

## JUMO dTRANS p20 DELTA

### Differential pressure transmitter

#### Brief description

The device with HART® interface combines maximum precision with simple operation. It is used to measure the system pressure of gases, steams, and liquids. The integrated LCD display shows measured values and device data.

The version with explosion protection "Ex ia (intrinsically safe)" allows the device to be installed up to zone 0.

The housing and sensors are manufactured from high-grade stainless steel. Diaphragm seals can also be connected for specific process technology applications (see data sheets 409772 to 409784).

The device is programmable and therefore readily adaptable to a variety of different measurement tasks. An easy-to-use setup program is available as an accessory to enable operation via the interfaces. A rotary knob makes manual operation on-site very convenient and quick.

The pressure transmitter with 4 to 20 mA and HART® protocol was evaluated with regard to functional safety and is certified by TÜV Nord according to DIN EN 61508/-1/-2, edition 2.0. These measuring devices are suitable for monitoring process level and process pressure up to SIL2. Further details can be found in the Safety Manual.

For the "Ex d" explosion protection version, see data sheet 403023.

For the relative and absolute pressure version, see data sheet 403025 and 403026.



Type 403022/0-0-1-...

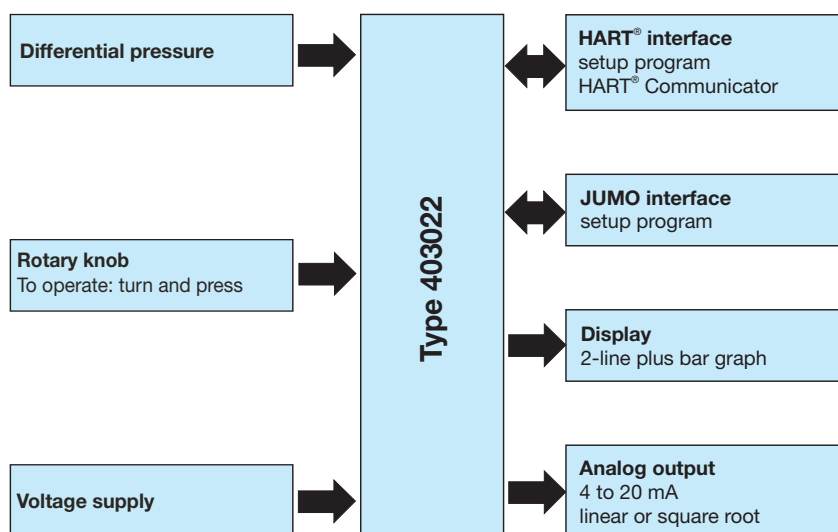


Type 403022/0-0-2-...



Type 403022/0-0-3-...

#### Block diagram



#### Special features

- Stainless steel case
- SIL certified (TÜV Nord)
- HART® interface
- Explosion protection Ex ia (gas and dust) according to ATEX and EAC
- Linearity 0.07 %
- Simple operation with rotary knob
- Setup program
- LCD display with bar graph
- Display scaling with a choice of measuring units
- Display of sensor temperature
- Display of minimum and maximum pressures
- Current-generator function
- Characteristic line and display also adjustable for flow measurement

#### Approvals/approval marks (see "Technical data")



## Technical data

### General Information

Reference conditions	DIN EN 60770 and DIN EN 61298
Ambient temperature	22 °C ±5 K
Air pressure	1000 hPa (±25 hPa)
Voltage supply	DC 24 V
Burden	50 Ω
Sensor system	Silicon sensor with stainless steel separating diaphragm
Pressure transfer medium	
For measuring system filling medium 1	Silicon oil
For measuring system filling medium 2	Halogenized filling oil
Admissible load changes	> 10 million
Position	
Mounting position	Any
Calibration position	Device upright, process connection at the bottom
Zero offset depending on position	≤ 1 mbar A zero offset is possible on-site or via setup
Display <sup>a</sup>	LCD, two-line with bar graph
Alignment	Display unit rotatable in 90° steps Housing rotatable ±160°
Size	Display 22 × 35 mm, font size 7 mm/5-digits
Color	Black
Portrayable measuring units	
Input pressure	inH <sub>2</sub> O, inHg, ftH <sub>2</sub> O, mmH <sub>2</sub> O, mmHg, psi, bar, mbar, kg/cm <sup>2</sup> , kPa, torr, MPa, mH <sub>2</sub> O
Measured value	% or scaled with freely adjustable measuring unit
Output current	mA
Sensor temperature	°C, °F
Additional display data	Minimum pressure, maximum pressure, error, overrange, underrange, operating hours
Operation	
On-site	With rotary knob and LCD
Setup program	Via interface
Interface	
Standard	JUMO interface <sup>b</sup>
For output 410 (4 to 20 mA with HART®)	JUMO interface <sup>b</sup> and HART® interface

