# GEMÜ C53 iComLine

## Motorized control valve

## Features

- Control valve for ultra pure applications in the semiconductor industry
- High-resolution linear actuator with stepper motor
- Integration in space-saving multi-port valve block solutions
- Long service life with over 1 million qualified control switching cycles
- Clean room production, fulfils SEMI F57
- Ideally suited for corrosive media
- Control valve based on the iComLine series

## Description

The GEMÜ C53 iComLine 2/2-way diaphragm globe valve was developed for precise and demanding control applications in semiconductor production. The sealing concept of the valve is based on the tried-and-tested GEMÜ PD design, whereby the actuator and medium are separated by a PTFE regulating cone. As the regulating cone contour, actuator stroke and connection size can be adapted, the GEMÜ C53 iComLine satisfies virtually all control and flow requirements of the semiconductor industry. The precise stepper motor, in conjunction with the ultra-pure body materials, is particularly suitable for lithography, CMP, and etching processes, as well as analytical applications in semiconductor production.

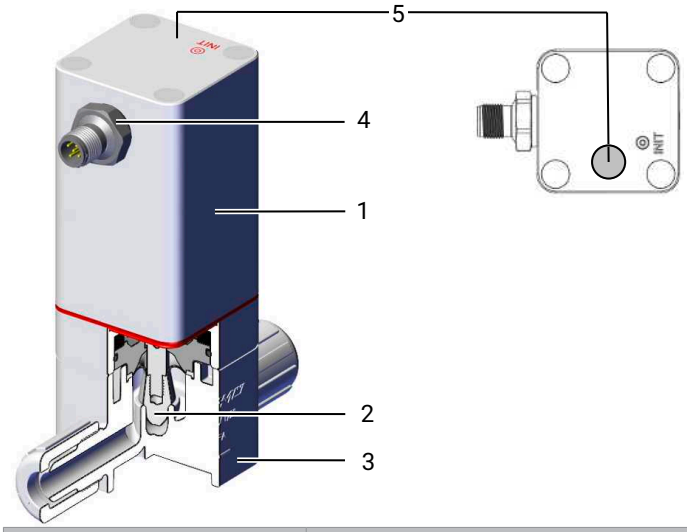
## Technical specifications

- **Media temperature :** 10 to 150 °C
- **Ambient temperature:** 0 to 40 °C
- **Operating pressure :** 0 to 6 bar
- **Connection sizes:** 1/4" to 3/4"
- **Body configurations:** Straight through body
- **Connection types:** Flare I PrimeLock® I Super 300 Type Pillar®
- **Body materials:** Modified PTFE I PFA
- **Seal material:** PTFE
- **Supply voltage:** 24 V DC
- **Input signals:** 0–10 V I 4–20 mA
- **Actuating speed:** Max. 2 mm/s
- **Valve stroke:** 4 mm
- **Protection class :** IP65

Technical data depends on the respective configuration

further information
webcode: GW-C53

# Product description




| No. | Name | Materials |
|---|---|---|
| 1 | Actuator | External actuator parts made of PVDF |
| 2 | Control PD | Modified PTFE |
| 3 | Valve body | PFA, PTFE |
| 4 | Electrical connection | PPS |
| 5* | Display of status LED | |

* Status LED available from device version 01 for control modules with codes S0, S1, S2 (see operating instructions – product label)

# Functional description

| Control module code [1)] | Fail-safe position | Function |
|---|---|---|
| S0 | Hold | Actuator stays in the approached position |
| S1 | Close | Actuator moves to CLOSED position |
| S2 | Open | Actuator moves to OPEN position |
| V0 | Hold | Actuator stays in the approached position |
| V1 | Close | Actuator moves to CLOSED position |

1) **Control module**
Code S0: Positioner 4–20 mA Hold safety position
Code S1: Positioner 4–20 mA Close error position
Code S2: Positioner 4–20 mA Open safety position
Code V0: Positioner 0–10 V Hold safety position
Code V1: Positioner 0–10 V Close error position

# Availability

| Connection size | Connection type | | |
|---|---|---|---|
| | Flare (code 73, 75 77), PrimeLock (code PL) | Flare (code 73, 75 77), PrimeLock (code PL) | Super 300 Pillar (code 79) |
| | Valve body material | | |
| | PFA (code 30) | PTFE (code 26, SP) | PTFE (code 26, SP) |
| **1/4“** | - | X | X |
| **3/8“** | - | X | X |
| **1/2“** | X | - | X |
| **3/4“** | X | - | X |

# Order data

The order data provide an overview of standard configurations.

