

Combi switchbox with integrated 3/2 way pilot valve

Construction

The GEMÜ 4222 combi switchbox with integrated 3/2 way pilot valve for pneumatically operated linear actuators has a microprocessor controlled intelligent position sensor as well as an analogue integrated travel sensor system. The optical position feedback is via LEDs.

Electrical activation and position feedback is provided via 24 V DC signals or via field bus (AS-Interface, DeviceNet).

The GEMÜ 4222 combi switchbox has a solid transparent plastic housing cover and a metal base.

Features

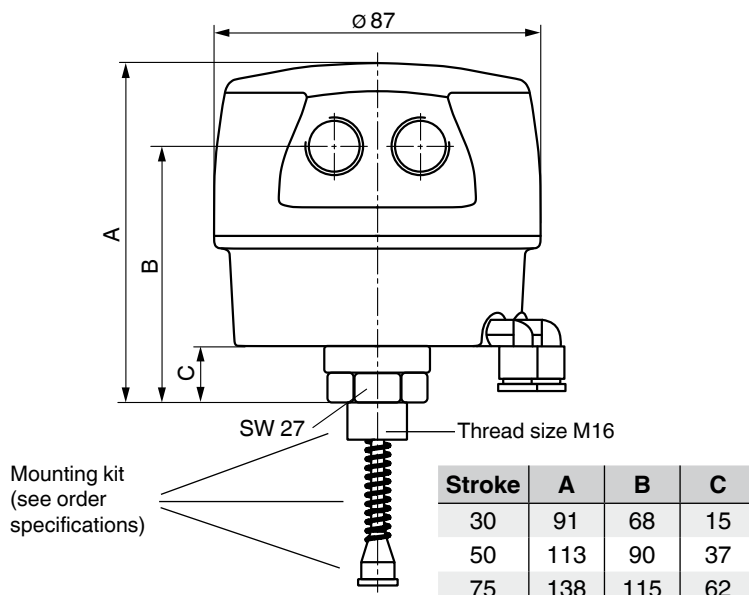
- Integrated end position control
- Integrated pilot valve for single or double acting actuators
- Integrated travel and system control

Advantages

- Design:
 - 24 V version but also direct field bus connection to
 - AS-Interface
 - DeviceNet
- Easy setting of valve end positions by automatic or manual programming mode
- Reduced cabling time
- Reduced planning time



Dimensions - GEMÜ 4222 [mm]



General technical data

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General information

| | |
|-----------------------------|---|
| Protection class | IP 65 |
| Electrical protection class | III |
| Weight | 380 g |
| Mounting position | optional |
| Mounting | M16 x 1 thread |
| Approvals | |
| AS-Interface certificate | 46901 (AS-Interface A2 version) 47001 (AS-Interface A3 version) |
| DeviceNet certificate | Composite Test Revision 18 ODVA File Number 10168 |
| Directives | |
| EC EMC directive | 89/336/EEC |
| Emission of interference | EN 61000-6-3 (24 V/DeviceNet version) AS-Interface Spec. 2.11 (AS-Interface version) |
| Immunity to interference | EN 61000-6-2 (24 V/DeviceNet version) AS-Interface Spec. 2.11 (AS-Interface version) |
| EC low voltage directive | 73/23/EEC |

Operating conditions

| | |
|----------------------|--|
| Medium | Quality classes to DIN ISO 8573-1 |
| Dust content | Class 3 (max. particle size 5 µm) (max. particle density 5 mg/m ³) |
| Pressure dew point | Class 4 (max. pressure dew point 3°C) |
| Oil concentration | Class 5 (max. oil concentration 25 mg/m ³) |
| Operating pressure | 1.5 - 7 bar |
| Flow rate (at 6 bar) | 100 l/min |
| Ambient temperature | 0°C to +50°C |

Attention: Note max. control pressure of valve actuator!