<sup>a</sup> optional; SIL version only available with display

<sup>b</sup> The JUMO interface may not be used in a potentially explosive area! In such a case the device can be operated via the rotary knob or the HART® interface.

### Input

Nominal pressure					
Nominal measuring range	-10 to +10 mbar DP <sup>a</sup>	-1 to +1 bar DP	0 to 1 bar DP	-1 to +6 bar DP	-1 to +100 bar DP
Nominal pressure (bar)	PN2	PN210	PN210, optionally PN420		

<sup>a</sup> Without SIL


## Output

<p>Analog output</p> <p>For output 405 (4 to 20 mA)</p> <p>For output 410 (4 to 20 mA with HART®)</p> <p>Jump response time T60</p> <p>Attenuation</p>	<p>4 to 20 mA, two-wire</p> <p>4 to 20 mA, two-wire with HART® version 7 (optionally with HART® version 5, extra code 932, always with SIL version)</p> <p>≤ 190 ms without attenuation</p> <p>Adjustable 0 to 100 s</p>
<p>Burden</p> <p>For output 405 (4 to 20 mA)</p> <p>For output 410 (4 to 20 mA with HART®)</p>	<p><math>\text{Burden} \leq (U_B - 12 \text{ V}) \div 0.022 \text{ A}</math></p> <p><math>\text{Burden} \leq (U_B - 12 \text{ V}) \div 0.022 \text{ A}</math>; additional: min. 250 Ω, max. 1100 Ω</p>

## Voltage supply

<p>For version</p> <p>Explosion protection 0 (none)</p> <p>Explosion protection 1 (ATEX Ex ia)</p>	<p>DC 12 to 36 V</p> <p>DC 12 to 28 V</p> <p>The voltage supply must be intrinsically safe and must not exceed the following maximum values:</p> <p><math>U_i \leq \text{DC } 28 \text{ V}</math></p> <p><math>I_i \leq 115 \text{ mA}</math></p> <p><math>P_i \leq 750 \text{ mW}</math></p> <p><math>C_i = 6 \text{ nF}</math></p> <p><math>L_i = 105 \mu\text{H}</math></p>
--	--

## Mechanical features

Process connection Materials Membranes For process connection 20 (stainless steel) For process connection 82 (HASTELLOY®) For process connection 80 (tantalum) Flange Seal	Stainless steel 316 L  HASTELLOY® C276, material-no. 2.4819  Tantalum Stainless steel 316 PTFE
Housing Materials For housing 1 (short, stainless steel) For housing 2 (long, stainless steel) For housing 3 (precision casting) For material lid 20 (stainless steel) For material lid 85 (plastic) For electrical connection 36 (round plug M12 × 1) For electrical connection 82 (cable fitting, plastic) For electrical connection 93 (cable fitting, metal) For operation 0 (without control knob) For operation 1 (with control knob)	Stainless steel 1.4404 Stainless steel 1.4404, VMQ Stainless steel 1.4408 Precision casting 1.4408, seal FPM PA, seal FPM  Brass nickel-plated  PA  Brass nickel-plated  -  PA
Explosion protection For Explosion protection 0 (without) Explosion protection 1 (ATEX Ex ia)	The device is <b>not</b> approved for use in an Ex-area. EC type examination certificate SEV 09 ATEX 0138 X  II 1G Ex ia IIC T4 Ga II 1D Ex ia IIIC T105 °C Da
Weight Type 403022/0-0-1 (housing short) Type 403022/0-0-2 (housing long) Type 403022/0-0-3 (housing precision casting) For extra code 694 (increased nominal pressure)	Approximately 3.0 kg Approx. 3.3 kg Approximately 4.0 kg  The weight of the device increases by approximately 3.8 kg.

