

Technical Data Combination Probe KS1D-Ex

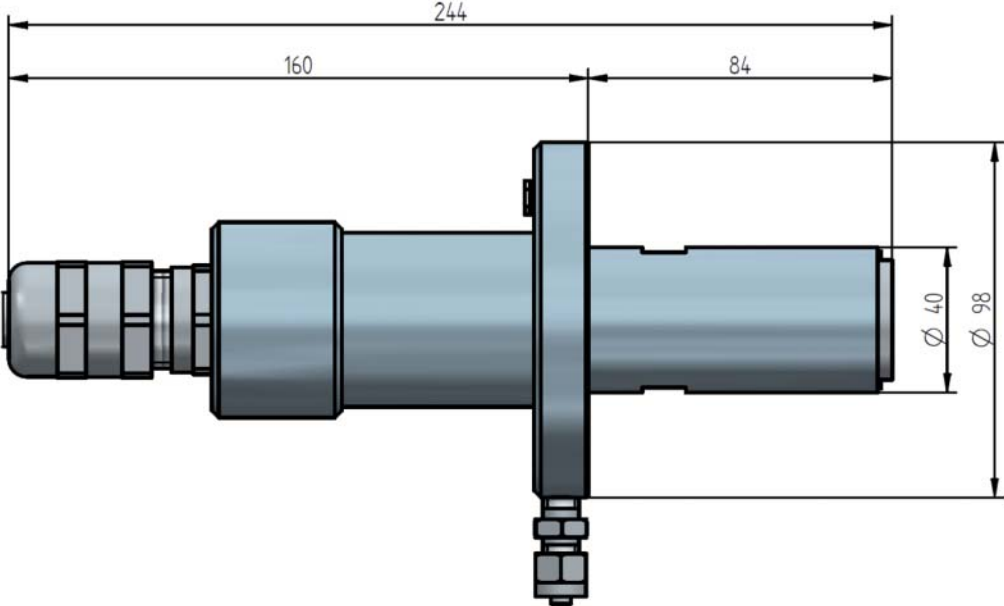


Fig. 1-1 Combination Probe KS1D-Ex (ZPF2)

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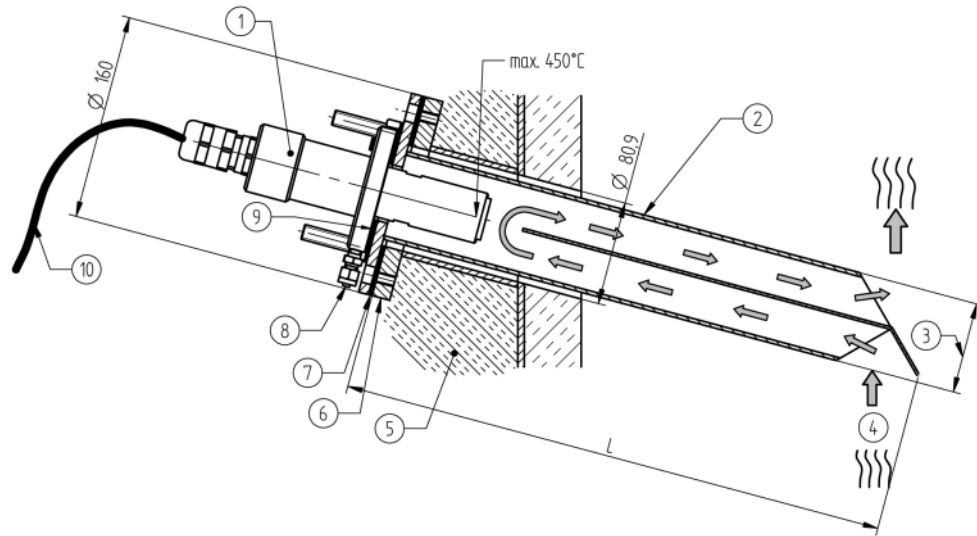


Fig. 1-2 Dimensional drawing KS1D-Ex with flue gas bypass tube

- 1 Combination Probe KS1D-Ex type 656R2021
- 2 Flue gas bypass tube
L= Length 500 ... 2,000 mm (19.685 ... 78.74 "in)
- 3 Diameter/diagonal maximum 70 mm (2.756 "in)
- 4 Gas velocity:
< 10 m/s (32.81 ft/s)* at a length of > 1,000 mm (39.370 "in)
< 30 m/s (98.42 ft/s)* at a length of ≤ 1,000 mm (39.370 "in)
From 16 m/s (52.5 ft/s)* on with increasing accuracy!
- 5 Insulation counter flange
- 6 Counter flange with tube socket KTL coated type 655R0179 or
Counter flange with tube socket stainless steel 1.4571 type 655R0180
- 7 Flange seal graphite type 655P4211
- 8 Test gas unit
- 9 Flange seal Novaphit type 656P0263
- 10 Connecting cable, length 2 m (78.74 "in)

* Measured at measuring gas temperature 25 °C. In case of smaller measuring gas temperatures it might be necessary to protect the probe from the incident flow.

