Special-Sensors
for
Automation

Opto High Capacity Systems

- For band-edge control
- For band-crack detection
- Through beam sensors
- For turbidimetry
- For positioning

ISO 9001 certified

www.ege.nt-rt.ru

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Technology and application

System description

The Opto Edge controller consists of an amplifier (1) to which two fibre-optic cables (2) of up to 10 m in length can be connected via a rapid action coupling. The first fibre-optic cable routes a send signal generated by the amplifier to a first optical converter (3), while the second fibre-optic cable returns a send signal detected by a second optical converter (4) to the amplifier as a receiving signal. This receiving signal is processed further in the amplifier into an output control signal.
The Opto Edge controller works with infra-red light which issues extremely short and fast impulse sequences which enable reliable recording of rapidly occurring processes, even in the presence of influences from external rays.
The process control system which is determined by the user, as well as the design of the optical converter, demands a high degree of flexibility from the system.

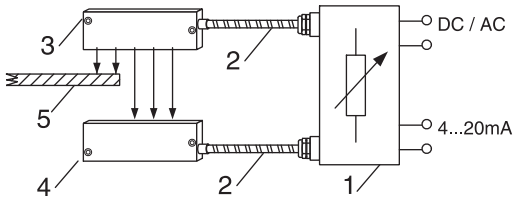


Fig. 1

Structure of the opto edge controller

In the system structure illustrated in Fig. 1 the optical converters (3, 4) are configured in opposing positions to form a photoelectric barrier. The material (5) which, for example, may be paper or a metal edge, pushes into the light ray and, depending on the depth of insertion, reduces the ray path of the light flow detected by the converter (4). The amplifier (1) which is connected by means of the fibre-optic cable (2) supplies a control signal (4...20 mA) to its output which is proportional to the insertion depth of the material (5) depending on the formation of the optical converters (3,4) with a repeating accuracy of up to +/- 0.5 mm.

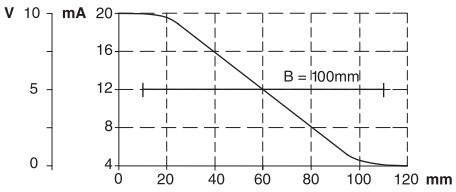


Fig. 2

Opportunities for adjustment are provided on the amplifier (1) which ensure the exact adaptation of the fibre-optic cable types, optical converters or output signals, such as to discriminate digital switching or analog recording.

A particular advantage of the system is that the fibre-optic cable and the optical converter for transmitting and receiving are identical and, thereby, interchangeable. As a result, modification of the recording arrangement is reduced to purely construction measures. The photoelectric barrier process can be changed to a reflex process by a simple modification.

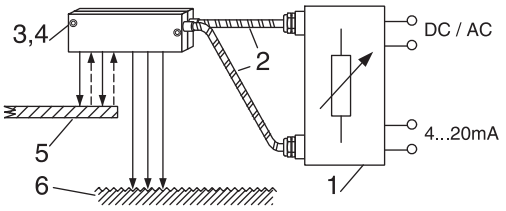


Fig. 3

In the reflex process illustrated in Fig. 3 the optical converters (3, 4) for the send and receive signals are arranged next to each other, e.g. above the material (5). With this arrangement the material does not interrupt the ray path between the sender and the receiver, but rather reflects a residual ray flow, which is detected by the receiver (4). The output corresponds to the distance of the materials. In this arrangement the result is also a current signal from the amplifier (1) which is proportional to the insertion depth of the material with high repeating accuracy.
In the case of the reflex process, however, accompanying conditions which are included in the measurement result have to be taken into account. In particular these include the reflection factor of the material (5) or the reflection due to the background (6) which is not covered by the material. Influences of this type have to be taken into account during installation.

Recording of cracks, impact or non-homogeneity

Cracks or non-homogeneity in the area of the edges are principally recognised by the processes described in Fig. 1 or Fig. 3. In accordance with Fig. 1, cracks or non-homogeneity are recognized as short flashes of light while passing through, whereas in accordance with Fig. 3 depending on the background the reflection is briefly altered.

