

JUMO GmbH & Co. KG
Delivery address: Mackenrodtstraße 14
36039 Fulda, Germany
Postal address: 36035 Fulda, Germany
Phone: +49 661 6003-0
Fax: +49 661 6003-607
Email: mail@jumo.net
Internet: www.jumo.net

JUMO Instrument Co. Ltd.
JUMO House
Temple Bank, Riverway
Harlow, Essex, CM20 2DY, UK
Phone: +44 1279 63 55 33
Fax: +44 1279 62 50 29
Email: sales@jumo.co.uk
Internet: www.jumo.co.uk

JUMO Process Control, Inc.
6733 Myers Road
East Syracuse, NY 13057, USA
Phone: +1 315 437 5866
Fax: +1 315 437 5860
Email: info.us@jumo.net
Internet: www.jumousa.com



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. 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× PNP or 2× PNP switching outputs or 1× PNP switching output and an analog output signal.

The process pressure is visualized by a large, positively lit LC display.

Configuration can simply be performed on the measuring instrument, or by using the more convenient setup program. The enclosure can be rotated $\pm 160^\circ$ 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).

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 $\pm 160^\circ$ 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.



Type 405052

Special features

- Linearity from 0.1 % of MSP (measuring span)
- 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 ($\pm 160^\circ$) to improve readability
- Option for increased medium temperature up to 200°C (SIP and CIP capability)

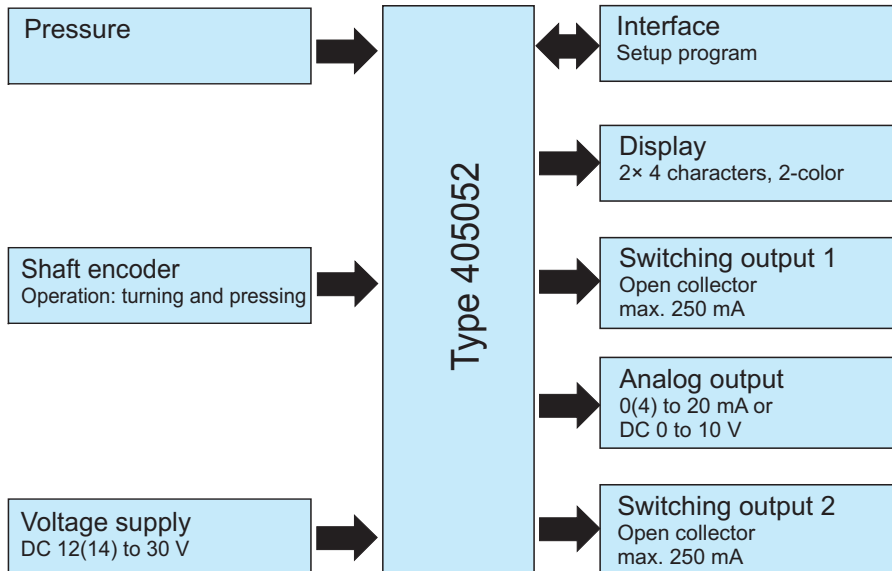
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Block diagram



Technical data

General Information

Reference conditions	DIN 16086 and DIN EN 60770
Sensor system Pressure transfer means Permissible load changes	Silicon sensor with stainless steel separating diaphragm Synthetic oil (silicon oil), FDA-compliant oil > 10 million
Location Mounting position Position-dependent zero point offset Basic type 000 standard Basic type 004 high-temperature design	Any Device standing upright, process connection on bottom ≤ 1 mbar ≤ 10 mbar
Display Alignment Size Color Switching state display Measuring unit	Positively lit display Display can be rotated 180° via software Enclosure rotatable ±160° (use the combination tool supplied) Display field 16 × 26 mm, font size 7 mm, 2× 4-digit Normal operation: amber-colored K1, K2 mbar, bar, kPa, MPa, psi, %
Operation Local Setup interface	Via control element under the screw plug with combination tool or 0.5 × 3 screwdriver or 2AF hex key Pin 5 of the M12 × 1 round plug

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Measuring range and accuracy

