

Technical Data Combination Probe KS1D-HT



Fig. 1 Combination Probe KS1D-HT with flue gas bypass tube

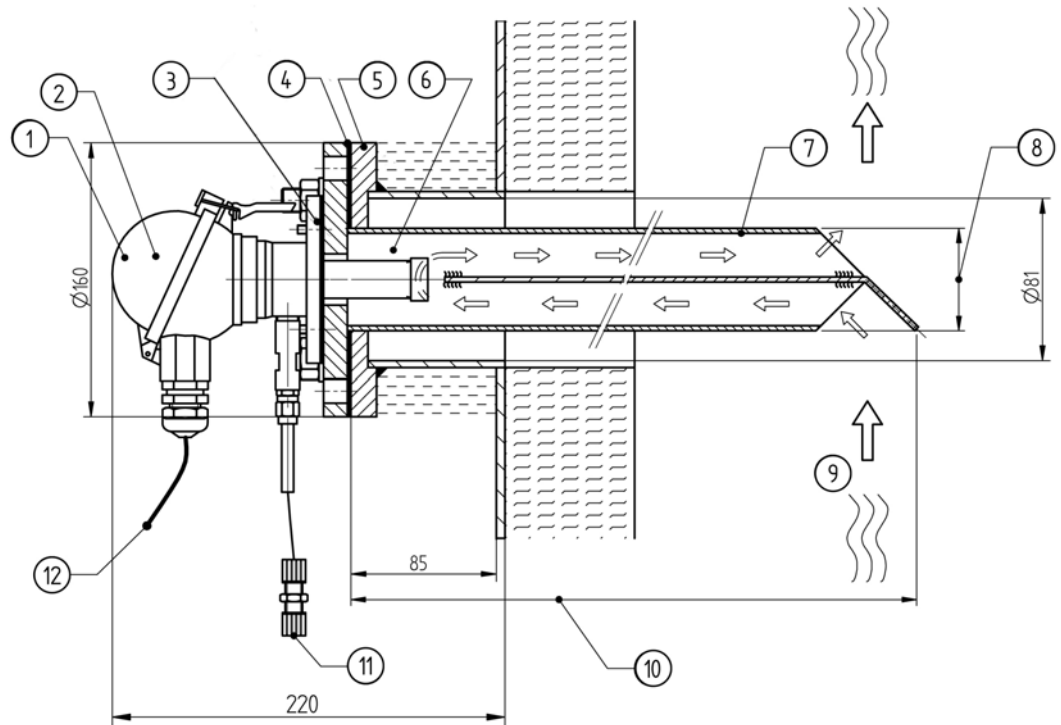
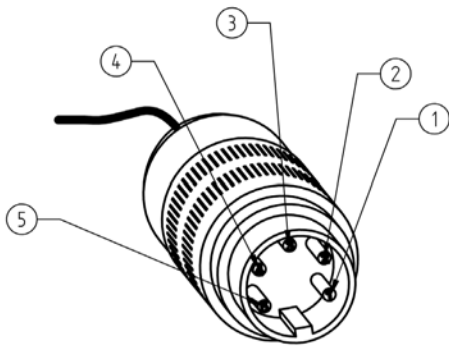


Fig. 2 Dimensional drawing Combination Probe KS1D-HT with flue gas bypass tube

- 1 Combination Probe KS1D-HT
- 2 Connecting 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 655R0180
- 6 Flue gas temperature at the probe head max. 300 °C / 572 °F in connection with LT3-F
Flue gas temperature at the probe head max. 450 °C / 842 °F in connection with LT3
and LT2
- 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 decreasing measurement!
- 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.

