# Flush-mounted pressure and level transmitters - KERAMESS KS S 200/201 - *Superior Precision*

Hengesbach Prozessmesstechnik

Superior Precision
≤± 0,05% FS

## FEATURES

- HIGH PRECISION ≤ ± 0.05% FS, TURN DOWN 10, VACUUM SAFE
- WITH DRY CERAMIC MEASURING CELL
- OPTIONAL WITH HART® PROTOCOL
- TANK LINEARISATION FOR STANDARD TANK SHAPES AND SPECIAL DESIGNS THANKS TO VOLUMETRIC MEASUREMENT
- DIAGNOSIS FUNCTION FOR MONITORING OF DEVICES
- COPYING OF DEVICE PARAMETERS WITH EASY TRANSFER
- INTEGRATED ON-SITE DISPLAY OR EXTERNAL OPUS*i* DISPLAY AND OPERATING MODULE FOR PARAMETRISATION AND DISPLAY OF MEASURING VALUES
- HIGHLY PRECISE MEASUREMENT OF THE CONTENT AND PROCESS PRESSURE WITH SMALL MEASURING RANGES WITH AN OVERLOAD-SAFE CERAMIC MEASURING CELL

## DESCRIPTION

The KERAMESS pressure transmitters are suitable for taking pressure and filling level measurements in pipelines and containers. The wide range of process connections enables use in all applications in the food and pharmaceutical industries. Customer-specific process connections are also possible on request.

The vacuum-proof and extremely overload safe measuring cell with a ceramic membrane made of highly pure aluminium oxide works on the basis of the capacitive measuring principle. The KERAMESS pressure transmitters are designed to measure from -1/0…1 to -1/0…70bar. The measuring ranges 0...0.05bar and -0.1...+0.1bar are available alongside other special measuring ranges. Thanks to the ceramic membrane, the KERAMESS pressure transmitters are particularly suited for aggressive and abrasive media. The design for long-term medium temperatures of up to 125°C enables CIP and SIP cleanin7g methods to be used on the transmitters. The high protection classes of IP67 and IP69K guarantee that the devices can be safely cleaned on the outside with foam and a high-pressure cleaner and that moisture is reliably prevented from entering into the device. For additional protection against moisture, the electronics are fully encapsulated in the housing.

All the pressure transmitters in series 200/201are highly precise and have been developed for difficult tank content measurements and, in particular, for applications with constantly high temperatures of up to 200°C. Furthermore, using the on-site display with series 200 and the display and operating module OPUS*i* in series 201, the pressure transmitters can be simply read out, configured and diagnosed. With the EASY TRANSFER function, the configuration data can be copied via the OPUS*i* module onto other pressure transmitters in series 201. This makes commissioning easier for the same applications. The option of programming in tank dimensions for standard tank designs as well as for special tanks using the volumes calculated by means of volumetric measurement means exact filling levels and tank content can be shown directly.

In addition to the features of the 200/201 series, the pressure transmitters in the 200H/201H series boast an integrated HART® modem. This also enables remote configuration and evaluation of the transmitters using the HART® protocol.



