



## TL $\mu$

*All registration mark detection applications*

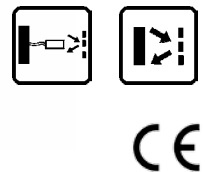
- Teach-in, Remote settings
- Red/green or white LED emission
- Various interchangeable lenses and fiber-optic models
- Metal housing with orientable optics and connector



SENSORS

### APPLICATIONS

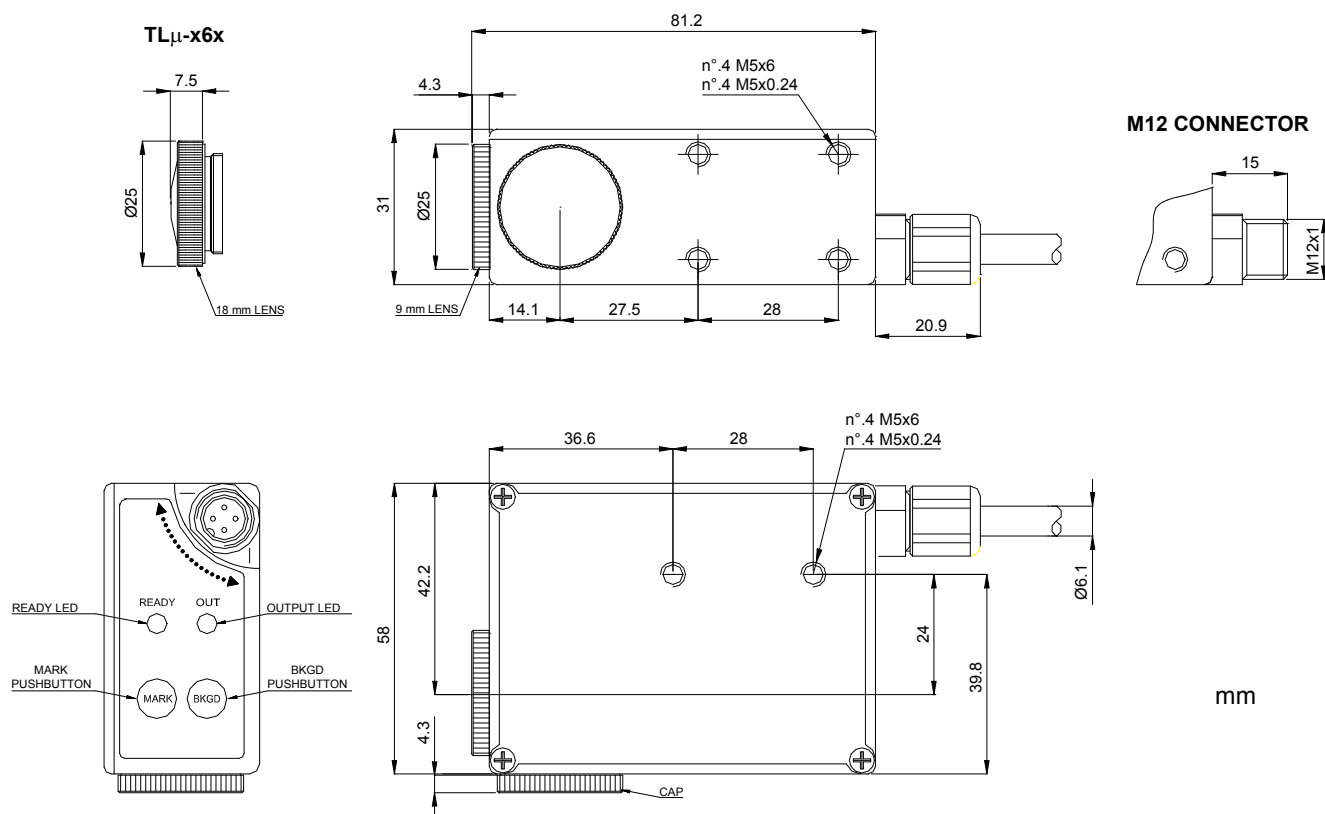
- Packaging and labeling machinery
- Beverage/Food/Cosmetic/Pharmaceutical industries
- Printing machinery



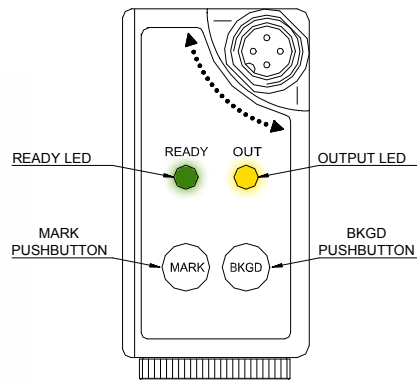
TL $\mu$		
Contrast sensor		6...12 mm (9 mm lens)
		14...22 mm (18 mm lens)
		22...34 mm (28 mm lens)
		40...60 mm (50 mm lens)
Contrast sensor with fiber optic		0...3 mm (proximity)
		0...10 mm (through beam)
Switching frequency		10 kHz
		20 kHz
Light emission		red/green LED
		white LED
Setting		push buttons
		remote
Power supply	Vdc	10...30 V
	Vac	
	Vac/dc	
Output	PNP	▪
	NPN	▪
	NPN/PNP	
	relay	
	other	0...5 V Analog Output
Connection	cable	▪
	connector	▪
	pig-tail	
Approximate dimensions (mm)		31x81x58
Housing material		Zama
Mechanical protection		IP67

