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**JUMO Process Control, Inc.**

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# JUMO DELOS SI

## Precision pressure transmitter with switching contacts and display

### Application

- Food & pharma
- CIP/SIP systems
- Machine and system construction
- Air conditioning and refrigeration system construction

### Brief description

The JUMO DELOS SI high-precision, electronic pressure switch with analog output meets technical requirements relevant to hygiene. In a readily cleanable design and with a front-flush, seal-free measuring system, it is specifically geared to hygienic process safety standards and has been engineered and certified in compliance with EHEDG guidelines. The nominal measuring ranges set at the factory extend from 400 mbar to 60 bar. They can be rescaled in the ratio 1:4, allowing the user to perform several measurement tasks with just one measuring instrument. The following output variants are available, depending on the application: 1 x PNP or 2 x PNP switching outputs or 1 x PNP switching output and an analog output signal. The process pressure is visualized by a large, positively lit LC display, which changes from an amber color to red, as an alarm function, if the nominal measuring range is exceeded (6.25% according to NAMUR). Configuration can simply be performed on the measuring instrument, or by using the more convenient setup program. The enclosure can be rotated +/-160° to make it easier to read, and the display can be rotated 180° for overhead mounting. A high-temperature variant is available for hot media up to 200°C (CIP and SIP cleaning systems).



Type 405052

### Customer benefits

- **Process safety**  
An hygienic design, with parts in contact with the medium made from stainless steel. The system has no dead zones, which prevents microbial contamination and ensures maximum process safety for hygienic processes.
- **Uncomplicated and time-saving**  
Save time with easy, local measuring instrument configuration or configuration via a more convenient setup program.
- **Flexible**  
The enclosure can be turned +/-160° and the display rotated 180° for user-friendly and individual alignment of the measuring instrument for optimum readability, configuration and electrical installation in any mounting position, as well as for running an auto-zero function.

### Key features

- Linearity from 0.1% of FS
- Scaling of measuring range 1 : 4
- Large, brilliant two-color display with alarm function
- Time-saving and simple configuration on the instrument or via a more convenient setup program
- Flexible mounting variance by rotating the display (180°), followed by auto zeroing
- Enclosure can be turned (+/-160°) to improve readability
- Option for increased medium temperature up to 200°C (SIP and CIP capability)

### Approvals/marks of conformity (see Technical data)



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## Technical data

### General

<b>Reference conditions</b>	DIN 16086 and EN 60770
<b>Sensor system</b>	Silicon sensor with stainless steel separating diaphragm
Pressure transfer medium	Synthetic oil (silicon oil), FDA-compliant oil
Permissible load changes	> 10 million
<b>Location</b>	
Mounting position	Any
Calibration position	Device standing upright, process connection on bottom
Position-dependent zero point offset	Zero point correction possible locally or via setup (20% of nominal measuring range).
- Basic type 000 standard	≤ 1 mbar
- Basic type 004 high-temperature design	≤ 10 mbar
<b>Display</b>	Positively lit display
Alignment	Display can be rotated 180° via the software Enclosure rotatable ±160° (use the combination tool supplied)
Size	Display field 16 x 26 mm / font size 7 mm / 2 x 4-digit
Color	Normal operation: amber-colored Error: red (text "Err", error code 1 - 9 flashes) Setup interface busy: red
Switching state indicator	K1, K2
Measuring unit	mbar, bar, kPa, MPa, psi, %
<b>Operation</b>	
Local	Via control element under the screw plug with the combination tool or 0.5x3 screwdriver or 2AF hex key
Setup interface	Pin 5 of M12x1 round plug

