21 A6 Valve actuator heating/cooling binary 906101

Use of the application program

Product family:	Heating, Air conditioning, Ventilation
Product type:	Heater
Manufacturer:	Siemens

Name:	Actuator for thermal positioners N 605
Order no.:	5WG1 605-1AB01

Functional description

The thermal drive actuator N 605 has been specially developed to control miniature valves with electrothermal valve drives for AC 230 V operating voltage. 6 channels with semiconductor outputs are available to control the valve drives. The outputs each have 2 output terminals (for N and switched L). A maximum of 4 thermal drives may be connected in parallel to one actuator output.

The application program enables the actuator outputs to be controlled via ON/OFF switching commands or via positioning commands expressed as a percentage. The latter are converted into switching commands with pulse width modulation under consideration of the heating up and cooling down periods of a thermal drive. A changed status or the current state of an output can be queried via a separate status object or sent automatically. The type of the output status object is always the same as the trigger object. If the parameter "Sending of valve position status objects" is set to "on change of values", the status objects of the valves are also sent once after bus voltage recovery.

Bus/mains voltage failure/recovery

The behaviour of the actuator on bus voltage failure can be preselected. It can be selected per output whether the valves that are connected to the output are opened or closed on bus voltage recovery, remain in their respective position or move into a forced position (only for continuous control). This position is then also maintained after bus voltage recovery until a telegram has been received with a switch or positioning command for the respective channel. When the N 605 is switched on for the first time or when the voltage for supplying the actuator electronics is recovered, all the outputs are switched to OFF (i.e. the valves are opened or closed depending on the type) and the corresponding status values are sent.

If no bus voltage is available when the voltage to supply the N 605 is recovered, the actuator is operated with the default parameter settings until the bus voltage is applied. As soon as a valve is connected which is opened in the de-energized state, it will continue to be open after mains voltage recovery.

Local operation

The power supply of the actuator electronics is carried out via an integrated power supply unit which is independent of the EIB bus voltage. Each output in a group of three outputs (channels 1-3 or channels 4-6) can be manually switched on or off or to the 50% open position via three push buttons which are integrated in the actuator and which each have 1 red LED. By pressing one of the three push buttons for a long period (> 2 s), the other valve group is selected. The manual switching also functions if the bus cable is not connected or if the bus communication fails.

Status display

The yellow LED indicates which of the two output groups can be operated and is being displayed (continuous light = channels 1-3, flashing light = channels 4-6). The status display of the actuator outputs is carried out via the red LEDs and is defined as follows:

LED ON:
Voltage is applied at the output.
LED OFF:
No voltage is present at the output.
LED FLASHES SLOWLY:
Voltage may be applied at the output. The actuator output operates in pulse-width modulation mode i.e. the voltage is alternately present/absent at the actuator output. The valve is thus neither permanently opened nor permanently closed.
LED FLASHES RAPIDLY:
No voltage is present at the output. The output has been switched off after detection of a short circuit or due to an overload or short circuit. Positioning commands which control this channel are rejected until the short circuit or overload is removed and a reset of the mains voltage has been carried out.
LEDs DISPLAY CIRCULATING LIGHT:
Voltage can be present at the outputs due to the activation of the short circuit detection function. The control variables of the outputs are however not processed during the detection procedure.

Protection against calcification

If the program function "Protection against calcification" is activated, each actuator output is switched on once within a period of 6 days for the duration of the valve repetition time (for continuously controlled valves) or for 5 minutes (for valves controlled by switching). This is to prevent the valves from being fixed in position outside the heating respectively cooling period.

Constrained position

If the user does not want that in a room with several windows the opening of one window only will switch the room thermostat to building protection mode and thus

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close all heating and cooling valves then the program function "Constrained Position" has to be activated. In this case, only the valve of the respective radiator or cooling ceiling element that is located in the immediate vicinity of the opened window is closed, except for a set residual opening (constrained position). The program function "Constrained position" can be linked with the object "Frost alarm" or "Outside temperature". If a frost alarm is not present or the outside temperature is ≥ 1°C, the valve is fully closed if the constrained position is activated. If the outside temperature falls below 1°C or a frost alarm occurs when the function is active, the corresponding valves are controlled with the constrained position value. If the constrained position function is deactivated, the position of the corresponding valve is set to the control variable value that was last sent by the controller.

The constrained position function can be triggered and deactivated for each channel (selectable) either via the EIB by a communication object or directly within the actuator by one of the inputs for window contacts.
Note: Once the application program has been downloaded, all the outputs are switched to OFF (i.e. the valves are opened or closed depending on the type). A possible constrained position, which is triggered by an update to the "Constrained position" object or by an active input after the application program has been started, is however taken into consideration.

