

Sensors and systems for combustion engineering



## 1 System Overview

The LT1 Lambda Transmitter is a universal, microprocessor based O<sub>2</sub> measuring instrument for the direct measurement of O<sub>2</sub> concentration in exhaust gases from oil and gas combustion facilities in the leaner-than-stoichiometric domain ( $\lambda$ >1), in conjunction with the LS1 Lambda Probe.

For the collection of combustible gas components (CO/H $_2$ ) the Combination Probe KS1 can be connected as an option:

- in combustion exhaust gases
- in industrial waste gases
- in furnace atmospheres
- in process gases

To detect combustibles  $(CO/H_2)$  you may use the Combination Probe KS1 as an option.

#### Advantages:

- · Linear probe signal (direct current [mA]) with fixed physical zero point
- Special calibration gases are not required, automatic calibration with ambient air (21% by vol. O<sub>2</sub>)
- Measuring accuracy better than 0,2% by vol.O $_2$  over the entire measuring range 0...21% by vol. O $_2$
- No gas purification necessary
- No reference gas required
- Settling time <20 s to 90% value (T<sub>90</sub>) with 450 mm gas extraction device
- Gas temperature does not affect measurement accuracy
- No temperature control of the ZrO2 measuring cell is required
- Automatic adjustment of cell temperature to the cell's internal resistance (ageing compensation)
- Measured gas temperature up to 800 °C / 1472 °F with metal extraction up to 1700 °C / 3092° F with ceramic extraction
- Does not constitute an ignition source in the flue gas duct. TÜV certification available.
- Intermittently operated gas pump with determination of the optimum pump running time.
- Simple operation
- Low maintenance



Fig. 1-1 System overview Lambda Transmitter LT1



Fig. 1-2 System overview in-put / output module Lambda Transmitter LT1





Fig. 2-1 Mounting principle of the LT1 with integral measuring gas pump and calibration unit for installation underroof

If the distance between the Lambda Probe LS1 and the Lambda Transmitter LT1 > 10 m, we recommend to provide a probe connection box (PCB) with the measuring gas pump and, if necessary, with the automatic calibration device (option), close to the probe. For open-air installation, a transmitter protection box is also required for weather protection.



Fig. 2-2 Mounting principle of the LT1 / LS1 with external pump and calibration device

## 3 Measuring Principle

#### Measuring principle:

O<sub>2</sub> concentration is continuously measured by the LS1 Lambda Probe.

A small quantity of gas (approx. 0.5 l/h) is drawn directly from the measured gas through a capillary tube.

A 7-wire plugged cable and a Teflon hose connect the LS1 probe to the LT1 Lambda Transmitter.

The probe's signal is analysed in the LT1 Lambda Transmitter, using the latest microprocessor technology.

The following components are available for the output of the measured values and operating conditions.

- a monitoring output 0...2,55 V DC  $\Leftrightarrow$  0...25,5% by vol. O<sub>2</sub>
- up to 4 analogue outputs 0/4...20 mA, 0...10 V
- up to 7 digital outputs

Internal LEDs provide operational information and indicate any system faults identified by the diagnostic functions.

#### The LT1 Lambda Transmitter provides the following functions:

- Automatic testing and calibration of the LS1 probe against the ambient air.
- Automatic ageing compensation of the ZrO<sub>2</sub> cell through determination of the cell's internal resistance and adjustment of the heater output.
- Compensation for the effect of gas composition on gas flow in highly unbalanced measured gases, such as flue gas after wet scrubber or in vapours resulting from fluctuating sound velocity and density, compared with conditions during calibration (air).
- Intermittent measuring gas pump with automatic calculation of optimum pump running time. Optional long-life mode with limited measuring accuracy.
- Optional automatic cold-start delay, 5...120min.
- Integral maintenance switch.
- LAMTEC SYSTEM BUS for direct coupling to the LAMTEC linked burner control systems VMS / FMS / ETAMATIC for O<sub>2</sub> optimization and LT2 KS1 for the detection of combustibles (CO/H<sub>2</sub>) in waste gases shown as CO equivalent (CO<sub>e</sub>)
- RS 422 interface is also available as an alternative to the LAMTEC SYSTEM BUS, for coupling to the customers' systems
- RS 232 interface is additionally available for PC-based remote control in combination with the (optional) remote display software.