### Input

<b>Relative pressure</b>	Nominal measuring ranges start at 0 bar.						
Nominal measuring range	0.4	1	4	10	25	60	bar
Overload capacity <sup>a</sup>	1.6	4	16	40	100	240	bar
Bursting pressure	2	5	20	50	125	300	bar
Nominal measuring range	-0.4 to 0.4	-1 to 1	-1 to 3	-1 to 9	-1 to 24		bar
Overload capacity <sup>a</sup>	1.6	4	16	40	100		bar
Bursting pressure	2	5	20	50	125		bar
<b>Absolute pressure</b>	Nominal measuring ranges start at 0 bar.						
Nominal measuring range	0.4	1	4	10	25	60	bar
Overload capacity <sup>a</sup>	1.6	4	16	40	100	240	bar
Bursting pressure	2	5	20	50	125	300	bar

<sup>a</sup> All measuring ranges can be overloaded to -1 bar (vacuum-proof).

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## Outputs

All analog outputs in 3-wire technology / Switching outputs: open collector, PNP switching

<b>Analog output</b>	
Current	
Output 475	4 - 20 mA and 1 x PNP switching output
Output 476	0 - 20 mA and 1 x PNP switching output
Voltage	
Output 477	0 - 10 V and 1 x PNP switching output
<b>Step response time</b> (analog input)	
T90	≤ 100 ms
<b>Switching output</b>	
Output 470, 475, 476 or 477	1 x PNP switching output
Output 471	2 x PNP switching outputs
Switching type	Break contact / make contact
Switching function	Window / hysteresis
<b>Switching capacity</b>	
Voltage drop from $U_B$	PNP ≤ 2 V
Contact rating	ON ≤ 250 mA / OFF ≤ 1 mA
Switching cycles	> 10 million
Response time	≤ 20 ms
Short-circuit proof	Yes
<b>Current load check</b>	
Pulse period	2 s; $T_{ON}$ 40 ms
Periodic protective circuit with overcurrent	f = 0.5 Hz Display: Err3 switching output K 1, Err4 switching output K 2
<b>Setting range</b>	
Analog output	Measuring range scaling (turn down) 1:4
<b>Switching output</b>	
Switching point	Configurable in the nominal measuring range (> reset point)
Reset point	Configurable in the nominal measuring range (< switching point)
Hysteresis	Configurable in the nominal measuring range
Input damping	0 - 99.99 s
Input delay	0 - 99.99 s
<b>Burden</b>	
Current	
4 - 20 mA, three wires	$RL \leq (U_B - 6.5 \text{ V}) / 0.022 \text{ A } (\Omega)$
0 - 20 mA, three-wires	$RL \leq (U_B - 6.5 \text{ V}) / 0.022 \text{ A } (\Omega)$
Voltage	
0 - 10 V DC, three wires	$RL \geq 10 \text{ K}\Omega$

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## Mechanical properties

<b>Process connection</b>	
Material	Stainless steel 316L
Surface	Ra ≤ 0.8 µm
Process seal	All flange connections are welded and therefore have no seals!
- Process connection 521, 523, 571, 576, 652	FPM as standard
- Process connection 575	FPM as standard, O-ring at front; FDA-compliant
- Process connection 997 JUMO PEKA	FPM, VMQ, silicon EPDM; FDA-compliant, options, see data sheet 409711
<b>Measurement diaphragm</b>	
Material	Stainless steel 316L
Surface	Ra ≤ 0.8 µm
<b>Enclosure</b>	
Material	Stainless steel 316L
Surface	Ra ≤ 0.8 µm
Threaded sleeve M 12 x 1	Stainless steel 316L
Enclosure seal	VMQ silicon; FDA-compliant
Display	PA (polyamide)
<b>Control element screw plug</b>	
Material	Aluminum 3.2315
Surface	Eloxal coating
Seal	VMQ silicon; FDA-compliant
<b>Weight</b>	200 g with process connection 504 (G½)