Inputs
There are 6 additional binary inputs available for floating signal contacts in order to record and transmit the switching state e.g. of window contacts or dew point detectors or to activate the constrained position function. The contact type (normally closed or normally open contact) can be set per binary input. The inputs have a debounce time of approx. 750 ms. To guarantee an error-free function, the terminal pairs 18/20, 22/24 and 26/28 may not be linked together.
Note: If the objects "Constrained position" and "Window contact" in a device are given the same group address and this address has not been assigned to any other device, then the window contact triggers the constrained position. However, the bus telegram is repeated three times with system priority because the acknowledgement of receipt is missing. In this case, the parameter should be set that a window contact will activate the constrained position internally (see ETS parameter menu "Channel 1...6").

Detection of short circuits and overload
The outputs are monitored for short circuit and overload. If a short circuit or overload is detected, all the outputs are temporarily de-energized and the red LEDs will show a circulating light. The value FF_{hex} in the

status byte of the "Overload" communication object is sent on the bus to signal that the detection of the short circuit has started. After a cooling down period of 6 minutes, the individual outputs are switched on in sequence to determine where the short circuit or overload has occurred. If a short circuit is detected at the output, the status byte is sent with the set bit 7 and the detected channel bit. The next output is then tested (if the last tested output was short-circuited, after a further cooling down period of 6 minutes) until the short circuit detection process is concluded by testing channel 6. Finally, the status byte is sent with the total result without the set bit 7. Short-circuited or overloaded outputs are disabled for further operation and their associated red LED flashes rapidly. All the other outputs are then operated as normal. It is only possible to reset a disabled channel by switching off the actuator from the mains voltage.
Note: In case of a small overload the software may be unable to detect the concerned output and will stay in the outputs testing routine. In this case the user has to find out which load at which output is wrong.

Prerequisites
The user of the program must ensure that the following requirements are met for the error-free operation of the application program for the N 605:
1. The user must specify via a parameter whether the room thermostat only sends switching command telegrams of type EIS 1 to activate a valve whereby a logical 0 corresponds to the command for closing the valve and a logical 1 corresponds to the command for opening the valve. Otherwise, it must be defined whether the valve is triggered via positioning commands of type EIS 6 expressed as percentage values whereby 0% corresponds to a closed valve and 100% to an opened valve.
2. The room thermostat must ensure that it never sends switching or positioning commands which lead to the simultaneous opening of the heating and cooling valves (i.e. a switching/positioning command to open a valve may only be sent by the thermostat if it has previously sent a switching/positioning command to close the other valve).
3. If dew point detectors have been installed and are connected to the EIB, the room thermostat must send a "CLOSE" command (0% command) to the cooling supply valve if a dew point alarm is present followed by an "OPEN" command (100% command) when the dew point alarm is no longer present and further cooling is required.
4. Thermal valve drives of the same type from the same manufacturer must be connected to all the outputs of the N 605. The user must indicate for each valve whether it is closed or opened in the de-energized state.

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5. If the opening of a window is reported to the room thermostat via the EIB and the program function "Constrained position" has not been activated, the thermostat must switch to "Building protection mode" and immediately send a "CLOSE" command (0% command) to the currently opened inlet valve. In the "Building protection mode", the room thermostat must ensure by controlling the valves that the room temperature does not fall below the setpoint for frost protection and that the setpoint for heat protection is not exceeded.

Communication objects

Phys.Addr.	Program			
no.	Object name		Function	Type
01.01.001	20 A6 valve actuator heating/cooling binary 906101			
0	Positioning value, Channel 1		continuously	1 Byte
1	Positioning value, Channel 2		continuously	1 Byte
2	Positioning value, Channel 3		continuously	1 Byte
3	Positioning value, Channel 4		continuously	1 Byte
4	Positioning value, Channel 5		continuously	1 Byte
5	Positioning value, Channel 6		continuously	1 Byte
6	Status valve position, Channel 1		8-bit Value	1 Byte
7	Status valve position, Channel 2		8-bit Value	1 Byte
8	Status valve position, Channel 3		8-bit Value	1 Byte
9	Status valve position, Channel 4		8-bit Value	1 Byte
10	Status valve position, Channel 5		8-bit Value	1 Byte
11	Status valve position, Channel 6		8-bit Value	1 Byte
12	Status, Input 1		On / Off	1 Bit
13	Status, Input 2		On / Off	1 Bit
14	Status, Input 3		On / Off	1 Bit
15	Status, Input 4		On / Off	1 Bit
16	Status, Input 5		On / Off	1 Bit
17	Status, Input 6		On / Off	1 Bit
18	Constrained position, Channel 1		On / Off	1 Bit
19	Constrained position, Channel 2		On / Off	1 Bit
20	Constrained position, Channel 3		On / Off	1 Bit
21	Constrained position, Channel 4		On / Off	1 Bit
22	Constrained position, Channel 5		On / Off	1 Bit
23	Constrained position, Channel 6		On / Off	1 Bit
24	Frost alarm		On / Off	1 Bit
25	Overload / Short Circuit		Status	1 Byte