Please check the availability before ordering. Other configurations available on request.

## Order codes

| 1 Type | Code |
|---|---|
| Plastic globe valve, electrical | C53 |

| 2 Connection size | Code |
|---|---|
| 1/4", international code: 4 | 4 |
| 3/8", international code: 6 | 6 |
| 1/2", international code: 8 | 8 |
| 3/4", international code: 12 | 12 |

| 3 Body configuration | Code |
|---|---|
| 2/2-way body | D |

| 4 Connection type | Code |
|---|---|
| Flare connection with CPFA union nut | 73 |
| Flare connection with PVDF union nut | 75 |
| Flare connection with PFA union nut | 77 |
| Super 300 type Pillar connection | 79 |
| PrimeLock connection | PL |

| 5 Valve body material | Code |
|---|---|
| PFA, perfluoroalkoxy | 30 |
| Modified PTFE, polytetrafluoroethylene | 26 |
| PTFE polytetrafluoroethylene, white | SP |

| 6 Seal material | Code |
|---|---|
| PTFE | 5 |

| 7 Voltage/Frequency | Code |
|---|---|
| 24 V DC | C1 |

| 8 Control module | Code |
|---|---|
| Positioner 4–20 mA<br>Hold safety position | S0 |
| Positioner 4–20 mA<br>Close error position | S1 |

| 8 Control module | Code |
|---|---|
| Positioner 4–20 mA<br>Open safety position | S2 |
| Positioner 0–10 V<br>Hold safety position | V0 |
| Positioner 0–10 V<br>Close error position | V1 |

| 9 Actuator version | Code |
|---|---|
| Actuator size 2<br>Seat diameter 9.55 mm | 2A |

| 10 Regulating cone | Code |
|---|---|
| **Version 1** | |
| 0.18 m³/h – linear | R3505 |
| 0.25 m³/h – linear | R3506 |
| 0.44 m³/h – linear | R3442 |
| **Version 2** | |
| 0.26 m³/h – mod.EQ | R3509 |
| 0.68 m³/h – mod.EQ | R3510 |
| 0.77 m³/h – mod.EQ | R3234 |
| **Version 3** | |
| 0.26 m³/h – linear | R3507 |
| 0.78 m³/h – linear | R3508 |
| 0.89 m³/h – linear | R3235 |
| **Version 4** | |
| 0.22 m³/h – linear | R3511 |
| 0.85 m³/h – linear | R3512 |
| 1.25 m³/h – linear | R3395 |
| **Version 5** | |
| 0.06 m³/h – linear | R3486 |

| 11 High Purity version | Code |
|---|---|
| High Purity | HP |

## Order example

| Ordering option | Code | Description |
|---|---|---|
| 1 Type | C53 | Plastic globe valve, electrical |
| 2 Connection size | 12 | 3/4", international code: 12 |
| 3 Body configuration | D | 2/2-way body |
| 4 Connection type | 75 | Flare connection with PVDF union nut |
| 5 Valve body material | 30 | PFA, perfluoroalkoxy |
| 6 Seal material | 5 | PTFE |
| 7 Voltage/Frequency | C1 | 24 V DC |
| 8 Control module | S1 | Positioner 4–20 mA<br>Close error position |

Order data

| Ordering option | Code | Description |
|---|---|---|
| 9 Actuator version | 2A | Actuator size 2<br>Seat diameter 9.55 mm |
| 10 Regulating cone | R3235 | 0.89 m³/h – linear |
| 11 High Purity version | HP | High Purity |

# Technical data

## Medium

**Working medium:** Corrosive, inert, gaseous and liquid media which have no negative impact on the physical and chemical properties of the body and diaphragm material.

