Fig. 1-1 Combination Probe KS1-HT with flue gas bypass tube

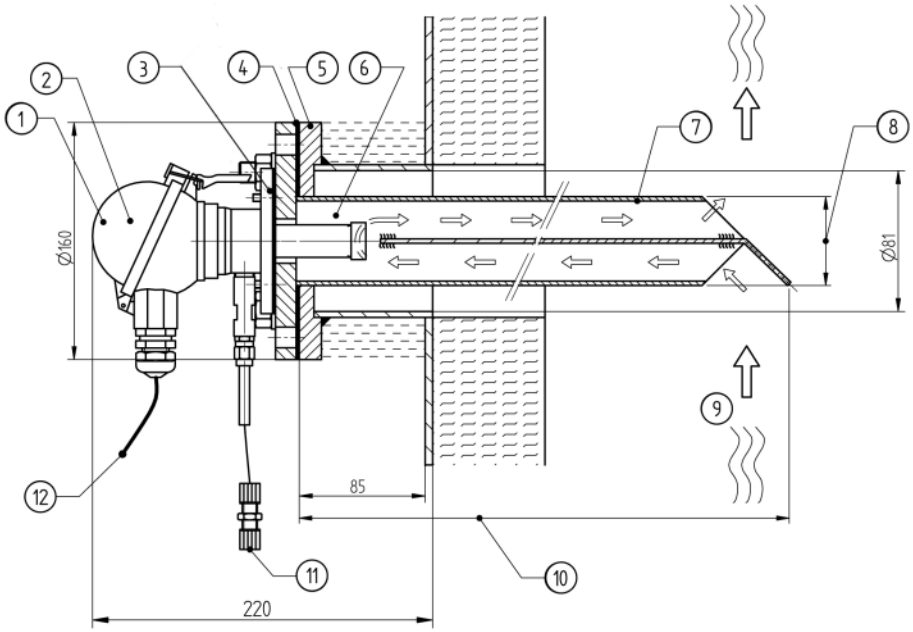


Fig. 1-2 Dimensional drawing Combination Probe KS1-HT (high temperature) with flue gas bypass tube

1 Combination Probe KS1-HT high temperature type 656R0015

2 Connecting head max. 100 °C (212 °F)

3 Flange seal Novaphit type656P0263

4 Flange seal graphite type 655P4211

5 Counter flange with tube socket KTL coated type 655R0179 or
Counter flange with tube socket stainless steel 1.4571 type 655R0180

6 Flue gas temperature at the probe head max. 450 °C (842 °F)

7 Flue gas bypass tube

8 Diameter/diagonal maximum 70 mm (2.756 in)

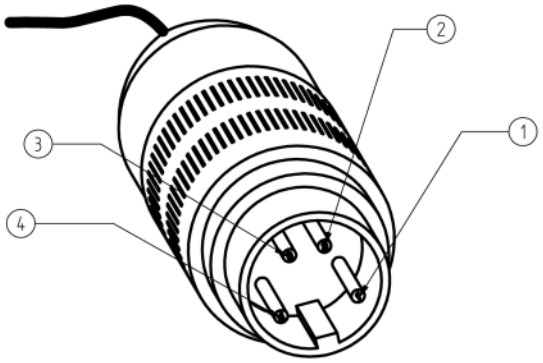
9 Gas velocity:
< 10 m/s (32.81 ft/s)* at a length of > 1,000 mm (39.370 in.)
< 30 m/s (98.42 ft/s)* at a length of ≤ 1,000 mm (39.370 in)
From 16 m/s (52.5 ft/s)* on with increasing accuracy!

10 Length 500 ... 2,000 mm (19.685 ... 78.74 in)

11 Hose connection 4/6 mm (0.02 in.) for calibration gas

12 Connecting cable with plug, length 2 m (78.74 in.)

* 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.



1 = (+) probe signal (black)
2 = (-) probe signal (grey)
3 = probe heating
4 = probe heating

Fig. 1-3 Pin assignment for plug

NOTICE

Observe cable cross.section!