## Ambient conditions

<b>Permissible temperatures</b>	
Medium	-25 to +100°C (+135°C max. 1 hour / day; no function here)
For basic type extension 004	-25 to +200°C
Environment	-25 to +75°C
Ambient temperature -50°C	Restricted function: stationary use only, danger of broken cable, display does not function
Storage	-40 to +85°C
<b>Permissible relative humidity</b>	
In operation	100% rel. humidity, incl. condensation of instrument outer sleeve
Storage	90% relative humidity, no condensation
<b>Permissible mechanical loading</b>	
Vibration resistance <sup>a</sup>	20 g, 10 - 2000 Hz
Shock resistance <sup>b</sup>	50 g for 11 ms / 100 g for 1 ms
<b>Electromagnetic compatibility</b>	
Interference emission <sup>c</sup>	Class B
Interference immunity <sup>d</sup>	Industrial requirements
<b>Protection<sup>e</sup></b>	IP 67

<sup>a</sup> IEC 60068-2-6

<sup>b</sup> IEC 60068-2-27

<sup>c</sup> EN 61326-2-3

<sup>d</sup> EN 61326-2-3

<sup>e</sup> EN 60529 (with suitable mating piece when connected)

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## Accuracy

<b>Relative pressure</b>	Nominal measuring ranges start at 0 bar.						
Nominal measuring range	0,4	1	4	10	25	60	bar
<b>Linearity<sup>a</sup></b>	<b>0.15</b>	<b>0.15</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>% of FS of NMR</b>
Accuracy at +20°C <sup>b</sup>	0.35	0.3	0.25	0.25	0.25	0.25	% of FS of NMR
Accuracy at -20 to +75°C <sup>c</sup>	0.7	0.6	0.5	0.5	0.5	0.5	% of FS of NMR
<b>Nominal measuring range</b>	-0.4 to 0.4	-1 to 1	-1 to 3	-1 to 9	-1 to 24		bar
<b>Linearity<sup>a</sup></b>	<b>0.15</b>	<b>0.15</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>		<b>% of FS of NMR</b>
Accuracy at +20°C <sup>b</sup>	0.35	0.3	0.25	0.25	0.25		% of FS of NMR
Accuracy at -20 to +75°C <sup>c</sup>	0.7	0.6	0.5	0.5	0.5		% of FS of NMR
<b>Absolute pressure</b>	Nominal measuring ranges start at 0 bar.						
Nominal measuring range	0.4	1	4	10	25	60	bar
<b>Linearity<sup>a</sup></b>	<b>0.15</b>	<b>0.15</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>% of FS of NMR</b>
Accuracy at +20°C <sup>b</sup>	0.35	0.3	0.25	0.25	0.25	0.25	% of FS of NMR
Accuracy at -20 to +75°C <sup>c</sup>	0.7	0.6	0.5	0.5	0.5	0.5	% of FS of NMR
Long-term stability <sup>d</sup>	0.2% of FS of NMR per year						

<sup>a</sup> Linearity based on limit point setting

<sup>b</sup> Includes: linearity, hysteresis, repeatability, deviation from initial and final values of measuring range

<sup>c</sup> Includes: linearity, hysteresis, repeatability, deviation from initial and final values of measuring range, thermal effect on initial value of measuring range and span.

<sup>d</sup> EN 61298-1

## Auxiliary power

<b>Supply voltage UB<sup>a</sup></b> 0 - 20 mA, three wires, output 476 4 - 20 mA, three wires, output 475 0 - 10 V, three wires, output 477 Less than the permitted supply voltage	Nominal voltage 24 V DC 12 - 30 V DC 12 - 30 V DC 14 - 30 V DC Display Err 5
More than the maximum supply voltage > 34 V DC	The specified properties are no longer met.
Reverse polarity protection	YES
Power consumption	≤ 45 mA without load, ≤ 545 mA with load 2 x PNP
Electrical connection	Round plug M 12 x 1, 4-pin, A-coded (for assignment see page 6, "Connection diagram")
Circuit	SELV

<sup>a</sup> Residual ripple: Peak voltages must not exceed or fall below the values specified for the supply voltage!