## Temperature

**Media temperature:** 10 — 150 °C

Observe pressure/temperature diagram

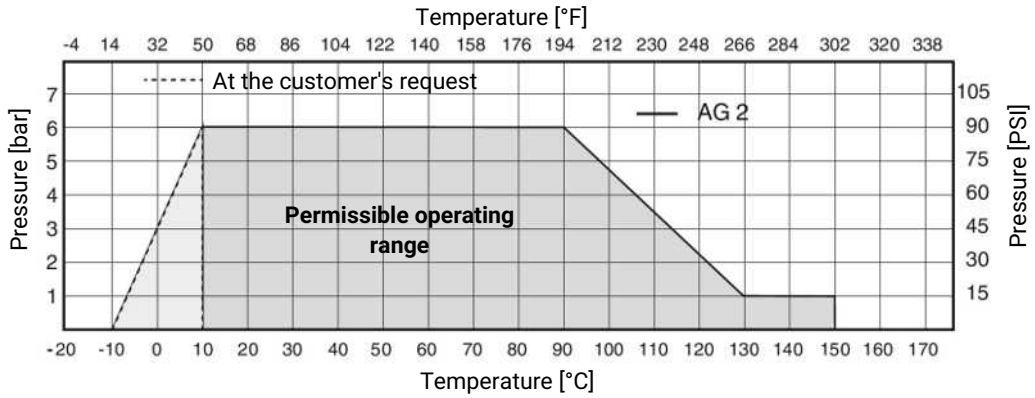
**Ambient temperature:** 0 — 40 °C

**Storage temperature:** -10 — 40 °C

## Pressure

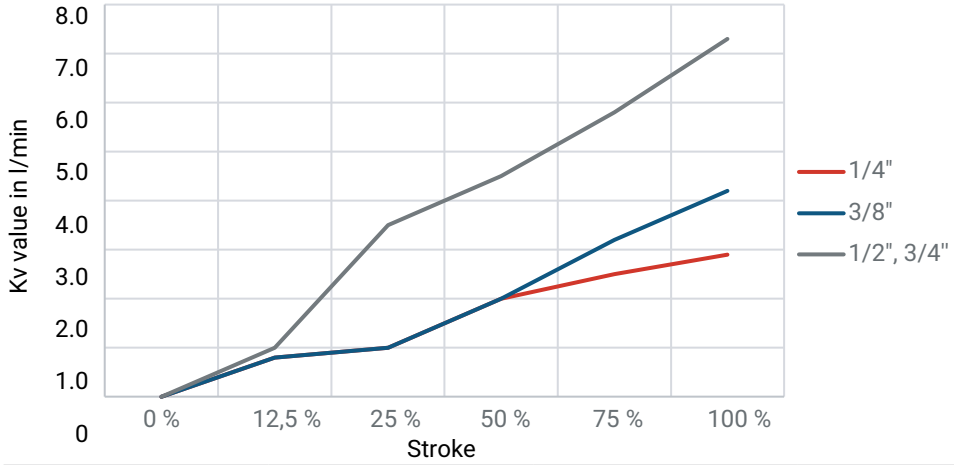
**Operating pressure:** 0 — 6 bar

**Pressure/temperature diagram:**



**Kv values:**

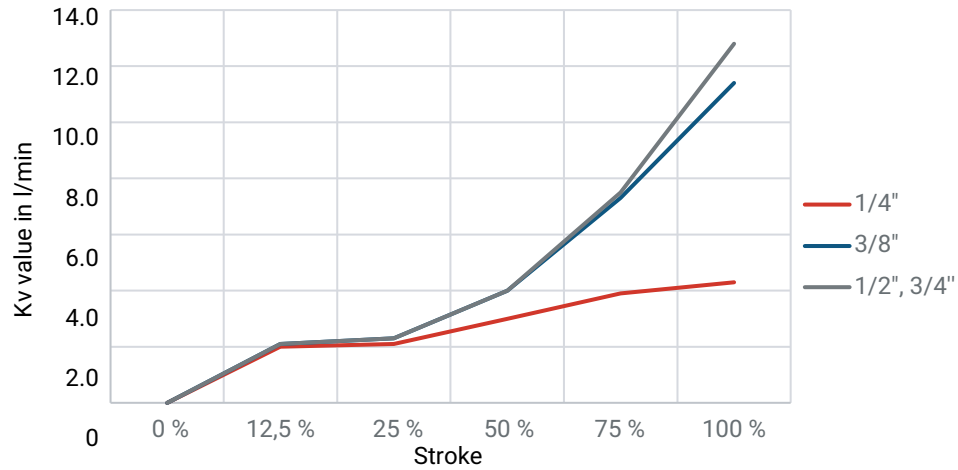
**Version 1 – flow range: 0.8–7.3 l/min (linear)**




