

## Technical Data LS2-HT Lambda Probe



Fig. 1 Lambda Probe LS2-HT with flue gas bypass tube

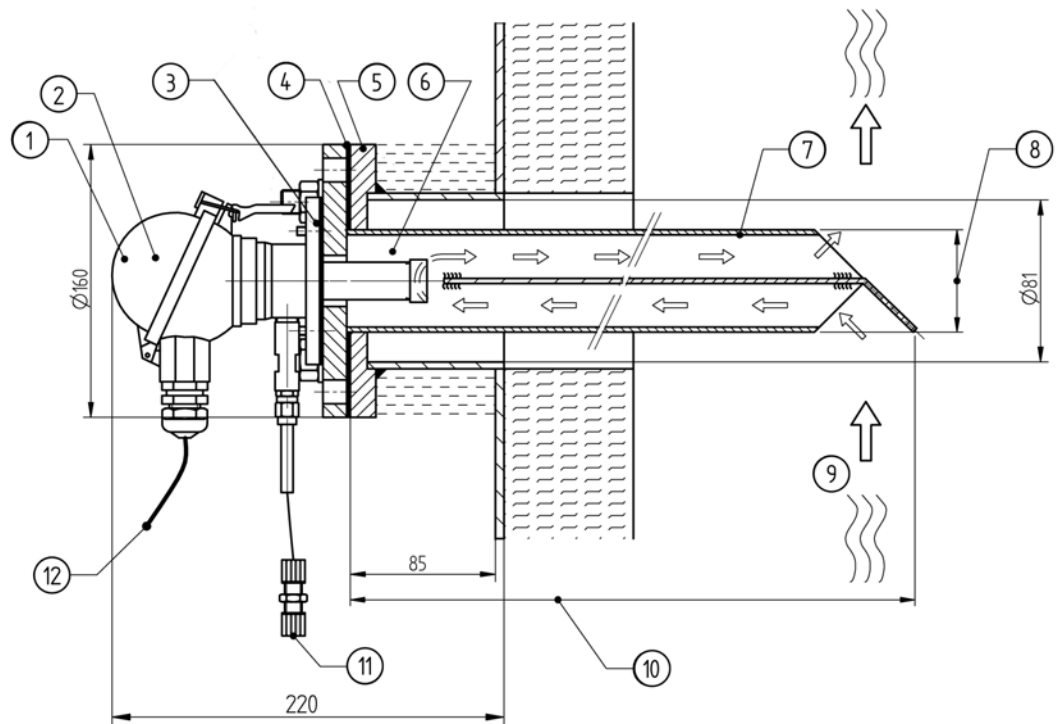


Fig. 2 Dimensional drawing Lambda Probe LS2-HT with flue gas bypass tube

- 1 Lambda Probe LS2-HT type 650R1515
- 2 Connection head max. 100 °C/212 °F
- 3 Flange seal Novaphit type 656P0263
- 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
- 6 Flue gas temperature at the probe head max. 450 °C/842 °F
- 7 Flue gas bypass tube
- 8 Diameter/diagonal maximum. 70 mm/2.76 "in
- 9 Gas velocity:  
1 ... 16 m/s  
(from 16 m/s: increasing measurement inaccuracy)  
(from 30 m/s: maximum length 1.000 mm/39.370" in)
- 10 Length: 500 ... 2.000 mm/19.68 ... 78.74" in)
- 11 Hose connection 4/6 mm (0.16" in/0.24" in) for calibration gas
- 12 Connecting cable with plug, length 2 m/6.6 ft.

