

## Technical Data Combination Probe KS1D without Housing



Fig. 1 KS1D Combination Probe without housing

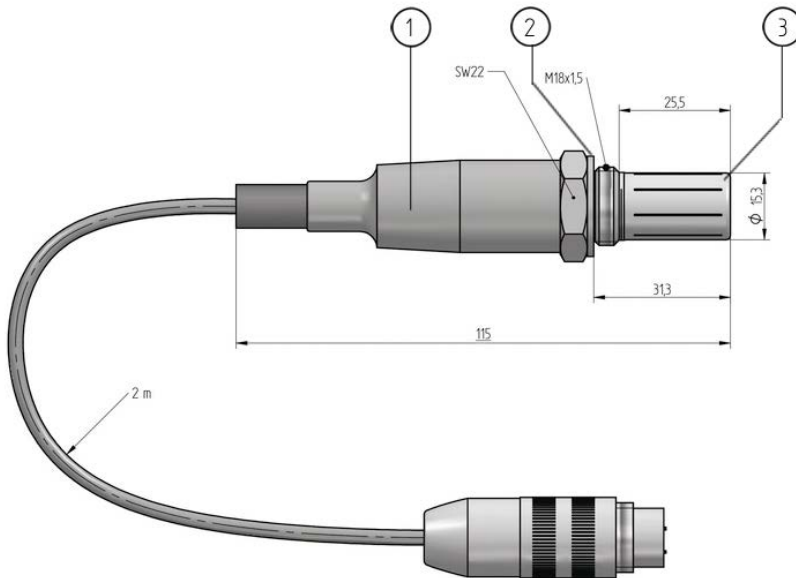


Fig. 2 Dimensional drawing KS1D Combination Probe without housing

- |   |  |          |
|---|--|----------|
| 1 | KS1D Combination Probe without housing | 656R2010 |
| 2 | sealing washer                         |          |
| 3 | probe head                             |          |

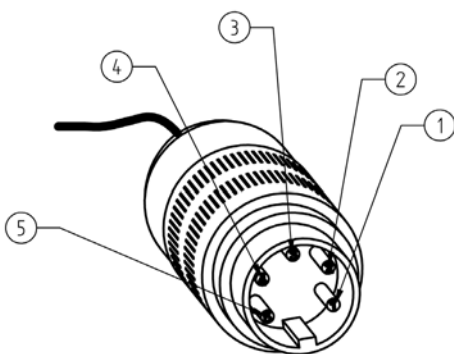


Fig. 3 Terminal assignment plug

- |     |   |
|-----|---|
| 1 = | (+) probe signal O <sub>2</sub> / CO <sub>e</sub> (black) |
| 2 = | (-) probe signal CO <sub>e</sub> (grey)                   |
| 3 = | probe heater (white)                                      |
| 4 = | probe heater (white)                                      |
| 5 = | (-) probe signal O <sub>2</sub> (red or blue)             |