| Stroke in % | R3505 | R3506 | R3442 |
|---|---|---|---|
| | 1/4" | 3/8" | 1/2", 3/4" |
| 0.0 | 0.0 | 0.0 | 0.0 |
| 12.5 | 0.8 | 0.8 | 1.0 |
| 25.0 | 1.0 | 1.0 | 3.5 |
| 50.0 | 2.0 | 2.0 | 4.5 |
| 75.0 | 2.5 | 3.2 | 5.8 |
| 100.0 | 2.9 | 4.2 | 7.3 |

Kv values in l/min

**Version 2 – flow range: 2.0–12.8 l/min (equal-percentage)**

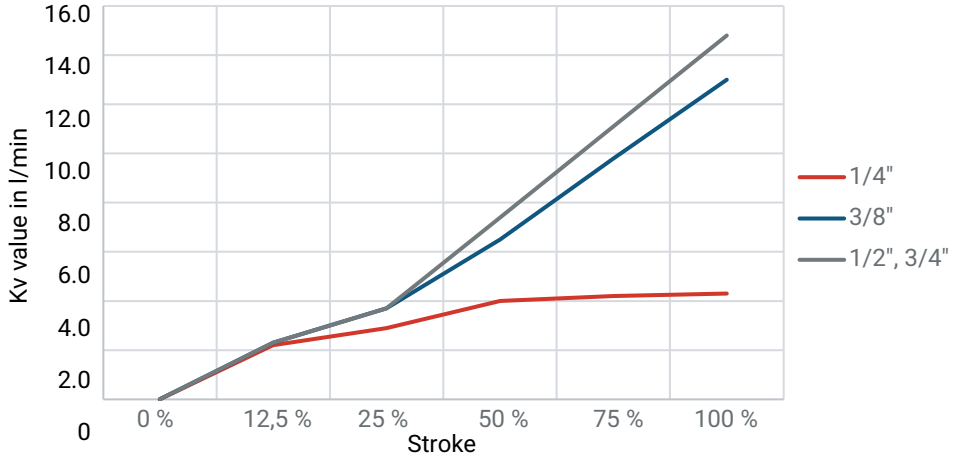



| Stroke in % | R3509 | R3510 | R3234 |
|---|---|---|---|
| | 1/4" | 3/8" | 1/2", 3/4" |
| 0.0 | 0.0 | 0.0 | 0.0 |
| 12.5 | 2.0 | 2.1 | 2.1 |
| 25.0 | 2.1 | 2.3 | 2.3 |
| 50.0 | 3.0 | 4.0 | 4.0 |
| 75.0 | 3.9 | 7.3 | 7.5 |
| 100.0 | 4.3 | 11.4 | 12.8 |

Kv values in l/min

**Kv values:**

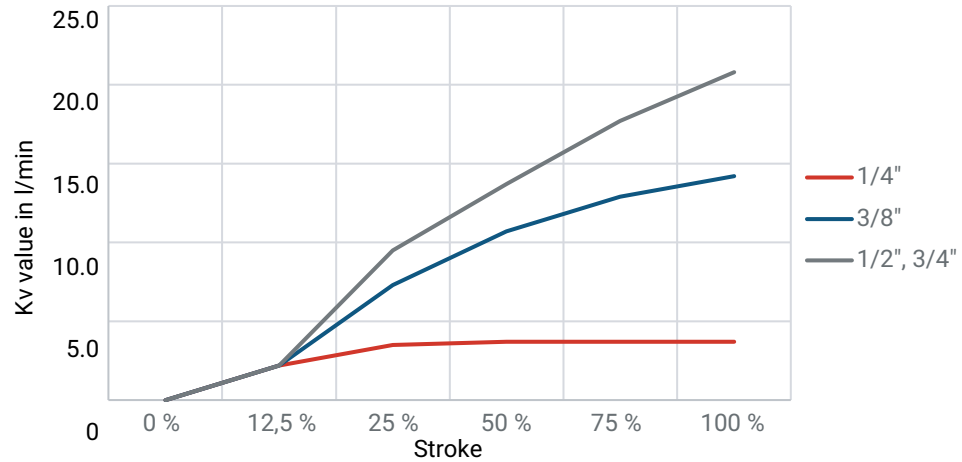
**Version 3 – flow range: 2.2–14.8 l/min (linear)**