NOTICE

LT3-Ex Lambda Transmitter, in combination with the Combination Probe KS1D-Ex cannot be used for LAMTEC CO/O₂ control.

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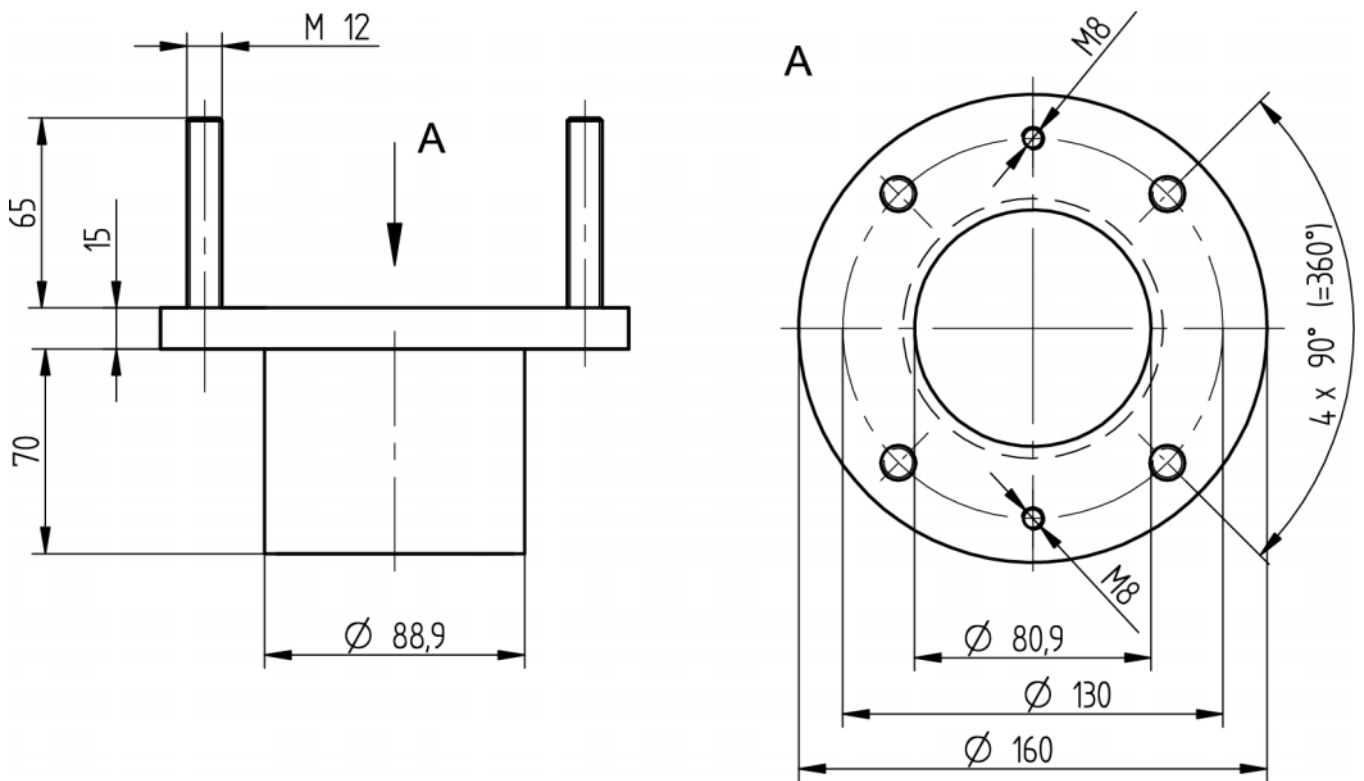


