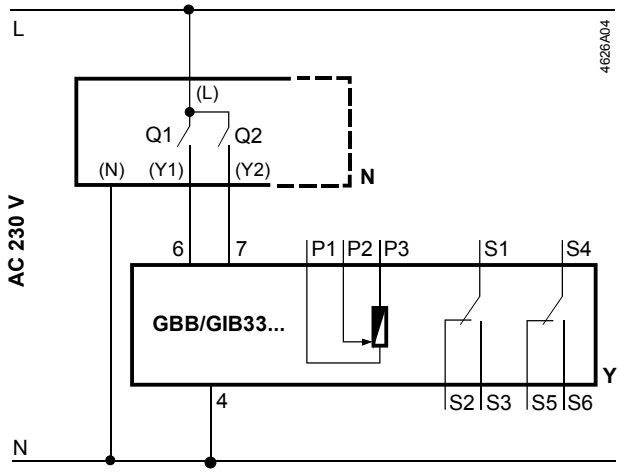
9.3 Connection diagrams (three-position control)

GBB/GIB13..1
AC 24 V



N Controller
Y Actuator GBB/GIB13..1
SP System potential AC 24 V
SN System neutral
Q1, Q2 Controller contacts

GBB/GIB33..1
AC 230 V



N Controller
Y Actuator GBB/GIB33..1
L System potential AC 230 V
N System neutral
Q1, Q2 Controller contacts

Operating states for actuators GBB/GIB13..1, GBB/GIB33..1

The table shows the actuator's operating state for both directions of rotation regardless of the position of the controller contacts Q1 and Q2.

Controller contacts Q1	Controller contacts Q2	Operating state
		Remains in current position
		Not permissible

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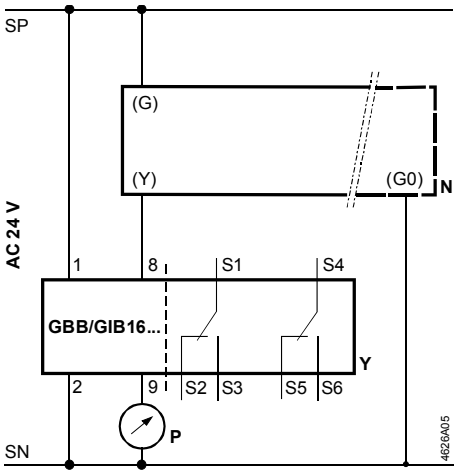
9.4 Connection diagrams (modulating)

9.4.1 Typical application

The controller output is connected directly to the actuator input.

GBB/GIB16..1

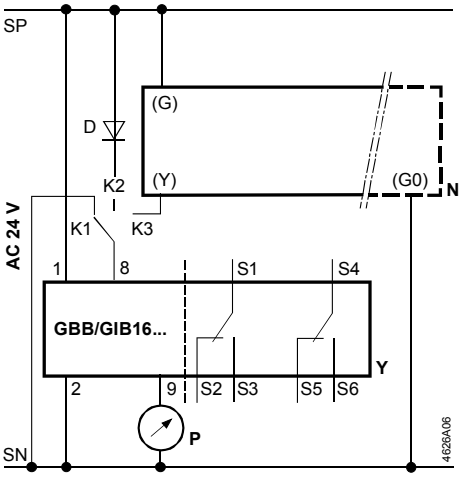


N	Controller
Y	Actuator GBB/GIB16..1
P	Position indication
SP	System potential AC 24 V
SN	System neutral

9.4.2 Special diagram for modulating control

The following diagram enables enable different operating states of the actuator depending on the position of the changeover switch with switch contacts K1, K2, K3 (see table of operating states).

Modulating control, fully open, fully locked with GBB/GIB16..1



N	Controller
Y	Actuator GBB/GIB16..1
P	Position indication
SP	System potential AC 24 V
SN	System neutral
D	Diode (e.g. R4000)
K1...K3	Switch contacts (10 V / 0.1 mA)

Operating states with GBB/GIB16..1

Switch contacts	Operating state	Direction of rotation	
K3	Modulating control	↶	↷
K2	Fully open	↶	↷
K1	Fully closed	↷	↶
Rotary direction switch		**Factory setting**	

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Note

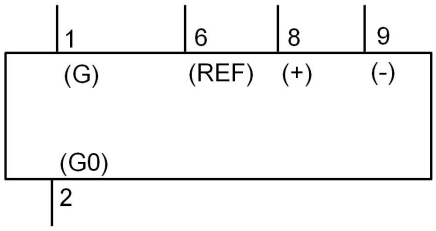
*) Full opening for actuator types with adjustable characteristic function depends on the set voltage values (Uo, ΔU) and the supply voltage tolerance.