## 4 Options

## 4 Options

- Display and operating unit
- Automatic calibration unit for fully automated testing and calibration of the installed LS1 Lambda Probe when the system operates with ambient air; alternatively via an integral pump or pneumatically.
- Test gas actuation (1...4 test gases) for checking the calibration (EPA-Norm)
- Purge device
- Pressure compensation of the measured value; pressure range 800...1200 mbar
- · Temperature compensation of the measured value
- \*Measurement of flue gas and intake air temperature, and calculation of combustion efficiency
- \*Calculation of fuel-referenced CO<sub>2</sub> concentration is derived from the measured O<sub>2</sub> value and the CO<sub>2</sub>-max value
- \*Load-dependent and fuel-specific boundary values / boundary curves
- KS1 combination probe for the detection of combustible components (CO/H<sub>2</sub>)
- Electric heating of the gas extraction device and the sintered metal prefilter
- \*1...4 additional analogue outputs, max. 2 floating (outputs 1 and 2) max. potential difference ±20 V. Range and physical quantity configurable
  - direct current 0/4...20 mA, load 0...600  $\Omega$
  - direct voltage 0...10 V, load > 10  $\Omega$
- \*Galvanic isolation of analogue outputs
- Relay modules for digital outputs with 6 relays (1 change-over-switch) for output of operational, status and boundary value messages, switching capability 230 V AC, 4 A
- \*1...4 analogue inputs via measuring cards, freely configurable, e.g. for actuating temperature sensors, further pressure sensors, standard signals etc. - max. 2 of these floating, potential difference ±20 V max.
- Bus-interface for
  - PROFIBUS DP
  - Modbus
  - CAN-Bus
  - Ethernet
- Remote display software for PC, Windows-based
- Measuring gas pump, 12 V DC, for aggressive measured gases
- Measuring gas extraction by ejector
- Electric casing heating for ambient temperatures below -10°C to -25°C / 50°F to -13°F

not available with OEM version

## 5 Technical Data

Versions	<ul> <li>Wall-mounted housing IP 54</li> <li>Wall-mounted housing IP 65, optional in stainless steel</li> <li>Mounting plate IP00 for control cabinet installation</li> <li>OEM-Version → output of measuring value available only via LAMTEC SYSTEM BUS or alternatively via a serial interface RS 422.</li> <li>19"- version available</li> </ul>		
Accuracy	$\pm 0,2\%$ by vol. $O_2$ after calibration with air to 21% $O_2$ (with Lambda Probe LS1)		
Setting time	<20 s to 90% of the final value (T <sub>90</sub> ) (with Lambda Probe LS1 type 650 R 0001 and 450 mm GED)		
Correction factors			
Error attributable to temperature	1% of the measured value / 10 K housing temperature Lambda Probe LS1, compensation of the temperature (optional)		
Error attributable to pressure	1,3% of the measured value / 10 mbar pressure variation, compensation of the pressure (optional)		
Mean molar mass / gas constants	$\left(\begin{array}{c} 0,10\ \%\\ 0,05\ \%\\ 0,05\ \%\\ 0,00\ \%$		

Fig. 5-1 Correction factors attributable to the dependency of the flow rate

Correction factors attributable to the dependency of flow rate of the measuring gas to the mean flue gas molar mass / gas constants with different fuels and their typical ratio of  $CO_2$  to  $H_2O$  in the flue gas, LS1 calibrated in dry air.

Fuel-specific compensation is included in standard version.

### 5.1 Technical Data Lambda Transmitter LT1

Housing	Wall-mounted Housing sheet-steel housing, powder-coated	<b>Mounting Plate</b> mounting plate, sheet- steel	<b>19"-version</b> 3 HE / 19" panel-mounted housing
Protection Class DIN 40050	IP 54 / IP 65	IP 00	IP 20 IP 40 front-side
Dimensions (xwxh)	400x450x170	455x400x130	133x482x315
Colour	grey RAL 7032		silver metallic (anodised Aluminium), control elements brown
Weight	17,2 kg	8,0 kg	9,4 kg
- Plus Display and Operat- ing Unit	0,5 kg	0,5 kg	-
- Fully Automatic Calibra- tion Unit		1,5 kg	
- Power Pack for GED and filter heating		3 kg	
Ambient Temperature			
- Operation		0°C+60°c	
- Transport and Storage		-40°C+85°C	
Supply Voltage	230V AC and 115 V AC +10% / -15%, 48 Hz62 Hz To be used only in a grounded power line network!		
Power Consumption	150310 VA max. at maximum heating power (without GED- and filter heating)		
- Plus	190 VA max. for GED heating 80 VA max. for filter heating		
Display	LCD - graphical display 100x80mm ( <i>bxh</i> ) with wall-mounted housing LT1 optional with 19" - version standard display- and operating unit type 6 57 R 0830 (type housing installation) display- and operating unit type 6 57 R 0830T (type panel installation LT1 on mounting plate)		
Resolution	0,01%	by vol. O <sub>2</sub> across the whole	e range
Time to Operating State with LS1		12 h, after "POWER ON"	