Fig. 1-3 Dimensions of counter flange with tube socket

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Technical data*	
Measuring range	<p>O₂: 0 ... 21 % O₂</p> <p>CO_e: 0 ... 1.000 ppm (0 ... 10.000 ppm upon request)</p>
Measuring precision	<p>O₂: ± 5 % of measured value - not better than ± 0.3 Vol. %</p> <p>CO_e: ± 25 % of measured value- not better than ± 20 ppm after prior calibration under operating conditions with a CO reference measurement</p> <p>In measuring range ≤ 100 ppm: ± 10 ppm</p>
Sensor signal	<p>O₂: -30 ... +150 mV</p> <p>CO_e: -30 ... +800 mV</p>
Response time	<p>O₂: t₆₀: < 50 s t₉₀: < 130 s</p> <p>CO_e: t₆₀: < 60 s t₉₀: < 140 s</p>
Response time with flue gas bypass tube**	t _{60AUR} = Δt _{AUR} + t ₆₀ (see Fig. 1-4 Flue gas bypass tube delay time as function of the velocity in the exhaust air channel depending on the varying lengths of the flue gas bypass tube)
Offset to environment	<p>O₂ < 0.3 Vol. %</p> <p>CO_e < 2 ppm</p>
Hysteresis	<p>O₂ < 1 % from measured value</p> <p>CO_e < 1.5 % from measured value</p>
Linearity	<p>O₂ < 1 % from measured value</p> <p>CO_e < 9 % from measured value</p>
Repeating precision	<p>O₂ < 0.1 % deviation from measured value</p> <p>CO_e < 0.7 % deviation from measured value</p>
Ambient pressure dependency	<p>O₂ < 0.1 % from measured value (of normal pressure at sea level in comparison with pressure at altitude of 2000 m, i.e., op = -200 mbar)</p> <p>CO_e < 16 % from measured value (of normal pressure at sea level in comparison with pressure at altitude of 2000 m, i.e., op = -200 mbar)</p>
Differential pressure dependency	<p>O₂ < -1.8 mV U_{O₂} per 100 mbar overpressure in the measuring chamber in comparison with environment</p> <p>CO_e < -0.17 mV U_{CO_e} per 100 mbar overpressure in the measuring chamber in comparison with environment</p>
Drift	<p>O₂ < 1.7 % from measured value (after 1000 h of operation in EL light fuel oil and 1004 switching cycles on/off)</p> <p>CO_e < 18.4 % from measured value (after 1000 h of operation in EL light fuel oil and 1004 switching cycles on/off)</p>

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Technical data*	
Cross sensitivity ***	<p>O₂: to CO₂ (15 Vol. %) < 0.1 Vol. %</p> <p>O₂: to CO (874 ppm) < 0.1 Vol. %</p> <p>O₂: to CH₄ (76 ppm) < 0.1 Vol. %</p> <p>O₂: to SO₂ (76 ppm) < 0.1 Vol. %</p> <p>O₂: to NO (245 ppm) < 0.1 Vol. %</p> <hr/> <p>CO_e: to CO₂ (15 Vol %) < 26 ppm</p> <p>CO_e: to O₂ (1 Vol. %) < 38 ppm</p>
Moisture	<p>O₂: < 2.3 % from measured value</p> <p>CO_e: < 9.1 % from measured value</p>
Influence of the installation position	None if KS1D-Ex is installed according to the information in the operating instructions.
Influence of the mains voltage	None if KS1D-Ex is installed according to the information in the operating instructions.
Influence of leakage	None if KS1D-Ex is installed according to the information in the operating instructions.
Internal resistance of probe	15 ... 25 Ω (ZrO ₂ -measuring cell in the air in case of 17 W heating output)
Heating consumption	10 ... 25 W, (at T _{Gas} 350 °C (662 °F) approx. 18 W) (according to design, measuring gas temperature, and measuring speed)
Supply voltage for heating	<p>AC/DC</p> <p>At P_H 18 VA → 11,4 V</p> <p>At P_H 20 VA → 12,34 V</p> <p>At P_H 25 VA → 14,8 V</p>
Heating current at P _H 20 VA	<p>Approx. 1,6 A</p> <p>Approx. 5 A short term during heating</p> <p>PTC-characteristic</p>
Insulation resistance	< 30 MΩ (between heating and probe connection)
Lifetime	> 3 years (in case of natural gas)
Weight	3.500 g (2.886 lb)
Material of probe housing	1.4401 (SS316L)
Material of connection line	Nickel-plated copper strand insulation polyester, reinforced and shielded 2 m
Operating temperature of the measuring cell (sensor) at 13 V heating voltage in the air (20 °C/ 68 °F)	650 °C (1202 °F)
Measuring principle	Zirconium dioxide cell (ZrO ₂) potentiometric (voltage probe)
Heating time	10 min until operating temperature is reached