| Stroke in % | R3507 | R3508 | R3235 |
|---|---|---|---|
| | 1/4" | 3/8" | 1/2", 3/4" |
| 0.0 | 0.0 | 0.0 | 0.0 |
| 12.5 | 2.2 | 2.3 | 2.3 |
| 25.0 | 2.9 | 3.7 | 3.7 |
| 50.0 | 4.0 | 6.5 | 7.4 |
| 75.0 | 4.2 | 9.8 | 11.1 |
| 100.0 | 4.3 | 13.0 | 14.8 |

Kv values in l/min

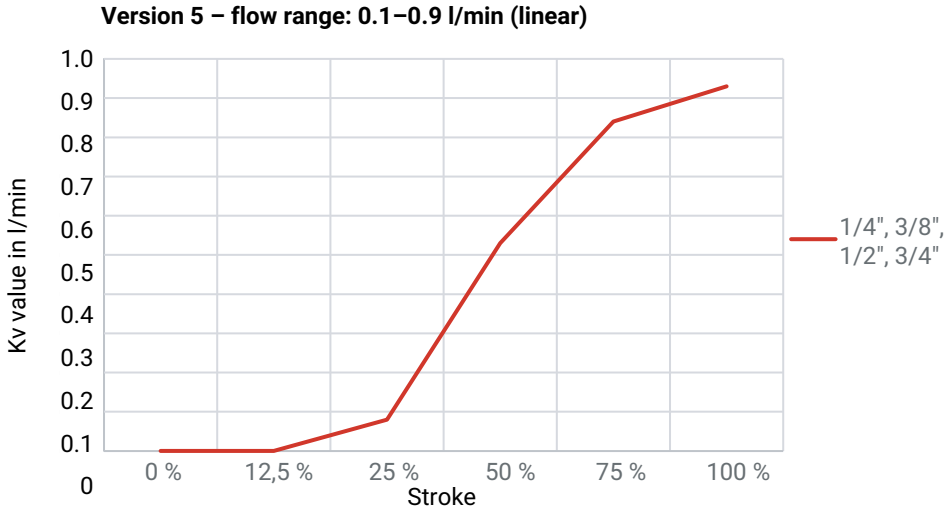
**Version 4 – flow range: 2.2–20.8 l/min (linear)**




| Stroke in % | R3511 | R3512 | R3395 |
|---|---|---|---|
| | 1/4" | 3/8" | 1/2", 3/4" |
| 0.0 | 0.0 | 0.0 | 0.0 |
| 12.5 | 2.2 | 2.2 | 2.2 |
| 25.0 | 3.5 | 7.3 | 9.5 |
| 50.0 | 3.7 | 10.7 | 13.7 |
| 75.0 | 3.7 | 12.9 | 17.7 |
| 100.0 | 3.7 | 14.2 | 20.8 |

Kv values in l/min

**Kv values:**




| Stroke in % | R3486 |
|---|---|
| | 1/4", 3/8", 1/2", 3/4" |
| 0.0 | 0.0 |
| 12.5 | 0.0 |
| 25.0 | 0.08 |
| 50.0 | 0.53 |
| 75.0 | 0.84 |
| 100.0 | 0.93 |

Kv values in l/min

**Vacuum:** 400 mbar absolute

## Product conformities

**Machinery Directive:** 2006/42/EC

**EMC Directive:** 2014/30/EU

**Interference resistance:** DIN EN 61000-6-2 (Nov. 2019)

**Interference emission:** DIN EN 61000-6-4

## Mechanical data

**Protection class:** IP 65 acc. to EN 60529

**Weight:**

| Connection size | Weight |
|---|---|
| 1/4" | 660 g |
| 3/8" | 660 g |
| 1/2" | 600 g |
| 3/4" | 600 g |

## Duty cycle and service life

**Service life:** **Open / Close duty** - Minimum 1,000,000 switching cycles at room temperature and permissible duty cycle.