### Analogue outputs

Monitor output	02,55 V DC, load >10 kΩ, <100 nF		
- Accuracy	2 % of the measured value, not better than 0,2% by vol. $O_2$		
- Resolution	10 mV		
- Factory Settings	02,55 V DC $\triangleq$ 025,5% by vol. O <sub>2</sub> switchable via micro switch to: 01 V DC $\triangleq$ 01000 mA probe current Is 02,55 V DC $\triangleq$ 02550 mV probe voltage Us		
<sup>*</sup> 14 current- / voltage outputs (1 standard, 24 optional)	<ul> <li>direct current 0/420mA, load 0600 Ω</li> <li>direct voltage 010 V, load &gt; 10kΩ</li> <li>non floating (potential isolation optional)</li> </ul>		
- Accuracy	0,05% of the measured va	lue, not better than 0,1% by vol. $O_2$	
- Resolution	0,01% by vol. O <sub>2</sub> measurer	ment range and physical quantity configurable	
- Factory Settings	0 21% by vol. O <sub>2</sub> ≙ 42	20 mA	
Operating controls	multifunction key and maintenance switch		
Indicators	2 LEDs operating mode 2 LEDs RS 422	7 LEDs service 1 LED maintenance	
	display and operating unit v	with graphical LCD display available	
Interfaces	LAMTEC SYSTEM BUS or RS 422 floating, RS 232 only in combination with remote display software type 657 R 1101		
*Digital outputs	1 relay output 6 open-collector freely configurable	042 V DC 3 A / 0230 V AC 2A +24 V DC, switching current 25 mA max. process status and fault messages, limit values	
- Factory settings	relay output open-collector outputs	accumulated fault messages quiescent current principle warning calibration maintenance	
Measuring gas pump	intermittent operation with a	automatic determination of pump running time	
Calibration	automatic calibration with ambient air and probe ageing compensation		
Cold start delay	adaptive and automatic cold start delay, 5 - 120 min.		
TÜV-test for emission metres to the 13th and 17th BImSchV	352/118/96/689724		
Conformity with the fol- lowing European Direc- tives	2004 / 108 / EEC EMC Dire 2006 / 95 / EEC Low Voltag	ective ge Directive (LVD)	
* not available with OFM-versid	าก		

## 5 Technical Data

## 5.2 Technical Data Lambda Probe LS1

### Extract of the TÜV Qualification Test

TÜV-Qualification Test in accordance with the 13th and 17th BImSchV	502/0118/96/6897	724/01
Tested measuring range	021% by vol. O	2
Availability	99,5%	
Maintenance rate	4 weeks	
Detection limit	0,002% by vol. O	2
Effect on the vapour content	-0,20% by vol. O <sub>2</sub>	$_2$ (-0,95% of the measuring range limit value)
Influence of the line voltage	no influence	
Ambient temperature	-20°C up to +50°0	C / -4°F up to 122°F
Effect on the temperature variations	zero point reference point	$\leq~0,02\%$ by vol. $O_2$ $\leq~0,02\%$ by vol. $O_2$
Response time t <sub>90</sub>	20 sec.	
Effect on the variations of the maintenance period	zero point sensitivity	< ± 0,02% by vol. O <sub>2</sub> < 0,10% by vol. O <sub>2</sub>
Repeatability	330	
Linearity at measuring range of 021% by vol. O <sub>2</sub>	< 0,10% by vol. (	D <sub>2</sub>

## 6 Connection Diagrams

### LT 1 Lambda Transmitter



- (2) Other levels/signal inputs possible, depending on measuring card. Max. 2 hereof floating potential; max. possible potential difference  $\pm 20$  V
- (3) Max. 2 hereof floating potential; max. possible potential difference  $\pm$  20 V

Fig. 6-1 Connecting diagram Lambda Transmitter LT1





Fig. 6-3 Connecting diagram digital outputs



Interface Module:

- RS232 only in combination with Remote-Display-Software
- RS422 / 485 at terminals

Fig. 6-4 25-pin plug for interface module

<sup>(1)</sup> not available with OEM-version



#### Lambda Probe LS1 in connection with LT1 instead of LR1



#### Analogue Inputs Terminals 11 to 26 – Connection variable

Ó 41





Fig. 6-6 Connecting diagram LT1 in conjunction with a probe connection box (PCB)

# 7 Dimensions

### Type 657 R 0020...0029

Wall-mounting housing IP 54 with display and operating unit (optional)

Installation under protecting shed Ambient temperature 0 °C bis +60 °C



### Type 657 R 0045 / R 0046

With option 657 R 0049 19"-panel-mounted housing With display and operating unit

Installation frame (h x w): 172mm x 482mm Panel cutout (h x w): 140mm x 450mm

depth: 320mm

482 AMBDA TRANSMITTER L  $\bigotimes$  $\oplus$ + 57.1 132.5 (3HE) 172 ENTER 66 (13TE) 426 (84TE) 464 4 188 (37TE) 172 (34TE) 140 panel cut-out

