

Technical Data Lambda Probe LS2-HT



Fig. 1 Lambda Probe LS2-HT with gas extraction device GED FLEX



Fig. 2 Lambda Probe LS2-HT with gas extraction device GED FLEX with T adapter

Application:

- Flue gas temperatures: depending on material up to 1.400 °C / 2,552 °F at the GED FLEX
450 °C / 842 °F at probe head for LT2/LT3
300 °C / 572 °F at probe head for LT3-F
- Flow velocities: 0,1 ... 30 m/s / 0.33 ... 98.43 ft/s
- Dust exposure: $\leq 1.000 \text{ mg/m}^3$

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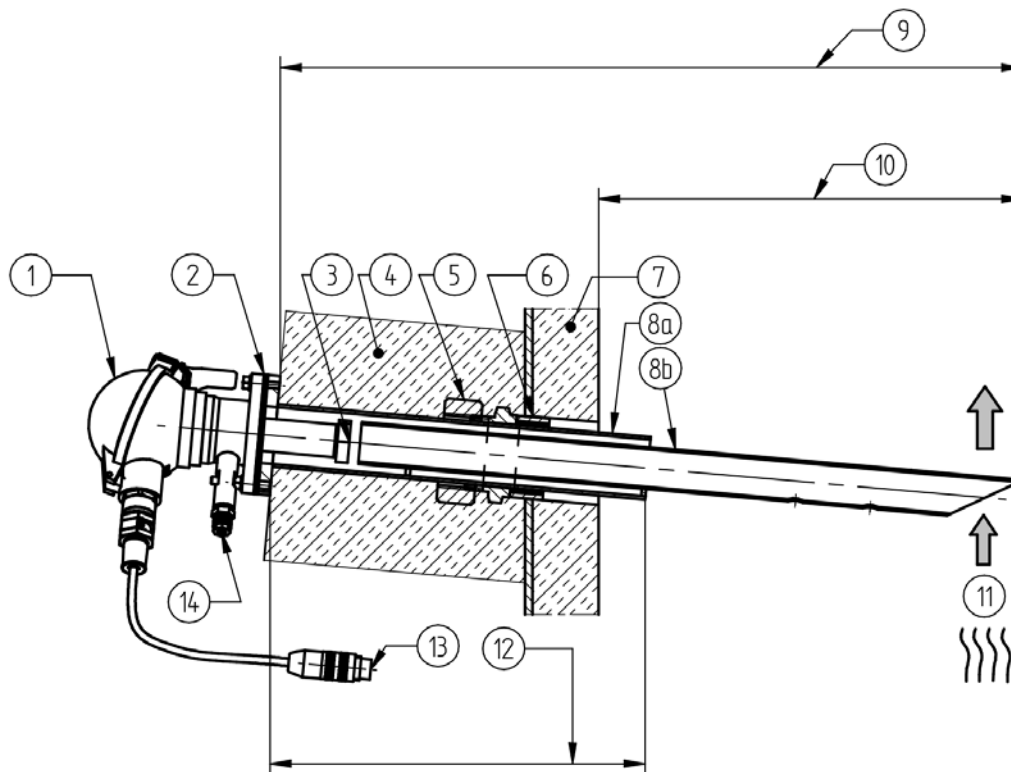


Fig. 3 GED FLEX made of Inconel or stainless steel without adapter

- | | |
|---|---|
| 1 HT probe | 8a GED FLEX outer tube |
| 2 Graphite sealing type 656P0263 | 8b GED FLEX inner tube |
| 3 Maximum measuring gas temperature at probe head
300 °C / 572 °F in connection with LT3-F
450 °C / 842 °F in connection with LT2/LT3 and NT1 | 9 Length GED FLEX |
| 4 Insulation GED FLEX (depending on the measuring gas temperature) | 10 Immersion depth GED FLEX |
| 5 Screw-in connection | 11 Flow direction measuring gas |
| 6 Half sleeve | 12 Variable range immersion depth |
| 7 Boiler wall (in this case with inner insulation) | 13 Connecting cable, length 2 m / 6.6 ft |
| | 14 Hose connection 4/6 mm / 0.16/0.24 "in for calibrating gas |