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## TECHNICAL DATA

| | | | | | | |
|---|---|---|---|---|---|---|
| **General details** | | | | | | |
| Device type / measuring principle | KS 200/201/200H/201H: capacitive | | | | | |
| **Input** | | | | | | |
| Measuring ranges | KS 200/201/200H/201H | | | | | |
| Standard nominal measuring ranges [bar] | relative | OP | relative | OP | absolute | OP |
| OP = overload protection [bar]<br>Special measuring ranges are available on request.<br>All measuring cells are vacuum-proof | 0.05 | 4 | 40 | 60 | 0.1 | 4 |
| | 0.1 | 4 | 70 | 105 | 0.2 | 6 |
| | ±0.1 | 4 | -1...1 | 10 | 0.4 | 6 |
| | 0.2 | 6 | -1...2 | 18 | 1 | 10 |
| | 0.4 | 6 | -1...4 | 25 | 2 | 18 |
| | 1 | 10 | -1...10 | 40 | 4 | 25 |
| | 2 | 18 | -1...20 | 40 | 10 | 40 |
| | 4 | 25 | -1...40 | 60 | 20 | 40 |
| | 10 | 40 | -1...70 | 105 | 40 | 60 |
| | 20 | 40 | | | 70 | 105 |
| Setting the measuring ranges | Via the keypad of the OPUS*i* display and operating module / via the integrated on-site display<br>Optional: via HART® | | | | | |
| Setting ranges | Start the measuring zero: 0...90% of the sensor's nominal measuring span<br>Measuring span span: 10...100% of the sensor's nominal measuring span | | | | | TD=10 |
| Burst pressure DIN16086 | ≥ 4-fold measuring range | | | | | |
| **Output** | | | | | | |
| Output signal | 2-wire: 4...20mA with a test circuit connection in the device<br>Optional: 4...20mA HART® | | | | | |
| Fault signal | Optional: 3.8mA, 22mA, hold (i.e. holding the last value) | | | | | |
| Current limitation | 3.85mA and 21.5mA (normal operation) | | | | | |
| Integration time | Continuously selectable between 0 and 300s (setting time after a pressure leap) | | | | | |
| **Measuring accuracy** | | | | | | |
| Reference conditions | acc. to DIN IEC 770 | | | | | |
| Linearity, hysteresis and repeatability as per the limit point method DIN IEC 770 | ≤ ± 0.05% of the sensor's nominal measuring range | | | | | |
| Activation time | < 5s (the device will carry out a self-test.) | | | | | |
| Setting time (without damping) | < 200ms | | | | | |
| Long-time drift | ≤ 0.2% of the span per year | | | | | |
| Thermal hysteresis | ≤ ± 0.75% beginning of the measuring range / ≤ ± 0.8% end of the measuring range | | | | | |
| **Conditions of use** | | | | | | |
| Installation position / calibration position | Any position / standing vertically (position-dependent zero point displacement) | | | | | |
| Medium temperature | T1: -40 to +125°C (140°C over one hour at the most) | | | | | |
| Ambient storage temperature | Type 201/201H: -40...+85°C<br>Type 200/200H: -30...+75°C<br>(Below -20°C cable breakage might occur and the display's function may be impaired.) | | | | | |
| Protection class acc. to EN60529 | IP 67 and IP 69K | | | | | |
| Electromagnetic compatibility | Sensitivity against interference: acc. to DIN IEC 61000-6-2<br>Interference radiation: acc. to DIN IEC 61000-6-4 | | | | | |
| **Construction** | | | | | | |
| Electrical connection | - Standard: cable screw connection M16x1.5, nickel-plated brass, stainless steel available on request<br>- Optional: round plug-in connector M12x1, nickel-plated brass, stainless steel available on request<br>- Optional: angle plug acc. to EN 175301-803<br>- Optional: reference cable | | | | | |
| Process connection | - All standard front-mounted process connections and those that are commonly used by the manufacturer | | | | | |
| Materials | - Field housing / lid: CrNiSt 1.4301 (304)<br>- Housing seal: FPM (Viton®)<br>- Pressure compensation element: polyamide<br>- Inspection gauge (type 200/200H): polycarbonate<br>- Process connection: CrNiSt 1.4404 (316L)<br>- Process membrane: $Al_2O_3$ (99%)<br>- Locking screw (type 201/201H): CrNiSt 1.4301 (304)<br>- Reference cable: 5-wire with reference tube: PUR (recommended: 80m maximum) | | | | | |



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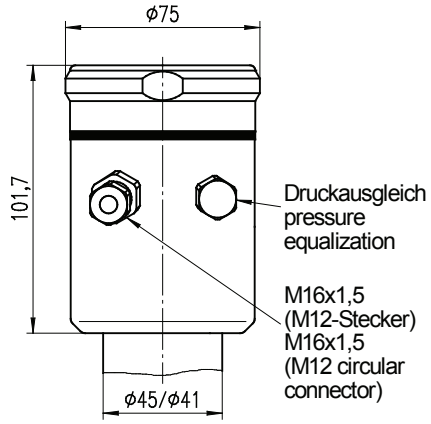
## TECHNICAL DATA