* Information according to EN 16340:2014 D

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

*** O₂: Information assumes an operating gas composition of 5 vol. % O₂, rest is N₂
 CO_e: Information assumes an operating gas composition of 5 vol. % O₂, 333 ppm CO_e, rest is N₂
 (333 ppm CO_e = 166.5 ppm H₂ + 166.5 ppm CO)

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Conditions for use	
Mounting / measuring gas extraction device	Directly in exhaust gas channel / in situ
Seal tightness	$q_L \leq 100 \text{ cm}^3/\text{h}^*$
Mounting position	Installation angle opposite horizontal 5 ... 90°
Permissible fuels	Residue-free, gaseous hydrocarbons, light fuel oil, heavy fuel oil (HFO), lignite and coal, biomass (according to design)
Permissible exhaust gas temperature on probe head	< 450 °C (842 °F)
Permissible operating temperature	up to max. 1200 °C (2192 °F) in connection with flue gas bypass tube
Permissible storage temperature	-20 ... +70 °C (-4 °F ... 158 °F)
Permissible measuring gas speed	< 10 m/s (32.81 ft/s) ⁽¹⁾ at a length of > 1,000 mm (39.370 "in) < 30 m/s (98.42 ft/s) ⁽¹⁾ at a length of ≤ 1,000 mm (39.370 "in) From 16 m/s (52.5 ft/s) ⁽¹⁾ on with increasing accuracy! ⁽¹⁾ Measured at measuring gas temperature 25 °C (77 °F). In case of smaller measuring gas temperatures it might be necessary to protect the probe from the incident flow. Attention: With flue gas bypass tube length > 1 m, a high current speed (> 30m/s (98.42 ft/s)) can lead to flutter and vibration of flue gas bypass tube.
Degree of protection DIN 40050	IP65
Type of protection	 II2G Ex d IIB+H2 T3 Gb (Ta : -20 °C to +60 °C LCIE 13 ATEX 3045X IECEx LCIE 13.0027X
Necessary test gas	for O ₂ : 3 Vol. % O ₂ in N ₂ for CO _e : 3 Vol. % O ₂ , 200 ppm CO, 100 ppm H ₂ , in N ₂ , a portable calibration unit is available as an accessory
Test gas consumption	Approx. 3 ... 5 litres per test gas/per calibration at a flow rate of 60 ... 90 nl/h
Test gas unit	6 mm (0.24 "in) Cutting ring fitting
Outlet port reference air	Inlet via sintered metal filter

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

Delay time due to the flue gas bypass tube (AUR) as a function of the flow velocity in the flue gas duct

