Data sheet

# U9C

## Force Transducer

### Special features

- **Tensile/compressive force transducer**
- **Accuracy class 0.2**
- **Nominal (rated) forces 50 N – 50 KN**
- **Non-rusting, protection class IP67**
- **Configurable with different cable lengths, plug assembly on request**
- **High rigidity, particularly suited for dynamic measurement tasks**

Principle of the U9C force transducer

## **Dimensions** (in mm)

U9C with nominal (rated) forces 50 N, 100 N and 200 N

U9C with nominal (rated) forces 0.5 kN to 50 kN

| Nominal (rated) force of the U9C | $A_{-0.1}$ | B | C | E | F | G | M | R | Y | Z |
|---|---|---|---|---|---|---|---|---|---|---|
| | [mm] | | | | | | | | | |
| 0.5 kN to 1 kN | 26 | 44.5 | 29.5 | 13 | 9.9 | 13.5 | M5 | 20 | approx. 5.5 | 2.7 |
| 2 kN to 20 kN | 26 | 60 | 28.5 | 21 | 16 | 21 | M10 | 40 | approx. 5.5 | 5 |
| 50 kN | 46 | 84 | 40 | 28 | 21.5 | 28 | M16 x 1.5 | 80 | approx. 5.5 | 8 |

U9C cable diagram

## **Mounting accessories** (dimensions in mm)

Knuckle eyes
(to be ordered separately)

| Nominal (rated) forces | Ordering number | A | $B^{H7}$ | D | F | G | H | J | K | L | M | a.f. | W |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | [mm] | | | | | | | | | | | |
| 50 N to 1 kN | 1-Z8/100kg/ZGW | 10 | 5 | 18 | 27 | 36 | 6 | 9 | 11 | 4 | M5 | 9 | 8 |
| 2 kN to 20 kN | 1-U9/20KN/ZGWR | 20 | 10 | 28 | 43 | 57 | 10.5 | 15 | 19 | 6.5 | M10 | 17 | 14 |
| 50 kN | 1-U9a/50kN/ZGW | 28 | 16 | 42 | 64 | 85 | 15 | 22 | 27 | 8 | M16 x 1.5 | 22 | 21 |

U9C with one or two knuckle eyes

| Nominal (rated) force | $a_{min}$ | $a_{max}$ | $b_{min}$ | $b_{max}$ |
|---|---|---|---|---|
| | [mm] | | | |
| 50 - 20 N | 55 | 59 | 82 | 86 |
| 0.5 - 1 kN | 56 | 61 | 83 | 88 |
| 2 - 20 kN | 79 | 82 | 122 | 125 |
| 50 kN | 116 | 116 | 180 | 180 |