**Type 657 R0024, R 0027...R 0029** LT1 on mounting plate



### Type 657 R 0830T

Display and operating unit for installation in the door of a control cabinet

## 8 Ordering Information

## 8.1 Ordering Information

LT1 - Wall mounted housing IP54 / IP65 without display and operating unit - without probe		
Product / Type	Order no.	
Lambda Transmitter LT1 OEM-version, with one analogue output PCB and fault relay (relay 1),with integral measuring gas pump, grey RAL 7032 IP 54	6 57 R 0022	
Lambda Transmitter LT1 OEM-version with one analogue output PCB and fault relay (relay 1), for exter- nal measuring gas pump, grey RAL 7032, IP 54	6 57 R 0023	
Lambda Transmitter LT1, grey RAL 7032, IP 54 with internal measuring gas pump	6 557 R 0025	
Lambda Transmitter LT1, grey RAL 7032, IP 65, probe connection via terminal bar, with internal meas- uring gas pump	6 57 R 0025IP65	
Lambda Transmitter LT1, for external measuring gas pump, gray RAL 7032, IP 65	6 57 R 0026	
LT 1 - Mounting plate IP00 without display and operating unit - without probe		

Product / type	Order no.
Lambda Transmitter LT1 OEM-version, with an analogue output recorder and a fault relay (relay 1), on mounting plate for assembly in control cabinet, with internal measuring gas pump	6 57 R 0024
Lambda Transmitter LT1 OEM-version, with an analogue output recorder and a fault relay (relay 1), on mounting plate for assembly in control cabinet, for external measuring gas pump	6 57 R 0027
Lambda Transmitter LT1, on mounting plate for assembly in control cabinet, for external measuring gas pump	6 557R 0028
Lambda Transmitter LT1, on mounting plate for assembly in control cabinet, with internal measuring gas pump	6 57 R 0029

### LT 1 - 19" with display and operating unit - without probe

Product / type	Order no.
Lambda Transmitter LT1 - 19", with internal measuring gas pump	6 57 R 0045
Lambda Transmitter LT1 - 19" with external measuring gas pump	6 57 R 0046

### **Display- and Operating Unit**

Product / type	Order no.
Display and operating unit mounted in LT1	6 57 R 0830
Display and operating in panel installation case 3HE/50TE (cable length 1,5 m)	6 57 R 0030T
O <sub>2</sub> -remote display 025,5% by vol., 96x48x135 mm ( <i>lxwxh</i> ), 230 V AC	6 57 R 1830
O <sub>2</sub> -teleindication 025,5% by vol., 96x48x135 mm ( <i>lxwxh</i> ), 24 V AC	6 57 R 1831
Remote-Display-Software incl. interface module type 663 P 0600	6 57 R 1101
Interface module RS422 instead of RS232	6 63 R 9002
Interface module RS 422/485 on terminals	6 63 R 0503
Serial connecting cable, 9-pole, Sub-D, female-female, length=10 m	6 63 R 0100
Extension for serial connecting cable, 9-pole, Sub-D, female-male, length=10 m (extend up to 40m max) for connecting a PC in combination with the Remote-Display-Software	6 63 R 0101
USB conversion to RS232 serial adapter for WIN2000/XP	6 63 R 9003

### **Fully Automatic Calibration**

Order no.
6 57 R 0800
6 57 R 0801
6 57 R 0809
6 57 R 0810
6 57 R 0811

Only available in combination with fully automatic calibration unit type 6 57 R 0800 / 0801 or PCB with calibration device type 657 R 0010 / 0013 / 0015 / 0016

#### **Gas Extraction Device (GED)**

Product / Type	Order no.
GED with extraction filter, length: 50 mm	6 55 R 0090
GED with extraction filter, length: 80 mm	6 55 R 0151
GED with extraction filter, length: 250 mm	6 55 R 0120
GED with extraction filter, length: 250 mm (strengthened)	6 55 R 0121
GED with extraction filter, length:350 mm	6 55 R 0026
GED with extraction filter, length: 450 mm	6 55 R 0022
GED with extraction filter, length: 600 mm	6 55 R 0149
GED with extraction filter, length: 800 mm	6 55 R 0030
GED with extraction filter, length: 1.000 mm	6 55 R 0027
GED with extraction filter, length: 1.200 mm	6 55 R 0122
GED with extraction filter, length: 1.400 mm	6 55 R 0123
GED with extraction filter, length: 1.600 mm	6 55 R 0148
GED with extraction filter, length: 1.800 mm	6 55 R 0124
GED with extraction filter, special length	6 55 R 0023
GED without extraction filter, length: 50 mm	6 55 R 0052
GED without extraction filter, length: 80 mm	6 55 R 0150
GED without extraction filter, length: 350 mm	6 55 R 0048
GED without extraction filter, length: 450 mm	6 55 R 0049
GED without extraction filter, length:1.000 mm	6 55 R 0112
GED without extraction filter, length: special length	6 55 R 0050
Extraction Filter, material:1.4762	6 55 R 0031
Ceramic gas extraction device, length: 450 mm	6 55 R 0025
Ceramic gas extraction device, length: 1.000 mm	6 55 R 0024
Ceramic gas extraction device, special length up to 1.000 mm	6 55 R 0029
Ceramic gas extraction device with wadding, length: 450 mm	6 55 R 0206
Ceramic gas extraction device with wadding, length 1.000mm lang	6 55 R 0205
Ceramic gas extraction device with wadding, special length up to 1.000 mm	6 55 R 0207