Electrical data

| | |
|--|--|
| Power supply | |
| 24 V version | 24 V DC (16 - 32 V DC) |
| AS-Interface version | 26.5 ... 31.6 V DC acc. to AS-Interface specification |
| DeviceNet version | 11 - 25 V DC |
| Current consumption | |
| 24 V version | typ. 100 mA |
| AS-Interface version | typ. 100 mA |
| DeviceNet version | 400 mA @ 11 V DC |
| Rating | continuously rated |
| Signal processing | |
| Switching frequency | max. 10 Hz |
| Hysteresis | 0.2 / 0.4 / 0.6 mm (30/50/75 mm travel length) |
| Electrical connection (A-coded) | |
| 24 V version | 2 x 5 pin M12 plug 1 x 8 pin M12 plug |
| AS-Interface version | 1 x 5 pin M12 plug |
| DeviceNet version | 1 x 5 pin M12 plug |
| Measuring range | |
| Minimum stroke | 3 / 6 / 9 mm (30/50/75 mm travel length) |
| Maximum stroke | 26/50/75 mm (30/50/75 mm travel length) |

24 V version

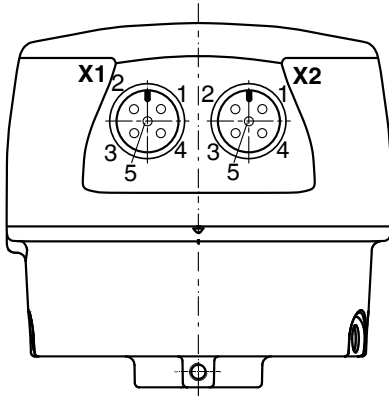
Technical data 24 V version - 5 pin (code 03)

| Switch points | | | | |
|--|-------|----|------------------|--------|
| Switch point group (Internal switch S2) | Input | | Switch point [%] | |
| | E2 | E1 | OPEN | CLOSED |
| 0 | 0 | 0 | 25 | 6 |
| 0 | 0 | 1 | 12 | 6 |
| 0 | 1 | 0 | 6 | 6 |
| 0 | 1 | 1 | 25 | 12 |
| 1 | 0 | 0 | 12 | 12 |
| 1 | 0 | 1 | 6 | 12 |
| 1 | 1 | 0 | 25 | 25 |
| 1 | 1 | 1 | 12 | 25 |

Switch points: The data in percent refer to the programmed stroke, before each end position

| DIP / DIL switch | |
|------------------|---|
| Switch | Function |
| S1 | 0 = Automatic programming mode 1 = Manual programming mode |
| S2 | Switch group change-over (see Switch point table) |
| S3 | 0 = Normal operation 1 = Quick programming on site |

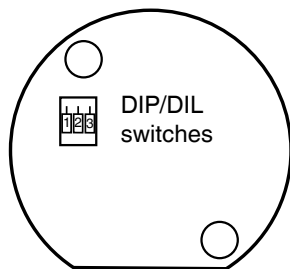
Electrical connections 24 V version - 5 pin



| Connection | Pin | Signal |
|---------------------------|-----|--------------------------|
| X1 A-coded M12 plug | 1 | + 24 V DC |
| | 2 | Control input |
| | 3 | GND |
| | 4 | Programming input |
| | 5 | ORed end position output |

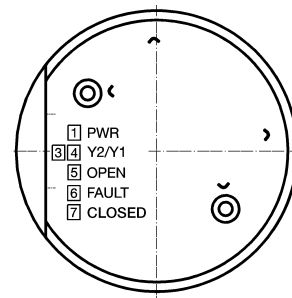
| Connection | Pin | Signal |
|---------------------------|-----|----------------------------|
| X2 A-coded M12 plug | 1 | End position CLOSED output |
| | 2 | End position OPEN output |
| | 3 | Error output |
| | 4 | Switch point 1 input |
| | 5 | Switch point 2 input |

Operating elements 24 V version - 5 pin



| | |
|----|---|
| S1 | Programming mode Auto/Manual |
| S2 | Change-over of switch point groups |
| S3 | Quick programming on site (see table DIP/DIL switches) |

Optical indication 24 V version - 5 pin



| LED | Colour | Function |
|-----|--------|----------------------------------|
| 1 | green | Power |
| 3 | yellow | Pilot valve Y2 activated |
| 4 | yellow | Pilot valve Y1 activated |
| 5 | yellow | Process valve in Open position |
| 6 | red | Fault |
| 7 | orange | Process valve in Closed position |