Nominal measuring range bar	Linearity ^a	Accuracy at		Long-term stability ^b % MSP per year	Overload capacity ^c bar	Burst pres- sure bar
	% MSP	20 °C ^d % MSP	-20 to +75 °C ^e % MSP			
0 to 0.4 bar relative pressure	0.15	0.35	0.7	≤ 0.2	1.6	2
0 to 1 bar relative pressure	0.15	0.3	0.6		4	5
0 to 4 bar relative pressure	0.1	0.25	0.5		16	20
0 to 10 bar relative pressure	0.1	0.25	0.5		40	50
0 to 25 bar relative pressure	0.1	0.25	0.5		100	125
0 to 60 bar relative pressure	0.1	0.25	0.5		240	300
-0.4 to +0.4 bar relative pressure	0.15	0.35	0.7		1.6	2
-1 to +1 bar relative pressure	0.15	0.3	0.6		4	5
-1 to +3 bar relative pressure	0.1	0.25	0.5		16	20
-1 to +9 bar relative pressure	0.1	0.25	0.5		40	50
-1 to +24 bar relative pressure	0.1	0.25	0.5		100	125
0 to 0.4 bar absolute pressure	0.15	0.35	0.7		1.6	2
0 to 1 bar absolute pressure	0.15	0.3	0.6		4	5
0 to 4 bar absolute pressure	0.1	0.25	0.5		16	20
0 to 10 bar absolute pressure	0.1	0.25	0.5		40	50
0 to 25 bar absolute pressure	0.1	0.25	0.5		100	125
0 to 60 bar absolute pressure	0.1	0.25	0.5	240	300	

^a Linearity according to limit point setting

^b Reference conditions DIN EN 61298-1

^c All pressure transmitters are vacuum-proof.

^d Includes: linearity, hysteresis, repeatability, deviation of measuring range initial value and measuring range end value

^e Includes: linearity, hysteresis, repeatability, deviation of measuring range initial value and measuring range end value, thermal effect on measuring range start and measuring span

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Outputs

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

Attenuation	0 to 99.99 s
Analog output	
Current	
Output 475	4 to 20 mA (and 1× PNP switching output)
Output 476	0 to 20 mA (and 1× PNP switching output)
Voltage	
Output 477	0 to 10 V (and 1× PNP switching output)
Setting range	Measurement range scaling (turn down) 1:4
Switching point	Configurable in the nominal measuring range (> release point)
Release point	Configurable in the nominal measuring range (< switching point)
Hysteresis	Configurable in the nominal measuring range
Input delay	0 to 99.99 s
Burden	
Current	
4 to 20 mA, three-wire (output 475)	$RL \leq (U_B - 6.5 \text{ V}) \div 0.022 \text{ A } (\Omega)$
0 to 20 mA, three-wire (output 476)	$RL \leq (U_B - 6.5 \text{ V}) \div 0.022 \text{ A } (\Omega)$
Voltage	
DC 0 bis 10 V, three-wire (output 477)	$RL \geq 10 \text{ k}\Omega$
Step response time (analog input)	
T_{90}	$\leq 100 \text{ ms}$
Switching output	
Output 470, 475, 476 or 477	1× PNP switching output
Output 471	2× PNP switching outputs
Switching type	Break contact/make contact
Switching function	Window/hysteresis
Switching capacity	
Voltage drop from U_B	PNP $\leq 2 \text{ V}$
Contact rating	ON $\leq 250 \text{ mA}$ /OFF $\leq 1 \text{ mA}$
Switching cycles	> 10 million
Response time	$\leq 20 \text{ ms}$
Short-circuit proof	Yes
Current load check	
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

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Mechanical features

Process connection	
Material	Stainless steel 316 L
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
Process connection 997 (JUMO PEKA)	FPM, VMQ, silicon EPDM; FDA-compliant, options see data sheet 409711
Measuring diaphragm	
Material	Stainless steel 316 L
Surface	Ra ≤ 0.8 µm
Housing	
Material	Stainless steel 316 L
Surface	Ra ≤ 0.8 µm
Threaded sleeve M12 × 1	Stainless steel 316 L
Housing seal	VMQ silicon; FDA-compliant
Display	PA (polyamide)
Control element screw plug	
Material	Aluminum 3.2315
Surface	Eloxal coating
Seal	VMQ silicon; FDA-compliant
Weight	200 g with G 1/2 (process connection 504)

Environmental influences

Permissible temperatures	
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
Permissible relative humidity	
In operation	100 % rel. humidity, including condensation of instrument outer sleeve
Storage	90 % rel. humidity, no condensation
Permissible mechanical loading	
Vibration resistance ^a	20 g, 10 to 2000 Hz
Shock resistance ^b	50 g for 11 ms/100 g for 1 ms
Electromagnetic compatibility	With 4-pin connecting cable and grounded enclosure only!
Interference emission ^c	Class B ^d
Interference immunity ^c	Industrial requirements
Protection ^e	IP67

^a IEC 60068-2-6

^b IEC 60068-2-27

^c DIN EN 61326-2-3

^d The product is suitable for industrial use as well as for households and small businesses.