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- 1 = (+) probe signal O₂/ CO_e (black)
- 2 = (-) probe signal CO_e (grey)
- 3 = probe heating (white)
- 4 = probe heating (white)
- 5 = (-) probe signal O₂ (red or blue)

Fig. 3 Pin assignment for plug

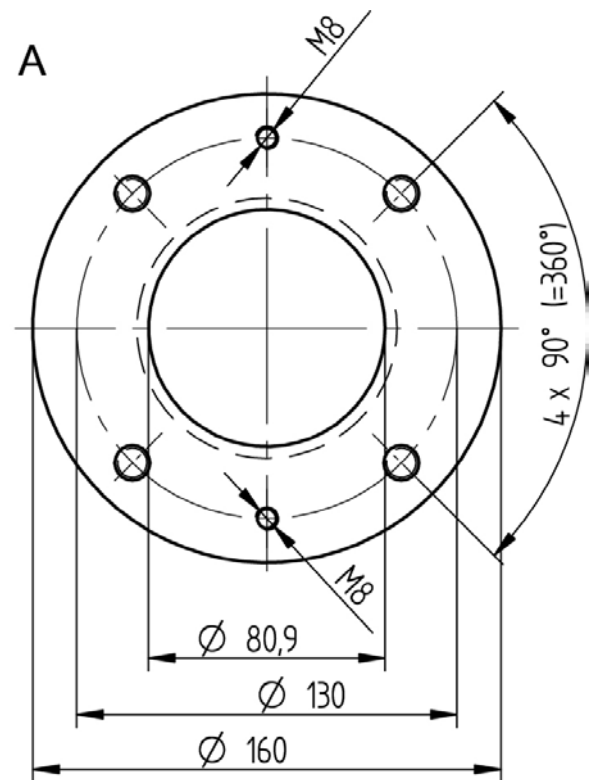
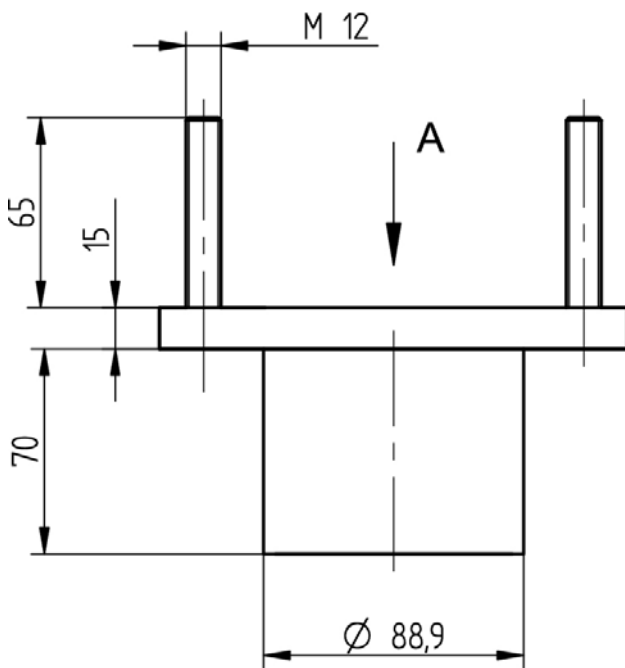


Fig. 4 Dimensions of counter flange with tube socket

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Fig. 5 Gas extraction device (GED) type 655R1420 ... 1423

Application:

- Flue gas temperatures: 550 °C / 1022 °F at the gas extraction device
450 °C / 842 °F at probe head for LT2/LT3
300 °C / 572 °F at probe head for LT3-F
- Flow velocities: 1-10 m/s / 3.28 ft/s ... 32.81ft/s.
- Dust exposure: < 200 mg/Nm³