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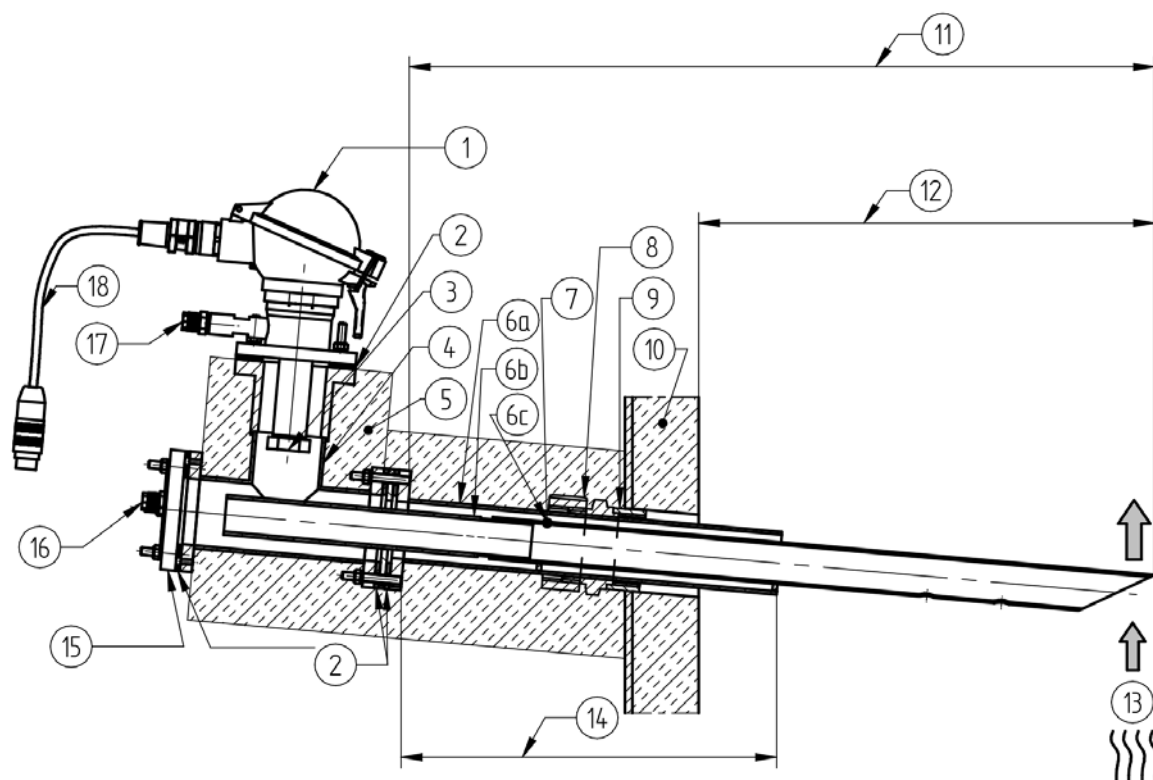


Fig. 4 GED FLEX made of Inconel or stainless steel with T-adapter

- | | |
|---|---|
| 1 HT probe | 10 Boiler wall (in this case with inner insulation) |
| 2 Graphite sealing type 656P0263 | 11 Length GED FLEX |
| 3 Maximum measuring gas temperature at probe head:
300 °C / 572 °F in connection with LT3-F
450 °C / 842 °F in connection with LT2/LT3 and NT1 | 12 Immersion depth GED FLEX |
| 4 T-adapter for the probe holder type 655R1565 ... 68 | 13 Flow direction measuring gas |
| 5 Insulation T-Adapter type 655R1569
(option, depending on the measuring gas temperature) | 14 Variable range immersion depth |
| 6a GED FLEX outer tube | 15 Sealing flange/cleaning flange with pneumatic connections |
| 6b GED FLEX extension inner tube (655R1574/
655R1575) | – For T-adapter type 655R1565:
blind flange |
| 6c GED FLEX inner tube | – For T-adapter type 655R1566:
cleaning flange with pneumatic connections (2x 12/10 mm / (0.47/0.39" in) |
| 7 Insulation GED FLEX, on site (depending on the measuring gas temperature) | – For T-adapter type 655R1567:
Ejector flange with pneumatic connection (6/4mm / 0.16/0.24" in) |
| 8 Screw-in connection | – For T-adapter type 655R1568:
Flange with all pneumatic connections |
| 9 Half sleeve | 16 Pneumatic connection |
| | 17 Hose connection 4/6 mm / 0.16/0.24" in for calibrating gas |
| | 18 Connecting cable, length 2 m / 6.6 ft |