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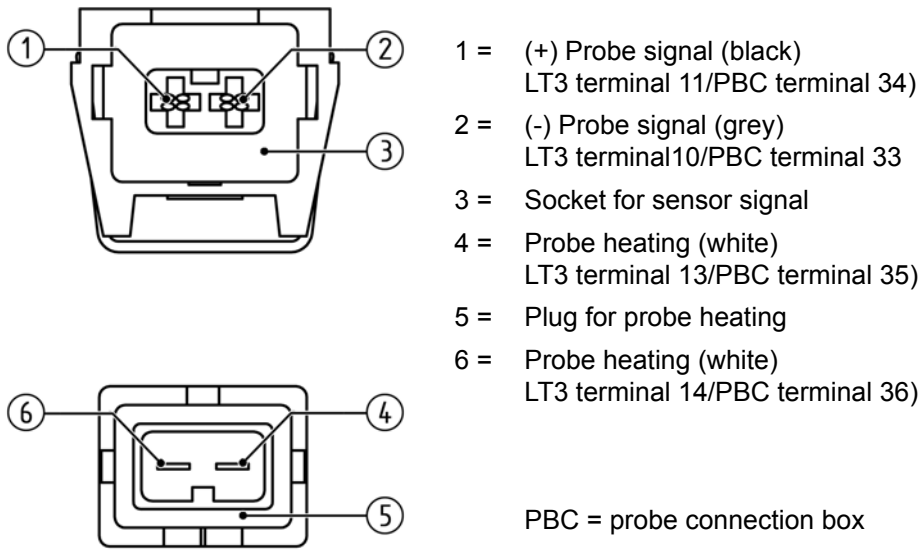