## Approvals/marks of conformity

Mark of conformity	Testing laboratory	Certificate/certification number	Test basis	valid for
EHEDG	TUM MAK	No. 03/2006	Document No. 8	Process connection 997 JUMO PEKA

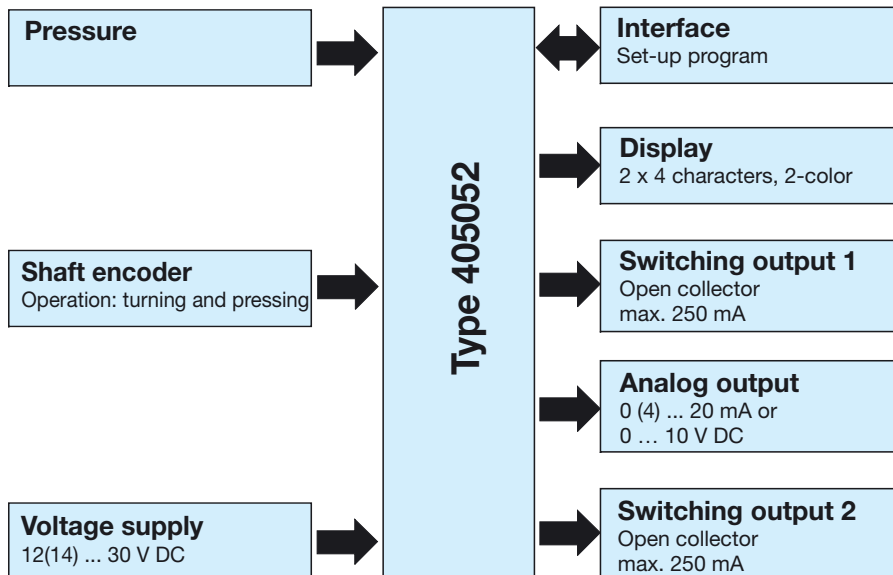
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## Block diagram



## Connection diagram

Output 470		Output 471		Outputs 475 - 477	
1 PNP switching output		2 PNP switching outputs		1 PNP switching output + 1 analog output	
Power supply		Power supply		Power supply	
1 L+	12 - 30 V DC	1 L+	12 - 30 V DC	1 L+	12(14) - 30 V DC
3 L-	GND	3 L-	GND	3 L-	GND
Output		Output		Output	
4 K1	High side open collector max. 250 mA	2 K2	High side open collector max. 250 mA	2 analog	0(4) - 20 mA / 0 - 10 V DC
2	nc	4 K1		4 K1	High side open collector max. 250 mA
5	Interface	5	Interface	5	Interface

<b>Color assignment: M12x1 round plug</b>	1 bn	Brown	4 bk	Black	The color assignment applies <b>only</b> to A-coded standard cables !
	2 wh	White	5 gy	Gray	
	3 bu	Blue			

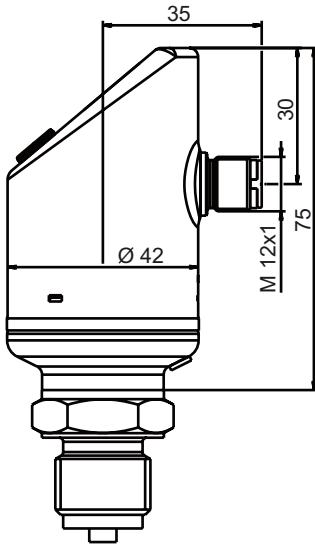
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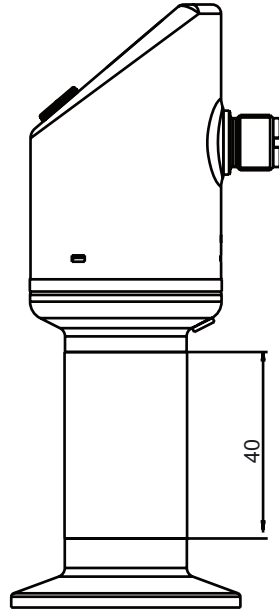
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## Dimensions



Type 405052/000-...