^e DIN EN 60529 (with suitable mating piece when connected)

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Auxiliary power

Voltage supply U_B^a 0 to 20 mA, three-wire (output 476) 4 to 20 mA, three-wire (output 475) 0 to 10 V, three-wire (output 477) Less than the permitted voltage supply Reverse polarity protection	Nominal voltage DC 24 V DC 12 to 30 V DC 12 to 30 V DC 14 to 30 V Display Err 5 YES
Power consumption	≤ 45 mA without load, ≤ 545 mA with load 2× PNP
Electrical connection	Round plug M12 × 1, 4-pin, A-coded (for assignment see "Connection diagram")
Circuit Requirements	SELV The device must be equipped with an electrical circuit that meets the requirements of EN 61010-1 with regard to "Limited-energy circuits".

^a Residual ripple: Peak voltages must not exceed or fall below the values specified for the voltage supply!

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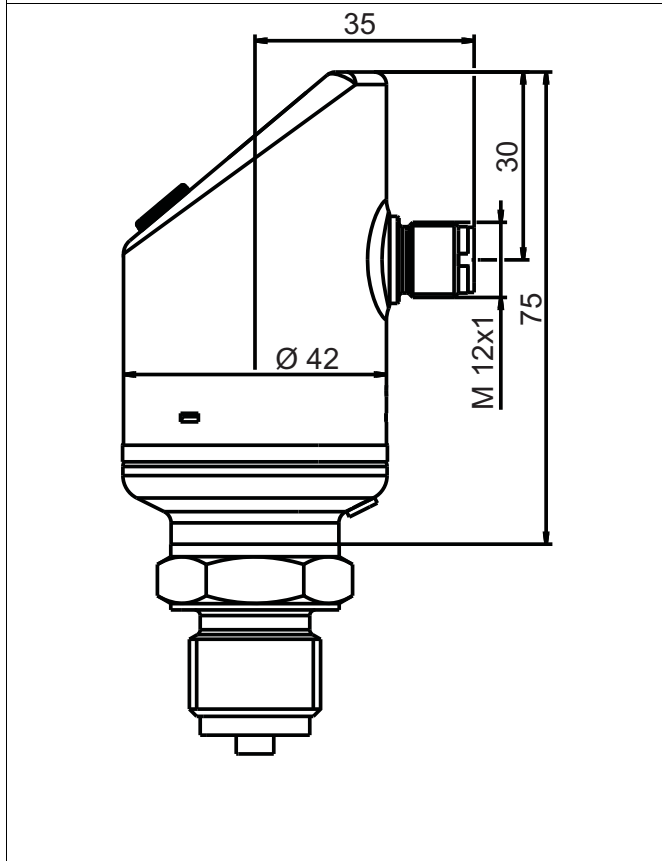
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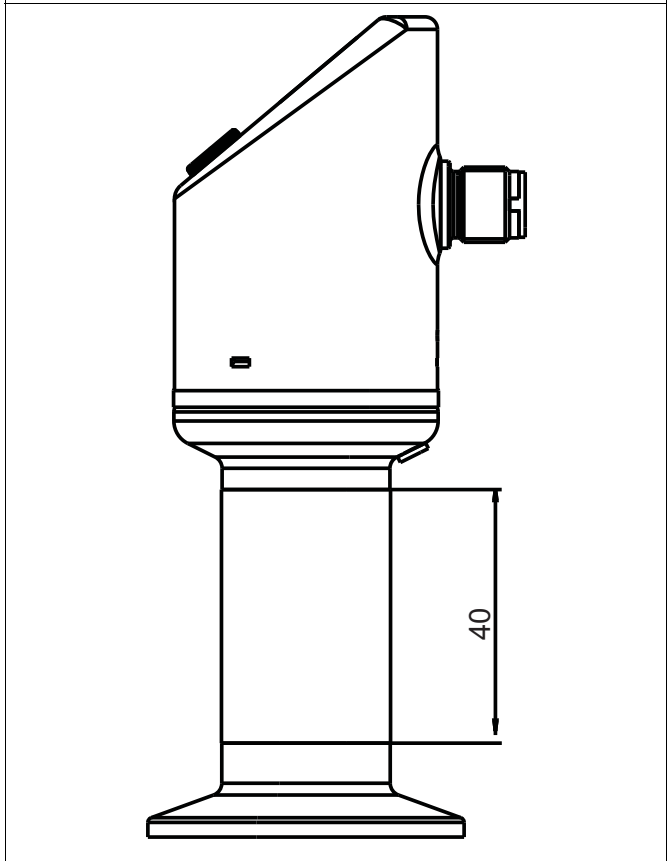


Dimensions

Type 405052/000-...