### Extension for Probe Connecting Cable

Product / Type	Order no.
Extension for the probe connecting cable, length: 2 m, shielded	6 55 R 0010
Extension for the probe connecting cable, length: 5 m lang, shielded	6 55 R 0011
Extension for the probe connecting cable, length: 10 m lang, schielded	6 55 R 0012
Extension for the probe connecting cable, with one-sided core cable ends, length: 2 m, shielded $^{\star}$	6 55 R 0043
Extension for the probe connecting cable, with one-sided core cable ends, length: 5 m, shielded $^{\star}$	6 55 R 0044
Extension for the probe connecting cable, with one-sided core cable ends, length:10 m, shielded $*$	6 55 R 0045

for the connection to LT1 1 - type 6 57 R 0025IP65 and 6 57 R 0045

### **Probe Installation Fitting (PIF)**

Product / Type	Order no.
PIF gas-tight recessed version, with test gas unit, material: stainless steel 1.4571 (V4A), without GED-protection tube	6 55 R 0083
PIF gas-tight recessed version, with test gas unit, material: steel zinc galvanised, without GED-protection tube	6 55 R 1183
PIF gas-tight with test gas unit, material: stainless steel 1.4571 (V4A), without GED-protection tube	6 55 R 0037
PIF gas-tight with test gas unit, material: steel zinc galvanised, without GED-protection tube	6 55 R 1137
GED-protection tube, material: stainless steel 1.4571 (V4A) with sintered metal prefilter up to 700 $^\circ\text{C},$ GED-length 350 mm	6 55 R 0597
GED-protection tube, material: stainless steel 1.4571 (V4A) with sintered metal prefilter up to 700 $^\circ\text{C},$ GED-length 340 mm	6 55 R 0624
GED-protection tube, material: stainless steel 1.4571 (V4A) with sintered metal prefilter up to 700 °C, GED-length 1.000 mm	6 55 R 0620
GED-protection tube, material: stainless steel 1.4571 (V4A) with sintered metal prefilter up to 700 $^\circ\text{C},$ GED-length 1.400 mm	6 55 R 0622
GED-protection tube, material: stainless steel 1.4571 (V4A) with sintered metal prefilter up to 700 $^\circ\text{C},$ GED-length 1.800 mm	6 55 R 0623
GED-protection tube with CU core and sintered metal prefilter 20 $\mu m$ up to700 °C, GED-length 350 mm	6 55 R 0596
GED-protection tube with CU core and sintered metal prefilter 20 $\mu m$ up to700 °C, GED-length 450 mm	6 55 R 0606
GED-protection tube with CU core and sintered metal prefilter 20 $\mu m$ up to700 °C, GED-length 1.000 mm	6 55 R 0608
GED-protection tube with CU core and sintered metal prefilter 20 $\mu m$ up to700 °C, GED-length 1.400 mm	6 55 R 0610
GED-protection tube with CU core and sintered metal prefilter 20 $\mu m$ up to700 °C, GED-length 1.800 mm	6 55 R 0611
GED-protection tube with CU core and sintered metal prefilter 20 $\mu m$ up to700 °C, GED-length 1.800 mm	6 55 R 0612
GED-protection tube, material: Inconell 600 for flue gas temperatures up to 950 °C, with sintered metal prefilter, GED-length 450 mm	6 55 R 0654
GED-protection tube, material: Inconell 600 for flue gas temperatures up to 950 °C, with sintered metal prefilter, GED-length 1.000 mm	6 55 R 0650