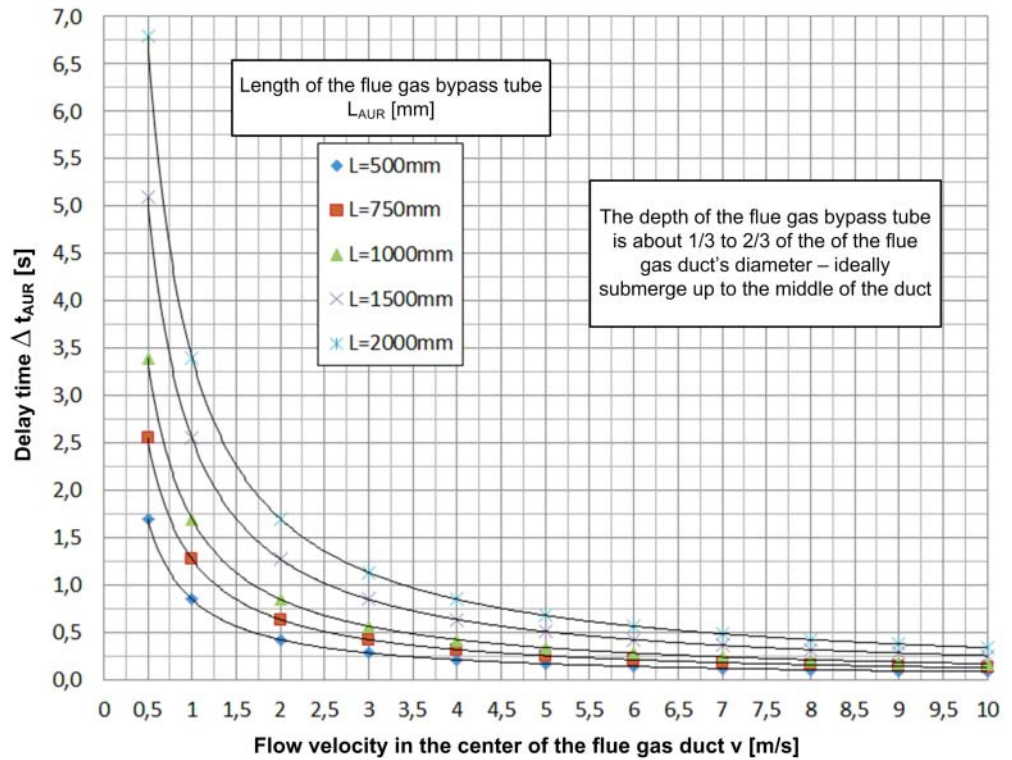


Fig. 1-4 Flue gas bypass tube delay time as function of the velocity in the exhaust air channel depending on the varying lengths of the flue gas bypass tube

The figure shows the delay time Δt_{EGDT} [s] resulting from the length of the flue gas bypass tube L_{EGDT} [mm] as a function of a flow velocity in the middle of the flue air channel v [m/s].

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Order Information

Combination Probe KS1D-Ex for simultaneous measurement of oxygen (O₂) and unburnt residue (CO/H₂) in combination with bypass tube for flue gas temperatures up to 1200 °C (2192 °F)

Description / Type	Type
Combination Probe KS1D-Ex (ZPF2), cable length 2 m (6.6 "ft.), IP65	656R2021

Flue gas bypass tube Ø 70 mm (2.755 "in), material: stainless steel 1.4571, for measuring gas temperatures up to 750 °C (1382 °F)

Type	656R1014	656R1015	656R1016	656R1080	656R1081
Length	500 mm (19.69 "in)	750 mm (29.53 "in)	1,000 mm (39.37 "in)	1,500 mm (59.06 "in)	2,000 mm (78.74 "in)

Flue gas bypass tube Ø 60 mm(2.36 in), material Inconel 600 for measuring gas temperatures up to 950 °C (1742 °F)

Type	656R1017	656R1018	656R1019	656R1085	656R1086
Length	500 mm (19.69 "in)	750 mm (29.53 "in)	1,000 mm (39.37 "in)	1,500 mm (59.06 "in)	2,000 mm (78.74 "in)

Flue gas bypass tube Ø 60 mm (2.36 "in), material Kanthal for measuring gas temperatures up to 1200 °C (2192 °F)

Type	656R1021	656R1022	656R1023	656R1088	656R1089
Length	500 mm (19.69 "in)	750 mm (29.53 "in)	1,000 mm (39.37 "in)	1,500 mm (59.06 "in)	2,000 mm (78.74 "in)