| | |
|---|---|
| **Display and operation** | |
| Display | LCD, 4-digit numerical display and 5-digit alphanumerical display<br>Type 200/200H: integrated on-site display (cannot be separated from device)<br>Type 201/201H: external OPUS*i* display and operating module |
| Displayable units | Pressure: mbar, bar, psi, Pa, $mH_2O$, mmHg, Torr, atm, at, kg/cm²<br>Temperature: °C, °F, K, °R, °Ré<br>Volume: l, hl, dm³, m³, ft³, US gal, UK gal, US bl, UK bl<br>Mass: kg, t, lbs, tn. sh., tn. l. |
| Additional displays | Output current in mA or % (in relation to the span) |
| Operation | 200/200H: via the configuration menu with the integrated on-site display<br>201/201H: via the configuration menu with the external OPUS*i* display and operating module |
| **Auxiliary energy resources** | |
| Power supply / burden | 12-36V DC, max. burden: ($V_{supply}$ – 12V) / 24mA, with HART® resistance min. 18V DC |
| **Accessories 200 series** | |
| OPUS*i* display and operating module | external display and operating module, CrNiSt, IP 67, 41x70 mm, 1 m connection cable and M12x1 round plug-in connector, integrated memory for the parameter transfer to other devices (downwardly compatible with existing devices of the 100 series, but without a copying function between the transmitter and the display and operating module) |
| Certificates | Calibration certificate<br>Declaration of conformity<br>Material inspection certificates as per EN 10204 |

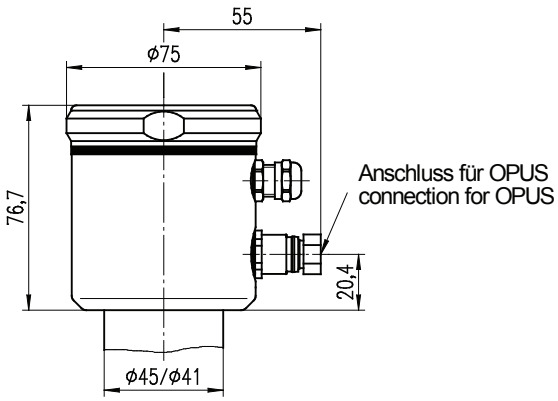
## DIMENSIONED DRAWINGS (dimensions in mm)

**KERAMESS 200 ... _K(M)**

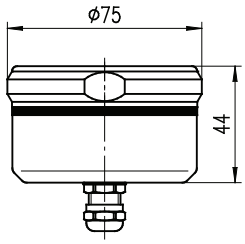



**Feldgehäuse mit integrierter Anzeige (Edelstahl, IP67 + IP69K EN 60529)**
**field-housing with integrated display (stainless steel, IP67 + IP69K EN 60529)**

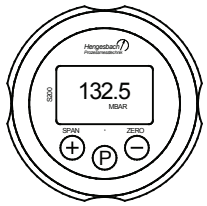
**KERAMESS 201 ... _K(M)**




**Feldgehäuse für OPUS (Edelstahl, IP67 EN 60529)**
**field-housing for OPUS (stainless steel, IP67 EN 60529)**

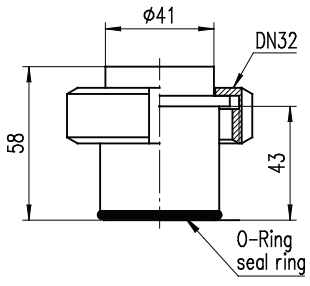



**OPUS**

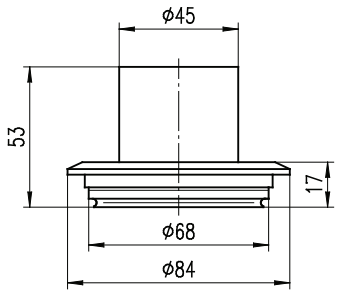



**Anzeige display**

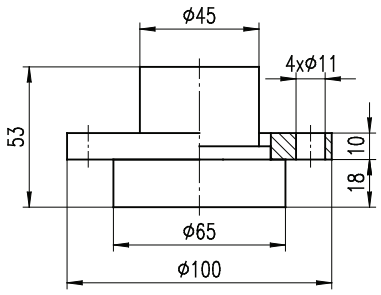
**Prozessanschlüsse** (weitere Ausführungen auf Anfrage)
**process-connections** (other constructions on request)