- ▶ smaller 20 m (65.6 ft.) = 1,5 mm^2 (AWG 15)
- ▶ up to 40 m (131.2 ft.) = 2,5 mm^2 (AWG 13)

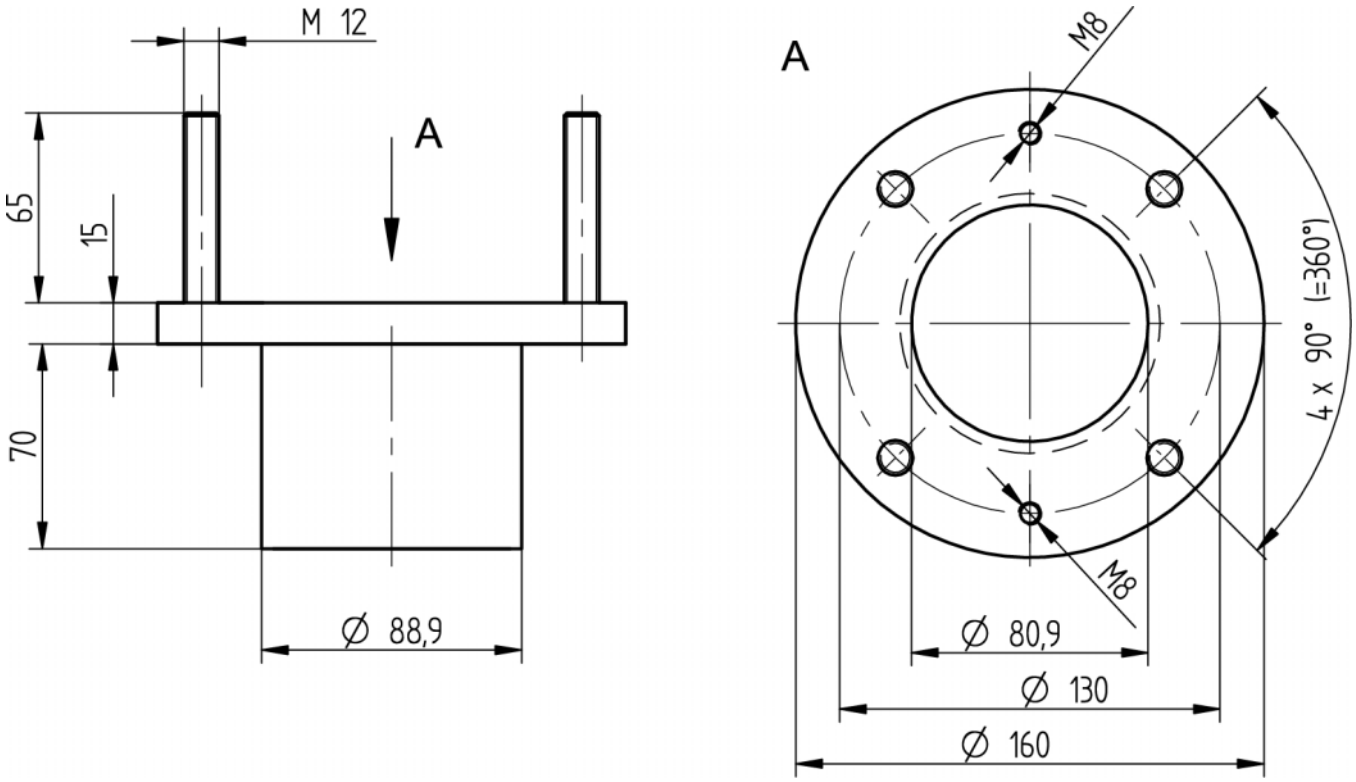


Fig. 1-4 Dimensions of counter flange with tube socket

Technical Data Combination Probe KS1-HT

Technical data	
Measuring range	**CO_e:** 0 - 1,000 ppm (0 - 10,000 ppm upon request)
Measuring precision	**CO_e:** ± 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	**CO_e:** - 30 ... + 800 mV
Response time	**CO_e:** t_{60}: < 9 s (unfiltered < 3 s) t_{90}: < 13 s (unfiltered < 4s)
Response time with flue gas bypass tube*	$t_{60EGDT} = \Delta t_{EGDT} + t_{60}$ (see *Fig. 1-5 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*)
Relaxation time (measurement readiness after overload)	**CO_e:** t_{90}: < 9 s
Offset to environment	**CO_e** < 2 ppm
Influence of the installation position	None if KS1 is installed according to the information in the operating instructions.
Influence of the mains voltage	None if KS1 is installed according to the information in the operating instructions.
Influence of leakage	None if KS1 is installed according to the information in the operating instructions.
Internal resistance of probe	10 ... 20 Ω (ZrO_2 measuring cell in the air in case of 22 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	AC/DC At P_H 18 VA → 11.4 V At P_H 20 VA → 12.34 V At P_H 25 VA → 14.8 V
Heating current at P_H 20 VA	Approx. 1.6 A Approx. 5 A short term during heating PTC characteristic
Insulation resistance	< 30 MΩ (between heating and probe connection)
Lifetime	> 3 years (in case of light fuel oil and natural gas)
Weight	1,300 g (2.886 lb)
Material of probe housing	1.4571
Material of connection housing	Aluminium
Material of connecting line	Nickel-plated copper strand FEP insulation
Operating temperature of the measuring cell (sensor) at 13 V heating voltage in the air (20 °C)	650 °C (1202 °F)
Measuring principle	Zirconium dioxide cell (ZrO_2) potentiometric (voltage probe)
Heating time	10 min until operating temperature is reached