## Environmental influences

Admissible temperatures Operation	Version	Temperature class	Maximum medium temperature	Ambient temperature <sup>a</sup>	Increased ambient temperature (extra code 681) <sup>a, b, c</sup>
	Standard		110 °C	-40 to +85 °C	-50 to +85 °C
	II 1G Ex ia	T4	100 °C	-40 to +60 °C	-50 to +60 °C
	II 1D Ex ia	T105 °C	100 °C	-40 to +60 °C	-50 to +60 °C
Storage	-40 to +85 °C				
Admissible humidity Operation	100 % including condensation on the device outer case				
Storage	90 % without condensation				
Admissible mechanical load					
Vibration strength	2 g, 10 to 500 Hz according to DIN EN 60770-3				
Shock resistance	15 g for 6 ms according to IEC 60068-2-29				
Electromagnetic compatibility	According to EN 61326				
Interference emission	Class B <sup>d</sup>				
Interference immunity	Industry				
Protection type					
For version					
Explosion protection 0 (without)	IP66/67 according to DIN EN 60529				
Explosion protection 1 (ATEX Ex ia)	IP66 according to DIN EN 60529				

<sup>a</sup> Under -20 °C limited function: stationary use, increased danger of cable break, display without function; under -30 °C operation of the device not possible.

<sup>b</sup> In the range from -40 to -50 °C the device must be permanently in operation. Furthermore, the lid with the device inspection glass must additionally be protected against mechanical impact and shock effects. Please contact JUMO for further details.

<sup>c</sup> Without SIL

<sup>d</sup> The product is suitable for industrial use as well as for households and small businesses.

## Accuracy

Including non-linearity, hysteresis, non-repeatability, zero point and final value deviation (corresponds to measurement deviations according to IEC 61298-2), calibrated at vertical installation position with the process connection at the bottom

Differential pressure					
Nominal measuring range	-10 to +10 mbar DP <sup>a</sup>	-1 to +1 bar DP	0 to 1 bar DP	-1 to +6 bar DP	-1 to +100 bar DP
Default measuring range	0 to 10 mbar	0 to 1 bar		0 bar to 6 bar	0 bar to 100 bar
Smallest MSP <sup>b</sup>	1 mbar <sup>c</sup>	5 mbar <sup>c</sup>		0.350 bar	2.5 bar
Turndown ratio (r) <sup>d</sup>	r ≤ 20	r ≤ 400	r ≤ 200	r ≤ 20	r ≤ 40
Non-linearity for reference conditions	0.1 % for r ≤ 2	0.07 % for r ≤ 10		0.07 % for r ≤ 5	
	r × 0.05 % for 2 ≤ r ≤ 20	r × 0.007 % for 10 ≤ r ≤ 400	r × 0.007 % for 10 ≤ r ≤ 400	r × 0.014 % for 5 ≤ r ≤ 20	r × 0.014 % for 5 ≤ r ≤ 40
Accuracy in % of the set MSP at 20 °C	0.2 % for r ≤ 2	0.1 % for r ≤ 10		0.1 % for r ≤ 5	
	r × 0.1 % for 2 ≤ r ≤ 20	r × 0.01 % for 10 ≤ r ≤ 400	r × 0.01 % for 10 ≤ r ≤ 200	r × 0.02 % for 5 ≤ r ≤ 20	r × 0.02 % for 5 ≤ r ≤ 40
Accuracy in % of the set MSP Range: 20 to 85 °C	0.5 % for r ≤ 2 (only to 60 °C)	0.2 % for r ≤ 10		0.2 % for r ≤ 5	
	r × 0.25 % for 2 ≤ r ≤ 20 (only to 60 °C)	r × 0.02 % for 10 ≤ r ≤ 400	r × 0.02 % for 10 ≤ r ≤ 200	r × 0.04 % for 5 ≤ r ≤ 20	r × 0.04 % for 5 ≤ r ≤ 40
Accuracy in % of the set MSP Range: -40 to +20 °C	1.0 % for r ≤ 2	0.6 % for r ≤ 10		0.6 % for r ≤ 5	
	r × 0.5 % for 2 ≤ r ≤ 20	r × 0.06 % for 10 ≤ r ≤ 400	r × 0.06 % for 10 ≤ r ≤ 200	r × 0.12 % for 5 ≤ r ≤ 20	r × 0.12 % for 5 ≤ r ≤ 40
Accuracy in % of the set MSP Range: 60 to 85 °C	2.0 % for r ≤ 2	2.0 % for r ≤ 2		2.0 % for r ≤ 2	
	r × 1.0 % for 2 ≤ r ≤ 20				
Influence of the static pressure P (bar) in % from the nominal measuring range	≤ 1 %	≤ P × 0.0005 %	≤ P × 0.0003 %	≤ P × 0.0025 %	≤ P × 0.001 %
Long-term stability in % as of the nominal measuring range	≤ 0.6 %/year	≤ 0.1 %/year			≤ 0.2 %/year