Technical data 24 V version - 8 pin (code 06)

Switch points

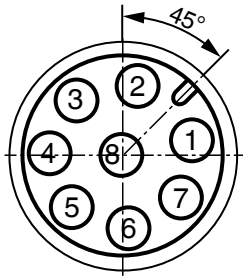
| Switch point group (Internal switch S2) | Switch point [%] | |
|--|------------------|--------|
| | OPEN | CLOSED |
| 0 | 25 | 12 |
| 1 | 12 | 25 |

Switch points: The data in percent refer to the programmed stroke, before each end position

DIP / DIL switch

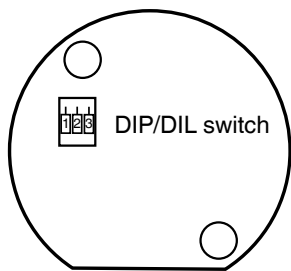
| Switch | Function |
|--------|---|
| S1 | 0 = Automatic programming mode 1 = Manual programming mode |
| S2 | Switch group change-over (see Switch point table) |
| S3 | 0 = Normal operation 1 = Quick programming on site |

Electrical connections 24 V version - 8 pin



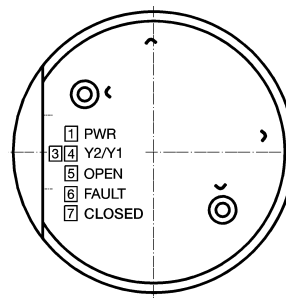
| Connection | Pin | Signal name |
|---------------------------|-----|-------------------------------------|
| X1 A-coded M12 plug | 1 | U, 24 V DC, supply voltage |
| | 2 | 24 V DC, OPEN end position output |
| | 3 | U, GND |
| | 4 | 24 V DC, CLOSED end position output |
| | 5 | 24 V DC, programming input |
| | 6 | 24 V DC, control input |
| | 7 | 24 V DC, error output |
| | 8 | n.c. |

Operating elements 24 V version - 8 pin



| | |
|----|---|
| S1 | Programming mode Auto/Manual |
| S2 | Change-over of switch point groups |
| S3 | Quick programming on site (see table DIP/DIL switches) |

Optical indication 24 V version - 8 pin



| LED | Colour | Function |
|-----|--------|----------------------------------|
| 1 | green | Power |
| 3 | yellow | Pilot valve Y2 activated |
| 4 | yellow | Pilot valve Y1 activated |
| 5 | yellow | Process valve in Open position |
| 6 | red | Fault |
| 7 | orange | Process valve in Closed position |

Inputs / Outputs - A3 version

Inputs AS-Interface (as seen from the AS-Interface master)

| Bit | Function | Logic |
|-----|-------------------------------|--|
| DI0 | Indication of Open position | 0 = process valve not in Open position 1 = process valve in Open position |
| DI1 | Indication of Closed position | 0 = process valve not in Closed position 1 = process valve in Closed position |
| DI2 | Indication of operating mode | 0 = normal operation 1 = programming mode |
| DI3 | Error 2 | see table: Error analysis |
| FID | Error 1 | see table: Error analysis |

Outputs AS-Interface (as seen from the AS-Interface master)

| Bit | Function | Logic |
|-----|---|---|
| DO0 | Activation of pneum. outlet 2/4 (c.f. 1, 2 + 3) (activation of pilot valve Y1/Y2) | 0 = pneum. outlet 2 vented/outlet 4 pressurized 1 = pneum. outlet 2 pressurized/ outlet 4 vented |
| DO1 | Programming mode | 0 = manual programming 1 = automatic programming |
| DO2 | Setting slave in programming mode | 0 = normal operation 1 = programming mode |
| DO3 | not available | |

Parameter outputs

| Bit | Function | Logic |
|-----|--------------------------|--------------------------|
| P0 | Setting of switch points | see table: Switch points |
| P1 | Setting of switch points | see table: Switch points |
| P2 | Setting of switch points | see table: Switch points |