Type 405052/004-...

### Process connections, not front-flush

504	511	521	523

A = profile seal DN G 1/4  
 B = profile seal DN G 1/2  
 E = 27 AF

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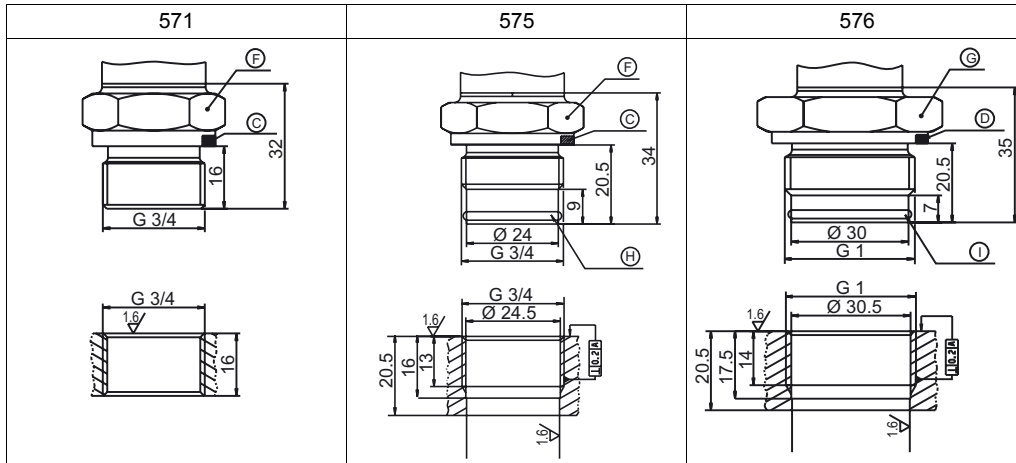
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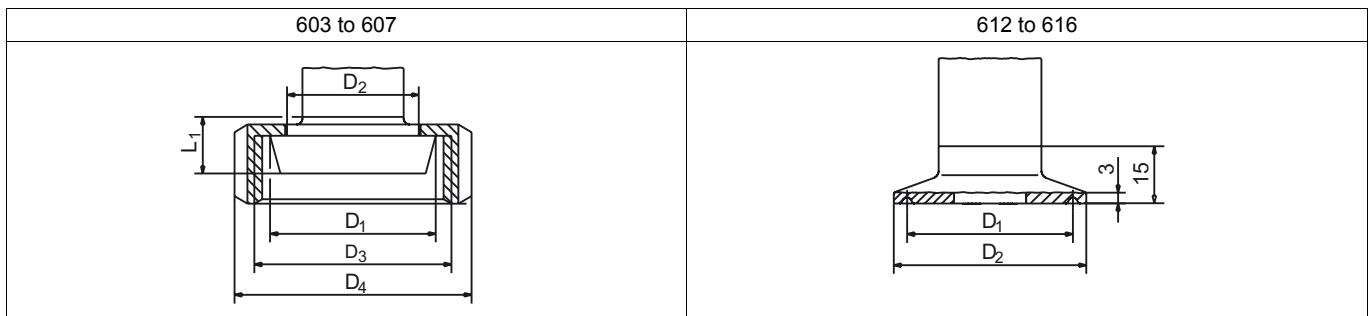