<sup>a</sup> Without SIL

<sup>b</sup> MSP = measuring span

<sup>c</sup> For the calibration certificate from JUMO the smallest MSP is 10 mbar. MSPs smaller than 10 mbar can be adjusted by the user.

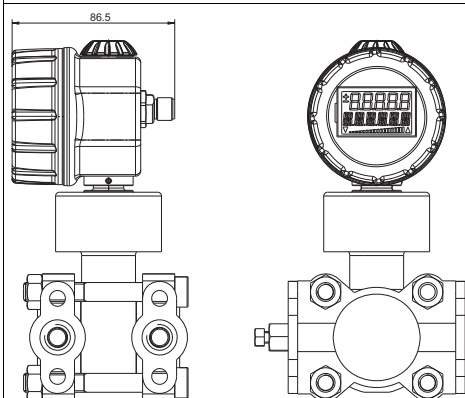
<sup>d</sup>  $r$  = span of the nominal measuring range ÷ adjusted measuring span

## Approvals/approval marks

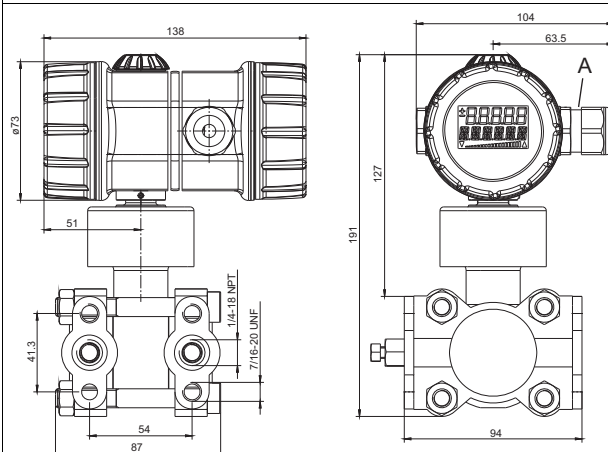
Approval mark	Test facility	Certificates/certification numbers	Inspection basis	Valid for
ATEX	Electrosuisse	SEV 09 ATEX 0138 X	EN 60079-0 EN 60079-11 EN 60079-26	403022/x-1-...
EAC	RU	RU C-DE.ME92.B.00440	-	Extra code 226
SIL	TÜV Nord (German Technical Inspection Agency)	No. SEBS-A. 140944/16 V1.0	DIN EN 61508/-1/-2	Basic type extension 2 and 3