Switch points - A3 version

| P2 | P1 | P0 | Switch point OPEN [%] | Switch point CLOSED [%] |
|----|----|----|-----------------------|-------------------------|
| 0 | 0 | 0 | 12 | 25 |
| 0 | 0 | 1 | 25 | 25 |
| 0 | 1 | 0 | 6 | 12 |
| 0 | 1 | 1 | 12 | 12 |
| 1 | 0 | 0 | 25 | 12 |
| 1 | 0 | 1 | 6 | 6 |
| 1 | 1 | 0 | 12 | 6 |
| 1 | 1 | 1 | 25 | 6 |

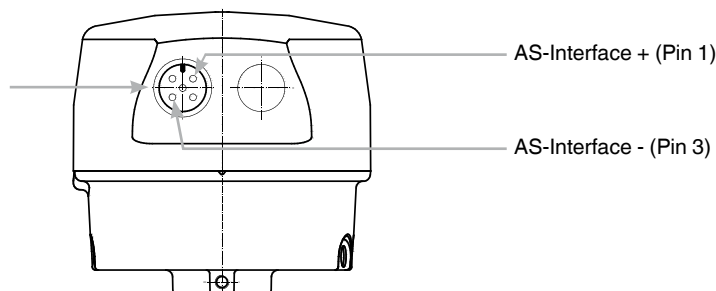
Switch points: The data in percent refer to the programmed stroke, before each end position

Error analysis

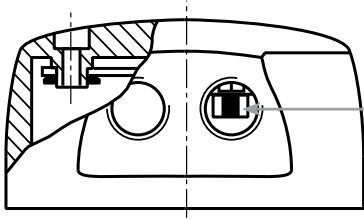
| Error 1 | Error 2 | Error function |
|---------|---------|-------------------|
| 1 | 0 | Internal error |
| 0 | 1 | Programming error |
| 1 | 1 | Sensor error |

Electrical connections - AS-Interface

Standard M12 plug
for yellow AS-Interface data wire
(connection via GEMU 4180)



Optical indication - AS-Interface

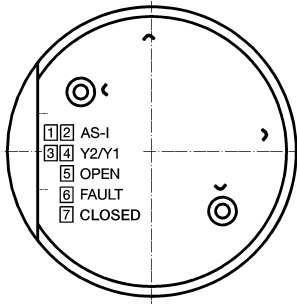


Slide switch for valve function (**manual operation**)

| | | | |
|-----------------|--------------|---------------|-------------------|
| Switch position | Left | Middle | Right |
| Valve: | Manual on | Manual off | Autom. via bus |

3 switch positions

Operating elements - AS-Interface



| LED | Colour | Function |
|-----|--------|----------------------------------|
| 1 | green | AS-Interface |
| 2 | red | AS-Interface error |
| 3 | yellow | Pilot valve Y2 activated |
| 4 | yellow | Pilot valve Y1 activated |
| 5 | yellow | Process valve in Open position |
| 6 | red | Fault |
| 7 | orange | Process valve in Closed position |

DeviceNet Version

Technical data - DeviceNet Version

I/O data

Inputs (as seen from the DeviceNet master), Class 64h, Inst. 1h, Attr. 2h

| Bit | Value/Default | Designation | Function | Logic |
|-----|---------------|-------------------|---|--|
| 0 | 0 | State Valve 1 | Status query pneum. outlet 2 (activation of pilot valve Y1) | 1 = pneum. outlet 2 pressurized 0 = pneum. outlet 2 vented |
| 1 | 0 | State Valve 2 | Status query pneum. outlet 4 (activation of pilot valve Y2) | 1 = pneum. outlet 4 pressurized 0 = pneum. outlet 4 vented |
| 2 | X | Operating mode | Indication of operating mode | 1 = normal operation 0 = programming mode |
| 3 | X | Position Closed | Indication of Closed position | 1 = process valve in Closed position 0 = process valve not in Closed position |
| 4 | X | Position Open | Indication of Open position | 1 = process valve in Open position 0 = process valve not in Open position |
| 5 | 0 | Sensor Error | Sensor error | 1 = sensor error 0 = normal operation |
| 6 | 0 | Programming Error | Programming error | 1 = programming error 0 = normal operation |
| 7 | 0 | Traveltime Error | Travel time error | 1 = travel time error 0 = normal operation |