Fig. 3 Terminal assignment for probe connection plug

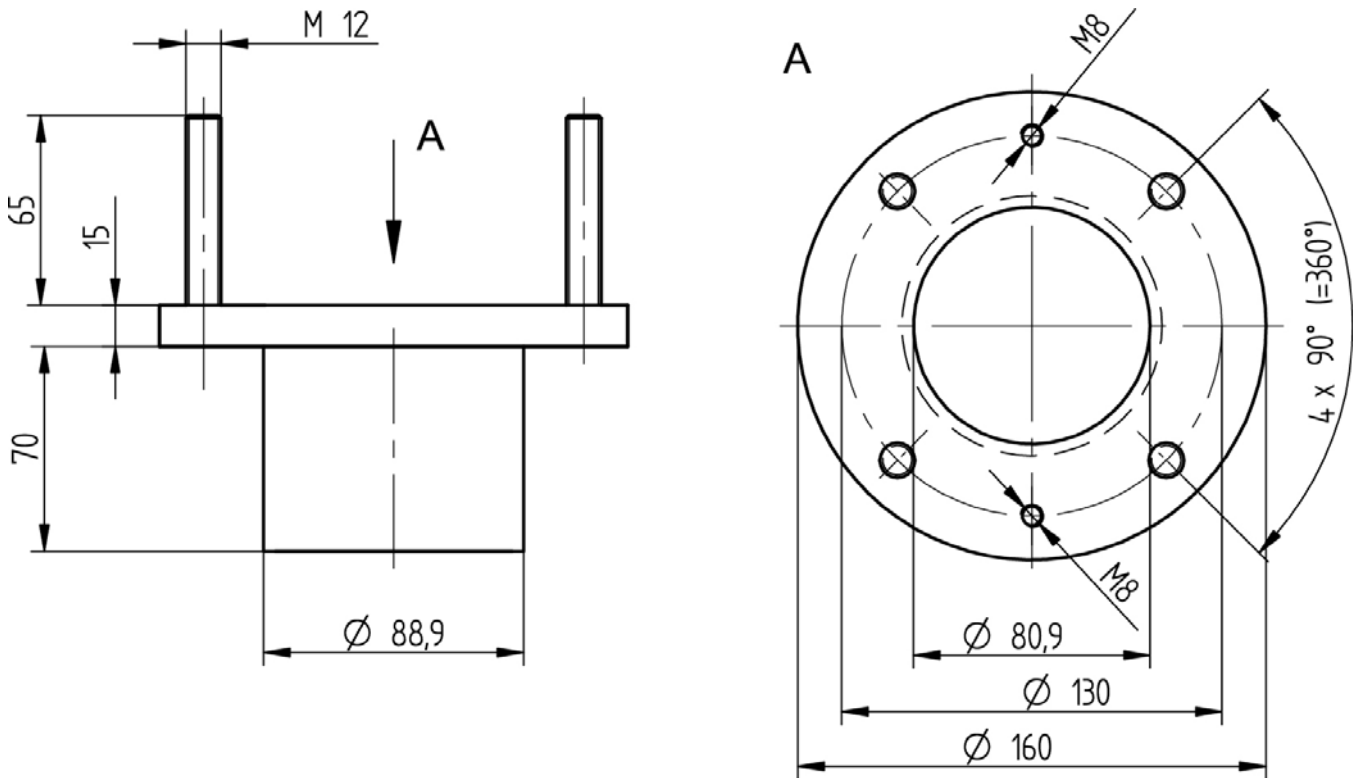


Fig. 4 Dimensions of counter flange with tube socket

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Technical data*	
Measuring range	0 ... 21 Vol. % O <sub>2</sub>
Measuring precision	±5 % of measured value – not better than ± 0.3 Vol. %
Sensor signal	- 30 ... + 150 mV
Response time	t <sub>60</sub> : < 3 s t <sub>90</sub> : < 9 s
Response time LS2-HT with flue gas bypass tube **	t <sub>60AUR</sub> = Δt <sub>AUR</sub> + t <sub>60</sub> (see Fig. 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)	t <sub>90</sub> : < 8 s
Offset to environment	< 0,3 Vol. %
Hysteresis	< 1 % from measured value
Linearity	< 1 % from measured value
Repeating precision	< 0.1 % deviation from measured value
Ambient pressure dependency	< 0.1 % from measured value (of normal pressure at sea level in comparison with pressure at altitude of 2000 m, i.e., Δp -200 mbar)
Differential pressure dependency	< -1.8 mV U <sub>O2</sub> per 100 mbar overpressure in the measuring chamber in comparison with environment
Drift	< 1.7 % from measured value (after 1000 h of operation in EL light fuel oil and 1004 switching cycles on/off)
Cross sensitivity***	to CO <sub>2</sub> (15 Vol. %) < 0,1 Vol. % to CO (874 ppm) < 0,1 Vol. % to CH <sub>4</sub> (76 ppm) < 0,1 Vol. % to SO <sub>2</sub> (76 ppm) < 0,1 Vol. % to NO (245 ppm) < 0,1 Vol. %
Humidity	< 2.3 % from measured value
Influence of the installation position	None if LS2 is installed according to the information in the operating instructions.
Influence of the mains voltage	None if LS2 is installed according to the information in the operating instructions.
Influence of leakage	None if LS2 is installed according to the information in the operating instructions.
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, (at T <sub>Gas</sub> 350 °C/662 °F approx. 18 W) (according to design, measuring gas temperature and measuring speed)
Supply voltage for heating	AC/DC At P <sub>H</sub> 18 VA → 11,4 V At P <sub>H</sub> 20 VA → 12,34 V At P <sub>H</sub> 25 VA → 14,8 V
Heating current P <sub>H</sub> 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)

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Technical data*	
Weight Probe LS2-HT	1300 g/2.867 lb
Material of probe housing	1.4571
Material connecting 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/ 68 °F)	650 °C/1202 °F
Measuring principle	Zirconium dioxide cell (ZrO <sub>2</sub> ) 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

\*\*\* O<sub>2</sub>: Information assumes an operating gas composition of 5 vol. % O<sub>2</sub>, rest is N<sub>2</sub>

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	up to 85° against 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 measuring gas speed	< 16 m/s/52.493 ft/s (higher measurement speed increases the measurement error). Current safety measures can be deployed. <b>Attention:</b> With flue gas bypass tube length > 1 m/3.3 ft, a high current speed (> 30m/s/98.425 ft/s) can lead to flutter and vibration of flue gas bypass tube. <b>Attention:</b> An ejector acceleration must be used for measuring speeds < 1 m/s.