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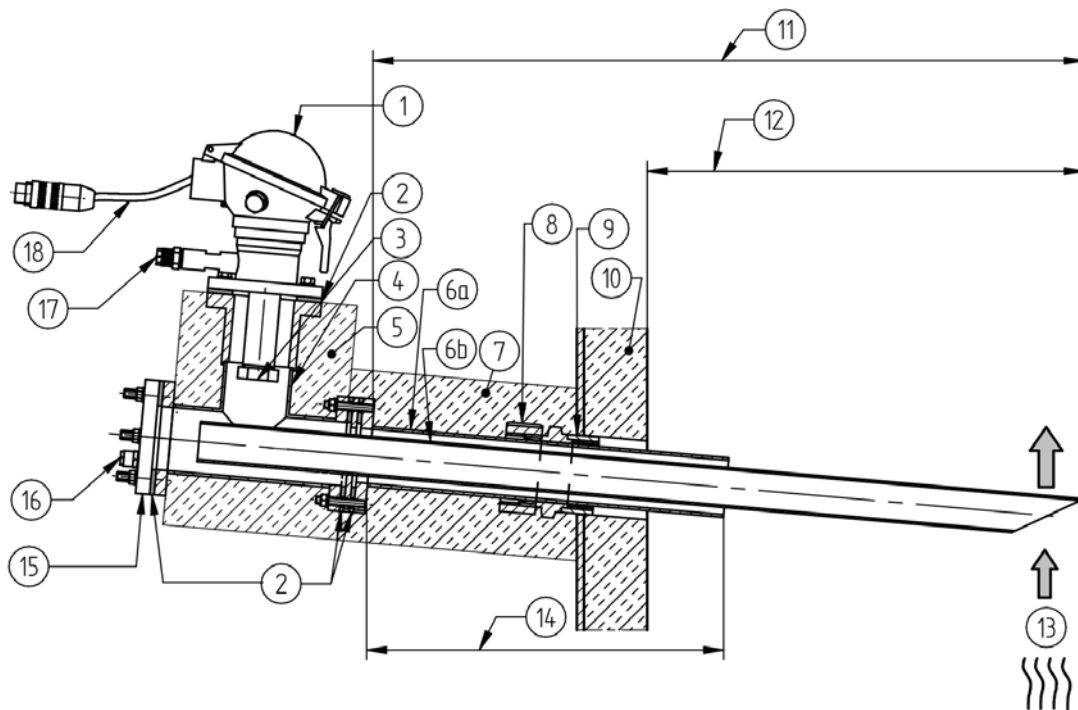


Fig. 5 GED FLEX made of Kanthal or AL203 with T-adapter

- | | |
|---|---|
| <p>1 HT probe</p> <p>2 Graphite seal type 656P0263</p> <p>3 Max. measuring gas temperature on probe head:
300 °C / 572°F in combination with LT3-F
450 °C / 842 °F in combination with LT2/LT3</p> <p>4 T-adapter for probe mount
for Injector Acceleration type 655R1565 ...68</p> <p>5 Insulation of T-adapter type 655R1569
(optional, depending on the measuring gas temperature)</p> <p>6a GED FLEX outer tube</p> <p>6b GED FLEX inner tube</p> <p>7 Insulation of GED FLEX, provided by customer
(depending on the measuring gas temperature)</p> <p>8 Male coupling</p> <p>9 Half collar</p> <p>10 Boiler wall (in this case with inner insulation)</p> <p>11 Length GED FLEX</p> | <p>12 Immersion depth of GED FLEX</p> <p>13 Flow direction of measuring gas</p> <p>14 Variable range of immersion depth</p> <p>15 Sealing flange/cleaning flange with pneumatic connections</p> <p>End flange</p> <ul style="list-style-type: none"> – For T-adapter type 655R1565: blind flange – For T-adapter type 655R1566:
cleaning flange with pneumatic connections (2x 12/10 mm / 0.47/0.39" in) – For T-adapter type 655R1567:
Ejector flange with pneumatic connection (6/4 mm / (0.16/0.24" in) – For T-adapter type 655R1568:
Flange with all pneumatic connections <p>16 Pneumatic connection</p> <p>17 Hose connection 4/6 mm (0.16/0.24" in) for calibration gas</p> <p>18 Connection cable</p> |
|---|---|