**aseptischer Anschluss (N3)**
**aseptical process-connection (N3)**




**VARIVENT-Flansch Ø68 (V8)**
**VARIVENT-flange Ø68 (V8)**




**DRD-Flansch Ø65 (D6)**
**DRD-flange Ø65 (D6)**



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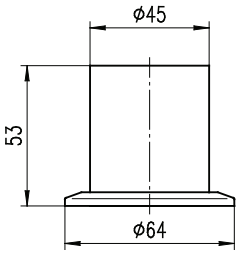
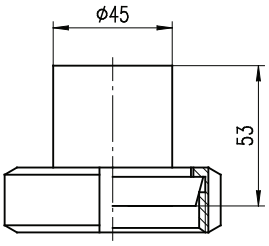
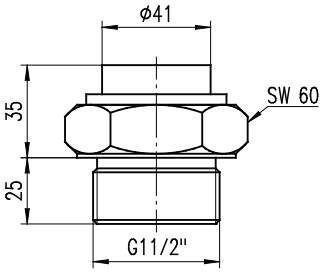
## DIMENSIONED DRAWINGS (dimensions in mm)



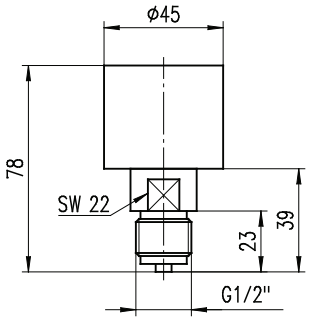

**Clamp DIN 32676 - DN50 (C5)**



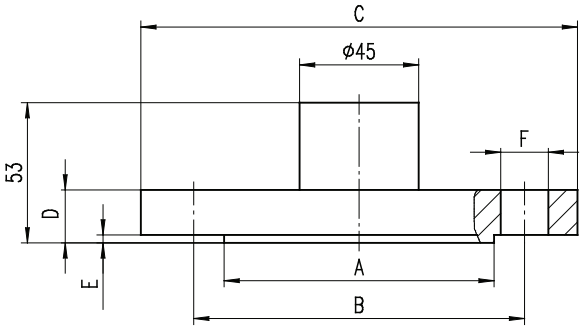

**Kegelstutzen DIN 11851**
**conical nozzle DIN 11851**
**DN40 (M4), DN50 (M5)**




**Einschraubgewinde DIN ISO 228**
**G11/2B (G5)**
**external thread DIN ISO 228**
**G11/2B (G5)**



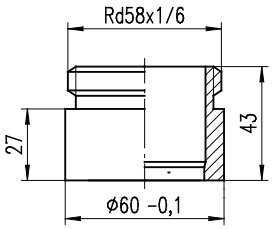

**Einschraubgewinde EN 837**
**G1/2B (G2)**
**external thread EN 837**
**G1/2B (G2)**




| | DN50 | DN80 |
|---|---|---|
| A | Ø102 | Ø138 |
| B | Ø125 | Ø160 |
| C | Ø165 | Ø200 |
| D | 20 | 24 |
| E | 3 | 3,5 |
| F | 4xØ18 | 8xØ18 |

**Flansch EN 1092-1**
**flange EN 1092-1**
**DN50 (F5), DN80 (F6)**

**Einschweißmuffe (PEM1FKSN) für Anschluss (N3)**
**welded socket (PEM1FKSN) for process-connection (N3)**



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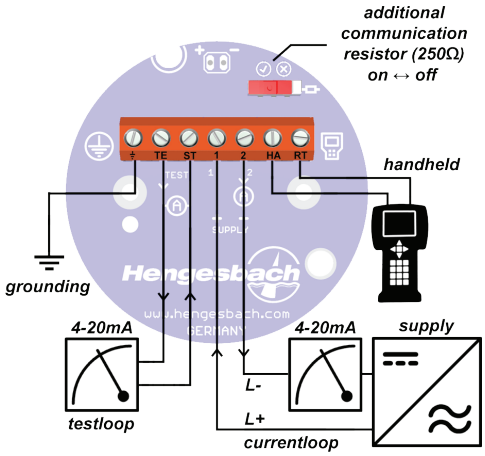
## ELECTRICAL CONNECTION

