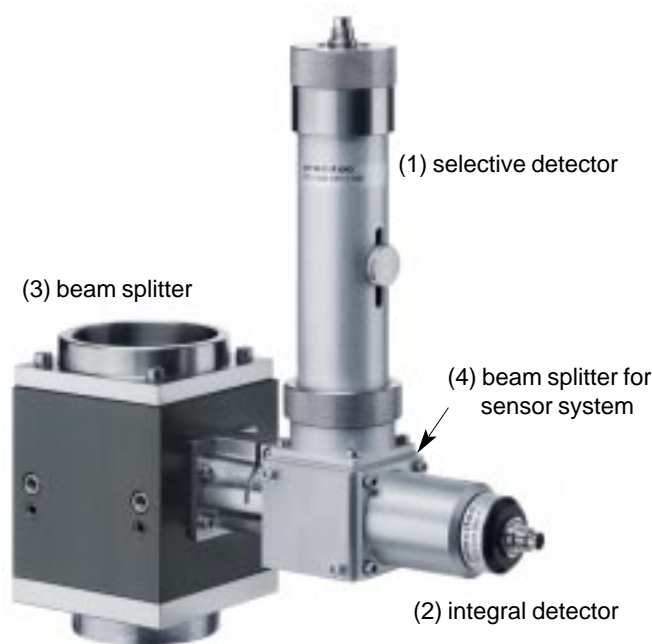




# LWM-Sensor System

for process control and monitoring  
of the welding seam quality



- detection of plasma, temperature and back reflection
- for Nd:YAG- and diode laser
- sensor system is modular extendable

The LWM sensor system is intended for the process control during laser beam welding. For the internal detectors the process radiation is tapped from the beam path by a beam splitting mirror (3). This way the internal LWM detectors can easily be integrated in Nd:YAG- or diode laser welding machines.

During the welding with laser radiation a process illumination occurs which for most welding applications correlates with the quality of the welded seam. By means of the LWM sensor system process radiation can be measured selectively depending on place or wave length. By comparing the signal characteristics having been recorded during the welding process with the signal characteristics of reference welds conclusions on the quality of the welded seam may be drawn both for pulse welds and for welds during continuous operation.

The metal vapour which generates during deep welding can be characterized by means of the P-detector and such way the energy coupling into the workpiece be determined. The proportion of the laser radiation which is back-reflected from the beam capillary into the laser path is determined by means of the R-detector. With an increasing duct ratio (welding depth/focus diameter) the degree of reflection decreases due to increasing

absorption. That way, conclusions on the welding depth may be drawn. The thermal characteristic of the workpiece as e. g. the cool down characteristic of a welding spot, is determined by means of the T-detector.

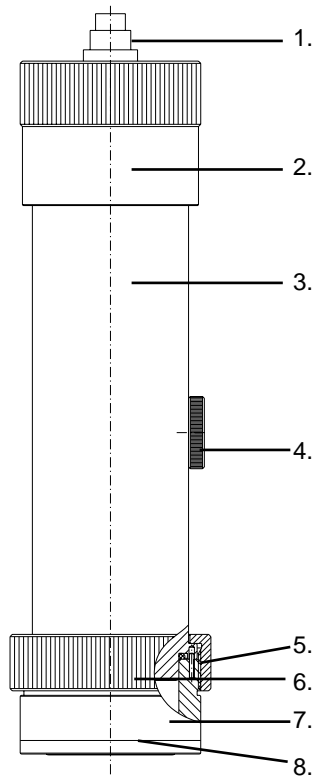
When dealing with the internal LWM sensor system position and size as well as form of the measuring surface on the workpiece can be adapted to the welding process, independent of the focussing optics of the laser beam. What concerns the deep-welding e. g. a temperature signal can be measured which is based on a ring-shaped measuring surface where the beam capillary is blanked. That way, the temperature signal is not affected by the temperature in the beam capillary. By a small measuring surface which is exactly aligned to the component it is e. g. possible to infer the place of the weld. This is an advantage especially when welding small component geometries as e. g. thin contacts or bars.

We would also be pleased to send you further information about external detectors which are aligned outside the beam path or the welding head.



Technical Specifications

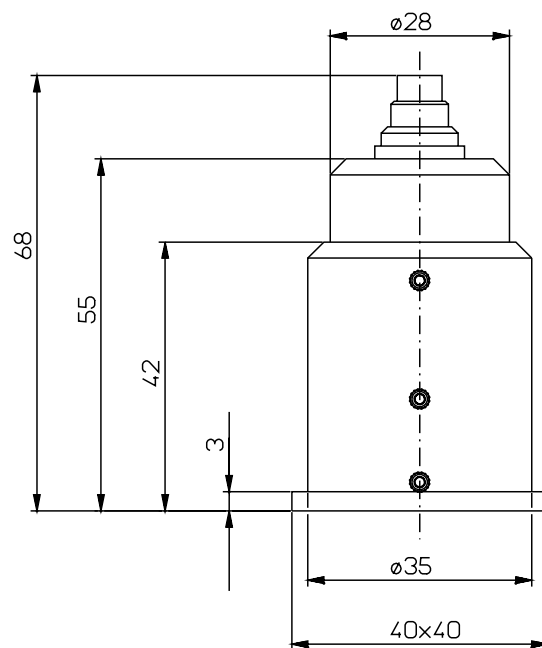
Selective Detector



- 1. circular detector
- 2. screen nut
- 3. sensor housing
- 4. knurled thumb screw
- 5. index pin
- 6. union nut
- 7. filter socket with filter
- 8. adapter