Obj	Object name	Function	Type	Flags
0-5	Positioning value, Channel 1-6	On / Off (1-bit) or continuously (8-bit)	1 Bit or 1 Byte	CW
This object is used to open/close the thermal drive on one of the actuator outputs 1- 6. It is set via a parameter whether the control variable is switching (1-bit, EIS 1) or continuous (8-bit, EIS 6).				
6-11	Status valve position, Channel 1-6	Open / Closed or 8-bit Value	1 Bit or 1 Byte	CTR
The status of the valve position on one of the actuator outputs 1-6 can be queried with this object or sent automatically if there is a change in the status, provided that the corresponding parameter is enabled. (Note: The information given is whether the valve is opened or closed or the opening of the valve is given as a percentage value. The switching state of the channel is not provided since it is also possible to connect a drive to the output whose valve is opened in the de-energized state). Caution: 230 V can still be present at the actuator output in spite of the closed valve. The type of this object should always be the same as the object used to control the channel.				
12-17	Status, Input 1-6	On / Off	1 Bit or 1 Byte	CTR
The status of one of the sensor inputs 1-6 can be queried with this object or sent either automatically after a change in the status or cyclically, provided that the corresponding parameter is enabled.				
18-23	Constrained position, Channel 1-6	On / Off	1 Bit	CW
The thermal drive on one of the outputs 1-6 is switched to the forced position via this object or reverts to the position selected in accordance with the last control variable sent by the controller. If a logical connection has been set between the forced position and the object "Frost alarm" or "Outdoor temperature", the valve is fully closed if no frost alarm is present or the outdoor temperature is $\geq$ 1°C, if the "Constrained position" object is equal to logical 1.				
24	Frost alarm or Outdoor temperature	On / Off or °C-Value (EIS 5)	1 Bit or 2 Byte	CWTU
The "Frost alarm" or the "Outdoor temperature" are received by the actuator via this object. An output is only switched to the set "Constrained position" if a frost alarm is present or the outdoor temperature is < 1°C. Otherwise, the thermal drive is closed if the assigned "Constrained position" object equals logical 1 or the associated input is active. If the transmit flag is set, the current value of the frost alarm or outdoor temperature object is automatically queried on the bus after bus or mains voltage recovery (to do so, it must be possible to read out the object in the room thermostat and the read flag of the object must also be set).				

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Obj	Object name	Function	Type	Flags
25	Overload / Short Circuit	Status	1 Byte	CTR

The status "Overload / Short Circuit" can be queried with this object or sent automatically in the event of an error or a change in the status. The set bits of the 8 bit object indicate the outputs that have an overload or short circuit. (The occurrence of a short circuit and start of the short circuit test is signalled by FF $_{hex}$. The bit 7 = 1 signals that the test is in progress. Once the test has been concluded, bit 7is set = 0. Bit 0 = 1 corresponds to a short circuit at output 1, bit 1 = 1 corresponds to a short circuit at output 2, etc.).

Maximum number of group addresses: 35
Maximum number of associations: 55

Parameters

General

Note:

The settings in bold type correspond to the factory settings (default values).

Parameters	Settings
Sending of valve position status objects	**using read request only** on change of values
If this parameter is set to "on change of values", each change in the status of a valve position and bus or mains voltage recovery leads to the automatic sending of the corresponding communication object.	
Sending of input status objects at power or bus voltage recovery	**disabled** enabled
The status of the input objects on bus or mains voltage recovery is only sent if the option has been enabled via the above parameter.	