# Dimensions

## Process connections, front-flush

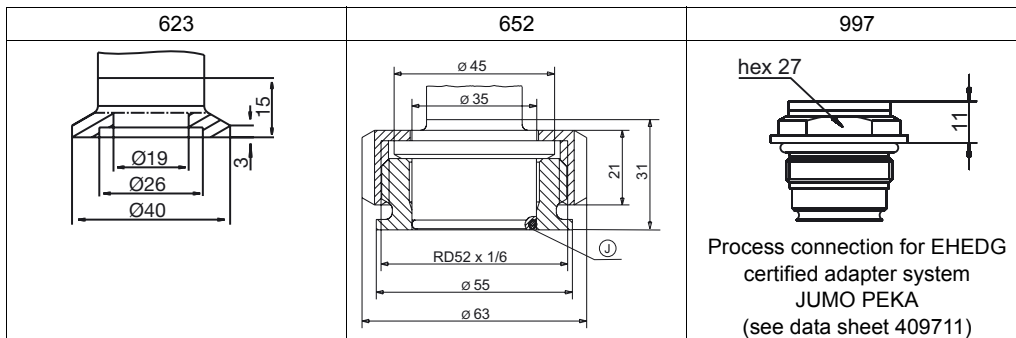


C = profile seal DN G 3/4  
 D = profile seal DN G 1  
 F = 32 AF  
 G = 41 AF  
 H = O-ring 20.35 x 1.78  
 I = O-ring 26.7 x 1.78  
 J = O-ring 29.82 x 2.62



Process connection	DN	Ø D <sub>1</sub>	Ø D <sub>2</sub>	Ø D <sub>3</sub>	Ø D <sub>4</sub>	L <sub>1</sub>
603	20	36.5	30	RD 44 x 1/6	54	13
604	25	44	35	RD 52 x 1/6	63	15
606	40	56	48	RD 65 x 1/6	78	15
607	50	68.5	61	RD 78 x 1/6	92	16

Process connection	DN DIN 32676	DN (inches)	DN ISO 2852	Ø D <sub>1</sub>	Ø D <sub>2</sub>
612	10		8	27.5	34
	15		10		
	20		15		
613	25	1	20	43.5	50.5
	32	1.5	25		
	40		32		
616	50	2	40	56.5	64



Process connection for EHEDG certified adapter system JUMO PEKA (see data sheet 409711)



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## Order details

	<b>(1) Basic type<sup>a</sup></b>
405052/000	JUMO DELOS SI Precision pressure transmitter with switching contacts and display
004	for increased medium temperatures up to 200°C <sup>b</sup>
999	Special design
	<b>(2) Input (nominal measuring range)</b>
	<b>Overpressure measuring ranges</b>
452	0 to 0.4 bar relative pressure
454	0 to 1 bar relative pressure
457	0 to 4 bar relative pressure
459	0 to 10 bar relative pressure
461	0 to 25 bar relative pressure
463	0 to 60 bar relative pressure
447	-0.4 to 0.4 bar relative pressure
449	-1 to 1 bar relative pressure
481	-1 to 3 bar relative pressure
483	-1 to 9 bar relative pressure
485	-1 to 24 bar relative pressure
486	0 to 0.4 bar absolute pressure
488	0 to 1 bar absolute pressure
491	0 to 4 bar absolute pressure
493	0 to 10 bar absolute pressure
495	0 to 25 bar absolute pressure
506	0 to 60 bar absolute pressure
	<b>(3) Output</b>
470	1 x PNP switching output
471	2 x PNP switching outputs
475	1 x PNP switching output and analog output, 4 - 20 mA, three wires <sup>c</sup>
476	1 x PNP switching output and analog output, 0 - 20 mA, three wires <sup>b, c</sup>
477	1 x PNP switching output and analog output, 0 - 10 V, three wires <sup>b, c</sup>

<sup>a</sup> Product is not intended for export to the USA.

<sup>b</sup> Measuring instruments for increased medium temperatures can only be supplied with front-flush process connections 571, 575, 576, 603, 604, 606, 607, 612, 613, 623, 652 and 997.

<sup>c</sup> Factory setting: the analog output is freely configurable.