Recognition of cracks or irregularities in the material characteristics, e.g. also holes, is dependent on high speed reception on the part of the recording system. If, for example, in accordance with Fig. 1 a crack approx. 2 mm wide moves past the optical converter at a belt speed of 10 m/s the duration of the flash amounts to 0.0002 s. In this case, the optical amplifier has to have a resolution of at least 5 kHz. Similar conditions exist if, for example, border recognition with an accuracy of only a few millimeters has to be carried out for rapid pipe throughput in a section reduction rolling mill.

Technology and application

High capacity amplifier URA 408

This amplifier is intended for connection to a 24 V direct voltage power supply and has a 4....20 mA current output. The instantaneous current is displayed on a LCD display. The zero point (4 mA) and amplification can be adjusted independently enabling the characteristic curve to be shifted in parallel, as well as adjusting the slope. In order to span larger distances between photoelectric barriers or larger intervals between reflex scanning the send capacity can be switched to "long". These characteristics enable adaptation to a wide variety of opto-converters, fibre-optic cables or application requirements. The ultrared light generated by the amplifier has a high pulse rate of 50 kHz which enables reliable recording of rapid processes in the range of 8 - 10 kHz. In addition to this high input resolution the amplifier also has a high EMC tolerance which excludes the possibility of disruptive pulses being confused with event pulses.

Universal high capacity amplifier URA 5001

In addition to the basic characteristics which have been described for the URA 408 amplifier, this device has additional characteristics which make it universally deployable. It is also equipped for alternating current power supplies, has an additional 0...10 V Voltage output, as well as two PNP switch outputs. Upper and lower thresholds can be set for the entire characteristic curve range by means of a precision potentiometer. If the upper threshold is exceeded or the lower threshold not achieved the respective switch output closed and the corresponding LED is activated. If no threshold is affected the signal value is within specified limits. This is displayed by a third LED. This discrimination technology allows direct control or monitoring, e.g. that a belt is operating correctly, with pre-set permissible tolerances. For applications which require higher currents for switched mode operation or require a system control center which is without voltage the PNP outputs are switched to internally installed relays.

Amplifier OKZ 550

This amplifier is intended for use with the high performance trough beam sensors ULM… and ULL… A system consists of one transmitter, one receiver and one amplifier.

Fibre-optic cable amplifier ULL

The amplifiers are used especially in high-temperature light barriers. Fibre optic cables are attached directly by means of rapid-action coupling. The fibre optic cables are used primarily in high-temperature zones, while the amplifiers are installed in zones with normal operating temperatures. The amplifier signal is connected to the analyser by means of a PVC or PUR cable that is up to 50 meters long.

Fibre-optic cable and optical converter

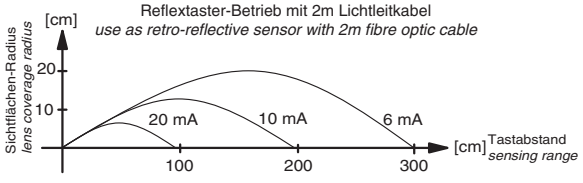
The fibre-optic cables used are made of glass fibre bundles which are installed in flexible stainless steel tubing or in a metal housing to protect them against environmental influences. They can be subjected to 250 °C and in special applications up to 350 °C. If a high degree of moisture is expected the stainless steel tubing is enclosed in an additional silicon sheath. The greatest advantage of the fibre-optic cable is that it is absolutely insensitive to electrical and magnetic influences, resistant to high temperatures, does not require a power supply and, for this reason, can also be used in areas where there is a danger of explosion.

Optical cross section converters convert the round fibre bundle of the fibre-optic cable into a narrow high resolution light line which can either emit or receive optical signals. By means of this exclusively mechanical conversion a reaction sensitivity which has been achieved on one occasion is stable over time. For this reason electrical adjustment, such as that necessary for electro-optical systems, is not required. The optical cross section converters are supplied with a fixed pre-assembled fibre-optic cable and a rapid action coupling socket. This reduces losses along the optical transmission paths. Fibre-optic cables for connection to lens systems are equipped with rapid action coupling in both directions. It is possible to have fibre-optic cables up to 10 m long. The standard lengths are 2 m and 3 m. In order to achieve greater lengths fibre-optic cables can be connected by means of a coupler. The coupling loss consists of approx. 30 % and is permitted when there is sufficient light current.