## 8 Ordering Information

GED-protection tube, material: Inconell 600 for flue gas temperatures up to 950 °C, with sintered metal prefilter, GED-length 1.400 mm	6 55 R 0655
GED-protection tube, material: Inconell 600 for flue gas temperatures up to 950 °C, with sintered metal prefilter, GED-length1.800 mm	6 55 R 0656
GED-protection tube, material: Inconell 600 for flue gas temperatures up to 950 °C, with sintered metal prefilter, GED special length <1.000 mm	6 55 R 0652
GED-protection tube, material: Inconell 600 for flue gas temperatures up to 950 °C, with sintered metal prefilter, GED special length >1.000 mm	6 55 R 0653
MEV-support-bracket, material: stainless steel 1.4571 (V4A)	6 55 R 0614
Concerning production to the with filter up to 1,400 °C, for CED length 450 mm	0.55 D 0400
Ceramic-protection tube with filter up to 1.400 °C, for GED-length 450 mm	6 55 R 0102
Ceramic-protection tube with filter up to 1.400°C, for GED-length 1.000 mm	0 55 R 0105
Metal-ceramic-protection tube with filter up to 1.400 °C, for GED-length < 800 mm	6 55 R 0139
	0 55 R 0129
Kanthal-protection tube, material Kanthal APM up to 1 200 °C, CED length 1 000 mm	6 55 R 0642
ISC-protection tube, material silicon carbide (Halsic-I) up to $1.400 ^{\circ}\text{C} \propto 60 \text{mm}$	6 55 R 0641
GED-length 450 mm	0 33 10 004 1
ISC-protection tube, material: silicon carbide (Halsic-I), up to 1.400 °C, $\varnothing$ 60 mm, GED-length 1.000 mm	6 55 R 0619
Intermediate flange DN 100 PN 16, for ISC-protection tube or Al <sub>2</sub> O <sub>3</sub> , with stud bolts on both sides,material: steel, zinc galvanized	6 55 R 0617
Intermediate flange DN 100 PN 16, for ISC-protection tube or Al <sub>2</sub> O <sub>3</sub> , with through holes, material: steel, zinc galvanized	6 55 R 0616
	0 55 D 0000
PIF (screw-on tube R 1 1/4")	6 55 R 0032
PIF gas-tight (screw-on tuber R 1 1/4"), material: steel zinc galvanised	6 55 R 0041
PIF gas-tight, tiange mounting type, material: steel zinc galvanised	6 55 R 0042
	0 55 D 0050
Outside insulation 230 mm for SEA 655 R 0037 and LST 650 R 0031	6 55 R 0056
Outside insulation 330 mm for PIF 655 R 0037 and LS1 650 R 0031	6 55 R 0057
Outside insulation 200 mm for PIF 655 R 0039/0042 and LS1 650 R 0031	6 55 R 0058
Outside insulation for PIF 650 R 0083/1183 and LS 1 650 R 0031/0034	6 57 P 0100
Outside insulation 230 mm for PIF 655 R 0032/0041 and LS1 650 R 0001/0004	6 55 R 0154
Sintered metal prefilter for PIF (655 R 0037 / 0083 / 1183) 2 µm instead of 20 µm	6 55 R 1209
Sintered metal prefilter for PIF (655 R 0037 / 0083 / 1183) 10 µm instead 20 µm	6 55 R 1211
Sintered metal prefilter for PIF (655 R 0037 / 0083 / 1183) 40 µm instead 20 µm	6 55 R 1210
Sintered metal prefilter for PIF filter heating 2 µm instead 20 µm	6 55 R 1215
Sintered metal prefilter for PIF filter heating 10 µm instead 20 µm	6 55 R 1214
Sintered metal pretilter for PIF filter heating 40 µm instead 20 µm	6 55 R 1216
Iransmitter protection box, material: GFK, for outdoor mounting with electric heating	6 55 R 0087
Basket shield with insulation and handle for Lambda Probe LS1	6 55 R 0055
Basket shield with insulation and screw-on-side bar for Lambda Probe LS1	6 55 R 0155

## 8 Ordering Information

Counter flange for PIF 655 0083 / 1183, with bracket for transmitter protection box,material: stainless steel 1.4571 (V4A), $\varnothing$ 140 mm	6 55 R 0187
Counter flange for PIF 655 R 0083/1183, with bracket for transmitter protection box material: Steel, KTL- coated black	6 55 R 0190
Counter flange for PIF 655 R 0037, with bracket for transmitter protection box material: Steel, KTL-coated black, $\varnothing$ 65 mm	6 55 R 0196
Counter flange for PIF 655 R 0037 with bracket for transmitter protection box material: stainless steel 1.4571 (V4A)	6 55 R 0197
Counter flange DN 65 PN 6, material: stainless steel 1.4571 (V4A)	6 55 R 0137
Counter flange DN 65 PN 6, material: Steel, KTL- coated black	6 55 R 0138
Counter flange for PIF 655 R 0083 / 1183, material: stainless steel 1.4571 (V4A), $\oslash$ 140 mm	6 55 R 0183
Counter flange for PIF 655 R 0083 / 1183, material: Steel, KTL- coated black	6 55 R 0185
Counter flange special length	6 55 R 0xxx/S
Flange seal for counter flange DN 65, 3 mm, graphite	6 55 P 4211
Flange seal for counter flange DN 100, 3 mm, graphite	6 55 P 4213
Flange seal for counter flange DN 100, 3 mm BAS green	6 55 P 4207
Blind flange PIF / LS, 8 drilled holes	6 57 P 0445

## Heating for Gas Extraction Device for Tmax 450°C incl Power Supply Unit

Product / Type	Order no.
Heating for gas extraction decive (GED) incl. power supply unit , GED-length 600 mm, material: stainless steel 1.4571 (V4A)	6 57 R 1151
Heating for gas extraction decive (GED) incl. power supply unit , GED-length 800 mm, material: stainless steel 1.4571 (V4A)	6 57 R 1152
Heating for gas extraction decive (GED) incl. power supply unit , GED-length 1.200 mm, material: stainless steel 1.4571 (V4A)	6 57 R 1153
Heating for gas extraction decive (GED) incl. power supply unit , GED-length 1.600 mm, material: stainless steel 1.4571 (V4A)	6 57 R 1154

