

LASER DISTANCE and LEVEL SENSOR

LD90-3GF

with Glass-Fiber coupled REMOTE OPTICAL HEAD



- Distance and level measurements in explosion-endangered areas
- Level measurement of liquid steel in melting pots or in transfer ladles
- Collision avoidance for cranes and vehicles
- Level measurement in silos
- Measurement of the position, width and thickness of glowing slabs in rolling mills
- Crane coordinate measurement
- Sensor for ship docking systems

General

The distance and level meter LD90-3-GF with glass-fiber coupled optical head makes use of the time-of-flight method to determine the distance of a remote target by measuring the transit-time between transmission and reception of a short laser pulse.

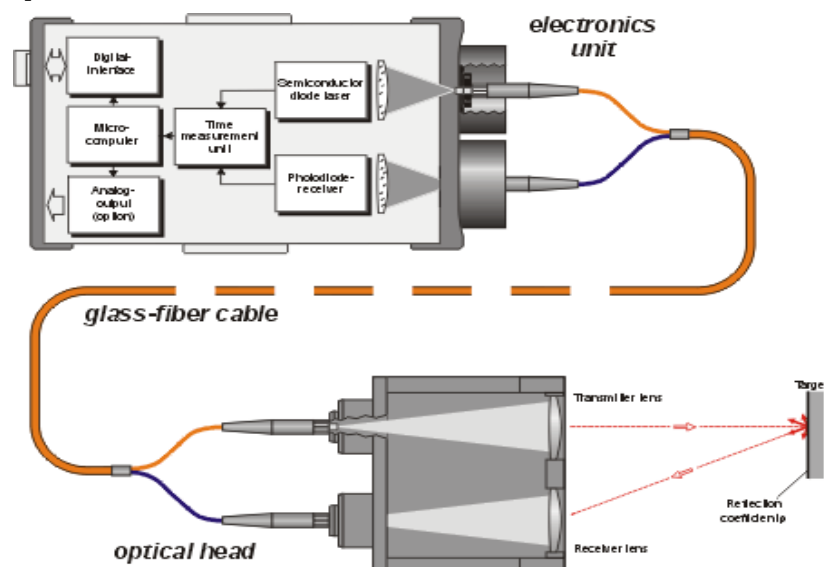
Distance measurements can be performed to both non-cooperative and cooperative targets with high accuracy, interference immunity, and excellent reliability. The serial interface allows communication and operation of the instrument. Furthermore, the LD90-3-GF can be equipped with the various digital and analog data outputs frequently used in industry.

The measuring system consists of a lightweight and small optical head and a separate electronics box, connected by a duplex glass-fiber cable with connectors on both sides. Its length can be chosen between 10 m and up to more than 100 m (-HA-GF/ -HT-GF not more than 15 m recommended).

The main features and advantages of this flexible and powerful configuration are:

- The LD90-3-GF electronics unit can be combined with various optical heads to suit nearly any requirement.
- The optical head contains no electronics and is therefore extremely small, lightweight, high-temperature resistant, and insensitive against electro-magnetic or ionizing radiation.
- The optical head can be operated in explosion-endangered areas as well as in high-temperature areas, whereas the electronics box can be remotely installed in a protected area.
- The glass-fiber cable provides galvanic insulation between optical head and electronics box.
- Installation as well as replacement of parts of the system in case of servicing requirements is easy and cost-effective.

Principle of operation



Optical heads

The LD90-3GF electronics can be combined with various optical heads to suit nearly any requirement:

- **MK36:** Small, lightweight head for general-purpose, short distance applications, dimensions 120x80x50 mm (L x W x H)
- **MK42:** Optical head for general-purpose, medium-range applications, dimensions 86x100x60 mm (L x W x H)
- **MK56:** High-performance head equipped with heat protecting filters and protection tube, dimensions total 550 x 120 x 70 mm (L x W x H) for applications, e.g. in steel plants
- **MK36-HT:** Cylindrically shaped, diameter 130 mm, length 650 mm, with heat protecting filters, completely water-cooled, with mounting flange, for high-temperature targets in worst environmental conditions.
- **MK56-HT:** Cylindrically or rectangular shaped, with heat protecting filters, water- or air cooled, optional with a protection shutter, for high-temperature targets in worst environmental conditions.

other cases (aluminium or steel made) on request.