The standard electrical connection is via a cable screw connection M16x1.5. On removing the device lid, the connection is created using screw terminals. The connection diagram in the transmitter head can be seen in the figure below (figure shows the connection for a type 200H/201H device with HART®):



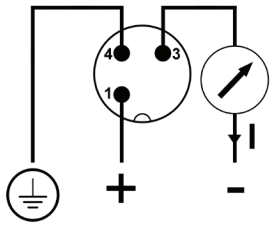
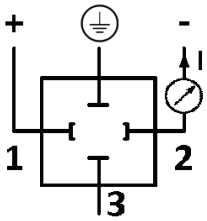

The supply voltage is connected via the two terminals 1 (+) and 2 (-). The current flowing in this loop represents the existing measuring value.

The terminals **TE** and **ST** provide a test circuit connection with which the actual loop current can be measured without interruption using an ammeter.

An operating device can be connected to terminals **HA** and **RT for on-site communication via the HART®protocol.** An additional communication resistor can be added via a sliding switch.

The ground terminal is for potential equalisation between the measuring device and the measuring point.

Alternative connection options are a round plug-in connector M12x1, an angle plug acc. to EN 175301-803 as well as a factory-fitted reference cable with integrated vent capillary. The reference cable comes in lengths of between 1...80m The electrical configurations are listed in the following:

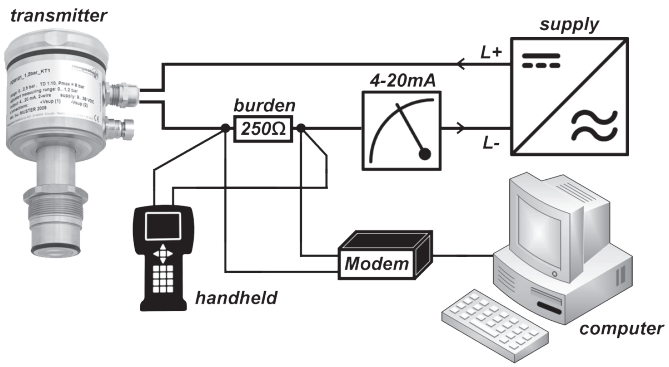
| Round plug-in connector M12x1 | angle plug acc. to EN 175301-803 | Connected reference cable |
|---|---|---|
|  |  | |

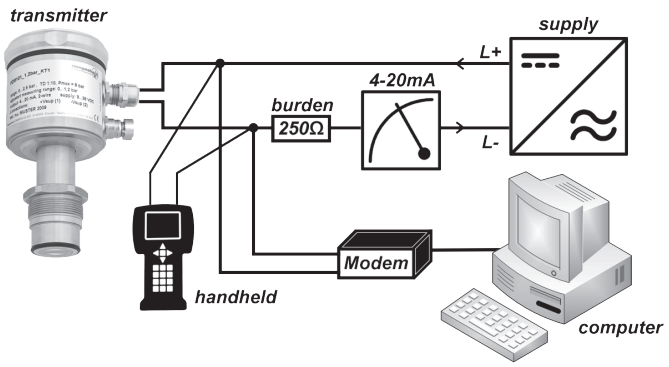


| | |
|---|---|
| Brown | Supply + |
| Black | Supply - |
| White | Earth |
| Shield | Earth |

## CONNECTION FOR HART® COMMUNICATION

For communication via the HART® protocol a minimum burden resistor of 250Ω is required. The following figures show the various options for correct connection. The transmitters can be parametrised via the HART®protocol using universal and pressure transmitter-specific common practice commands.