Outputs (as seen from the DeviceNet master), Class 64h, Inst. 1h, Attr. 1h

| Bit | Value/Default | Designation | Function | Logic |
|-----|---------------|------------------------|--|---|
| 0 | 0 | Activate valve 1 | Activation of pneum. outlet 2 (activation of pilot valve Y1) | 1 = pneum. outlet 2 pressurized 0 = pneum. outlet 2 vented |
| 1 | 0 | Activate valve 2 | Activation of pneum. outlet 4 (activation of pilot valve Y2) | 1 = pneum. outlet 4 pressurized 0 = pneum. outlet 4 vented |
| 2 | not used | | | |
| 3 | not used | | | |
| 4 | not used | | | |
| 5 | not used | | | |
| 6 | not used | | | |
| 7 | 0 | Reset traveltime error | Reset of travel time error | 1 = reset 0 = no reset |

Communication types I/O - data

| Function | Description | Value |
|------------|-----------------|-------------------------|
| Polling | Poll Size | 1 Byte In 1 Byte Out |
| COS | Change of State | yes |
| Cycle | Cyclic I/O | yes |
| Bit Strobe | | yes |

Note: Download EDS file from www.gemu-group.com

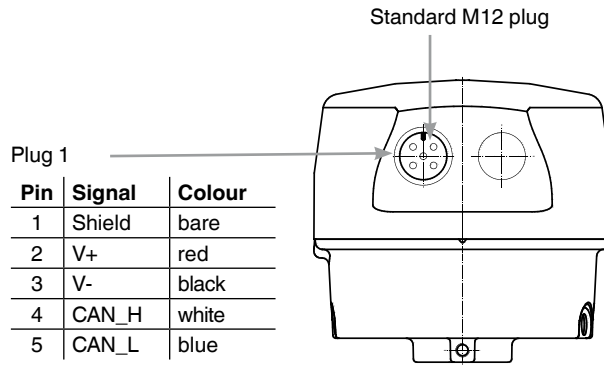
Parameter - Object

| Class | Inst. | Attr. | Service | Bit | Value/Default | Value range | Unit | Parameter |
|-------|-------|-------|---------|-----|---------------|---|--------|---------------------|
| Fh | 1h | 1h | Get | | X | 0-100 | 1% | Valve position |
| Fh | 2h | 1h | Get | | X | 0-1023 | | AD Value real |
| Fh | 3h | 1h | Get | | X | 0-65535 | h | Operating Time |
| Fh | 4h | 1h | Get/Set | | 3 | 3-97 | % | Threshold Close |
| Fh | 5h | 1h | Get/Set | | 3 | 3-97 | % | Threshold Open |
| Fh | 6h | 1h | Get/Set | | 1 | 1-5 | | Hysteresis Close |
| Fh | 7h | 1h | Get/Set | | 1 | 1-5 | | Hysteresis Open |
| Fh | 8h | 1h | Get | | 0 | 0-6000 | 0.1s | Close Time |
| Fh | 9h | 1h | Get | | 0 | 0-6000 | 0.1s | Open Time |
| Fh | Ah | 1h | Get/Set | | 200 | 0-6000 | 0.1s | Set Close Time |
| Fh | Bh | 1h | Get/Set | | 200 | 0-6000 | 0.1s | Set Open Time |
| Fh | Ch | 1h | Get | | 0 | 0-4294967295 | | Valve Cycles |
| Fh | Dh | 1h | Get/Set | 0 | 0 | 1 = automatic programming 0 = normal operation | | Programming Command |
| | | | | 1 | 0 | 1 = manual programming 0 = normal operation | | |
| Fh | Eh | 1h | Get | | 0 | 0-65535 | | Programming counter |
| Fh | Fh | 1h | Get | | | 0-65535 | | Powerfail counter |
| Fh | 10h | 1h | Get/Set | 0 | 0 | 1 = pneumatic outlet 2 pressurized 0 = pneumatic outlet 2 vented | | Bus off state |
| | | | | 1 | 0 | 1 = pneumatic outlet 4 pressurized 0 = pneumatic outlet 4 vented | | |
| Fh | 11h | 1h | Get | | X | 0-1000 | 0.1 mm | Stroke |
| Fh | 12h | 1h | Get | | X | 0-1000 | 0.1 mm | Min. Stroke |