## Heating for Gas Extraxtion Device for $T_{max}\,450^\circ\text{C}$ incl. power-supply unit

Product / Type	Order no.
Heating for gas extraction device with filter heating, incl. power-supply unit for MEV-length 600 mm, material: stainless steel 1.4571 (V4A)	6 57 R 1161
Heating for gas extraction device with filter heating, incl. power-supply unit for MEV-length 800 mm, material: stainless steel1.4571 (V4A)	6 57 R 1162
Heating for gas extraction device with filter heating, incl. power-supply unit for MEV-length für MEV- Länge 1.200 mm, material: stainless steell 1.4571 (V4A)	6 57 R 1163
Heating for gas extraction device with filter heating, incl. power-supply unit for MEV-length, 1.600 mm, material: stainless steel 1.4571 (V4A)	6 57 R 1164

## 8.2 Detection of Combustibles (CO/H) - Option

Product / Type	Order no.
Combination Probe KS1 with PTFE-connecting cable (up to 250°C), length: 2 m	6 56 R 0000 T
Combination Probe KS1 with glass-silk insulated connecting cable (up to 400°C), length: 1,5 m	6 56 R 0001 T
Probe connection box for KS1	6 56 R 1025
Lambda Transmitter LT1, in wall-mounting housing 300x400x150, IP54, to connect the Combination Probe KS1 directly, without display and operating unit, analogue output 0/4-20mA or 0/2-10V	6 57 R 1025KS1
Software upgrade for LT1/LT1 for CO-detection with the Combination Probe KS1, incl. remote-connection to one LT (master) with $O_2$ -measurement	6 57 R 0601
Software upgrade for LT1/LT1 for CO-control by the Combination Probe KS1, incl. remote-connection to one LT (master) with O <sub>2</sub> -measurement only in combination with FMS/ETAMATIC)	6 57 R 0602

## 8.3 Options

### Measurement of the flue gas temperature and calculation of the combustion efficiency

Product / Type	Order no.
Measurement of the flue gas temperature and calculation of the combustion efficiency incl. 2 tempera- ture inputs for PT100 temperature sensors	6 57 R 0895
Measurement of the flue gas temperature and calculation of the combustion efficiency incl. 2 temperature inputs for PT100 temperature sensors 150 and 250 mm and 2 analogue outputs 0/420mA	6 57 R 0917
Temperature input for PT100 , e.g. to measure flue gas temperature	6 57 R 0890
Temperature input for PT100, length = 150 mm	6 57 R 0897
Temperature input for PT100, length = 250 mm	6 57 R 0891

#### **CO2-Calculation**

Product / Type	Order no.
Calculation of the CO <sub>2</sub> -concentration	6 57 R 0895

### Limit Values

Product / Type	Order no.
Firing rate and fuel related limit curves / Limit values, incl. analogue input PCB-card type 657 R 0052 and 1 relay-module type 660 R 0017 for LT 1 wall mounting cabinet IP 54 - 657 R00200029 *	6 57 R 0923
Firing rate and fuel related limit curves / Limit values, incl. analogue input PCB-card type 657 R 0052 and 1 relay-module 660 R 0017-LT1 for LT 1 19"-version - 657 R 00450046 *	6 57 R 0924
Relay-module with 6 relays for output of operating status, for mounting in LT 1-19" version	6 57 R 0856/19
Relay-module with 6 relays for output of operating status, for mounting in LT 1 type 657 R 0022/0029	6 57 R 0856

Please specify in order: PO=for potentiometer input / ST=for current input

#### **O2-/CO-Revolution Control**

BUS-Interface PCB for Modbus (RTU)

Product / Type	Order no.	
Integrated PID-O <sub>2</sub> -controller	6 57 R 0120	
Software extension for CO-control / LT in additional connection with ETAMATIC or FMS/VMS	6 57 R 0602	
Software update LT (retrofitting CO-Control) incl. 657 R 0602	6 57 R 1110	
Burner firing rate dependent, and adjustable analogue output for controlling RPM by a frequency converter, incl. RPM-converter-module, without RPM pick up sensor	6 57 R 0123	
Field Bus Interface		
Product / Type	Oreder no.	
BUS-Interface PCB for Profibus DP	6 63 R 0401LT	