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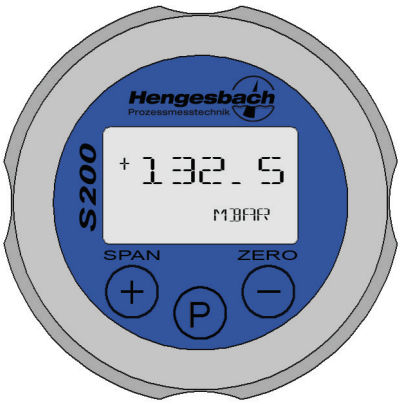
## CALIBRATION / SETTING

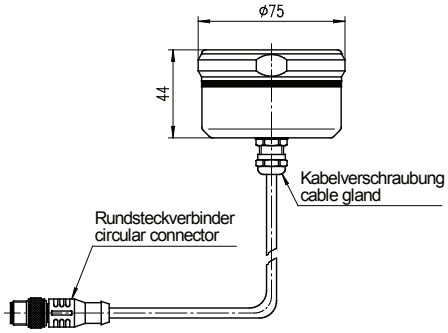
| | |
|---|---|
| Factory configuration | |
| Measuring range calibrated: | Nominal measuring range or as per the order data |
| Current output: | 4...20mA with extended span between 3.9 and 21mA |
| Damping: | 0s |
| Mains frequency: | 50Hz |
| Measuring value / measuring unit | Pressure / mbar |
| Current output in the event of a fault: | hold (last value is held) |

### Configuration menu / parameter list (basic settings of the first parameter level)

| No. | Parameter | Explanation |
|---|---|---|
| P-0 OFSET | Offset | This parameter is used for setting the beginning of the measuring range. The value, which is set here, is assigned the output current of 4mA. The adjustable range is between 0...90% of the sensor's nominal measuring range. |
| P-1 SPAN | Span | The span sets the end value for the measuring range. The value, which is set here, represents an output current of 20mA. The adjustable range is within 10...100% of the sensor's nominal measuring range. |
| P-2 I OUT | Output current | The current range of 4...20mA can by inverted if required. The beginning of the measuring range, in its inverted state, corresponds to 20mA, and the end of the measuring range to 4mA accordingly. |
| P-3 DAMP | Damping | If the pressure conditions vary heavily, the measuring value can be settled by activating the damping function. |
| P-4 MAINS | Mains frequency | The setting of the mains frequency, which is used at the respective operating location, serves to suppress any interference inside the device. This way, the mains noise of the power supply unit can be cut out to a large extent. |
| P-5 UNIT | Measuring unit | This setting is used for selecting between different measuring units depending on the measuring value (pressure, temperature, volume, mass), which is currently displayed. |
| P-6 DISPL | Measuring value | This parameter allows the selection of the displayed measuring value. Depending on the device configuration, you can choose between the pressure, temperature, current, percentage, volume or mass. |
| P-7 BIAS | Inlet pressure | A possible offset pressure, which should not be included in the measuring result, can be hidden by entering an inlet pressure / bias. This is particularly useful for volume measurements in pressurised tanks. |
| P-8 SYSTM | System | In the system level you can change basic settings of the device, e.g, linearisation, current simulation etc. |
| P-9 INFO | Information | This information menus provides details on the device's various parameters. These serve, amongst other things, to aid diagnoses and, in the case of faults, with troubleshooting. |

### Configuration menu / parameter list (basic settings of the first parameter level)




**externes Bedienmodul OPUS**
**external operation module OPUS**

Parametrisation of the transmitter as well as of the measuring value display on site is handled by the on-site display integrated in the device (type 200/200H) or via the OPUS*i* display and operating module (type 201/201H) located in external housing.

Parameter data can be exchanged between the series 200 devices via the OPUS*i*. Operation and the measuring value display functions are also guaranteed in devices from earlier series thanks to the downward compatibility of OPUS*i*.



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## ORDER INFORMATION for KERAMESS KS

### Electronics

| | |
|---|---|
| 200 | 4...20mA, integrated LCD display, TD 10 |
| 201 | 4...20mA, can be operated with OPUS*i*, TD 10 |
| 200H | 4...20mA, HART® protocol, integrated LCD display, TD 10 |
| 201H | 4...20mA, HART® protocol, can be operated with OPUS*i*, TD 10 |