Available instrument types (selection)

General purpose distance meter

Instrument type	Range "reflectorless"	Range with retroreflector	Accuracy typically	Update rate (selectable)
LD90-3100HS-GF equipped with optical head MK36	100 m	> 1000 m	± 1,5 cm	1 ÷ 200 Hz
LD90-3100HA-GF equipped with optical head MK36	100 m	> 1000 m	± 1 cm	0.5 ÷ 100 Hz

Distance and Level meter with "High Penetration" characteristic

Instrument type	Range "reflectorless"	Range with retroreflector	Accuracy typically	Update rate (selectable)
LD90-3200HiP-GF equipped with optical head MK42	600m	2000 m	± 25 mm	0,5 ÷ 3 Hz

Distance Sensors for High-Temperature Targets

Design principle: Transmitter and receiver optics are equipped with narrow-band optical filters to avoid disturbances of the measurement caused by the radiation of light and heat from the hot target surface. Furthermore, the small optical head can be surrounded by a water-cooled robust outer case to insulate the optical head against heat. If necessary the front side can be equipped with a protection tube, which can be flushed with nitrogen or compressed air to keep the lenses clean.

The **technical data** can, to a considerable extent, be influenced by the environmental conditions, especially by the following parameters:

- Surface temperature and reflection characteristics of the target
- Distance of the target
- Angle of the measurement beam with respect to the surface of the target
- Optical attenuation of the gases between target and instrument

Instrument type	Range "reflectorless"	Accuracy typically	Update rate (selectable)
LD90-310HT-GF equipped with optical head MK36 (-HT)	3 - 7 m (1450°C) 2 - 10 m (1200°C)	± 10 mm	0.5 ÷ 10 Hz
LD90-3100HT-GF equipped with optical head MK56	3 -10 m (1650°C) 2 - 35 m (1200°C)	± 15 mm	0.5 ÷ 10 Hz

LD90-3100HS-GF (equipped with optical head MK36)

High-Speed version of LD90-3100-GF for crane or robotics applications, automatic anticollision systems, etc.

Measuring range (depending on the reflection coefficient ρ of the target)

good, diffusely reflecting targets, $\rho \geq 80\%$	up to 100 m ¹⁾
bad, diffusely reflecting targets, $\rho \geq 10\%$	up to 35 m ¹⁾
Reflecting foil ²⁾ or plastic cat's-eye reflectors	> 1000 m
Minimum distance , typically	1 m

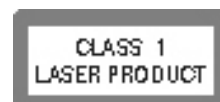
Distance measurement

Accuracy ³⁾ typically ± 15 mm, in the worst case ± 50 mm

Measuring time (ms or s) ⁴⁾	5ms	10ms	20ms	50ms	0.1	0.2	0.5	1
Statistical deviation (mm) ⁵⁾	± 30	± 20	± 15	± 10	± 7	± 5	± 3	± 2
Resolution (mm) ⁵⁾⁶⁾	20	20	10	10	5	5	2	2

Divergence of the infrared measuring beam ⁷⁾ 3.2 mrad

Eye safety class according to IEC 60825-1: 2001



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1. typical values for average conditions. In bright sunlight, the operational range is considerably shorter than under an overcast sky. At dawn or at night the range is even higher.
 2. reflecting foil 3M 2000X or equivalent, minimum dimensions 0.45 m x 0.45 m
 3. standard deviation, plus distance depending error ≤ 20 ppm
 4. adjustable via RS232 (RS232 data output useful only for measuring times of 10 ms or more)
 5. depending on measuring time
 6. chosen automatically by the internal microprocessor
 7. 1 mrad corresponds to 10 cm beamwidth per 100 m of distance

LD90-3100HA-GF (equipped with optical head MK36)

High-Accuracy version of LD90-3100-GF e.g. for profile measurement systems.