## Dimensions

**Type 403022/0-0-1**  
(short, stainless steel, with M12 connection)

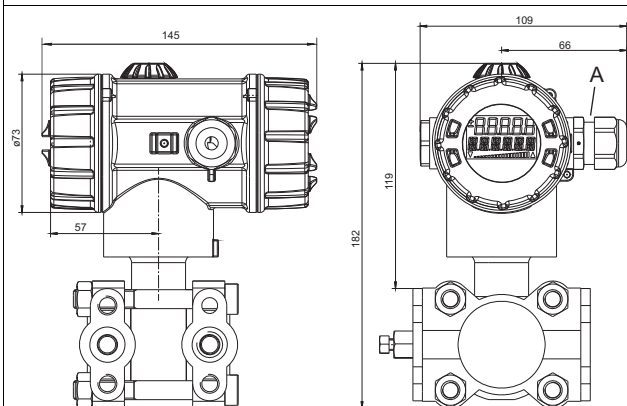


**Type 403022/0-0-2**  
(long, stainless steel, with cable fitting)



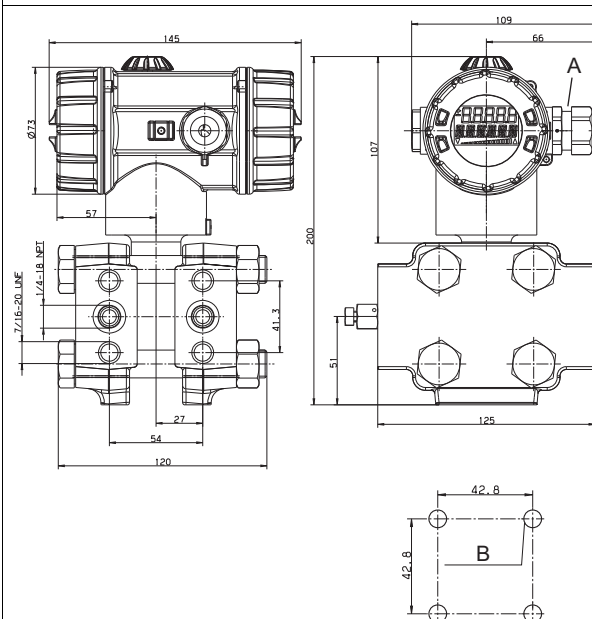
A M20 × 1.5 cable fitting

**Type 403022/0-0-3**  
(precision casting, with cable fitting)



A M20 × 1.5 cable fitting

**For extra code 694**  
(increased nominal pressure PN420)

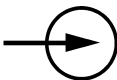
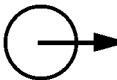



A M20 × 1.5 cable fitting

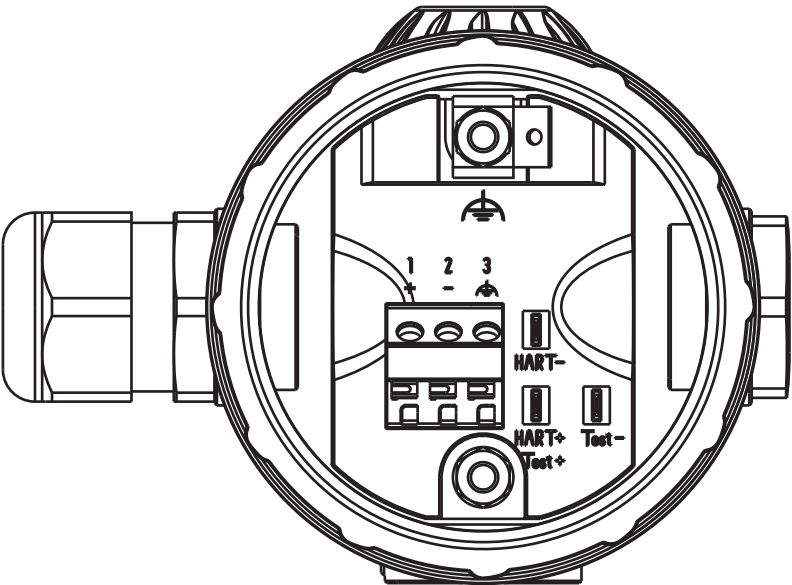
B M8 for mounting

# 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.

Connection		Terminal assignment	
		82 (plastic), 93 (metal) Cable gland	36 Round plug M12 × 1
Voltage supply DC 12 to 36 V for <b>none</b> Ex version DC 12 to 28 V for Ex version		1 L+ 2 L-	1 L+ 3 L-
Output 4 to 20 mA, two-wire Impressed current 4 to 20 mA in voltage supply		1 L+ 2 L-	1 L+ 3 L-
Current output test connection Inherent resistance of ammeter ≤ 10 Ω		TEST + TEST -	
HART® test connection Burden must be present!		HART + HART -	
Functional ground		3	4