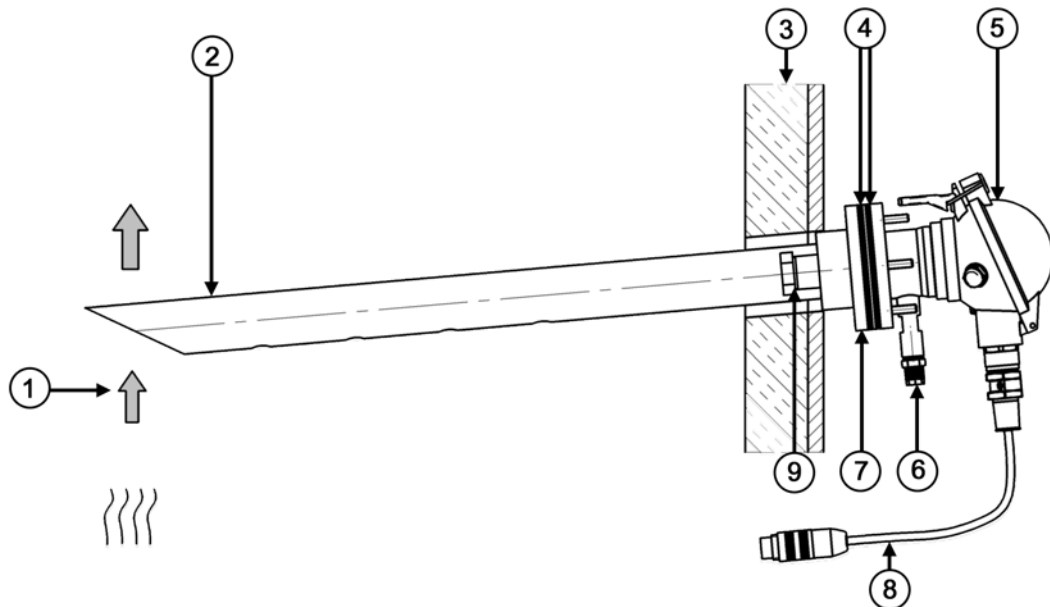


Fig. 6 Dimension drawing HT probe with gas extraction device (GED)

- 1 Flow direction measuring gas
- 2 GED type 655R1420 ... 1423
- 3 Boiler wall (in this case with inner insulation)
- 4 Graphite sealings type 656P0263
- 5 HT-probe 656R2015/650R1515
- 6 Hose connection 4/6 mm / 0.16/0.24" in for calibrating gas
- 7 Counter flange 655R1450
- 8 Connecting cable, length 2 m / 6.6 ft
- 9 Maximum measuring gas temperature at probe head
450 °C / 842 °F in connection with LT2/LT3
300 °C / 572 °F in connection with LT3-F

Technical Data Combination Probe KS1D-HT

Technical data*	
Measuring range	O₂ : 0 - 21 % O ₂
	CO_e : 0 - 1,000 ppm (0 - 10,000 ppm upon request)
Measuring precision	O₂ : ± 5 % of measured value - not better than ± 0.3 vol. %
	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	O₂ : -30 ... +150 mV
	CO_e : -30 ... +800 mV
Response time	O₂ : t ₆₀ : < 3 s t ₉₀ : < 9 s
	CO_e : t ₆₀ : < 3 s (electronically filtered at the factory < 9 s) t ₉₀ : < 4 s (electronically filtered at the factory < 13 s)
Response time with flue gas bypass tube**	t _{60EGDT} = Δt _{EGDT} + t ₆₀ (see Fig. 7 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)	O₂ : t ₉₀ : < 8 s
	CO_e : t ₉₀ : < 9 s
Offset to environment	O₂ < 0.3 vol. %
	CO_e < 2 ppm
Hysteresis	O₂ < 1 % from measured value
	CO_e < 1.5 % from measured value
Linearity	O₂ < 1 % from measured value
	CO_e < 9 % from measured value
Repeating precision	O₂ < 0.1 % deviation from measured value
	CO_e < 0.7 % deviation from measured value
Ambient pressure dependency	O₂ < 0.1 % from measured value (of normal pressure at sea level in comparison with pressure at altitude of 2000 m (6,561.68 ft), i.e., op = -200 mbar / -2,9 psi)
	CO_e < 16 % from measured value (of normal pressure at sea level in comparison with pressure at altitude of 2000 m (6,561.68 ft), i.e., op = -200 mbar / -2,9 psi)
Differential pressure dependency	O₂ < -1.8 mV U _{O₂} per 100 mbar / 1.45 psi overpressure in the measuring chamber in comparison with environment
	CO_e < -0.17 mV U _{CO_e} per 100 mbar / 1.45 psi overpressure in the measuring chamber in comparison with environment
Drift	O₂ < 1.7 % from measured value (after 1000 h of operation in EL light fuel oil and 1004 switching cycles on/off)
	CO_e < 18.4 % from measured value (after 1000 h of operation in EL light fuel oil and 1004 switching cycles on/off)