Type 405052/004-...
for increased measuring material temperatures



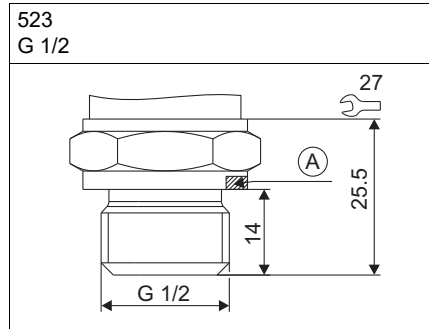
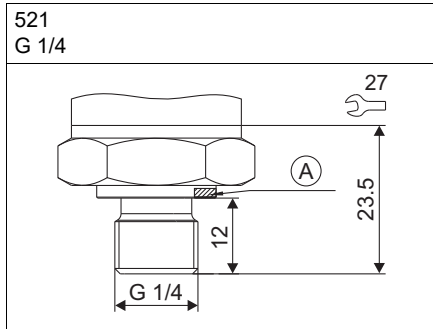
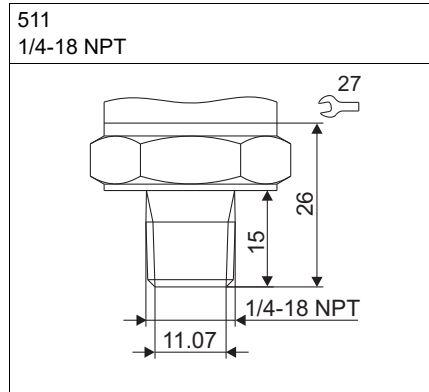
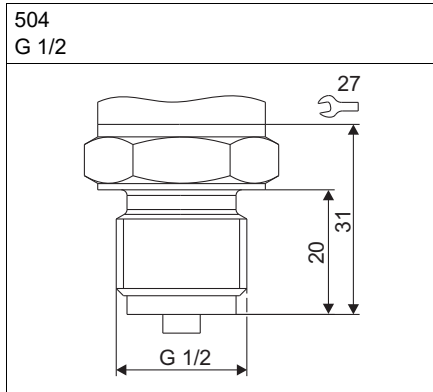
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Process connections, not front-flush



A Profile seal DN G 1/4

A Profile seal DN G 1/2

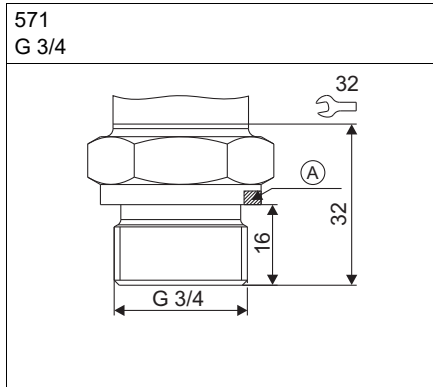
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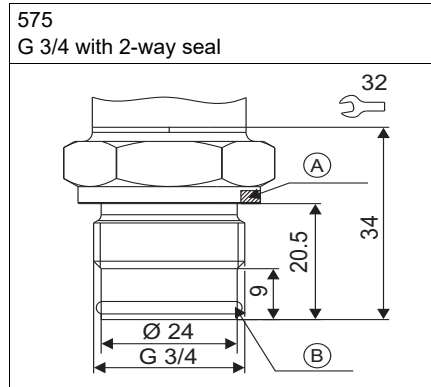
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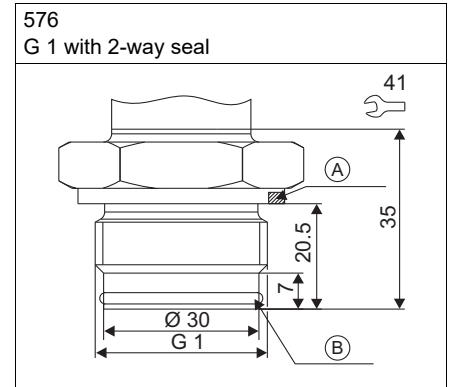
Process connections, front-flush