Attachment optics

Attachment optics focus the infrared radiation that is transmitted by the fibre optic cable. The have an angle of aperture in the range of 2...15°, which ensures precise object acquisition. They increase the range when used in light barriers. Attachment optics with a slit-type angle of aperture are best for acquiring objects on an inlet level.

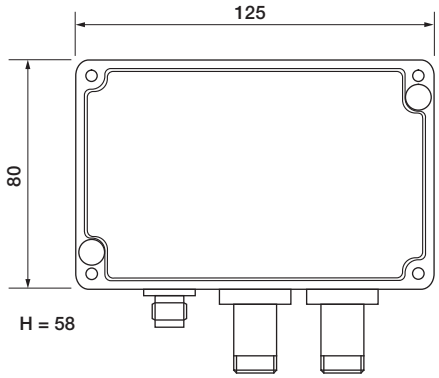
For high-temperature applications, fibre optic cables and attachment optics designed for temperatures up to 250 °C (up to 350 °C upon request) are used.

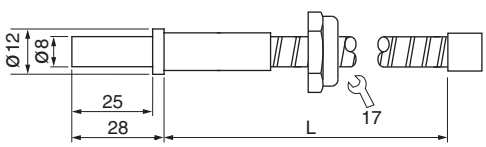


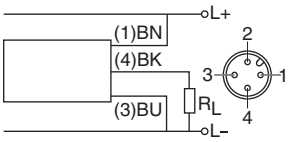
Analog high-capacity amplifier

Series URA

4...20 mA output
10 kHz detection frequency
LCD display

Design	URA 408 GI
Dimensions	
Sensitivity	adjustable
Output	
ID-No.	**P51022**
Type	URA 408 GI
Supply voltage [V]	24 DC ±10%
Current consumption [mA]	<120
Current output [mA]	4...20
Load resistance R_L [Ω]	200...500
Detection frequency [kHz]	10
Accuracy [mA]	±1
Ambient temperature [°C]	–20...+60
EMC-class	A
Protection [EN60529]	IP 65
Display	LCD
Housing material	aluminium
Connection	fibre-optic cable rapid action coupling | M12 connector





Accessories	see page 5.11

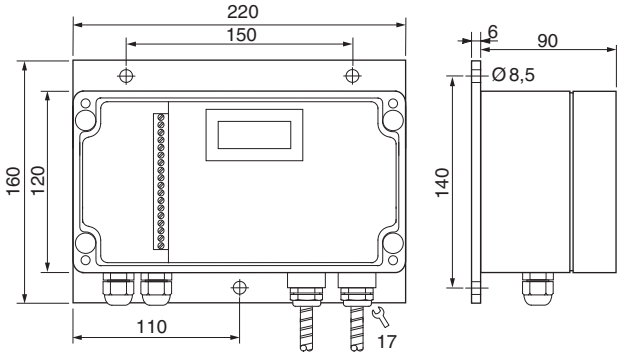
Universal high-capacity amplifier

Series URA

Outputs
4...20 mA
0...10 V
Relay output
PNP output
Discriminator

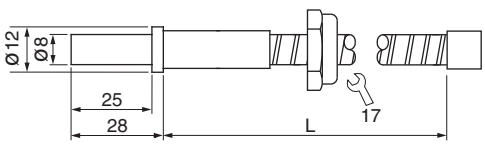
Design	URA 5001

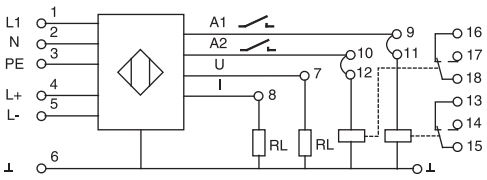
Dimensions



ID-No.		**P50029**			
Type		URA 5001			
Supply voltage	**[V]**	**24 DC / 230 AC ±10%**			
Current consumption	[mA]	70 DC / 20 AC			
Ambient temperature	**[°C]**	**–20...+70**			
EMC-class		A			
Protection	**[EN60529]**	**IP 65**			
Display		LCD			
Housing material		**aluminium**			
Output		4...20 mA	0...10 V	PNP	Relay
Switching current	**[mA]**	**–**	**–**	**200**	**400**
Detection frequency	[kHz]	8	8	6	0,01
Accuracy	**[%]**	**3**	**3**	**5**	**5**
Load resistance R_L	[Ω]	200...500	500...5000	–	–
Connection		**terminal screws**			