Counterflanges

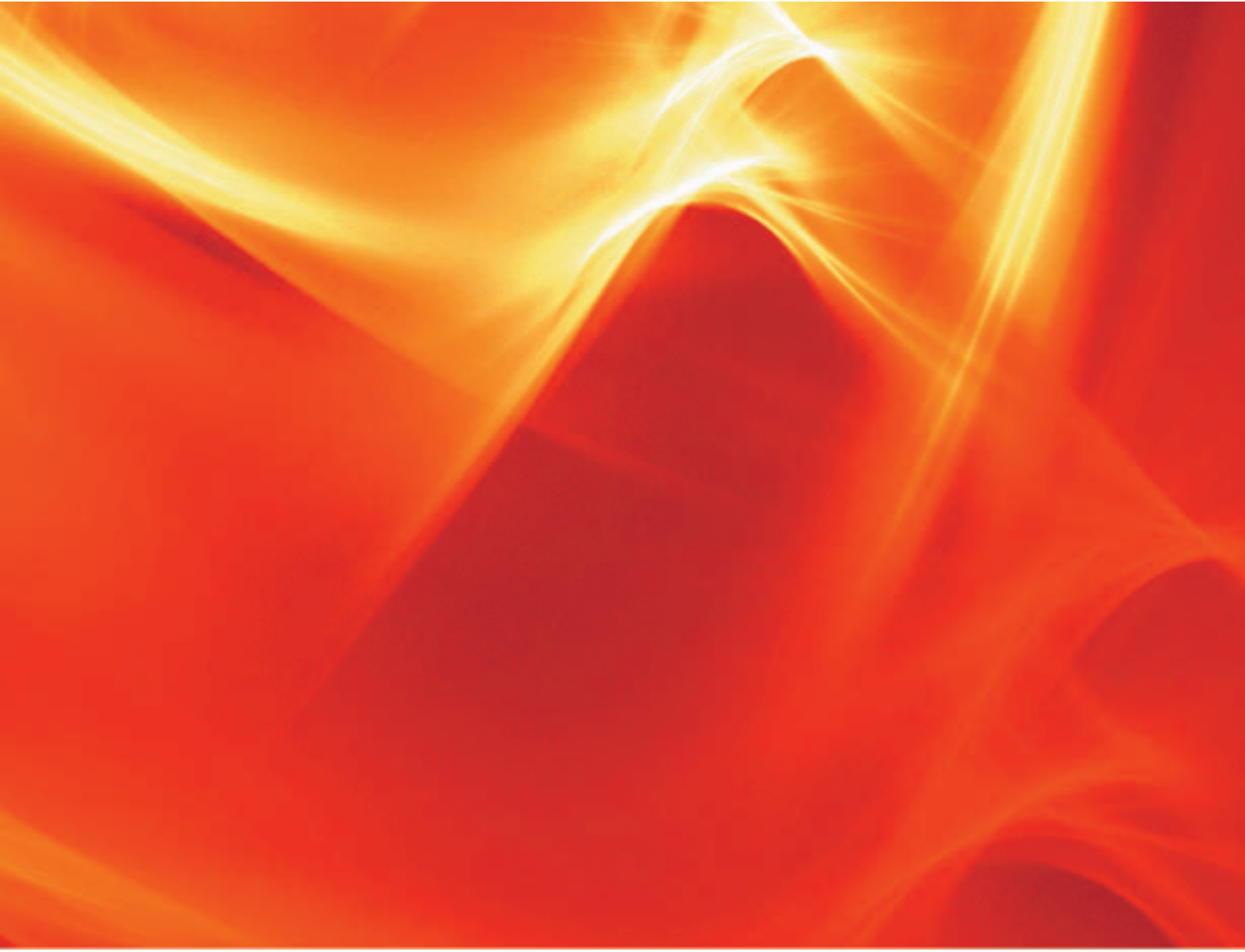
Description / Type	Type
Counterflange, inside tube diameter 80 mm (3.15 "in), tube length 70 mm (2.756 "in), Material: steel, EPD black, int. hole diameter in acc. to DN65 PN6	655R0179
Counterflange, inside tube diameter 80 mm, special length up to 500 mm (19.69 "in), material: steel galv., int. hole diameter in acc. to DN65 PN6	655R0179/S
Counterflange, inside tube diameter 80 mm (3.15 "in), tube length 70 mm (2.756" in), Material: stainless steel 1.4571, int. hole diameter in acc. to DN65 PN6	655R0180
Counterflange, inside tube diameter 80 mm (3.15 "in), special length up to 500 mm (19.69 "in), material: stainless steel 1.4571, int. hole diameter in acc. to DN65 PN6	655R0180/S
Sealing for counterflange DN65 PN6, 3 mm (0.118 "in), material: graphite	655P4211

Accessories

Description / Type	Type
ATEX connection cable combination probe KS1D-Ex / lambda probe LS2-Ex	656R2025
Probe connection box for combination probe KS1D-Ex / lambda probe LS2-Ex Housing for hazardous area 1 in acc. to ATEX/IECEx type of protection: IP66 Max. distance to LT3-Ex: 40 m (131.23 "ft) Material: aluminum die-casting 110 x 175 x 85 mm (4.331 "in x 6.89 "in x 3.35 "in)	650R4028
Probe connection box for combination probe KS1D-Ex / lambda probe LS2-Ex Housing for hazardous area 1 in acc. to ATEX/IECEx type of protection: IP66 Max. distance to LT3-Ex: 40 m (131.23 "ft) Material: stainless steel 1.4301 150 x 210 x 81 mm (5.91 "in x 8.27 "in x 3.19 "in)	650R4029
Portable Calibration Unit with 2 test gases for O ₂ and CO	699R0062
Portable Calibration Unit with 2 test gases for O ₂ and CO, as well as synthetic air	699R0063

Spare parts

Description / Type	Type
Maintenance-Set (dust protection filter, graphite gasket) for probe KS1D-Ex / LS2-Ex	656R2027
Gasket for connecting head, Novaphit SSTC	656P0263



The information in this publication is subject to technical changes.



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