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

Conditions for use	
Mounting / measuring gas extraction device	Directly in exhaust gas channel / in situ
Seal tightness	$q_L \leq 100\ cm^3/h$*
Mounting position	Horizontal to vertical
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	< 100 °C (212 °F) on cable lead < 100 °C (212 °F) on connecting cable
Permissible storage temperature	-20 °C ... +70 °C (-4 °F ... 158 °F)
Permissible measuring gas speed	< 16 m/s (52.5 ft/s) (higher measurement speed increases the measurement error). Current safety measures can be deployed. (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	IP65

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

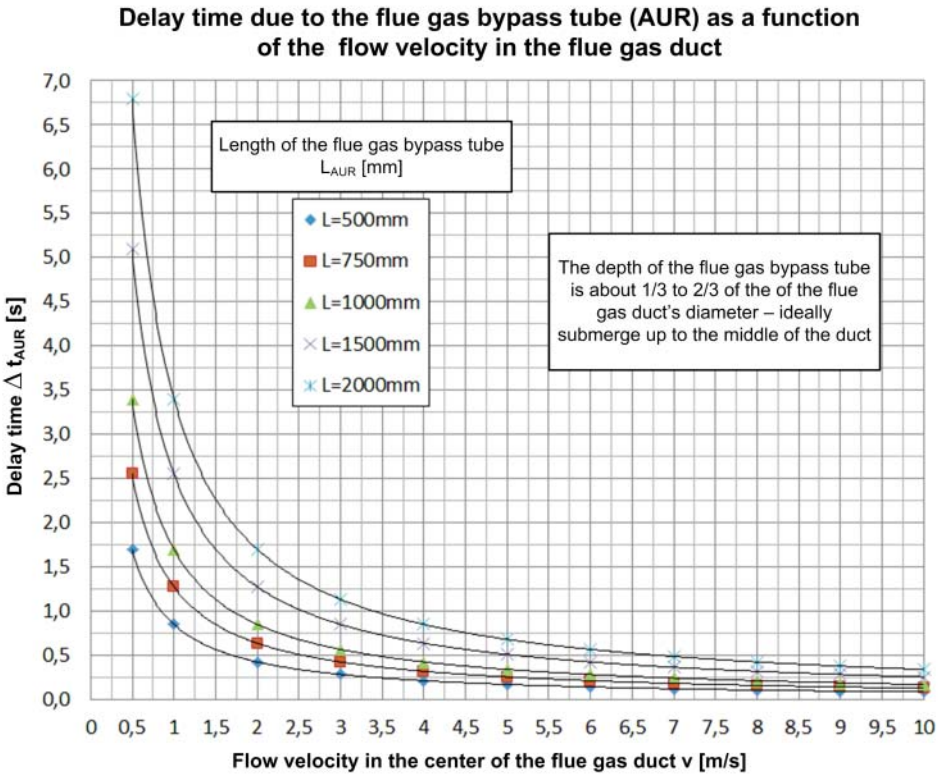


Fig. 1-5 Flue gas bypass tube delay time as function of the velocity in the exhaust air channel depending on the varying lengths of the flue gas bypass tube

The figure shows the delay time $\Delta \mathbf{t}_{EGDT}$ [s] resulting from the length of the flue gas bypass tube $\mathbf{L}_{EGDT}$ [mm] as a function of a flow velocity in the middle of the flue air channel v [m/s].

Order Information

Combination Probe KS1-HT for detection of non-burned residue (CO/H_2), in combination with bypass tube for flue gas temperatures up to 1200 °C (2192 °F)

NOTICE

Apply Combination Probe KS1 only in conjunction with LAMTEC CO/O_2control, for CO-monitoring use Combination Probe KS1D!