### Process connection

| | |
|---|---|
| C5 | Clamp acc. to DIN32676 DN50, front-mounted |
| D6 | DRD flange d = 65mm |
| F5 | Flange acc. to EN 1092-1 (DIN2527 D) DN50 / PN10-40, front-mounted |
| F6 | Flange acc. to EN 1092-1 (DIN2527 D) DN80 / PN10-40, front-mounted |
| G2 | Screw-in thread G½", acc. to EN837, interior sensor (manometer connection) |
| G5 | Screw-in thread G1½", acc. to ISO228, front-mounted |
| M4 | Conical coupling with a groove union nut acc. to DIN 11851, DN40 / PN40, front-mounted |
| M5 | Conical coupling with a groove union nut acc. to DIN 11851, DN50 / PN25, front-mounted |
| N3 | Aseptic process connection with a groove union nut |
| V8 | VARIVENT® flange d=68 / PN16, for pipe DN 40-125, front-mounted |
| S9 | Other process connections available on request. |

### Pressure type / sensor's measuring range

| | | |
|---|---|---|
| A | 0.05bar | max. overload 4bar |
| B | 0.1bar | max. overload 4bar |
| T | 0.2bar | max. overload 6bar |
| D | 0.4bar | max. overload 6bar |
| E | 1bar | max. overload 10bar |
| F | 2bar | max. overload 18bar |
| H | 4bar | max. overload 25bar |
| K | 10bar | max. overload 40bar |
| L | 20bar | max. overload 40bar |
| N | 40bar | max. overload 60bar |
| P | 70bar | max. overload 105bar |

| | |
|---|---|
| R | Relative pressure, overpressure (0...xxx bar) |
| N | Relative pressure, vacuum (-1...xxx bar) |
| A | Absolute pressure |

### Electrical connection

| | |
|---|---|
| K | Cable screw connection M16x1.5 |
| M | Round plug-in connector M12x1 |
| W | Right-angle connector EN 175301-803 (not with 200/200H) |
| R05 | Reference cable, 5m, securely fixed |
| R10 | Reference cable, 10m, securely fixed |
| R15 | Reference cable, 15m, securely fixed |
| R20 | Reference cable, 20m, securely fixed |
| RXX | Reference cable, length in excess of 20m is to be stated in plain text (max. 80m) |

### Run options

| | |
|---|---|
| 2 | EPDM (FDA-compliant) |
| 3 | FKM (O-ring) |
| 4 | FKM (FDA-compliant) |
| 5 | FFKM (O-ring) |

**KS** [ ] [ ] [ ] [ ] [ ] [ ]

**Nominal measuring range if different from sensor's measuring range**



HENGESBACH GMBH & CO. KG · Schimmelbuschstr. 17 · 40699 Erkrath, Germany · Tel. +49 (0) 21 04/30 32-0 · Fax +49 (0) 21 04/30 32-0 · www.hengesbach.com

## ORDER INFORMATION for KERAMESS KS accessories

| **Accessories/assembly parts** (please order separately) | **Article number** |
|---|---|
| OPUS*i* external operating module, for 201/201H, electronics, 1.4301 (304) | OPUS*i* |
| Compression fitting for process connection N3, 1.4404 (316L) | Z-PEM1FKSN |
| DRD weld-in block flange DRD, 1.4435 (316L) | ZEB1FDRD |
| Flat seal made of EPDM for DRD flange | ZFA1FDRD |
| Flat seal made of FKM (Viton®) for DRD flange | ZFC1FDRD |
| Flat seal made of ePTFE for DRD flange (FDA) | ZFD1FDRD |
| 4 x fastening screws for DRD flange, 1.4301 (304) | ZDS4FDRD |
| Pressure compensation element, "Gore™ prevent", IP69K | ZDAE69K |
| Locking screw for OPUS*i* connection with series 201/201H, 1.4301 (304) | ZVS1F101 |
| Reference cable made of PUR with pressure compensation capillary | ZKP1FDMU |
| Approval certificate 3.1 acc. to EN 10204 for compression fittings | WZ31 |
| Certificate of compliance 2.1 acc. to EN 10204 | WZ2.1 |
| Test report 2.2 acc. to EN 10204 | WZ2.2 |

Please observe the permissible nominal pressure of the process connection selected.
All specifications and certifications specified are only guaranteed when Hengesbach original components are used.
Our devices are subject to constant development; subject to technical modification.



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