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Fig. 6 GED BASE type 655R1420 ... 1422

Application:

- Flue gas temperatures: 550 °C / 1,022 °F at GED BASE
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 ... 32.81 ft/s.
- Dust exposure: $\leq 200 \text{ mg/Nm}^3$

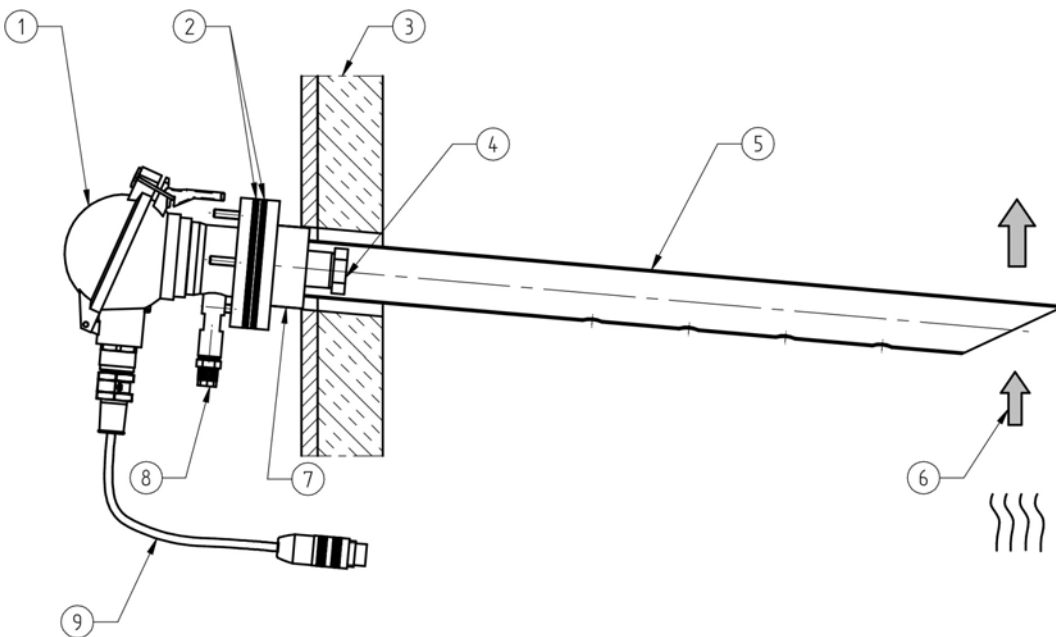
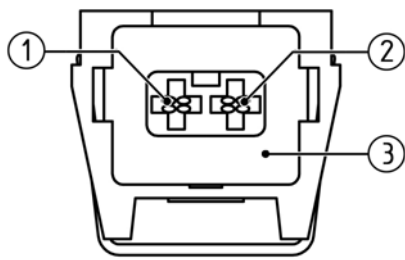


Fig. 7 Dimension drawing HT probe with gas extraction device (GED BASE)

- 1 HT probe
- 2 Graphite sealings type 656P0263
- 3 Boiler wall (in this case with inner insulation)
- 4 Probe head, maximum measuring gas temperature:
450 °C / 842 °F in connection with LT2/LT3
300 °C / 572 °F in connection with LT3-F
- 5 GED BASE type 655R1420 ... 1422
- 6 Flow direction measuring gas
- 7 Counter flange 655R1450
- 8 Hose connection 4/6 mm / 0.16/0.24" in for calibrating gas
- 9 Connecting cable, length 2 m / 6.6 ft