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| Technical data*  |   |
|--|---|
| Measuring range  | <b>O<sub>2</sub></b> : 0 ... 21 % O <sub>2</sub>  |
|  | <b>CO<sub>e</sub></b> : 0 ... 1,000 ppm (0 ... 10,000 ppm upon request)   |
| Measuring precision  | <b>O<sub>2</sub></b> : ± 5 % of measured value - not better than ± 0.3 vol. %   |
|  | <b>CO<sub>e</sub></b> : ± 25 % of measured value - not better than ± 20 ppm after prior calibration under operating conditions with a CO reference measurement            |
|  | In measuring range ≤ 100 ppm: ± 10 ppm  |
| Sensor signal  | <b>O<sub>2</sub></b> : -30 ... +150 mV  |
|  | <b>CO<sub>e</sub></b> : -30 ... +800 mV   |
| Response time  | <b>O<sub>2</sub></b> : t <sub>60</sub> : < 3 s<br>t <sub>90</sub> : < 9 s   |
|  | <b>CO<sub>e</sub></b> : t <sub>60</sub> : < 3 s (electronically filtered at the factory < 9 s)<br>t <sub>90</sub> : < 4 s (electronically filtered at the factory < 13 s) |
| Relaxation time<br>(measurement readiness after overload)      | <b>O<sub>2</sub></b> : t <sub>90</sub> : < 8 s  |
|  | <b>CO<sub>e</sub></b> : t <sub>90</sub> : < 9 s   |
| Offset to environment  | <b>O<sub>2</sub></b> < 0.3 vol. %   |
|  | <b>CO<sub>e</sub></b> < 2 ppm   |
| Hysteresis   | <b>O<sub>2</sub></b> < 1 % from measured value  |
|  | <b>CO<sub>e</sub></b> < 1.5 % from measured value   |
| Linearity  | <b>O<sub>2</sub></b> < 1 % from measured value  |
|  | <b>CO<sub>e</sub></b> < 9 % from measured value   |
| Repeating precision  | <b>O<sub>2</sub></b> < 0.1 % deviation from measured value  |
|  | <b>CO<sub>e</sub></b> < 0.7 % deviation from measured value   |
| Ambient pressure dependency                                    | <b>O<sub>2</sub></b> < 0.1 % from measured value (of normal pressure at sea level in comparison with pressure at altitude of 200 m / 656.17 ft<br>i.e., op = -200 mbar)   |
|  | <b>CO<sub>e</sub></b> < 16 % from measured value (of normal pressure at sea level in comparison with pressure at altitude of 200 m / 656.17 ft<br>i.e., op = -200 mbar)   |
| Differential pressure dependency                               | <b>O<sub>2</sub></b> < -1.8 mV U <sub>O<sub>2</sub></sub> per 100 mbar overpressure in the measuring chamber in comparison with environment                               |
|  | <b>CO<sub>e</sub></b> < -0.17 mV U <sub>CO<sub>e</sub></sub> per 100 mbar overpressure in the measuring chamber in comparison with environment                            |
| Drift  | <b>O<sub>2</sub></b> < 1.7 % from measured value (after 1000 h of operation in EL light fuel oil and 1004 switching cycles on/off)  |
|  | <b>CO<sub>e</sub></b> < 18.4 % from measured value (after 1000 h of operation in EL light fuel oil and 1004 switching cycles on/off)                                      |
| Cross sensitivity ***  | <b>O<sub>2</sub></b> : to CO <sub>2</sub> (15 vol. %) < 0.1 vol. %  |
|  | <b>O<sub>2</sub></b> : to CO (874 ppm) < 0.1 vol. %   |
|  | <b>O<sub>2</sub></b> : to CH <sub>4</sub> (76 ppm) < 0.1 vol. %   |
|  | <b>O<sub>2</sub></b> : to SO <sub>2</sub> (76 ppm) < 0.1 vol. %   |
|  | <b>O<sub>2</sub></b> : to NO (245 ppm) < 0.1 vol. %   |
| <b>CO<sub>e</sub></b> : to CO <sub>2</sub> (15 vol %) < 26 ppm |   |
| <b>CO<sub>e</sub></b> : to O <sub>2</sub> (1 vol. %) < 38 ppm  |   |

## Technical Data Combination Probe KS1D without Housing

| Technical data*  |  |
|--|--|
| Humidity   | <b>O<sub>2</sub></b> : < 2.3 % from measured value<br><b>CO<sub>e</sub></b> : < 9.1 % from measured value          |
| Influence of the installation position   | none, if KS1D is installed according to the information in the operating instructions.                             |
| Influence of the mains voltage   | none, if KS1D is operated according to the information in the operating instructions.                              |
| Influence of leakage   | none, if KS1D is operated according to the information in the operating instructions.                              |
| Influence of the measuring gas   | change of -1.6 mV/100 mbar   |
| Internal resistance of probe   | 15 ... 25 Ω (ZrO <sub>2</sub> measuring cell in the air in case of 22 W heating output)                            |
| Heating consumption  | 10 ... 25 W (according to design, measuring gas temperature, and measuring speed)                                  |
| Supply voltage for heating   | AC/DC<br>At P <sub>H</sub> 18 VA → 11.4 V<br>At P <sub>H</sub> 20 VA → 12.34 V<br>At P <sub>H</sub> 25 VA → 14.8 V |
| Heating current at P <sub>H</sub> 20 VA  | approx. 1.6 A<br>approx. 5 A short term during heating<br>PTC characteristic                                       |
| Insulation resistance  | < 30 MΩ (between heating and probe connection)   |
| Lifetime   | > 3 years (in case of light fuel oil and natural gas)  |
| Weight   | 320 g / 0.71 lb  |
| Material of probe housing  | 1.4571   |
| Material of connecting line  | nickel-plated copper strand<br>FEP insulation  |
| Operating temperature of the measuring cell (sensor) at 13 V heating voltage in the air (20 °C / '68 °F) | 650 °C / 1,202 °F  |
| Measuring principle  | zirconium dioxide cell (ZrO <sub>2</sub> ) potentiometric (voltage probe)  |
| Heating time   | 10 minutes until operating temperature is reached  |