Measuring range (depending on the reflection coefficient ρ of the target)

good, diffusely reflecting targets, $\rho \geq 80\%$	up to 100 m ¹⁾
bad, diffusely reflecting targets, $\rho \geq 10\%$	up to 35 m ¹⁾
Reflecting foil ²⁾ or plastic cat's-eye reflectors	> 1000 m
Minimum distance , typically	2 m

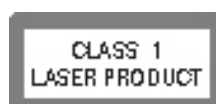
Distance measurement

Accuracy ³⁾	typically ± 10 mm							
Measuring time (ms or s) ⁴⁾	10ms	20ms	50ms	0.1	0.2	0.5	1	2
Statistical deviation (mm) ⁵⁾	± 20	± 15	± 10	± 7	± 5	± 3	± 2	± 2
Resolution (mm) ⁵⁾⁶⁾	20	10	10	5	5	2	2	1

Divergence of the infrared measuring beam ⁷⁾ 3.2 mrad

Eye safety class

according to IEC 60825-1: 2001



-
1. typical values for average conditions. In bright sunlight, the operational range is considerably shorter than under an overcast sky. At dawn or at night the range is even higher.
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 3. standard deviation, plus distance depending error ≤ 20 ppm
 4. adjustable via RS232 (RS232 data output useful only for measuring times of 10 ms or more)
 5. depending on measuring time
 6. chosen automatically by the internal microprocessor
 7. 1 mrad corresponds to 10 cm beamwidth per 100 m of distance

LD90-310HT-GF (equipped with optical head MK36 or MK36-HT)

High-Temperature version of LD90-3-GF for distance measurements

Measuring range

(depending on the surface temperature and the reflection coefficient ρ of the target)

liquid steel, temperature up to 1450 °C 3 m to 7 m

glowing slabs, temperature up to 1200 °C 2 m to 10 m

Accuracy (typically) ± 10 mm plus statistical deviation

Measuring time (s)	0.1	0.2	0.5	1	2
Statistical deviation (mm)	± 7	± 5	± 3	± 2	± 2
Resolution (mm)	5	5	2	2	1

Diameter of the infrared measuring beam approx. 30 mm

Eye safety class according to IEC 60825-1: 2001 – Laser Class 1

LD90-3100HT-GF (equipped with optical head MK56-HT)

High-Temperature version of LD90-3-GF for distance or level measurements for high-temperature targets.

Measuring range

(depending on the surface temperature and the reflection coefficient ρ of the target)

liquid steel, temperature up to 1650 °C 3 m to 10 m

glowing slabs, temperature up to 1200 °C 2 m to 35 m

other targets, temperature up to 800 °C 2 m to 100 m

Accuracy (typically) ± 15 mm plus statistical deviation

Measuring time (s)	0.1	0.2	0.5	1	2
Statistical deviation (mm)	± 10	± 7	± 5	± 3	± 2
Resolution (mm)	5	5	2	2	1

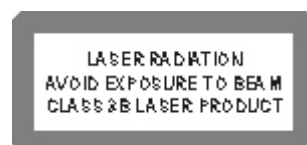
Diameter of the infrared measuring beam approx. 50 mm at 2 m,
approx. 150 mm at 50 m,

Eye safety class

according to IEC 60825-1: 2001

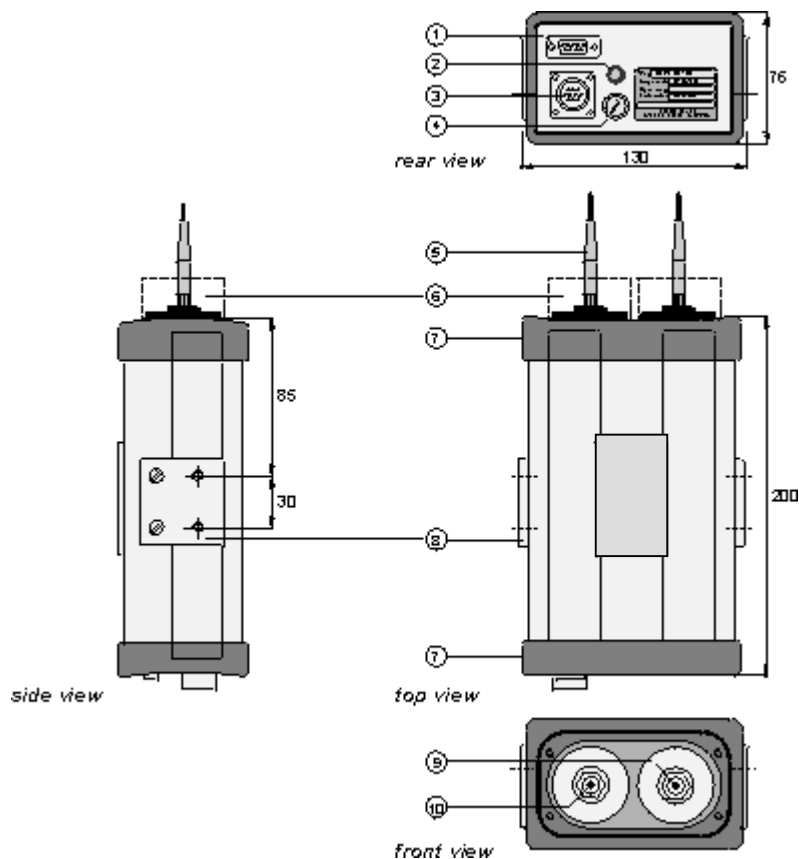
Laser class 1M (only LD90-3100HT-GF)