## Cable fitting



## Round plug M12 × 1





## Order details

	<b>(1) Basic type</b>
403022	JUMO dTRANS p20 DELTA – differential pressure transmitter
	<b>(2) Basic type extension</b>
0	None
2	SIL <sup>a</sup>
3	SIL, customer-specific <sup>a</sup>
9	Special version
	<b>(3) Explosion protection</b>
0	None
1	ATEX Ex ia <sup>b</sup>
	<b>(4) Housing</b>
1	Short, stainless steel, with M12 connection <sup>c</sup>
2	Long, stainless steel, with cable fitting
3	Precision casting, with cable fitting
	<b>(5) Electrical connection</b>
36	Round plug M12 × 1
82	Plastic cable fitting
93	Metal cable fitting
	<b>(6) Cover material</b>
20	CrNi (stainless steel)
85	Plastic
	<b>(7) Display</b>
0	None
1	With display (LCD)
	<b>(8) Operation</b>
0	None
1	With control knob
	<b>(9) Input – nominal measuring range</b>
530	-10 to +10 mbar DP <sup>d, e, f</sup>
532	0 to 1 bar DP
531	-1 to +1 bar DP <sup>e</sup>
533	-1 to +6 bar DP
534	-1 to +100 bar DP
	<b>(10) Output</b>
405	4 to 20 mA, two-wire, without SIL
410	4 to 20 mA, two-wire with HART® protocol
	<b>(11) Process connection</b>
511	2× pressure connection 1/4-18 NPT according to DIN EN 837
998	Diaphragm seal process connection
	<b>(12) Process connection material</b>
20	CrNi (stainless steel)
80	Tantalum
82	NiMo
	<b>(13) Measuring system, filling medium</b>
01	Silicon oil
02	Halogenized oil for oxygen application
	<b>(14) Extra codes</b>
000	None
100	Customer-specific factory setting <sup>g</sup>

226	With GOST/EAC approval <sup>h</sup>
624	Oil and grease free
633	Mounting brackets for 2" tube
634	With TAG number
635	With NACE manufacturer's declaration <sup>i</sup>
681	Expanded admissible ambient temperature <sup>f</sup>
694	Increased nominal pressure PN 420 bar
932	With HART® version 5, always with SIL version (basic type extension 2 and 3)

<sup>a</sup> SIL version always with LCD display (display 1), connection 4 to 20 mA (output 410) and HART® version 5 (extra code 932)

<sup>b</sup> ATEX Ex ia does not apply in connection with a cable fitting made out of plastic (process connection material 82) and the connection 4 to 20 mA (output 405).

<sup>c</sup> The short housing is only available with a round plug M12 × 1 (electrical connection 36).

<sup>d</sup> This input is only available with a process connection made out of stainless steel (process connection 20).

<sup>e</sup> The inputs are not available with an increased nominal pressure (extra code 694).

<sup>f</sup> Without SIL

<sup>g</sup> Please specify the setting you want in plain text. For default setting see "Accuracy" section in the data sheet.

<sup>h</sup> Upon request

<sup>i</sup> Only with NiMo (process connection material 82); not for pressure ranges -10 to +10 mbar and -1 to +1 bar

Order code                      (1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14)  
     /  -  -  -  -  -  -  -  -  -  -  -  -  /   
 Order example                403022 / 0 - 0 - 2 - 82 - 20 - 1 - 1 - 532 - 405 - 511 - 20 - 1 / 000

## Accessories

Article	Part no.
PC interface with USB/TTL converter <sup>a</sup>	00456352
HART® modem USB <sup>b</sup>	00443447
4-pole terminal box, straight, M12 × 1, with 2 m PVC cable	00404585
4-pole terminal box, angled, M12 × 1, with 2 m PVC cable	00409334
5-pole terminal box, straight, M12 × 1, without cable	00419130
5-pole terminal box, angled, M12 × 1, without cable	00419133
SET oval flange 1/2" NPT/accessories set 7/16-20UNF	00543775
Mounting kit, set includes 7/16-20UNF screws	00543777

Article	Part no.
Manifolds	409706
Pressure separator with milk pipe fitting DIN 11851	409772
Pressure separator with clamp connection	409774
Pressure separator with DRD flange or VARIVENT® connection	409776
Pressure separator with ISS connection or SMS connection or RJT connection and slotted ring nut	409778
Diaphragm chemical seals 4MDV-10	409780
Pressure separator with male thread ISO 228/1 or ANSI B1.201	409782
Pressure separator with flange connection EN 1092-1 with sealing lip Form B1	409784
Pressure separator with flange connection to ANSI B 16.5 with sealing lip Form RF	409786
Ex-i Power supply/input isolating amplifier	707530

<sup>a</sup> The PC interface cable is the connection between the JUMO interface of the differential pressure transmitter and the USB interface of a PC.

<sup>b</sup> The HART® modem is the connection between the HART® interface of the differential pressure transmitter and the USB interface of a PC.



## Software

Description	Part no.
JUMO setup dTRANS p20 series	00537577
JUMO dTRANS p20 series, DD (device description)	Upon request
JUMO dTRANS p20 series, DTM (device type manager)	Upon request