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Technical data*	
Cross sensitivity***	<p>O₂: to CO₂ (15 vol. %) < 0.1 vol. % O₂: to CO (874 ppm) < 0.1 vol. % O₂: to CH₄ (76 ppm) < 0.1 vol. % O₂: to SO₂ (76 ppm) < 0.1 vol. % O₂: to NO (245 ppm) < 0.1 vol. %</p> <p>CO_e: to CO₂ (15 vol. %) < 26 ppm CO_e: to O₂ (1 vol. %) < 38 ppm</p>
Moisture	<p>O₂: < 2.3 % from measured value CO_e: < 9.1 % from measured value</p>
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 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 / 2.86 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 / 1,202 °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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Operating Condition	
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	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 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.

* 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 (572 °F) permissible flue gas temperature on probe head.
The flue gas temperature can be considerably higher since it is reduced by the correctly selected length of the flue gas bypass tube.

Environmental Conditions

Operation	perm. temperature range	on cable gland	< 100 °C / 212 °F
		on connection cable	< 100 °C / 212 °F
Transport	perm. temperature range		-20 ... +70 °C / -4 ... +158 °F
Storage	perm. temperature range		-20 ... +70 °C / -4 ... +158 °F
Degree of protection	according DIN EN 40050		IP65

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)/gas extraction tube (GET) as a function of the flow velocity in the flue gas duct

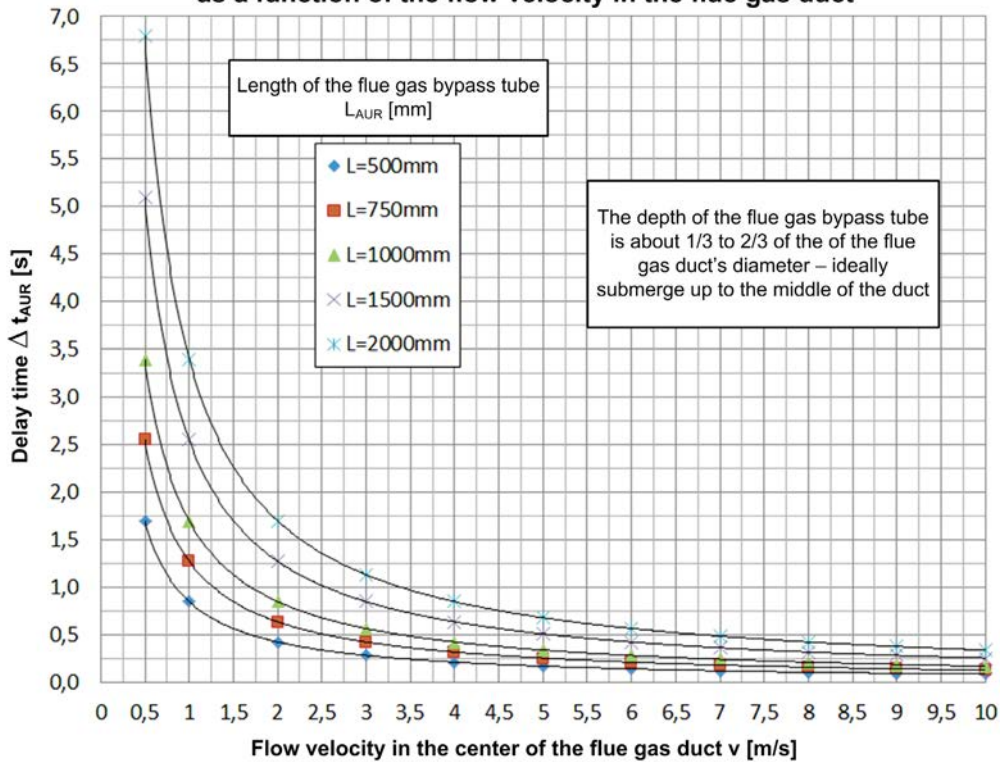


Fig. 7 Flue gas bypass tube delay time as function of the velocity in the exhaust air channel depending on the varying lengths of the flue gas bypass tube