Fibre-optic cable rapid action coupling





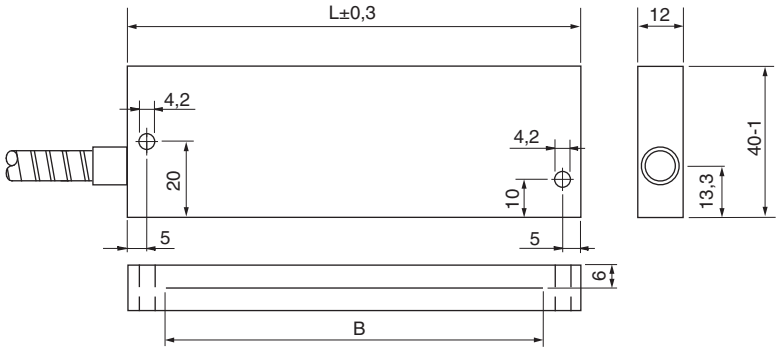
Accessories	see page 5.11

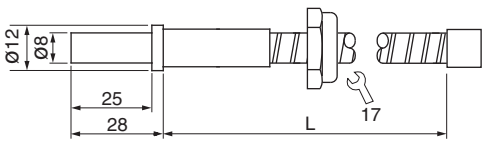
Opto-Sensors

Cross sectional converter

Series ULW

Recording width up to 100 mm
Ambient temperature up to 200 °C
High resolution

Design	ULW	
Dimensions		
Recording width B [mm]	50	100
Length of converter L [mm]	70	120
ID-No.	P51023	P51024
Type	ULW 50-200	ULW 100-200
Length of light cable [cm]	200	
Temperature range [°C]	−25...+200	
Detecrion tolerance [mm]	±0.5	
Protection [EN 60529]	IP 54	
Material converter	aluminium	
Material cable	stainless steel *	
Connection	fibre-optic cable rapid action coupling	



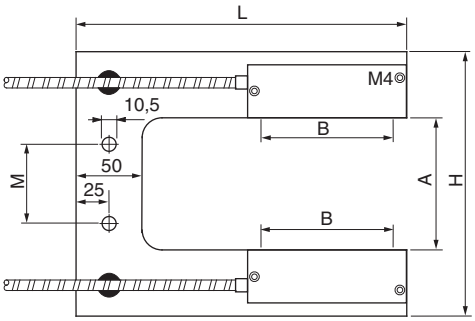
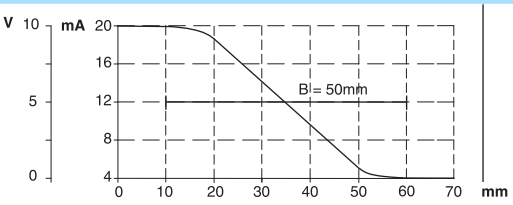
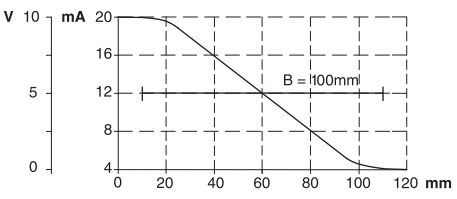
Accessories	see page 5.11

Band-edge detector

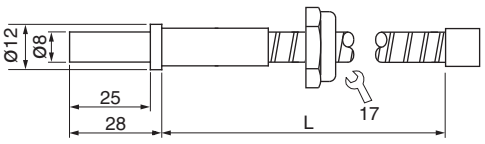
Series UBD

Light barrier technology

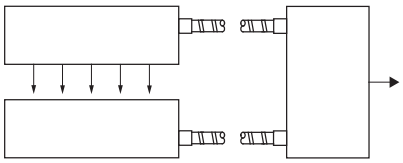
Up to 100 mm sensing range
Up to 200 mm fork width