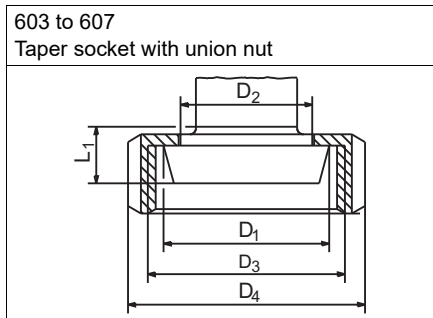
A Profile seal DN G 3/4



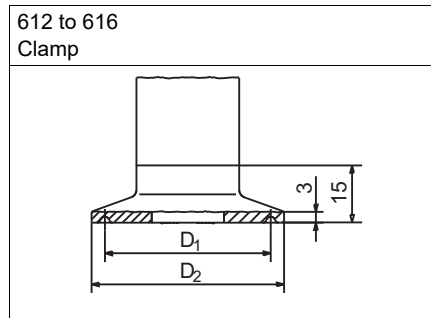
A Profile seal DN G 3/4
 B O-ring 20.35 × 1.78



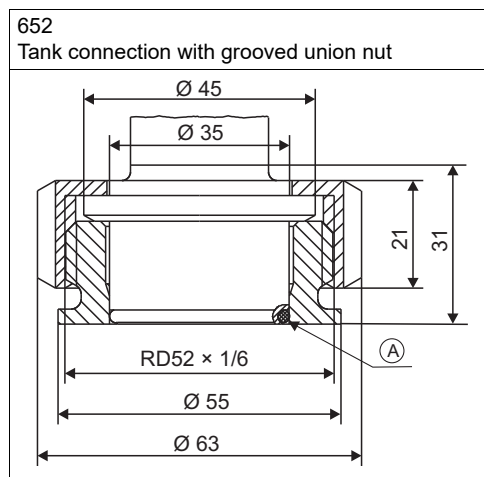
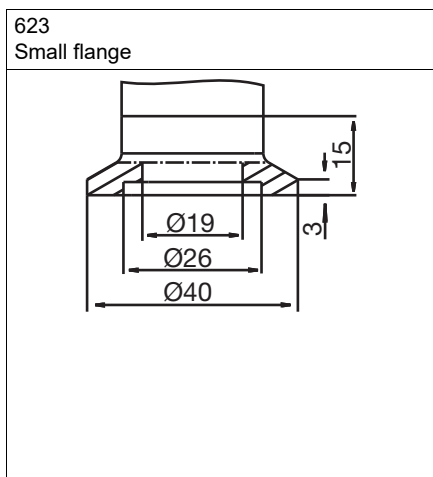
A Profile seal DN G 1
 B O-ring 26.7 × 1.78



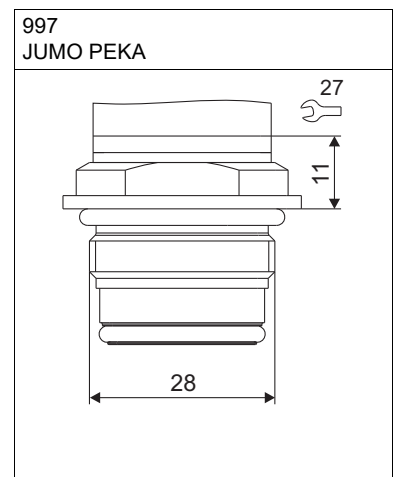
Process connection	DN	Ø D ₁	Ø D ₂	Ø D ₃	Ø D ₄	L ₁
603	20	36.5	30	RD 44 × 1/6	54	13
604	25	44	35	RD 52 × 1/6	63	15
606	40	56	48	RD 65 × 1/6	78	15
607	50	68.5	61	RD 78 × 1/6	92	16



Process connection	DN DIN 32676	DN (inch)	DN ISO 2852	Ø D ₁	Ø D ₂
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



A O-ring 29.82 × 2.62



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Connection diagram

The connection diagram in the data sheet provides preliminary information about the connection options. For the electrical connection, only use the installation instructions or the operating manual. The knowledge and the correct technical compliance with the safety information and warnings contained in these documents are mandatory for mounting, electrical connection, and startup as well as for safety during operation.

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

Color assignment: Connecting cable round plug M12 × 1		
1 BN	Brown	
2 WH	White	
3 BU	Blue	
4 BK	Black	
5 GY	Grey	

The color assignment is **only** apply for A-coded standard cables!