Technical Specifications

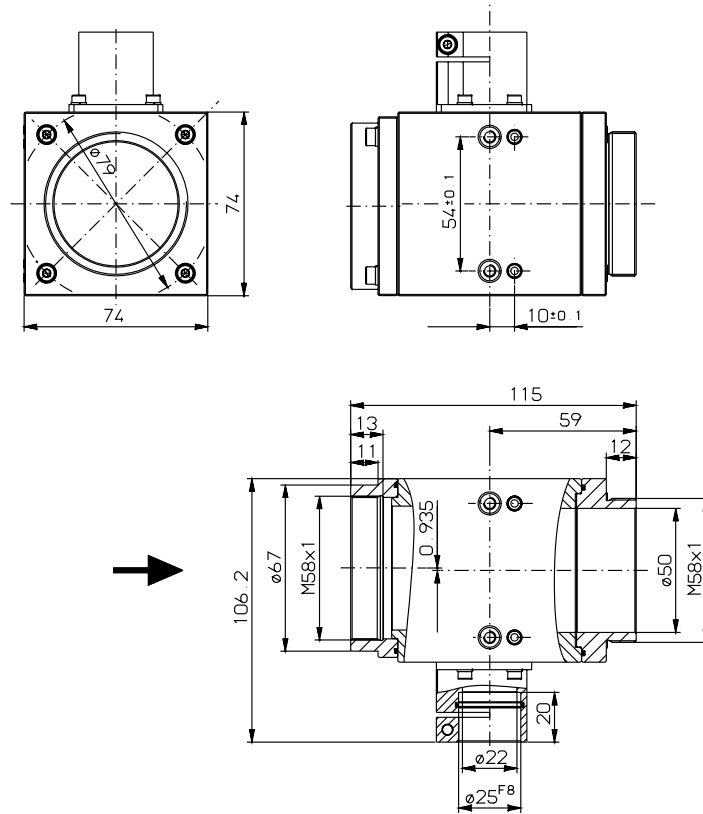
Integral Detector





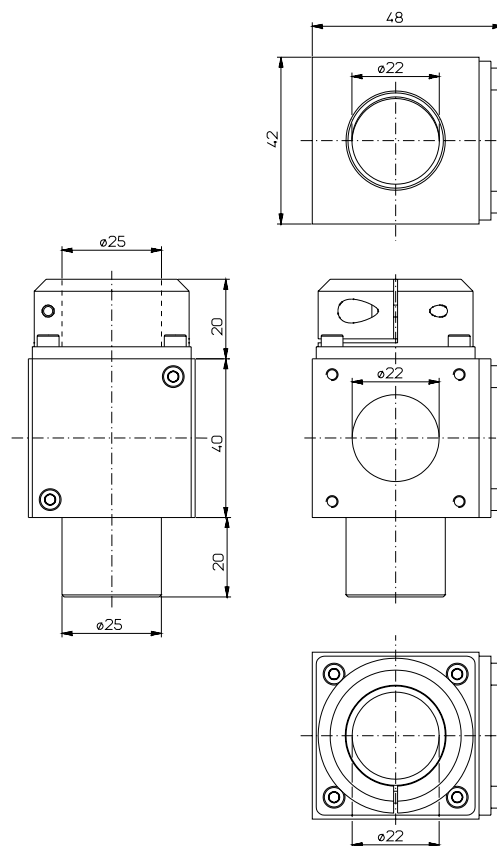
Technical Specifications

Beam Splitter



Technical Specifications

Beam Splitter for Sensor System





## Technical Data LWM-Detectors, Beam Splitters

### selective detectors:

focal length of the lens	100 mm ( $\pm 2\%$ )
adjusting range, z-direction	$\pm 13$ mm
adjusting range, x- and y-direction	$\pm 2$ mm

mass	500 g
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### integral detectors:

focal length of the lens	18 mm
mass	100 g

### additional technical data of selective and integral detectors:

operating temperature	5° C till 55° C
humidity	30% till 95% (non condensing)
type of protection	IP 50

### beam splitter:

laser power max.	6 kW
mass (incl. beam splitter plate)	approx. 1.8 kg
operating temperature	5° C till 55° C
humidity	30% till 95% (non condensing)
type of protection	IP 50

### beam splitter for sensor system:

mass	225 g
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## Ordering Data LWM-Sensorics, Beam Splitter

Product	Designation	Order Number
<u>selective detectors:</u>		
P-detector, int., YAG 100mm	SD LWM DPI-Y 100	P0103-235-00001
R-detector, int., YAG 100mm	SD LWM DRI-Y 100	P0103-240-00001
T-detector, int., YAG 100mm	SD LWM DTI-Y 100	P0103-245-00001
sensor cable	KS I-SKAB L0.6	P0101-390-00600
adjustment tool	ZM LWM SD Y Just	P0103-130-00001
<u>integral detectors:</u>		
T-detector, int., YAG	SD LWM DTI-Y	P0101-790-00001
P-detector, int., YAG	SD LWM DPI-Y	P0101-560-00001
R-detector, int., YAG	SD LWM DRI-Y	P0101-640-00001
sensor cable	KS I-SKAB L0.6	P0101-390-00600
<u>beam splitter:</u>		
beam splitter (incl. beam splitter plate)	ZM LWM BS 50	P0102-135-00001
mounting tool	WH 1080	P0001-080-00002
<u>beam splitter for sensor system:</u>		
beam bender DSTW-DH	ZM LWM BS	P0101-630-00001

**Subject to change without notice**

02/Bg/11.04.2002