\* Information according to EN 16340:2014 D

\*\* Test report LTC-14-IB-09-V1.0 upon request

\*\*\* O<sub>2</sub>: Information assumes an operating gas composition of 5 vol. % O<sub>2</sub>, rest is N<sub>2</sub>  
CO<sub>e</sub>: Information assumes an operating gas composition of 5 vol. % O<sub>2</sub>, 333 ppm CO<sub>e</sub>, rest is N<sub>2</sub>  
(333 ppm CO<sub>e</sub> = 166.5 ppm H<sub>2</sub> + 166.5 ppm CO)

| Conditions for use                         |  |
|--|--|
| Mounting / measuring gas extraction device | directly in exhaust gas channel / in situ  |
| Connection thread                          | M18 x 1,5  |
| Tightening torque                          | 40 Nm  |
| Seal tightness                             | q <sub>L</sub> ≤ 100 cm <sup>3</sup> /h *  |
| Mounting position                          | horizontal to vertical   |
| Permissible fuels                          | residue-free, gaseous hydrocarbons, light fuel oil, lignite and coal, biomass (according to design) ** |

# Technical Data Combination Probe KS1D without Housing

## Environmental Conditions

|                             |                                  |  |
|-----------------------------|----------------------------------|--|
| <b>Probe head</b>           | permissible flue gas temperature | $\leq 450\text{ °C} / 842\text{ °F}$ ***   |
| <b>Operation</b>            | permissible temperature          | < 300 °C / 572 °F on hexagon of probe housing<br>< 200 °C / 392 °F on cable lead<br>< 150 °C / 302 °F on connecting cable,<br>up to 230 °C / 446 °F short termed |
| <b>Storage</b>              | permissible temperature          | -20 ... +70 °C / -4 ... +158 °F  |
| <b>Measuring gas</b>        | optimum speed                    | 1 m/s $\leq X \leq$ 6 m/s (deviating speeds on request)<br>3.28 ft/s $\leq X \leq$ 19.69 ft/s  |
| <b>Degree of protection</b> | DIN EN 40050                     | IP42   |

\* According to DIN V 18160-1:2006-01, seal tightness towards environment through housing and fastening.

\*\* EN 16340:2014 D approval (in connection with LT3-F) only with gaseous and liquid fuels

\*\*\* In Connection with LT3-F max. 300 °C permissible exhaust gas temperature on probe head.

## NOTICE

The limits of the technical data must be strictly adhered to.

## Order Information

**KS1D Combination Probe for simultaneous measurement of oxygen (O<sub>2</sub>) and unburnt residue (CO/H<sub>2</sub>) with connecting cable and connector**

| Description / Type  | Type     |
|---|----------|
| KS1D Combination Probe without housing, with FEP-connecting cable up to 450 °C / 842 °F, cable length 2 m, IP42 | 656R2010 |

Additional required:

Lambda Transmitter LT2, conf. for KS1D in type "Standard"  
order no. 657R102 / KS1D / S / ...

or

Lambda Transmitter LT3-F in wall mounting housing (for CO/O<sub>2</sub> control)  
order no. 657R50

or

Lambda Transmitter LT3-F in wall mounting housing (for CO/O<sub>2</sub> monitoring)  
order no. 657R51

none Gas extraction device (GED)

none Probe installation fitting (PIF)

The information in this publication is subject to technical changes.



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