(Lasers emitting in the wavelength range from 302,5 to 4000 nm which are safe under reasonably foreseeable conditions of operations, but may be hazardous if the user employs optics within the beam (Sub-clause 8.2).

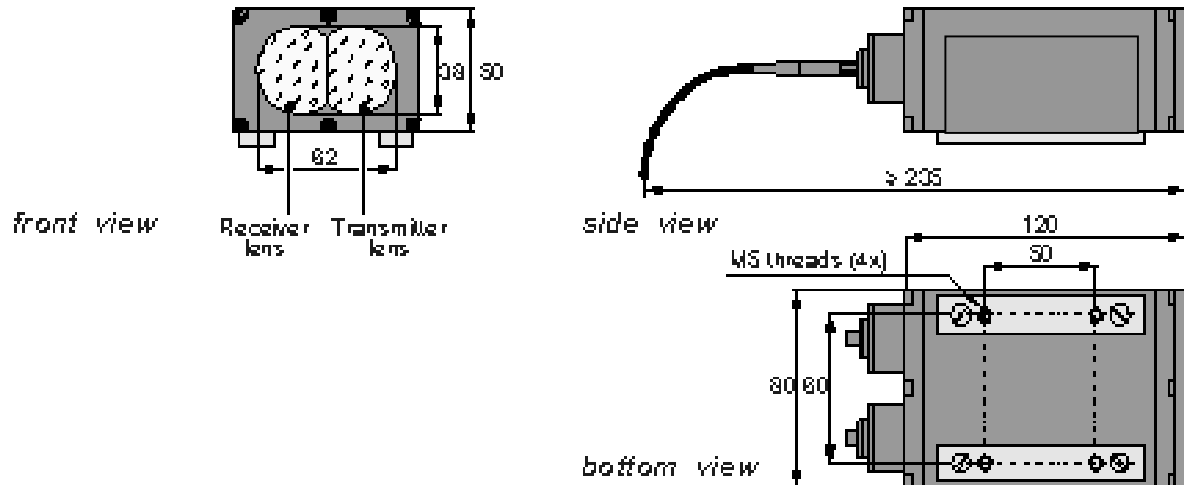


Dimensional drawings for LD90-3GF series

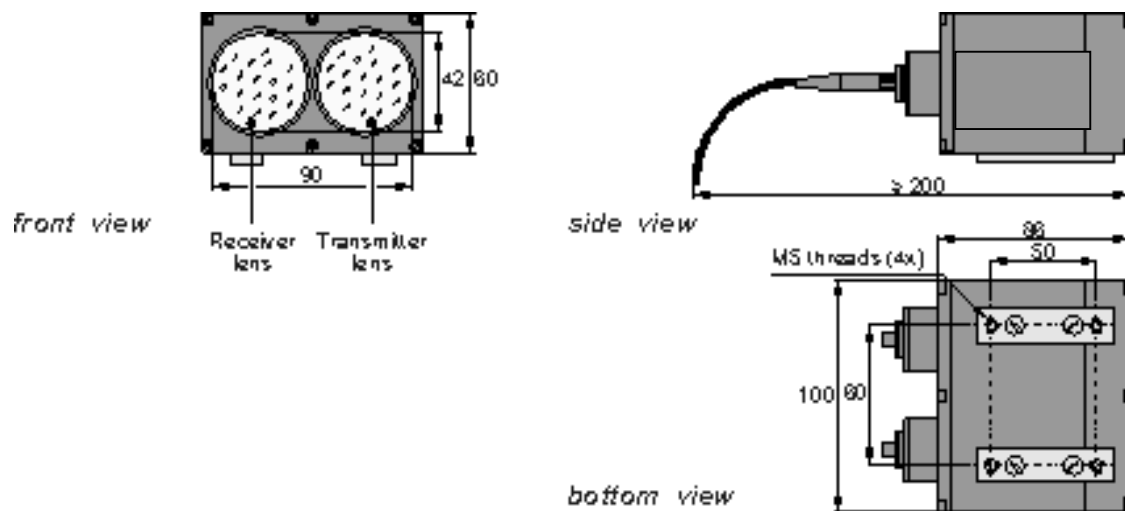
Electronics LD90-3-GF