**Control operation** – Class C acc. to EN 15714-2 (≙ 1,800,000 start-ups).

**Duty cycle:** 60% duty

# Electrical data

## Supply voltage

**Voltage:** 24 V DC ± 10%

**Rating:** ≤ 24 W (24 V DC)

**Reverse polarity protection:** Yes

## Analogue input signals

### Set value as current signal, control module code S0 / S1 / S2

**Input signal:** 4–20 mA

**Input type:** passive

**Input resistance:** 50 Ω

**Control accuracy:** ±1%

### Set value as voltage signal, control module code V0 / V1

**Input signal:** 0–10 V

**Input type:** passive

**Input resistance:** 110 KΩ

**Control accuracy:** ±1%

## Digital input signals

**Function:** Initialization of the positioner

**Voltage:** 24 V DC

**Logic level "1":** > 15 V DC

**Logic level "0":** ≤ 5 V DC

## Analogue output signals

### Actual value as current signal, control module code S0 / S1 / S2

**Output signal:** 4–20 mA

**Output type:** Active

**Load resistor:** 650 Ω

**Short-circuit proof:** Yes

### Actual value as voltage signal, control module code V0 / V1

**Output signal:** 0–10 V

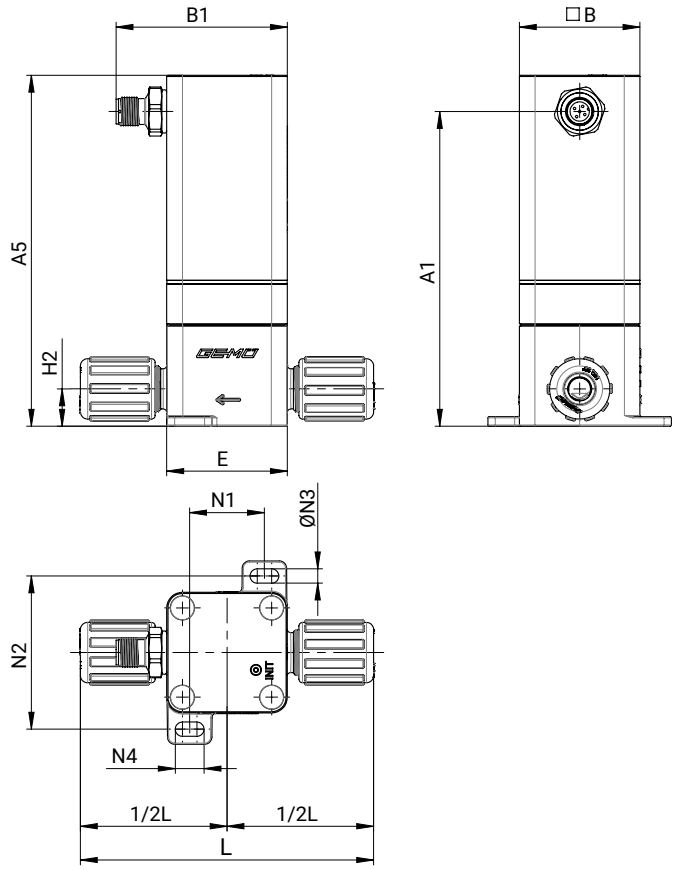
**Output type:** Active

**Short-circuit proof:** Yes

## *Behaviour in the event of an error*

| | |
|---|---|
| **Function:** | In the event of an error the valve moves to the error position.<br>Notes: Moving to the error position is only possible with full power supply. This behaviour is not a safety position. The valve must be operated with a GEMÜ 1571 emergency power supply module (see accessories) to ensure the function in case of voltage loss. |
| **Error position:** | Hold - Actuator stays in the approached position (control module S0 and V0)<br>Close - Actuator moves to the Closed position (control module S1 and V1)<br>Open - Actuator moves to the Open position (control module S2) |