9.5 Connection diagrams (networked)

9.5.1 Typical application

GIB161.1E/MO

The application controller is connected to the actuator by the bus cable.



10 Environmental compatibility and disposal

General notes

These actuators were developed and manufactured by using environmentally-compatible materials and by complying with our environmental standards.

For disposal, please remember the following at the end of product life or on defects:

- As a rule, dispose of all waste in an environmentally compatible manner and in accordance with environmental, recycling, and disposal techniques.
  Ad-here to all local and applicable laws.
- The aim is to achieve maximum recyclability at the lowest possible pollution. To do this, note the various material and disposal notes printed on specific parts.

The device is considered electrical and electronic equipment for disposal in terms of the applicable European Directive and may not be disposed of as domestic garbage.

- Dispose of the device through channels provided for this purpose.
- Comply with all local and currently applicable laws and regulations.

Environmental declaration

The environmental declarations for these actuators contain detailed information on the materials and volumes used. Request a declaration at your local Siemens sales office.

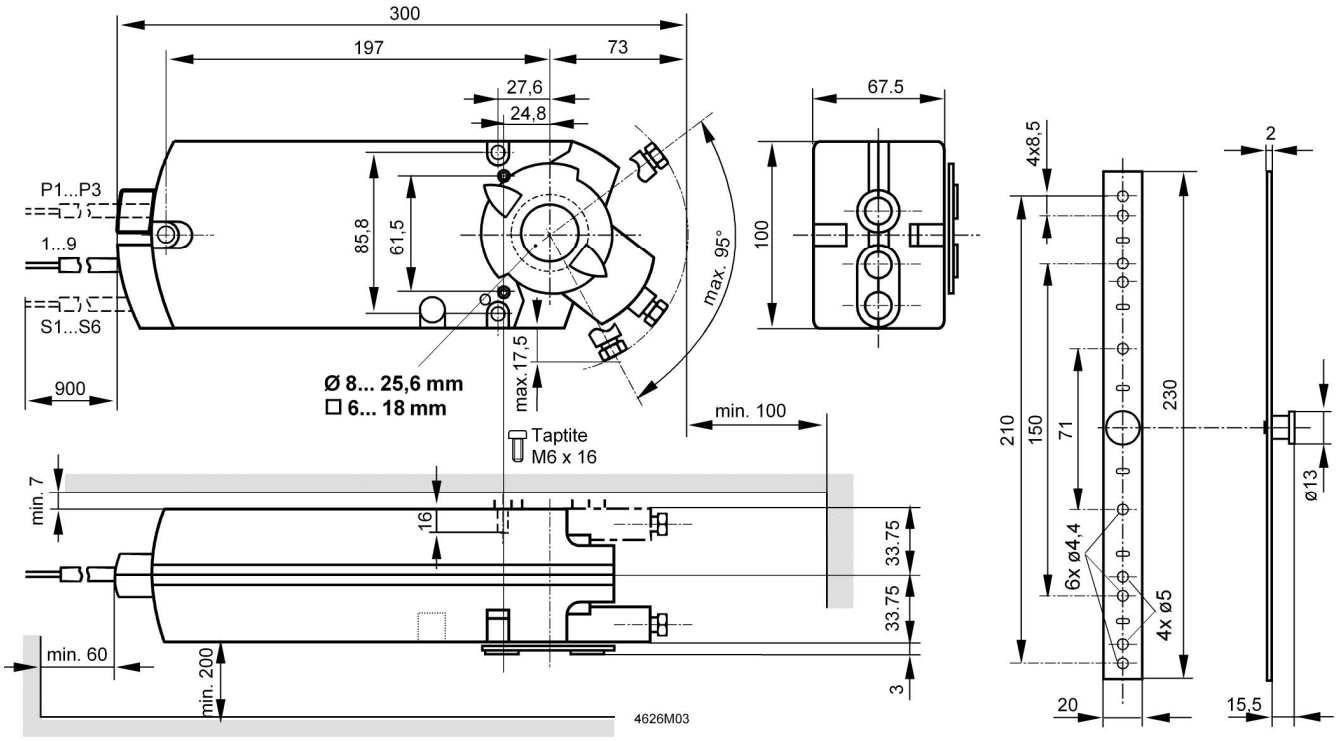
11 Appendix

Chapter contents

This chapter contains:

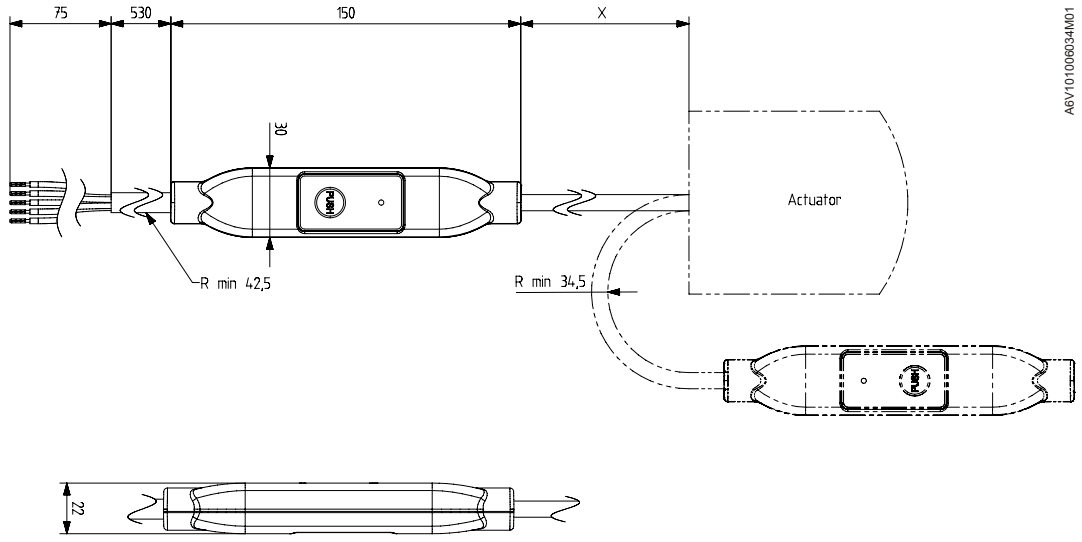
- Actuator dimensions
- Referenced documents

11.1 Dimensions



Dimensions in mm

External Modbus Interface



X = 220 mm

Dimensions in mm

11.2 Referenced documents

Purpose of this listing

The previous chapters contain all information relevant to safety and project-specific requirements, mounting, wiring, and commissioning of actuators.

Documents and standards

The following list contains all documents referenced by this document on basics:

- Data sheets (N....) with detailed specifications
- Basic documentation (Z....) with basics on air damper actuators
- Mounting instructions (M….), documents supplied with product

Note

The document and classification numbers listed in the table below match those of the database “STEP” on the company-internal Intranet.

Standards

All standards and directives relevant to engineering are also listed.

Technical documentation
Type series GBB/GIB..1

Document number (classification no.)	Title/description	Contents
N4626en (N4626)	Actuators for air dampers, rotary version (GBB/GIB..1: Three-position, modulating)	Type overview, function and selection criteria
A6V101037253	Data sheet: Air Damper Actuators Modbus RTU, GEB.., GIB.. non-spring return types	Type overview, function and selection criteria.
4 319 2685 0 (M4626)	Mounting instructions: GBB/GIB..1	Instructions on mounting a rotary actuator without spring return
A6V101006034	Installation Instruction: G..161../MO S..6../MO	Installation of types with external Modbus interface.

Accessories for type series GBB/GIB..1

N4699en (N4699)	Accessories and spare parts for air dampers actuators ASK7..	Overview, allocation to actuator type and application
N4615en (N4615)	External Auxiliary Switches ASC77..	Detailed specifications
74 319 0413 0 (M4615)	External Auxiliary Switches ASC77..	Mounting instructions and application examples
4 319 2659 0 (M4626.1)	Rotary/linear set for duct mounting ASK71.1	
4 319 2708 0 (M4626.2)	Rotary/linear set for frame mounting ASK71.2	
4 319 2725 0 (M4626.3)	Rotary/linear set with lever ASK71.3	
4 319 2846 0 (M4626.4)	Rotary/linear set with lever and mounting plate ASK71.4	
74 319 0236 0 (M4614.1)	Universal lever ASK71.9	
4 319 2849 0 (M4613.1)	Bracket for powerpack ASK73.1	
4 319 2950 0 (M4613.2)	Self-aligning bracket for powerpack ASK73.2	
4 718 1406 0	Special shaft adapter ASK74.1	
4 319 2946 0 (M4626.11)	Weather shield for rotary actuator ASK75.1	

Standards

HD 384	Electrical installations in buildings
EN 61 558	Safety of transformers, mains-powered units and similar equipment
EN 60 730	Automatic electrical controls for household and similar use
IEC/EN 61 000-6-3 IEC/EN 61 000-6-2	Electromagnetic compatibility: Emissions Electromagnetic compatibility: Immunity
IEC/EN 61 000-6-1	Electromagnetic compatibility: Immunity
89/336/EEC	Directive for electromagnetic compatibility
73/23/EEC	Low-voltage directive

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