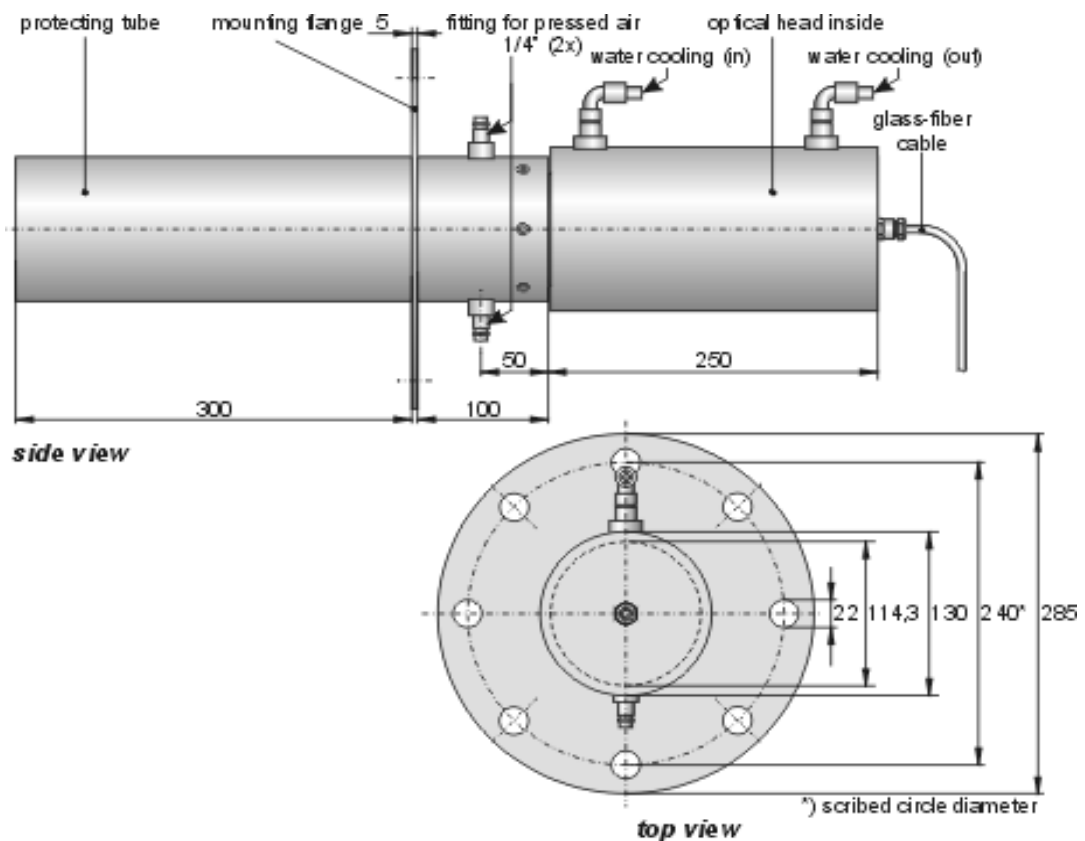
1. 9pole plug for RS232/RS422 data interface
2. LED "POWER ON"
3. 10pole socket for power supply and current output 4-20 mA
4. Fuse holder
5. SMA glass-fiber connectors
6. Protecting tube glass-fiber plug
7. Rubber-armoured front and rear panel
8. Mounting plates with 2x M6 threads
9. SMA glass-fiber plug for receiver
10. SMA glass-fiber plug for transmitter