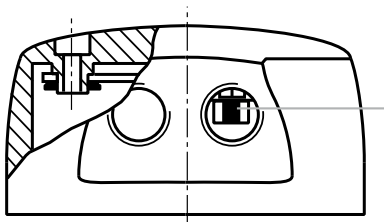
Identity - Object

| Class | Inst. | Attr. | Function | Value |
|-------|-------|-------|--------------|------------------------------|
| 1h | 1h | 1h | Vendor ID | 869 |
| | | 2h | Product Type | 0 |
| | | 3h | Product Code | 4220 |
| | | 4h | Rev. | 1.1 |
| | | 5h | Status | 0 |
| | | 6h | Series No. | Continuous serial number |
| | | 7h | Name | 4221/4222 DN combi switchbox |

Electrical connections - DeviceNet



Operating elements - DeviceNet

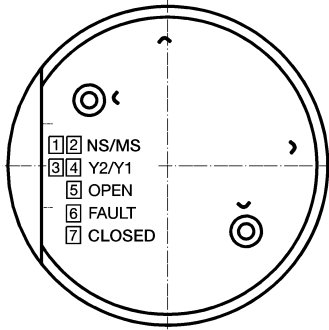


Slide switch for valve function (**manual operation**)

| Switch position | Left | Middle | Right |
|-----------------|-----------|------------|----------------|
| Valve: | Manual on | Manual off | Autom. via bus |

3 switch positions

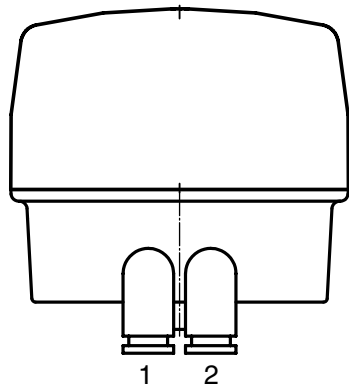
Optical indication - DeviceNet



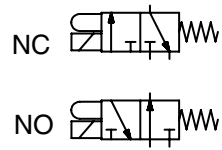
| LED | Colour | Function |
|-----|-----------|----------------------------------|
| 1 | green/red | Network Status |
| 2 | green/red | Module Status |
| 3 | yellow | Pilote valve Y2 activated |
| 4 | yellow | Pilot valve Y1 activated |
| 5 | yellow | Process valve in Open position |
| 6 | red | Fault |
| 7 | orange | Process valve in Closed position |

Pneumatic connections

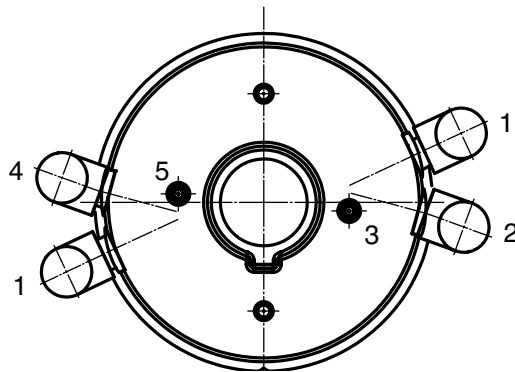
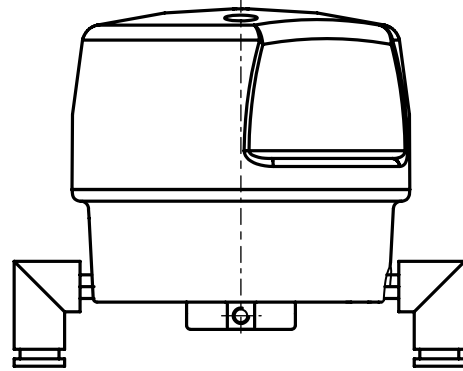
Single acting



Key:
 1 (P) = air supply
 2 = outlet



Double acting



Key:
 1 = air supply
 2 = outlet c.f. 1, 2 and 3
 3 = outgoing air c.f. 1, 2 and 3
 4 = outlet c.f. 3
 5 = outgoing air c.f. 3

Air supply: 1.5 - 7 bar **Attention:** Note maximum control pressure of pneumatic valve actuator!