Design	Light barrier fork			
Dimensions				
Recording breadth B [mm]	50	50	100	100
ID-No.	P51025	P51026	P51027	P51028
Type	UBD 50-100	UBD 50-200	UBD 100-100	UBD 100-200
Fork width A [mm]	100	200	100	200
Mounting breadth M [mm]	60	160	60	160
Fork size L x H [mm]	250 x 200	250 x 300	250 x 200	250 x 300
Length of light cable [cm]	200			
Temperature range [°C]	–25...+200			
Detection tolerance [mm]	1			
Protection [EN 60529]	IP 54			
Material converter	aluminium			
Material cable	stainless steel			
Characteristics				

Fibre-optic cable rapid coupling



Set-up

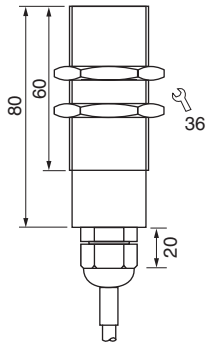


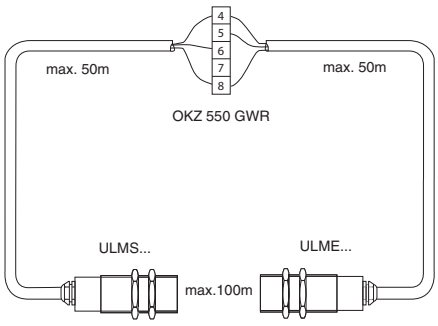
Note	required amplifier series URA..., see page 5.04, 5.05

High performance through beam sensors

Series ULM

Range up to 100 m

Design	M30x1.5	
Dimensions		
Sensing range [m]	100	
Function	Transmitter	Receiver
ID-No.	P50001	P50002
Type	ULMS 030 VS	ULME 030 VS
Ambient temperature [°C]	–20...+70	
Field of view [°]	10	
EMC-class [mm]	A	
Housing material	brass-nickel	
Protection [EN 60529]	IP 67	
Connection	5 m PVC-cable 4x0.34 mm²	

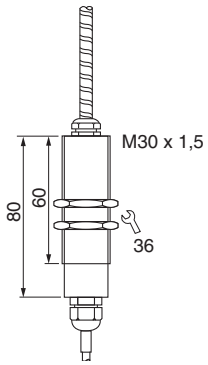
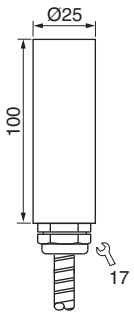
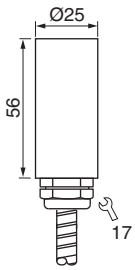


Note	reqiured amplifier series OKZ 550 GWR, see page 5.10

High temperature through beam sensors

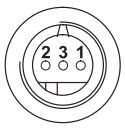
Series ULL

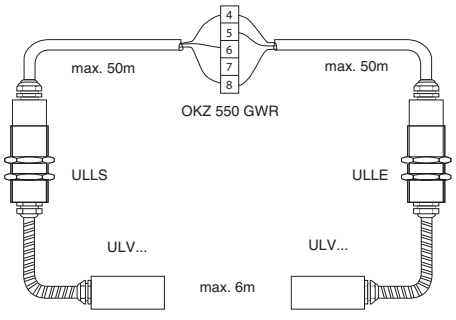
To be used with fibre-optic
Up to 350 °C
With intermediate repeater

Design	Fibre-optic amplifier		Attachment optics	
Dimensions				
Sensing range [m]	6			
Function	Transmitter	Receiver	Optic 4°	Optic 8°
ID-No.	**P50003**	**P50004**	**P60150**	**P60151**
Type	ULLS 030 VS	ULLE 030 VS	ULV 024	ULV 028
Ambient temperature [°C]	−20...+70		−40...+250	−40...+250
Field of view [°]	90		4	8
EMC-class	A		–	–
Housing material	brass-nickel		brass-nickel	brass-nickel
Protection [EN 60529]	IP 67		IP 65	IP 65
Fibre-optic cable	LLKS...		LLKS...	LLKS...
Connection	5 m PVC-cable 4x0.34 mm²		PG 9	PG 9