### Environmental Conditions

Operation	Permissible temperature range	on cable lead	< 100 °C/212 °F
		on connecting cable	< 100 °C/212 °F
Transport	Permissible temperature range		-40 ... +90 °C/-40 ... 194 °F
Storage	Permissible temperature range		-20 ... +70 °C/-4 °F ... 158 °F
Degree of protection	According to DIN EN 60529		IP65 (in mounting condition)

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

### NOTICE

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

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

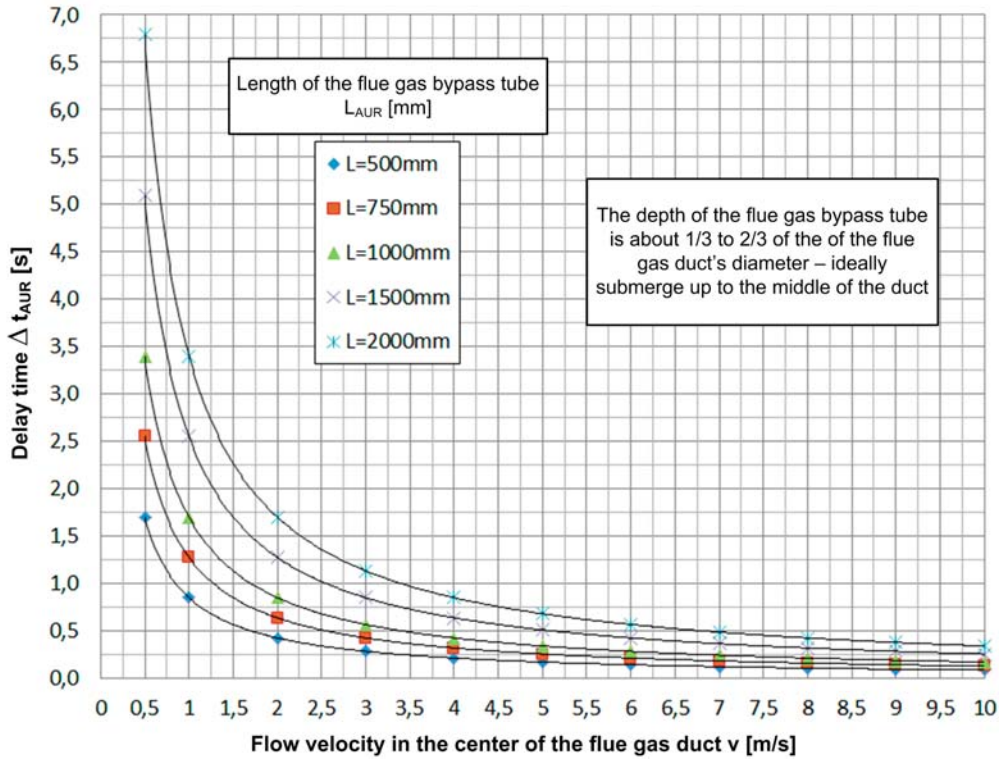


Fig. 5 Flue gas bypass tube delay time as function of the velocity in the exhaust air channel depending on the varying lengths of the flue gas bypass tube

The figure shows the delay time  $\Delta t_{EGDT}$  [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].

# Technical Data LS2-HT Lambda Probe

Lambda Probe LS2-HT for measurement of oxygen (O<sub>2</sub>), for flue gas temperatures up to 1.200 °C (2192 °F) in combination with bypass tube

Description / Type	Type
Lambda Probe LS2-HT, cable length 2 m (6.6 ft), IP65, from 450 °C (842 °F)	650R1515

\* Additional required:

- Lambda Transmitter LT2, conf. for LS2 in type "Standard" (without purging)  
Order no. 657R102/LS2/S/...
- or
- Lambda Transmitter LT2, conf. for LS2 in type "with bypass tube and purge unit"  
Order no. 657R102 / LS2 / 3A / ...
- or
- Lambda Transmitter LT3, conf. for LS2  
Order no. 657R51 / ... / LS2 / ...
- Counter flange, order no. 655R0179 / R0180
- Sealing for counter flange, order no. 655P4211
- Bypass tube with / without purge connection
- Purge unit, order no. 657R0934, if bypass tube with purge unit (order no. 656R10...A)

**Flue gas bypass tube Ø 70 mm (2.755" in), material: stainless steel 1.4571, for measuring gas temperatures up to 750 °C (1,382 °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 1.200 °C (2,192 °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

The information in this publication is subject to technical changes.



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