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**(4) Process connection**

**Not front-flush**

- 504 G 1/2 EN 837
- 511 1/4-18 NPT EN 837
- 521 G 1/4 DIN 3852 T11
- 523 G 1/2 DIN 3852 T11

**Front-flush**

- 571 G 3/4 EN ISO 228-1
- 575 G 3/4 front-flush seal (2-way seal)
- 576 G 1 front-flush seal (2-way seal)
- 603 Tapered adapter / hygienic coupling DN 20 DIN 11851 <sup>a</sup>
- 604 Tapered adapter / hygienic coupling DN 25 DIN 11851 <sup>a</sup>
- 606 Tapered adapter / hygienic coupling DN 40 DIN 11851 <sup>a</sup>
- 607 Tapered adapter / hygienic coupling DN 50 DIN 11851 <sup>a</sup>
- 612 Clamp DN 10, 15, 20 DIN 32676; DN 8, 10, 15 ISO 2852
- 613 Clamp DN 25, 32, 40 DIN 32676; DN 20, 25, 32 ISO 2852; DN 1, 1.5 inches
- 616 Clamp DN 50 DIN 32676; DN 40 ISO 2852; DN 2 inches
- 623 Small flange connection DN 25 DIN 28403
- 652 Tank connection DN 25 <sup>b</sup>
- 997 JUMO PEKA (EHEDG-certified) <sup>c</sup>

**(5) Process connection material**

- 20 Stainless steel 316L

**(6) Electrical connection**

- 36 Round plug, M12x1

**(7) Measuring system filling medium**

- 01 Silicon oil
- 12 FDA-compliant oil

**(8) Extra codes**

- 000 none
- 591 Throttle in pressure channel
- 624 free of oil and grease
- 691 Partially sealed

<sup>a</sup> The groove union nut is included among the items supplied.

<sup>b</sup> The welding socket, seal and groove union nut are included among the items supplied.

<sup>c</sup> For suitable process connection adapters, see data sheet 409711.

**Order code**      (1)      (2)      (3)      (4)      (5)      (6)      (7)      (8)  
 Order example     -  -  -  -  -  -  /   
                          405052/000 - 459 - 471 - 504 - 20 - 36 - 01 / 000

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 Fax: 315-697-5867  
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 Internet: www.jumo.us



## Stock instruments

Delivery in 3 working days after receipt of order

Type	Version	Sales no.
405052/000-459-475-504-20-36-01/000	0 to 10 bar rel., 1 PNP switching output and 4 - 20 mA, G 1/2	40/00520630
405052/000-449-475-504-20-36-01/000	-1 to 1 bar rel., 1 PNP switching output and 4 - 20 mA, G 1/2	40/00523317
405052/000-454-475-504-20-36-01/000	0 to 1 bar rel., 1 PNP switching output and 4 - 20 mA, G 1/2	40/00527029
405052/004-491-475-504-20-36-01/000	increased medium temperature, 0 to 4 bar abs., 1 PNP switching output and 4 - 20 mA, G 3/4	40/00527725
405052/000-457-475-504-20-36-01/000	0 to 4 bar rel., 1 PNP switching output and 4 - 20 mA, G 1/2	40/00528156
405052/000-452-475-504-20-36-01/000	0 to 0.4 bar rel., 1 PNP switching output and 4 - 20 mA, G 1/2	40/00528746
405052/000-461-475-504-20-36-01/000	0 to 25 bar rel., 1 PNP switching output and 4 - 20 mA, G 1/2	40/00528994
405052/000-452-475-997-20-36-01/000	0 to 0.4 bar rel., 1 PNP switching output and 4 - 20 mA, JUMO PEKA	40/00530067
405052/000-483-475-997-20-36-01/000	-1 to 9 bar rel., 1 PNP switching output and 4 - 20 mA, JUMO PEKA	40/00533816

## Accessories

Designation	Sales no.
4-pin (straight) cable connector M12x1 with 2 m PVC cable	40/00404585
4-pin angled cable connector M12x1 with 2 m PVC cable	40/00409334
Setup program CD <sup>a</sup>	40/00522384
PC interface cable including USB/TTL converter and adapter (USB connecting cable) <sup>a</sup>	40/00456352
Connecting cable (Y cable) <sup>a</sup>	40/00507861
Combination tool	40/00526614

<sup>a</sup> The Setup program can only be used for configuration in conjunction with these accessories.