PG-plug

DC
1: BN
2: BU
3: BK





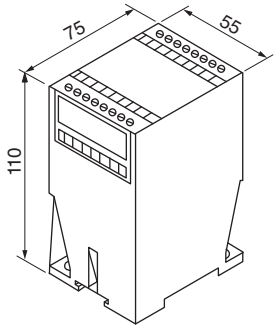
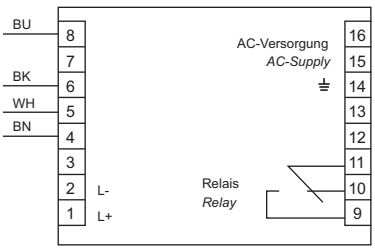
Note	required amplifier series OKZ 550 GWR, see page 5.10

Opto-Sensors

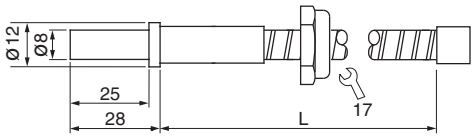
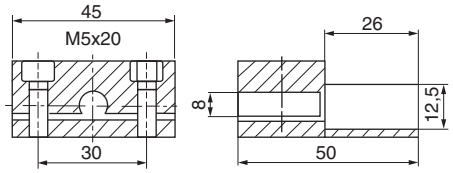
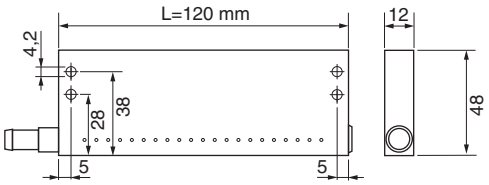
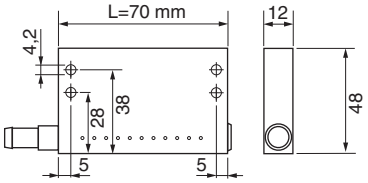
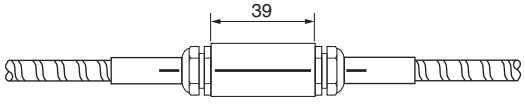
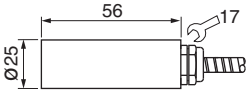
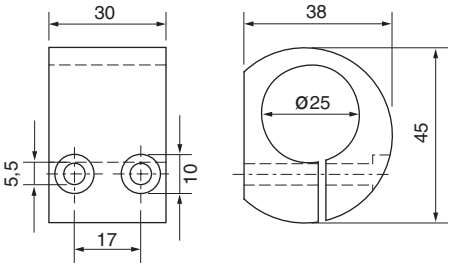
Amplifier

Series OKZ

AC-Voltage supply
DC-Voltage supply
LED indication
Cable break and
short circuit monitoring

Design	***OKZ 550 GWR***
Dimensions	
ID-No.	**P50030**
Type	OKZ 550 GWR
Supply voltage [V]	24 DC / 230 AC
Current consumption [mA]	60 / 10
Sensing range	adjustable
Hysteresis	max. 10%
Light on / dark on	switchable
Output	relay with change-over conact
Switching current	max. 4 A / 250 V AC
Switching power	1000 VA / cos φ >0.7 / L/R <200 ms
Switching frequency [Hz]	5
Ambient temperature [°C]	–20...+60
EMC-class	A
Protection [EN60529]	screw terminals IP 20, housing IP 40
Function indicator	LED yellow
Housing material	Polycarbonate
	
Connection	screw terminals

Accessories

Type	ID-No.	Dimensions	Design
LLKS-100-BE	P60101		1 m fibre-optic cable up to 250 °C
LLKS-200-BE	P60102		2 m fibre-optic cable up to 250 °C
LLKS-300-BE	P60103		3 m fibre-optic cable up to 250 °C
LLKS-500-BE	P60104		5 m fibre-optic cable up to 250 °C
LLKS-1000-BE	S60001		10 m fibre-optic cable up to 250 °C Fibre-optic cable with increased lengths or with protection hose on request.
LLKM	Z01160		Fibre-optic mounting clamp
UWB 100	Z01161		Air blower for optical converter ULW 100-200, length L=120 mm
UWB 50	Z01166		Air blower for optical converter ULW 50-200, length L=70 mm
ULK 20	Z01162		Fibre-optic coupling up to 250 °C
ULVW061	P51029		Optic converter 8° x 2°
Mounting clamp Ø25	Z00126		Mounting clamp for optic ULV

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