# Dimensions

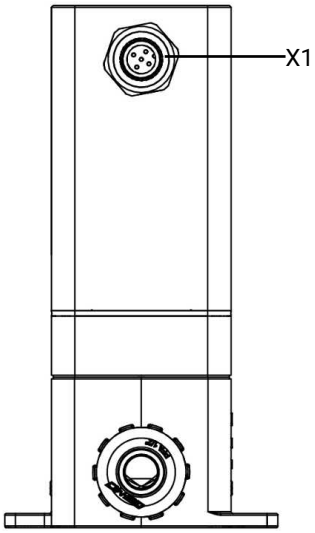



| Connection size | Actuator version | Connection | A1 | A5 | □B | B1 | E | H2 | L | N1 | N2 | ØN3 | N4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1/4"** | **2A** | **Flare** | 131.0 | 146.0 | 50.0 | 71.0 | 50.0 | 16.0 | 111.0 | 71.0 | 49.0 | 6.0 | 12.0 |
| | | **Prime-Lock** | 131.0 | 146.0 | 50.0 | 71.0 | 50.0 | 16.0 | 109.0 | 71.0 | 49.0 | 6.0 | 12.0 |
| | | **Pillar** | 131.0 | 146.0 | 50.0 | 71.0 | 50.0 | 16.0 | 88.0 | 71.0 | 49.0 | 6.0 | 12.0 |
| **3/8"** | **2A** | **Flare** | 131.0 | 146.0 | 50.0 | 71.0 | 50.0 | 16.0 | 117.8 | 71.0 | 49.0 | 6.0 | 12.0 |
| | | **Prime-Lock** | 131.0 | 146.0 | 50.0 | 71.0 | 50.0 | 16.0 | 113.0 | 71.0 | 49.0 | 6.0 | 12.0 |
| | | **Pillar** | 131.0 | 146.0 | 50.0 | 71.0 | 50.0 | 16.0 | 100.0 | 71.0 | 49.0 | 6.0 | 12.0 |
| **1/2"** | **2A** | **Flare** | 131.0 | 146.0 | 50.0 | 71.0 | 50.0 | 16.0 | 121.6 | 31.0 | 63.5 | 6.0 | 12.0 |
| | | **Prime-Lock** | 131.0 | 146.0 | 50.0 | 71.0 | 50.0 | 16.0 | 120.0 | 31.0 | 63.5 | 6.0 | 12.0 |
| | | **Pillar** | 131.0 | 146.0 | 50.0 | 71.0 | 50.0 | 16.0 | 108.0 | 71.0 | 49.0 | 6.0 | 12.0 |
| **3/4"** | **2A** | **Flare** | 131.0 | 146.0 | 50.0 | 71.0 | 50.0 | 16.0 | 128.0 | 31.0 | 63.5 | 6.0 | 12.0 |
| | | **Prime-Lock** | 131.0 | 146.0 | 50.0 | 71.0 | 50.0 | 16.0 | 128.0 | 31.0 | 63.5 | 6.0 | 12.0 |
| | | **Pillar** | 131.0 | 146.0 | 50.0 | 71.0 | 50.0 | 16.0 | 108.0 | 71.0 | 49.0 | 6.0 | 12.0 |

Dimensions in mm

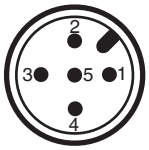
# Electrical connection

## Position of the connectors




## Electrical connection

**Connection X1**




Five-pin M12 built-in socket, A-coded

| Pin | Signal name |
|---|---|
| 1 | 24 V supply voltage |
| 2 | I+/U+, set value input |
| 3 | GND |
| 4 | I+/U+, actual value output |
| 5 | Digital input 1 / tube replacement function |

# Qualification of the valve

### Bursting pressure at room temperature

| Valve | Component | Test conditions | Required criteria |
|---|---|---|---|
| **C53** | Valve body | Maintain defined water pressure for 10 minutes, if OK, increase water pressure until leakage is detected. | No leakage externally.<br>Bursting pressure = 5.8 x P max. (35.0 bar) |

### Service life at room temperature

| Valve | Component | Test conditions | Required criteria |
|---|---|---|---|
| **C53** | Valve | Valves switched at room temperature, medium pressure 6 bar, water, full stroke | No leakage externally<br>or via the seat for up to **1 million switching cycles*** |
| **C53** | Valve | Valves switched at room temperature, medium pressure 6 bar, water, 20% control stroke | No leakage externally<br>or via the seat for up to **1 million switching cycles*** |

### Hot oil inspection

| Valve | Component | Test conditions | Required criteria |
|---|---|---|---|
| **C53** | Valve | Valves switched at 150 °C hot oil, medium pressure 2 bar, full stroke, seals tightly | No leakage externally or<br>via the seat **300,000 switching cycles*** every 2 weeks |