Parameters	Settings
Sending of input status objects	**using read request only** on change of values
If this parameter is set to "on change of values", each change in the input status leads to the automatic sending of the corresponding communication object.	
Periodical sending of input status objects	**disabled** enabled
The status of the input objects is only sent cyclically if this option has been enabled via the above parameter.	
Cycle time	1 ... 60 minutes **10 minutes**
The cycle time for sending the input status objects is set in this parameter.	
Telegram rate limitation	enabled **disabled**
It is defined via this parameter whether a limitation of the telegram rate (e.g. when sending the status objects) should be carried out or not.	
Maximum telegram rate	**30 telegrams per 17 sec** 60 telegrams per 17 sec 100 telegrams per 17 sec 127 telegrams per 17 sec
This parameter sets the maximum number of telegrams when the telegram rate is limited.	
Protection against calcification	**Off** On
The program function "Protection against calcification" is enabled or disabled for all the outputs together via this parameter.	

Valve control

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Parameters	Settings
Repetition time (for moving from 0% to 100% and back to 0%) in minutes (3 – 60)	3 ... 60 minutes **10 minutes**
The repetition time in minutes is the period which is required by a thermal drive to travel from 0% to 100% and back again from 100% to 0%. The period is necessary to convert positioning commands expressed as percentage values into pulse-width modulated switching commands. It should be rounded up to the nearest full minute.	
Valves always closed if positioning value below ... percent (1 - 30)	1 ...30% **15%**
The non-linear behaviour of valves can be taken into account via this parameter. Positioning commands that are smaller than the set value are then treated as a 0% positioning command when converting positioning commands into pulse-width modulated switching commands i.e. the valve remains closed.	
Valves always open if positioning value upper or equal ... percent (70-100)	70 ... 100% **85%**
The non-linear behaviour of valves can be taken into account via this parameter. Positioning commands that are greater than or equal to the set value are then treated as a 100% positioning command when converting positioning commands into pulse-width modulated switching commands i.e. the valve remains fully open.	
Constrained position linked with object	no linkage frost alarm outdoor temperature
If the forced position is not linked to an object, the associated output is always controlled in the set constrained position in a percentage value if the object "Constrained position, Channel x" = logical 1 or the corresponding input is active. If the constrained position function is linked with the "Frost alarm" or "Outdoor temperature" object, the associated output is only set to the constrained position if either a frost alarm is present or the outdoor temperature is < 1°C and the object "Constrained Position Channel x" is = logical 1 or the corresponding input signals a logical 1. If no frost alarm is present or the outdoor temperature is ≥ 1°C and the object "Constrained position, Channel x" is = logical 1 or the corresponding input is active (= logical 1), then the thermal drive that is connected to the relevant output is closed.	
Constrained position in percent (0-100)	0 ... 100% **30%**
The required constrained position is set for all the outputs together via this parameter. If this value is smaller than the value set in the parameter "Valves always closed if positioning value below ... percent (1-30)"(with the exception of 0%), the greater value of the two parameters is used to trigger the constrained position.	

Channel 1

Parameters	Settings
Valve if de-energized	**closed** open
This parameter determines whether the connected valve is closed or open in the de-energized state (OFF).	
Type of positioning valve	**On / Off (1-bit)** continuous (8-bit)
It is set via this parameter whether the output is controlled via a switching controller with ON/OFF switching commands (EIS 1) or via a continuous controller with positioning commands in percentage values (EIS 6).	
Activate constrained position via	**Constrained position object** Input 1 Input 2 Input 3 Input 4 Input 5 Input 6
This parameter determines whether the constrained position should be activated and disabled via an object or via an input when the positioning valve is continuous. If "Input x" is selected here, the "Constrained position" object which is assigned to the channel is no longer visible.	
Behaviour on bus voltage failure	**no action** valve opens valve closes constrained position
It is set via this parameter which state should be adopted by the valve connected to the actuator output when the bus voltage fails. On bus voltage recovery, this state is maintained until a switch or positioning command is received by the controller for this channel. If the transition to the "Constrained position" is carried out on bus voltage failure, the forced position value is controlled regardless of the outdoor temperature or the frost alarm.	

Note:

The parameterisation of the other outputs is carried out in the same way.

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Inputs

Parameters	Settings
Contact type input 1	**normally closed contact** normally open contact
Contact type input 2	**normally closed contact** normally open contact
Contact type input 3	**normally closed contact** normally open contact
Contact type input 4	**normally closed contact** normally open contact
Contact type input 5	**normally closed contact** normally open contact
Contact type input 6	**normally closed contact** normally open contact
It is set via this parameter whether the connected contact is opened (normally closed contact) or closed (normally open contact) when it is <u>operated</u>.	

Note:

The settings for inputs 2 to 6 are carried out accordingly.

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