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Order details

(1) Basic type	
405052/000	JUMO DELOS SI – Precision pressure transmitter with switching contacts and display ^a
405052/004	JUMO DELOS SI – Precision pressure transmitter with switching contacts and display for increased measuring material temperatures up to 200 °C ^b
405052/999	JUMO DELOS SI – Precision pressure transmitter with switching contacts and display, special version
(2) Input	
447	-400 to +400 mbar relative pressure
449	-1 to +1 bar relative pressure
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
481	-1 to +3 bar relative pressure
483	-1 to +9 bar relative pressure
485	-1 to +24 bar relative pressure
486	0 to 400 mbar 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
(3) Output	
470	1× PNP switching output
471	2× PNP switching outputs
475	1× PNP switching output and 1× analog output 4 to 20 mA ^c
476	1× PNP switching output and 1× analog output 0 to 20 mA ^c
477	1× PNP switching output and 1× analog output 0 to 10 V ^c
(4) Process connection	
504	G 1/2 EN 837
511	1/4-18 NPT EN 837
521	G 1/4 DIN 3852-11
523	G 1/2 DIN 3852-11
571	G 3/4 front-flush EN ISO 228-1
575	G 3/4 front-flush with 2-way seal
576	G 1 front-flush with 2-way seal
603	Taper socket with union nut DN 20 DIN 11851 (dairy screw connection) ^d
604	Taper socket with union nut DN 25 DIN 11851 (dairy screw connection) ^d
606	Taper socket with union nut DN 40 DIN 11851 (dairy screw connection) ^d
607	Taper socket with union nut DN 50 DIN 11851 (dairy screw connection) ^d
612	Clamp DN 10, 15, 20 DIN 32676
613	Clamp DN 25, 32, 40 DIN 32676
616	Clamp DN 50 DIN 32676, 2" ISO 2852
623	Small flange DN 25 DIN 28403
652	Tank connection with grooved union nut DN 25 ^e
997	JUMO PEKA hygienic process connection ^f
998	Diaphragm seal, version with screw connection
(5) Process connection material	
20	CrNi (stainless steel)

JUMO GmbH & Co. KG
 Delivery address: Mackenrodtstraße 14
 36039 Fulda, Germany
 Postal address: 36035 Fulda, Germany
 Phone: +49 661 6003-0
 Fax: +49 661 6003-607
 Email: mail@jumo.net
 Internet: www.jumo.net

JUMO Instrument Co. Ltd.
 JUMO House
 Temple Bank, Riverway
 Harlow, Essex, CM20 2DY, UK
 Phone: +44 1279 63 55 33
 Fax: +44 1279 62 50 29
 Email: sales@jumo.co.uk
 Internet: www.jumo.co.uk

JUMO Process Control, Inc.
 6733 Myers Road
 East Syracuse, NY 13057, USA
 Phone: +1 315 437 5866
 Fax: +1 315 437 5860
 Email: info.us@jumo.net
 Internet: www.jumousa.com



(6)	Electrical connection
36	Round plug M12 × 1
(7)	Measuring system filling medium
01	Silicon oil
12	FDA-compliant oil
(8)	Extra codes
000	None
100	Customized setting (specify required setting in plain text)
452	Parts in contact with the medium are electropolished, surface roughness $R_a \leq 0.8 \mu\text{m}$
591	Throttle in pressure channel
624	Free of oil and grease
634	TAG-number
691	Improved humidity/vibration protection
769	Calibration certificate

- ^a This JUMO product is licensed under United States and Canadian patents. Purchasers of the JUMO product outside of the United States and Canada should advise JUMO of any planned sales of products incorporating the JUMO product into the United States and Canada.
- ^b Measuring devices for increased measuring material temperatures can only be delivered with process connection 571, 575, 576, 603, 604, 606, 607, 612, 613, 623, 652, 997.
- ^c Factory setting - the analog output can be freely configured.
- ^d Union nut is included in delivery.
- ^e Welding socket, seal and groove union nut are included in delivery.
- ^f Suitable adapter for process connection 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

Accessories

Article	Part no.
PC interface cable including USB/TTL converter ^a	00456352
Y transmitter cable, 5 pole ^a	00507861
Combination tool	00526614
Cable connector, straight, 4 pole, M12 × 1, 2 m PVC cable	00404585
Cable connector, angled, 4 pole, M12 × 1, 2 m PVC cable	00409334
Cable socket, 5 pole, M12 × 1, straight, without connecting cable, assembly by customer	00419130
Measuring device holder for wall and 2" pipe	00597711
CD-setup program ^a	00522384

^a The setup program can only be used for configuration in conjunction with these accessories.