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- 1 = (+) Probe signal (black) (PCB/LT2 term. 34)
- 2 = (-) Probe signal (grey) (PCB/LT2 term. 33)
- 3 = Socket sensor signal
- 4 = Probe heater (white) (PCB/LT2 term. 35)
- 5 = Plug probe heater
- 6 = Probe heater (white) (PCB/LT2 term. 36)

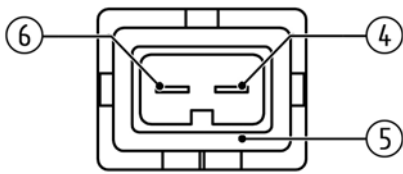


Fig. 8 Terminal assignment probe connection plug

Technical data*	
Measuring range	0 ... 21 Vol. % O ₂
Measuring precision	±5 % of measured value – not better than ± 0.3 Vol. %
Sensor signal	- 30 ... + 150 mV
Response time	t ₆₀ : < 3 s t ₉₀ : < 9 s
Relaxation time (measurement readiness after over- load)	t ₉₀ : < 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 _{O₂} 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 ₂ (15 Vol. %) < 0,1 Vol. % to CO (874 ppm) < 0,1 Vol. % to CH ₄ (76 ppm) < 0,1 Vol. % to SO ₂ (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.

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Technical data*	
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 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 P _H 20 VA	approx. 1.6 A approx. 5 A short term during heating PTC characteristic
Insulation resistance	< 30 M Ω (between heating and probe connection)
Lifetime	> 3 years (in case of light fuel oil and natural gas)
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 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

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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	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)
Ideal measuring gas speed	<p>without GED: $1 < X < 6 \text{ m/s} / 19.69 \text{ ft/s}$ with GED BASE: $1 \text{ m/s} < X < 10 \text{ m/s}$ $3.28 \text{ ft/s} < X < 32.81 \text{ ft/s}$ with GED FLEX: $0,1 < X$ depending on version</p> <p>(Higher measurement speed increases the measurement error. Flow protection systems can be used. 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.)</p> <p>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.</p>

Environmental Conditions

Probe head	permissible flue gas temperature	< 450 °C / 842 °F ***
Operation	permissible temperature	< 100 °C / 212 °F on cable gland < 100 °C / 212 °F on connection cable
Transport	permissible temperature	-40 ... +90 °C / -40 ... +194 °F
Storage	permissible temperature	-20 ... +70 °C // -4 ... +158 °F
Degree of protection	according DIN EN 40050	IP65

* 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.

Technical Data Lambda Probe LS2-HT

Order Information

**Lambda Probe LS2-HT for measurement of oxygen (O₂),
for flue gas temperatures up to 1.400 °C / 2,552 °F in combination with GED FLEX or GED BASE**

Description / Type	Type
Lambda Probe LS2-HT, cable length 2 m / 6.56 ft, IP65, gasket for connecting head, Novaphit SSTC	650R1515
Lambda Probe LS2-HT, cable length 5 m / 16.40 ft, IP65, gasket for connecting head, Novaphit SSTC	650R1516

Additional required:

- For measurements without purge operation, without fully automatic calibration
 - Lambda Transmitter LT3, conf. for LS2, order no. 657R51 / ... / LS2 / ...
 - Gas extraction device GED BASE or GED FLEX

- For measurements without purge operation (cyclic triggering)
 - Lambda Transmitter LT2, configured for LS2 in application "purge operation"
Order no. 657R102 / LS2 / 3A / ...
 - Gas extraction device GED FLEX, T-adapter for purge operation
 - Dedusting / purge unit, IP65, for T-adapter GED FLEX order no. 657R0934

- For measurements without purge operation (manual triggering)
 - Lambda Transmitter LT3, configured for LS2, order no. 657R51 / ... / LS2 / ...
 - Gas extraction device GED FLEX, T-adapter for purge operation
 - Dedusting / purge unit, IP65, for T-adapter GED FLEX order no. 657R0934