Description / Type	Type
Combination Probe KS1-HT "high temperature", cable length 2 m (6.6 ft.), IP65	656R0015

Flue gas bypass tube ∅ 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 ∅ 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 ∅ 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)

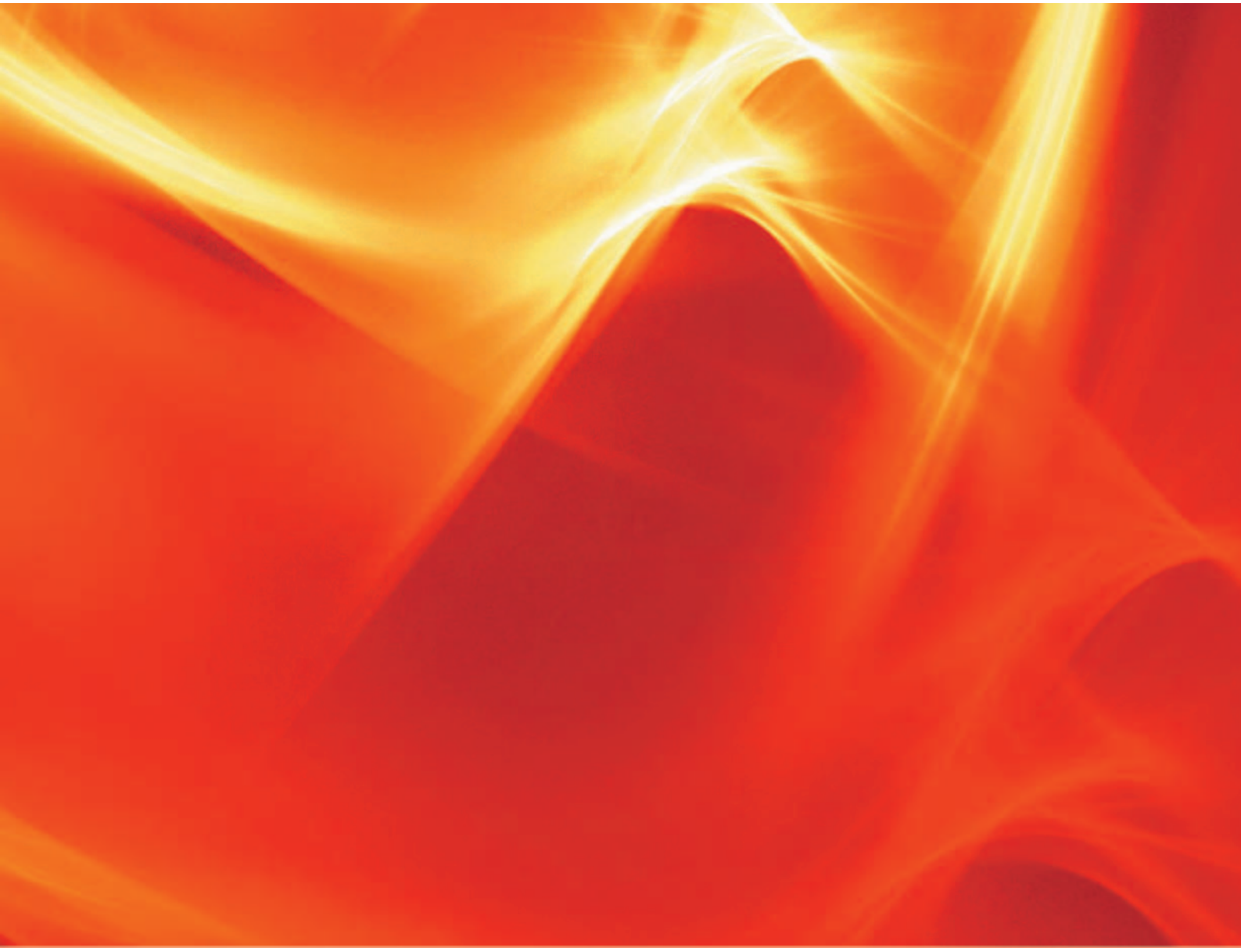
Counterflanges

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
Extension cable for probe-connection-cable KS1, length 2 m (6.6 ft.) (1)	656R1006
Extension cable for probe-connection-cable KS1, length 5 m (16.4 ft.) (1)	656R1007
Probe connection box (PCB) for KS1 (1)	656R1025

(1)For using when distances >2 m between Lambda-Transmitter LT2 and Combination Probe KS1



The information in this publication is subject to technical changes.

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