*Mounting dimensions of the U9C when using knuckle eyes*

## Specifications

| Nominal (rated) force | $F_{nom}$ | N | 50 | 100 | 200 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | kN | | | | 0.5 | 1 | 2 | 5 | 10 | 20 | 50 |
| **Accuracy** | | | | | | | | | | | | |
| **Accuracy class** | | | 0.2 | | | | | | | | | |
| **Relative reproducibility and repeatability errors without rotation** | $b_{rg}$ | % | < 0.2 | | | | | | | | | |
| **Relative reversibility error** | $v_{0.5}$ | % | < 0.2 | | | | | | | | | |
| **Non-linearity** | $d_{lin}$ | % | < 0.2 | | | | | | | | | |
| **Relative creep (30 min)** | $d_{cr,F}$ | % | < 0.2 | | | < 0.1 | | | | | | |
| **Effect of the bending moment at 10% $F_{nom}$ * 10 mm (typical)** | $d_{Mb}$ | % | 0.055 | | 0.045 | 2.35 | | | | | 2.45 | 0.5 |
| **Effect of temperature on sensitivity** | | | | | | | | | | | | |
| **in the nominal (rated) temperature range** | $TK_C$ | % / 10 K | 0.2 | | | | | | | | | |
| **in the operating temperature range** | $TK_C$ | % / 10 K | < 0.5 | | | | | | | | | |
| **Effect of temperature on the zero signal** | | | | | | | | | | | | |
| **in the nominal (rated) temperature range** | $TK_0$ | % / 10 K | < 0.2 | | | | | | | | | |
| **in the operating temperature range** | $TK_0$ | % / 10 K | < 0.50 | | | | | | | | | |
| **Electrical characteristics** | | | | | | | | | | | | |
| **Nominal (rated) sensitivity** | $C_{nom}$ | mV/V | 1 | | | | | | | | | |
| **Relative zero signal error** | $d_{s,0}$ | mV/V | +/- 0.2 | | | | | | | | | |
| **Sensitivity error** | $d_c$ | % | < +/-1 tensile , < +/-2 compressive | | | | | | | | | |
| **Tensile/compressive sensitivity variation** | $d_{zd}$ | % | < 2 | | | | | | | | | |
| **Input resistance** | $R_i$ | Ω | 250 - 400 | | | 300 - 450 | | | | | | |
| **Output resistance** | $R_o$ | Ω | 200 - 400 | | | 145 - 450 | | | | | | |
| **Insulation resistance** | $R_{is}$ | Ω | > 1*10 $^9$ | | | | | | | | | |
| **Operating range of the excitation voltage** | $B_{u,gt}$ | V | 0.5 - 12 | | | | | | | | | |
| **Reference excitation voltage** | $U_{ref}$ | V | 5 | | | | | | | | | |
| **Connection** | | | 4-wire circuit | | | | | | | | | |
| **Temperature** | | | | | | | | | | | | |
| **Reference temperature** | $t_{ref}$ | °C | 23 | | | | | | | | | |
| **Nominal (rated) temperature range** | $B_{t,nom}$ | °C | -10 to +70 | | | | | | | | | |
| **Operating temperature range** | $B_{t,g}$ | °C | -30 to +85 | | | | | | | | | |
| **Storage temperature range** | $B_{t,S}$ | °C | -30 to +85 | | | | | | | | | |
| **Characteristic mechanical quantities** | | | | | | | | | | | | |
| **Max. operating force** | $F_G$ | % of $F_{nom}$ | 200 | | | 150 | | | | | | |
| **Limit force** | $F_L$ | % of $F_{nom}$ | > 200 | | | > 150 | | | | | | |
| **Breaking force** | $F_B$ | % of $F_{nom}$ | > 400 | | | | | | | | | |
| **Limit torque** | | Nm | 1.7 | 3.4 | 2.5 | 3.7 | 4.5 | 28 | 23 | 11 | 11 | 35 |
| **Limit bending moment when loading with nominal (rated) force** | | Nm | 0.17 | 0.7 | 1.5 | 3.7 | 3.8 | 10.2 | 14.4 | 8.2 | 8.6 | 28.5 |
| **Static lateral limit force when loading with nominal (rated) force 2)** | $F_q$ | % of $F_{nom}$ | 100 | | | | 50 | 100 | 50 | 18 | 6 | 8 |
| **Nominal (rated) displacement** | | mm | 0.008 | | | 0.018 | | | 0.03 | 0.05 | 0.09 | 0.14 |
| **Fundamental resonance frequency** | | kHz | 6.5 | 9.1 | 12.6 | 15.3 | 15.9 | 13.2 | 14.5 | 14.6 | 14.6 | 7.2 |
| **Relative oscillation width** | | % of $F_{nom}$ | 70 | | | 80 | | | | | | 70 |
| **General information** | | | | | | | | | | | | |
| **Degree of protection per EN 60529 1)** | | | IP67 | | | | | | | | | |
| **Spring element material** | | | Steel | | | | | | | | | |
| **Potting material** | | | Silicone | | | | | | | | | |
| **Cables** | | | Four-wire circuit, PUR insulation | | | | | | | | | |
| **Cable length** | | m | 1.5, 3, 7, 12 | | | | | | | | | |
| **Weight** | | g | 75 | | | 100 | | | | | | 400 |

1) 1 m water column; 0.5 h
2) Pure lateral force without bending moment

## Versions and ordering numbers

| Code | Measuring range | Ordering number |
|---|---|---|
| **0050** | 50 N | 1-U9C/50N |
| **0100** | 100 N | 1-U9C/100N |
| **0200** | 200 N | 1-U9C/200N |
| **00K5** | 0.5 kN | 1-U9C/0.5KN |
| **01k0** | 1 kN | 1-U9C/1KN |
| **02k0** | 2 kN | 1-U9C/2kN |
| **05k0** | 5 kN | 1-U9C/5kN |
| **10k0** | 10 kN | 1-U9C/10kN |
| **20k0** | 20 kN | 1-U9C/20KN |
| **50k0** | 50 kN | 1-U9C/50KN |

The ordering numbers shown in gray are preferred types, they can be delivered rapidly. All force transducers with 1.5 m cable, open ends and without TEDS.

The order no. for the preferred types is 1-U9C…

The order no. for customer-specific designs is K-U9C-…

The ordering number example **K−U9C−05k0−12m0−F−T** shown further below refers to a: U9C, 5 kN nominal (rated) force with 12 m cable, 15-pin Sub-D connector and TEDS

| Cable length | Plug version | Transducer identification |
|---|---|---|
| 1.5 m<br>**01m5** | Free ends<br>**Y** | With TEDS<br>**T** |
| 3 m<br>**03m0** | 15-pin Sub-D connector<br>**F** | Without TEDS<br>**S** |
| 5 m<br>**05m0** | MS3106PEMV connector<br>**N** | |
| 6 m<br>**06m0** | 15-pin Sub-HD connector<br>**Q** | |
| 7 m<br>**07m0** | | |
| 12 m<br>**12m0** | | |

| | | | | |
|---|---|---|---|---|
| **K-U9C-** | **05k0-** | **12m0-** | **F-** | **T** |

All cable lengths can be combined with all plugs.

TEDS can only be ordered in conjunction with a plug option. It is not possible to combine TEDS and free cable ends.

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