- For measurements with fully automatic calibration
 - Lambda Transmitter LT2, configured for LS2 in application "fully automatic calibration"
Order no. 657R102 / LS2 / V / ...
 - Gas extraction device GED BASE or GED FLEX
 - Dedusting / purge unit, IP65, for T-adapter GED FLEX order no. 657R0934
 - Fully automatic calibration system, order no. 657R0940

- For measurements without purge operation (cyclic triggering) and fully automatic calibration
 - Lambda Transmitter LT2, configured for LS2 in application "fully automatic calibration and purging"
Order no. 657R102 / LS2 / VA / ...
 - Gas extraction device GED FLEX, T-adapter for purge operation
 - Dedusting / purge unit, IP65, for T-adapter GED FLEX order no. 657R0934
 - Fully automatic calibration system, order no. 657R0940

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Accessories

Application up to 750 °C / 1382 °F, inner tube material 1.4571, outer tube material 1.4571

Designation / Type	Order no.
GED FLEX for HT/EX applications up to 750 °C / 1382 °F, stainless steel 1.4571 material, L 500 mm / 19.69 "in	655R1520
GED FLEX for HT/EX applications up to 750 °C / 1382 °F, stainless steel 1.4571 material, L 1000 mm / 39.37 "in	655R1521
GED FLEX for HT/EX applications up to 750 °C / 1382 °F, 1.4571 stainless steel material, L 1500 mm / 59.06 "in	655R1522
GED FLEX for HT/EX applications up to 750 °C / 1382 °F, 1.4571 stainless steel material, L 2000 mm / 78.74 "n	655R1523

Application up to 950 °C / 1742 °F, inner tube material INCONEL, outer tube material INCONEL

Designation / Type	Order no.
Measuring flue gas extraction tube flue gas extraction tube for HT/EX applications up to 950 °C / 1742 °F, INCONEL material, L 500 mm / 19.69 "in	655R1530
GED FLEX for HT/EX applications up to 950 °C / 1742 °F, INCONEL material, L 1000 mm / 39.37 "in	655R1531
GED FLEX for HT/EX applications up to 950 °C / 1742 °F, INCONEL material, L 1500 mm / 59.06 "in	655R1532
GED FLEX for HT/EX applications up to 950 °C / 1742 °F, INCONEL material, L 2000 mm / 78.74" in	655R1533

Application up to 1200 °C / 2192 °F, inner tube material KANTHAL, outer tube material INCONEL

Designation / Type	Order no.
GED FLEX for HT/EX applications up to 1200 °C / 2192 °F, KANTHAL material, L 500 mm / 19.69 "in	655R1540
GED FLEX for HT/EX applications up to 1200 °C / 2192 °F, KANTHAL material, L 1000 mm / 39.37 "in	655R1541
GED FLEX for HT/EX applications up to 1200 °C / 2192 °F, KANTHAL material, L 1500 mm / 59.06 "in	655R1542
GED FLEX for HT/EX applications up to 1200 °C / 2192 °F, KANTHAL material, L 2000 mm / 78.74" in	655R1543

Application up to 1400°C / 2552 °F, inner tube material Al₂O₃, outer tube material INCONEL

Designation / Type	Order no.
GED FLEX for HT/EX applications up to 1400 °C / 2552 °F, aluminium oxide material Al ₂ O ₃ , L 500 mm / 19.69 "in	655R1550
GED FLEXGED FLEX for HT/EX applications up to 1400 °C / 2552 °F, aluminium oxide material Al ₂ O ₃ , L 1000 mm / 39.37 "in	655R1551
GED FLEX for HT/EX applications up to 1400 °C / 2552 °F, aluminium oxide material Al ₂ O ₃ , L 1500 mm / 59.06 "in	655R1552

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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

Gas Extraction Device (GED BASE)

Description / Type	Order no.
Gas Extraction Device GED BASE for HT- 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 GED BASE for HT- and NO _x applications up to 550 °C / 1,022 °F, material stainless steel 1.4571/1.4404, L 350 mm / 13.78 "in	655R1421
Gas Extraction Device GED BASE for HT- 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

Counter flange

Description / Type	Order no.
Counter flange	655R1450

The information in this publication is subject to technical changes.



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