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-HT for simultaneous measurement of oxygen (O₂) and unburnt residue (CO/H₂) in combination with bypass tube for flue gas temperatures up to 1,200 °C / 2,192 °F

Description / Type	Type
Combination Probe KS1D-HT "high temperature", cable length 2 m / 6.6 ft), IP65	656R2015

Additional required:

- Lambda Transmitter LT2, conf. for KS1D in type "Standard" (without purging)
order no. 657R102 / KS1D / S / ...
or
- Lambda Transmitter LT2, conf. for KS1D in type "purge operation"
order no. 657R102 / L KS1D / 3A / ...
or
- Lambda Transmitter LT3, conf. for KS1D
order no. 657R51 / ... / KS1D / ...
or
- Lambda Transmitter LT3 in wall mounting housing (for CO/O₂ control)
order no. 657R50
- Counter flange, order no. 655R0179 / R0180
- Sealing for counter flange, order no. 655P4211
- Bypass tube without / with purge connection for purge operation

or

- Lambda Transmitter LT2, conf. for KS1D in type "Standard" (without purging)
order no. 657R102 / KS1D / S / ...
or
- Lambda Transmitter LT2, conf. for KS1D in type "purge operation"
order no. 657R102 / L KS1D / 3A / ...
or
- Lambda Transmitter LT3, conf. for KS1D
order no. 657R51 / ... / KS1D / ...
or
- Lambda Transmitter LT3 in wall mounting housing (for CO/O₂ control)
order no. 657R50
- Gas extraction tube for HT and Ex applications
- Fitting for installation
- Adapter for probe reception
- maybe Purge unit for purge operation, order no. 657R0934