6 63 R 0403LT

### **Options and Accessory**

Product / Type	Order no.
Pressure compensation of measured values	6 57 R 0866
Temperature compensation of measured values	6 57 R 0864
Extension cable for temperaturesensor (optional temperature compensation type 657 R 0864), length 10 m (for other lengths, please specify in order)	6 57 R 0405
Analogue output 0/420 mA, 010 V	6 57 R 0050
Additional analogue output 0/420 mA, 010 V, floating, max. potential difference $\pm 20$ V $^{*}$	6 57 R 0051
Galvanic insulation for analogue output 0/420 mA, 010 V	6 57 R 0053
Analogue output 1, floating, max. potential difference ±20 V	6 57 R 0054
Analogue input potentiometer	6 57 R 6000
Analogue input 0/420 mA	6 57 R 6001
Analogue input 0/420 mA with +24 V DC supply for transducer	6 57 R 6002
Analogue input 0/210 V	6 57 R 6005
Diaphragm suction pump 12 VDC for aggressive flue gas	6 57 R 0835
Ejector-flue gas pump instead of diaphragm suction pump, material: steel **	6 57 R 0868
Ejector-flue gas pump instead of diaphragm suction pump, for aggressive flue gas, material: stainless steel 1.4571(V4A)**	6 57 R 0902
Software-update LT 1 on CD (Flash-programming PC mit RS232 interface required))	6 57 R 1111
2-Way-Ball-Valve, material: PP for condensation outlet for LT 1 657 R 0000/0009	6 57 R 0898
Small parts assortment box for LT 1	6 57 R 0305
Vacuum gauge 01 bar	6 57 R 0230
LS 1 probe simulator OS 4, O <sub>2</sub> -value	6 57 R 0300
Electric cabinet heater 320 W / 230 V AC with thermostat for LT 1 compact version IP 65, operating temperatures up to $-25$ °C	6 57 R 0825
Electric cabinet heater 500 W / 230 V AC, with thermostat and additional cabinet insulation for LT 1 compact version IP65, operating temperatures up to -40 $^\circ\text{C}$	6 57 R 0826

\* In interlinking with VMS/FMS-configuration, 4...20mA = 0...25 Vol. % O2 necessary. Please attach an essential note after the 'order no.' "REG" part.

\*\* Required air pressure > 5 bar, air consumption ~ 2  $Mm^{3}/h$  with 5 bar

#### **Ordering Examples** 8.4

#### O2- Measurement LT1 - installation under protection shed

Pro	oduct / Type	Order-No.
1	Lambda Probe LS1, gastight version	6 50 R 0031
1	gas extraction device (GED), 450mm long	6 55 R 0022
1	extension for probe connection cable, 5m long	6 55 R 0011
1	probe installation fitting (PIF), gastight, submerged	6 55 R 1183
1	GED-protection tube, material stainless steel 1.4571 (V4A), sintered metal prefilter 20 $\mu$ m	6 55 R 0642
1	outside insulation for PIF 655 R 0083/1183	6 57 R 0100
1	flange seal for counter flange DN 100, 3 mm BAS green	6 55 R 4207
1	Lambda Transmitter LT1 in wall-mounting housing IP54	6 57 R 0025
1	display- and operating unit	6 57 R 0830

#### In Combination with VMS / FMS / ETAMATIC for O2-control - installation under protection shed

Product / Type		Order-No.
1	Lambda Probe LS1	6 50 R 0001
1	gas extraction device (GED), 350mm long	6 55 R 0026
1	extension for probe connection cable, 5m lang, shielded	6 55 R 0010
1	probe installation fitting (PIF), tube frame R $1\frac{1}{4}$ " with outside insulation	6 55 R 0032
1	Lambda Transmitter LT1 OEM-version, with one analogue output PCB and one faulty relay (relay1) with measured-gas pump, grey RAL 7032	6 57 R 0022
1	additional charge for isolated analogue output 1, ± 20V common mode voltage REG	6 57 R 0054 REG <sup>(1)</sup>

#### O2- measurement in combination with the detection of combustibles (CO/H2) indicated as CO-equivalent (COe) [ppm]

Product / Type		Order-No.
1	Lambda Sonde LS1	6 50 R 0001
1	gas extraction device (GED), 350mm long	6 55 R 0026
1	extension for probe connection cable, 2m long shielded	6 55 R 0011
1	probe installation fitting (PIF), tube frame R $1\frac{1}{4}$ " with outside insulation	6 55 R 0032
1	PCB with measured-gas pump	6 57 R 0014
1	Kombi-Probe KS 1 with PTFE-connection cable (up to 300°C), 2m long	6 56 R 0000
1	gas extraction device (GED), 300mm lang	6 55 R 1002
1	probe installation fitting (PIF), pipe screwing R 1¼ "	6 55 R 1010
1	Lambda Transmitter LT2 / KS 1 in wall-mounting housing IP 54 KS1	6 57 R 1025KS1 <sup>(2)</sup>
1	Lambd Transmitter LT1	6 57 R 0026
1	display and operating unit	6 57 R 0830
1	LT1 / LT2 software-extension for additional connection of the Combinaiton Probe KS1	6 57 R 0601

Keep the temperature of the flue gas intake above the appropriate dew point along the entire length of the tube. If you cannot guarantee this, the MEV must have additional electric heating. Reference values: gas > 80 °C, LFO > 120°C, Coal, HFO, pyrolysis gases with which an increased buildup of SO<sub>2</sub>, HCL or other corrosive substances is possible, > 180 °C.

Product / Type		Order-No.
1	GED-protective tube with heater, material: stainless steel 1.4571 (V4A), length 800 mm	6 50 R 0031

(1) To be canceled in combination with ETAMATIC >> please note after the order number "REG"
 (2) Please note after the order number "KS1"



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