Optical head MK36

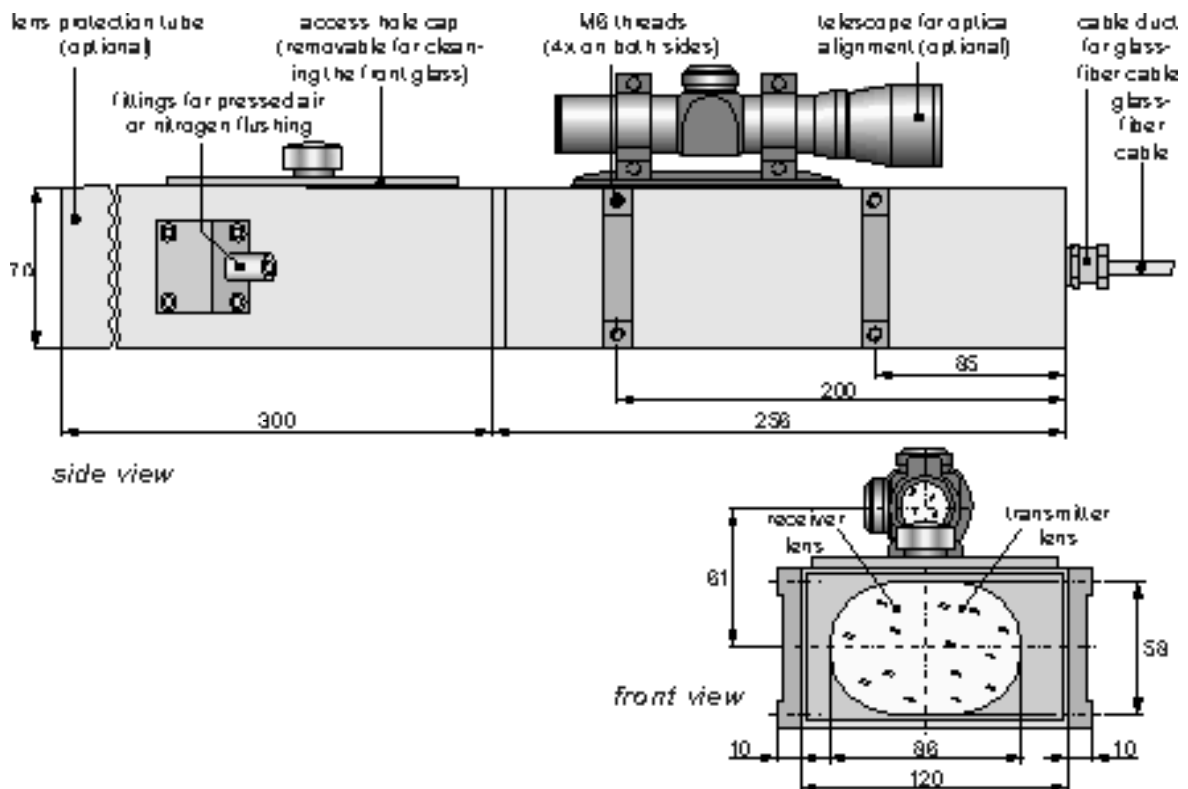


Optical Head MK42



Optical Head MK36-HT

water cooling with 0,5 – 2,0 l/min



Optical Head MK56 / MK56-HT

pressed air with 1,5 ... 2 bar, 600 l/min

General technical data LD90-3-GF

Serial data interface

RS232 or alternatively RS422 (selectable, standard for all types)
Baud rate selectable between 150 Bd and 19200 Bd, further 38.4 kBd and 115.2 kBd.
ASCII or Siemens 3964R protocol, (optional RK 512 or Modbus).

Additional data output available (optional but not for all types)

Analog current output 4-20 mA
resolution 16 bit, not galvanically isolated
accuracy / linearity 0.5 ‰ of full scale

Switching output 2 x PNP transistor driver
built-in thermal and short-circuit protection
switching current 250 mA max.
switching voltage = supply voltage

Power supply

Standard 11-28 Volts DC, approx. 10 Watt
built-in protecting circuitry for over-voltage
and reverse polarity

Option 230 V AC external power supply module.

Temperature range

Electronic unit

Optical heads

Operation	-10° C bis +50° C	-20° C bis +80° C
Storage	-20° C bis +60° C	-20° C bis +80° C

Physical data

	Electronic unit	MK 36	MK 36-HT	MK56-HT
Dimensions	see drawings			
Weight (approx.)	1,5 kg	0,6 kg	10 kg	3,0 kg
Protection class	IP64	IP62	IP64	IP60

Aiming device (optional)

Telescope attached to the optical head with a mounting plate.

Information contained herein is believed to be accurate and reliable. However, no responsibility is assumed by Ferrotron for its use. Technical data are subject to change without notice.

Data sheet: LD90_3GF(Nov/2009).doc

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