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Flue Gas Bypass Tubes

Description/Type	Order no.
Flue gas bypass tube, length 500 mm / 19.69" in, stainless steel 1.4571, for measuring gas temperature up to 750 °C / 1,382 °F	656R1014
Flue gas bypass tube with hose connection for purge operation * length 500 mm / 19.69" in, stainless steel 1.4571 for measuring gas temperature up to 750 °C / 1,382 °F	656R1014A
Flue gas bypass tube, length 750 mm / 29.53" in, stainless steel 1.4571, for measuring gas temperature up to 750 °C / 1,382 °F	656R1015
Flue gas bypass tube with hose connection for purge operation * length 750 mm / 29.53" in, stainless steel 1.4571 for measuring gas temperature up to 750 °C / 1,382 °F	656R1015A
Flue gas bypass tube, length 1.000 mm / 39.37" in, stainless steel 1.4571, for measuring gas temperature up to 750 °C / 1,382 °F	656R1016
Flue gas bypass tube with hose connection for purge operation * length 1.000 mm / 39.37" in, stainless steel 1.4571 for measuring gas temperature up to 750 °C / 1,382 °F	656R1016A
Flue gas bypass tube, length 1.500 mm / 59.06" in, stainless steel 1.4571, for measuring gas temperature up to 750 °C / 1,382 °F	656R1080
Flue gas bypass tube with hose connection for purge operation * length 1.500 mm / 59.06" in, stainless steel 1.4571 for measuring gas temperature up to 750 °C / 1,382 °F	656R1080A
Flue gas bypass tube, length 2.000 mm / 78.74" in, stainless steel 1.4571, for measuring gas temperature up to 750 °C / 1,382 °F	656R1081
Flue gas bypass tube with hose connection for purge operation * length 2.000 mm / 78.74" in, stainless steel 1.4571 for measuring gas temperature up to 750 °C / 1,382 °F	656R1081A
Flue gas bypass tube, length 500 mm / 19.69" in, INCONEL 600, for measuring gas temperature up to 950 °C / 1,742 °F	6565R1017
Flue gas bypass tube with hose connection for purge operation * length 500 mm / 19.69" in, INCONEL 600 for measuring gas temperature up to 950 °C / 1,742 °F	656R1017A
Flue gas bypass tube, length 750 mm / 29.53" in, INCONEL 600, for measuring gas temperature up to 950 °C / 1,742 °F	656R1018
Flue gas bypass tube with hose connection for purge operation * length 750 mm / 29.53" in, INCONEL 600 for measuring gas temperature up to 950 °C / 1,742 °F	656R1018A
Flue gas bypass tube, length 1.000 mm / 39.37" in, INCONEL 600, for measuring gas temperature up to 950 °C / 1,742 °F	656R1019
Flue gas bypass tube with hose connection for purge operation * length 1.000 mm / 39.37" in, INCONEL 600 for measuring gas temperature up to 950 °C / 1,742 °F	656R1019A
Flue gas bypass tube, length 1.500 mm / 59.06" in, INCONEL 600, for measuring gas temperature up to 950 °C / 1,742 °F	656R1085
Flue gas bypass tube with hose connection for purge operation * length 1.500 mm / 59.06" in, INCONEL 600 for measuring gas temperature up to 950 °C / 1,742 °F	656R1085A
Flue gas bypass tube, length 2.000 mm / 78.74" in, INCONEL 600, for measuring gas temperature up to 950 °C / 1,742 °F	656R1086
Flue gas bypass tube with hose connection for purge operation * length 2.000 mm / 78.74" in, INCONEL 600 for measuring gas temperature up to 950 °C / 1,742 °F	656R1086A
Flue gas bypass tube, length 500 mm / 19.69" in, KANTHAL, for measuring gas temperature up to 1.200 °C / 2,192 °F **	656R1021
Flue gas bypass tube with hose connection for purge operation * length 500 mm, KANTHAL for measuring gas temperature up to 1.200 °C / 2,192 °F **	656R1021A
Flue gas bypass tube, length 750 mm / 29.53" in, KANTHAL, for measuring gas temperature up to 1.200 °C / 2,192 °F **	656R1022
Flue gas bypass tube with hose connection for purge operation * length 750 mm / 29.53" in, KANTHAL for measuring gas temperature up to 1.200 °C / 2,192 °F **	656R1022A
Flue gas bypass tube, length 1.000 mm / 39.37" in, KANTHAL, for measuring gas temperature up to 1.200 °C / 2,192 °F **	656R1023
Flue gas bypass tube with hose connection for purge operation * length 1.000 mm / 39.37" in, KANTHAL for measuring gas temperature up to 1.200 °C / 2,192 °F **	656R1023A
Flue gas bypass tube, length 1.500 mm / 59.06" in, KANTHAL, for measuring gas temperature up to 1.200 °C / 2,192 °F **	656R1088
Flue gas bypass tube, length 2.000 mm / 78.74" in, KANTHAL, for measuring gas temperature up to 1.200 °C / 2,192 °F **	656R1089

* Combined dedusting/purging air unit must be ordered separately order no. 657R0934

** Extended delivery time

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Counter flanges

Description / Type	Type
Counter flange, 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
Counter flange, inside tube diameter 80 mm / 3.15" in, special length up to 500 mm / 19.69" in, material: steel, EPD black, int. hole diameter in acc. to DN65 PN6	655R0179/S
Counter flange, 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
Counter flange, 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 counter flange DN65 PN6, 3 mm / 0.118" in, material: graphite	655P4211
Counter flange with tube 50x2mm / 1.9"x0.079" in, length 20 mm / 0.79" in, material: stainless steel 1.4404	655R1450

Gas Extraction Device (GED)

Description / Type	Order no.
Gas Extraction Device for HT-/FT- and NO _x applications up to 550 °C /1,022 °F, material stainless steel 1.4571/1.4404, L 200 mm / 7.87" in	655R1420
Gas Extraction Device for HT-/FT- and NO _x applications up to 550 °C /1,022 °F, material stainless steel 1.4571/1.4404, L350 mm / 13.78" in	655R1421
Gas Extraction Device for HT-/FT- and NO _x applications up to 550 °C /1,022 °F, material stainless steel 1.4571/1.4404, L 500 mm / 19.69 " in	655R1422
Gas Extraction Device for HT-/FT- and NO _x applications up to 550 °C /1,022 °F, material stainless steel 1.4571/1.4404, L 1.000 mm / 39.37" in	655R1423

The information in this publication is subject to technical changes.



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