Order data

| Field bus | Code |
|--|------|
| Without (24 V DC version) | 000 |
| AS-Interface; 31 Slaves, Spec. 2.11 | A2 |
| AS-Interface; 62 Slaves, Spec. 2.11 | A3 |
| DeviceNet; 63 Slaves, Spec. Release 2.0 Errata 5 | DN |

| Transmission | Code |
|--|------|
| Standard isolation cable 24 V DC version | 00 |
| 2-wire AS-Interface AS-Interface version | 01 |
| DeviceNet Group 2 only DeviceNet version | 03 |

| Housing material | Code |
|---|------|
| Base: Aluminium, black powder coated Cover: Polysulfone, transparent Seal: FPM | 02 |
| Base: Aluminium, black powder coated Cover: PMMA, transparent Seal: FPM | 04 |
| Base: Stainless steel 1.4301 Cover: Polysulfone, transparent Seal: FPM | 05 |
| Base: Stainless steel 1.4301 Cover: PMMA, transparent Seal: FPM | 06 |

| Voltage | Code |
|--|------|
| Link Power via bus wire AS-Interface version | 00 |
| Field bus specific DeviceNet version | 01 |
| 24 V DC version | C1 |

| Functional profile | Code |
|---|------|
| 1 Pilot valve, position feedback OPEN/CLOSED | S2 |
| 2 Pilot valves, position feedback OPEN/CLOSED | D2 |

| Travel length | Code |
|------------------------------------|------|
| Potentiometer, 30 mm travel length | 030 |
| Potentiometer, 50 mm travel length | 050 |
| Potentiometer, 75 mm travel length | 075 |

| Electrical connection | Code |
|--|------|
| M12 plug, 5-pin AS-Interface and DeviceNet version | 01 |
| 2 x M12 plug, 5-pin 24V DC version | 03 |
| M12 plug, 8-pin 24V DC version | 06 |

| Pneumatic connection | Code |
|---|------|
| Without | 00 |
| Air supply 6 mm angled connection Outlet 6 mm angled connection | 31 |
| Air supply 6 mm T-connection Outlet 6 mm angled connection | 41 |
| Air supply and outlet 6 mm straight, st.st. Swagelok | 50 |
| Air supply 1/4" straight, st.st., Swagelok Outlet 6 mm straight, st.st. Swagelok | 51 |

| Order example | 4222 | 000 | Z | 02 | S2 | 06 | 00 | C1 | 030 | 00 |
|------------------------------|------|-----|---|----|----|----|----|----|-----|----|
| Type | 4222 | | | | | | | | | |
| Field bus system (Code) | | 000 | | | | | | | | |
| | | | Z | | | | | | | |
| Housing material (Code) | | | | 02 | | | | | | |
| Functional profile (Code) | | | | | S2 | | | | | |
| Electrical connection (Code) | | | | | | 06 | | | | |
| Transmission (Code) | | | | | | | 00 | | | |
| Voltage (Code) | | | | | | | | C1 | | |
| Travel length (Code) | | | | | | | | | 030 | |
| Pneumatic connection (Code) | | | | | | | | | | 00 |

Note: Mounting kit 4222S01Z... dependent on valve type. Please order separately specifying valve type, DN, control function and actuator size. Photo see page 12 (last page). Observe travel length of mounting kit (see price list).

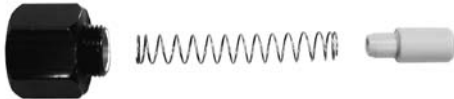
Accessories



AS-Interface connector GEMÜ 4180
for A2 / A3 version



Cable socket GEMÜ 1219



Mounting kit GEMÜ 4222S01Z...
(Spindle + mounting parts)
(Threaded adapter only included if necessary)



GEMÜ 4112
AS-Interface Controller;
ControlNet / AS-Interface Gateway;
Profibus-DP / AS-Interface Gateway

For further products please see our Product Range catalogue and Price List.
Contact GEMÜ.



DeviceNet
CONFORMANCE TESTED

GEMÜ® VALVES, MEASUREMENT
AND CONTROL SYSTEMS