### Hot water test

| Valve | Component | Test conditions | Required criteria |
|---|---|---|---|
| **C53** | Valve | Valves switched at 90 °C hot water, medium pressure 2.1 bar, full stroke, seals tightly | No leakage externally or<br>via the seat **200,000 switching cycles*** every 2 weeks |

### Temperature change test

| Valve | Component | Test conditions | Required criteria |
|---|---|---|---|
| **C53** | Valve | Valves not switched at -15 °C/+70 °C in temperature changes,<br>no medium, no pressure, cycle time 4 hours | Protection class inspection IP 65 passed, no penetration of humidity into the actuator can be detected |

### Vacuum test

| Valve | Component | Test conditions | Required criteria |
|---|---|---|---|
| **C53** | Valve | Closed for 2 weeks | Valve fully open at -930 mbar (relative) |

### Positioner inspection

| Valve | Component | Test conditions | Required criteria |
|---|---|---|---|
| **C53** | Control actuator | Modulation test 10% stroke, 20% force, at room temperature | 1.8 million start-ups |

### Shock and vibration

| Valve | Component | Test conditions | Required criteria |
|---|---|---|---|
| **C53** | Valve | Vibration test acc. to EN 60068-2-6 test Fc<br>Shock test acc. to EN 60068-2-27 test Ea | Function OK before and after test |

* All concluding tests were carried out at testing pressure at room temperature.
Seat leak tightness: PSx1.1 =(6.6 bar). External leak tightness: PSx1.5 =(9 bar).

# Accessories

## GEMÜ 1219

### Cable socket / cable plug M12

The GEMÜ 1219 is a connector (cable socket / cable plug) M12, 5-pin. Straight and/or 90° angled plug type. Defined cable length or with threaded connection without cable. Various materials available for the threaded ring.

| Description | Length | Material | Item number |
|---|---|---|---|
| 5-pin, angle | without cable | PA | 88208750 |
| | 2 m cable | PA/PUR | 88221316 |
| | 5 m cable | PA/PUR | 88279160 |
| | 2 m cable | PA/PTFE | 88708098 |
| | 5 m cable | PA/PTFE | 88708099 |
| | 10 m cable | PA / PVC | 88708102 |
| 5-pin, straight | without cable | PA | 88208749 |
| | 2 m cable | PA/PUR | 88353742 |
| | 5 m cable | PA/PUR | 88440263 |
| | 2 m cable | PA/PTFE | 88708100 |
| | 5 m cable | PA/PTFE | 88708101 |

## GEMÜ 1571

### Emergency power supply module

The GEMÜ 1571 capacitive emergency power supply module is suitable for valves with motorized actuators such as GEMÜ eSyStep and eSyDrive as well as the GEMÜ C53 iComLine control valve. In the event of a power failure, the product provides an uninterrupted power supply so that the valve can be moved to the safety position. The emergency power supply module is available individually or with an expansion module and can supply several valves. The input and output voltage is 24 V.

| GEMÜ 1571 emergency power supply module | | | |
|---|---|---|---|
| Input voltage | Output voltage | Capacity | Item number |
| 24 V | 24 V | 1700 Ws | 88660398 |
| 24 V | 24 V | 13200 Ws | 88751062 |

## GEMÜ 1573

### Switching power supply unit

The GEMÜ 1573 switching power supply unit converts unstable input voltages from 100 to 240 V AC into a continuous DC voltage. It can be used as an accessory for valves with motorized actuators e. g. GEMÜ eSyLite, eSyStep und eSyDrive and for additional devices with a 24 V DC power supply. Different power levels, output currents and a 48 V DC version for servoDrive actuators are available.

| Description | Input voltage | Output voltage | Output current | Item number |
|---|---|---|---|---|
| Power supply unit 24 V, 5 A | 100–240 V AC | 24 V DC | 5 A | 88660400 |
| Power supply unit 24 V, 10 A | 100–240 V AC | 24 V DC | 10 A | 88660401 |



GEMÜ Gebr. Müller Apparatebau GmbH & Co. KG
Gert-Müller-Platz 1, 74635 Kupferzell, Germany
Phone +49 (0) 7940 1230 · info@gemue.de
www.gemu-group.com