TECHNICAL DATA	
Power supply	10 ... 30 Vdc (limit values; reverse polarity protection)
Ripple	2 Vpp max.
Consumption (output current excluded)	80 mA max.
Light emission	green LED 526 nm / red LED 630 nm (mod. TL $\mu$ -0/1xx) white LED 400-700 nm (mod. TL $\mu$ -4/5xx)
Setting	teach-in push-buttons / remote by 2 wires, 4 settings storage cable version
Operating mode	Light / Dark automatic setting with teach-in procedure
Indicators	red OUTPUT LED green READY LED
Output	PNP or NPN; analog output
Output current	200 mA max.
Saturation voltage	1 V max. NPN vers., 2 V max. PNP vers.
Response time	50 $\mu$ s max. (mod. TL $\mu$ -4xx) 25 $\mu$ s max. (mod. TL $\mu$ -5xx)
Switching frequency	10 kHz max. (mod. TL $\mu$ -4xx) 20 kHz max. (mod. TL $\mu$ -5xx)
Connection	3 m shielded cable $\varnothing$ 6.1 mm, M12 4-pole connector
Dielectric strength	500 Vac, 1 min between electronics and housing
Insulating resistance	>20 M $\Omega$ , 500 Vdc between electronics and housing
Electrical protection	class 1
Mechanical protection	IP67
Ambient light rejection	according to EN 60947-5-2
Vibrations	0.5 mm amplitude, 10 ... 55 Hz frequency, for every axis (EN60068-2-6)
Shock resistance	11 ms (30 G) 6 shock for every axis (EN60068-2-27)
Minimum spot dimension	1.5 x 5 mm (TL $\mu$ -x1x), 2 x 7 mm (TL $\mu$ -x6x), $\varnothing$ 3 mm (TL $\mu$ -4xx/5xx)
Depth of field	$\pm$ 3 mm (TL $\mu$ -x1x/4xx/5xx) / $\pm$ 4 mm (TL $\mu$ -x6x)
Housing material	ZAMA
Lens material	glass
Operating temperature	-10 ... 55 °C
Storage temperature	-20 ... 70 °C
Weight	450 g max. cable vers., 310 g max. connector vers.

## DIMENSIONS

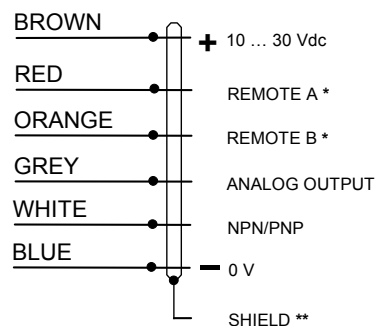


## INDICATORS AND SETTINGS



## CONNECTIONS

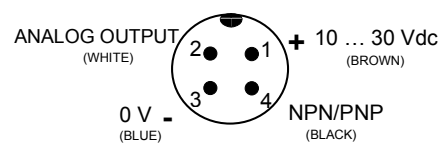
### CABLE



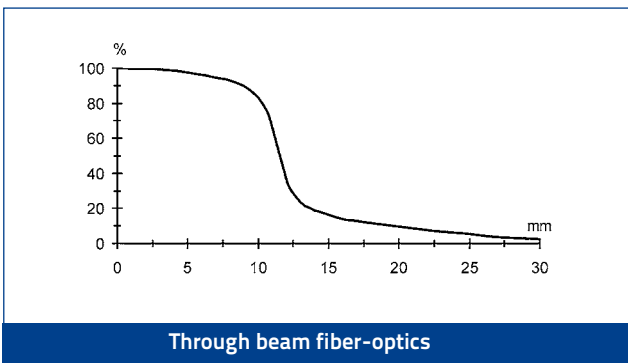
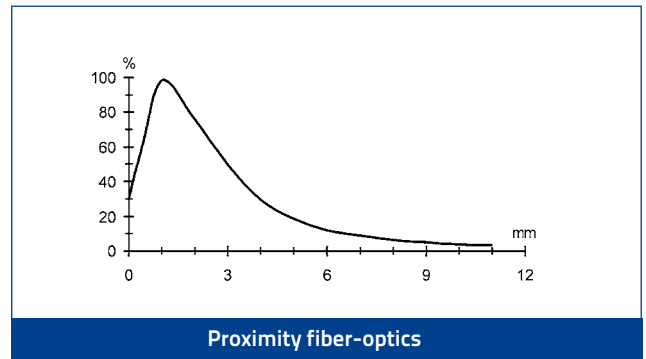
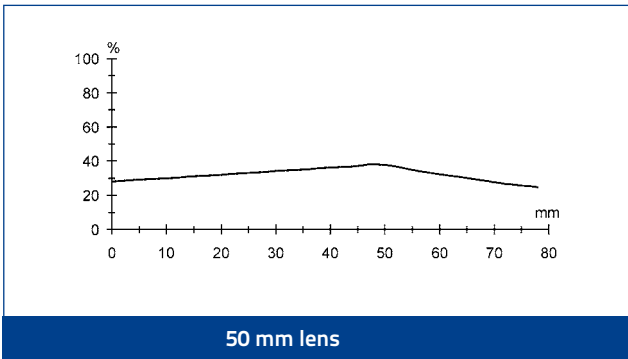
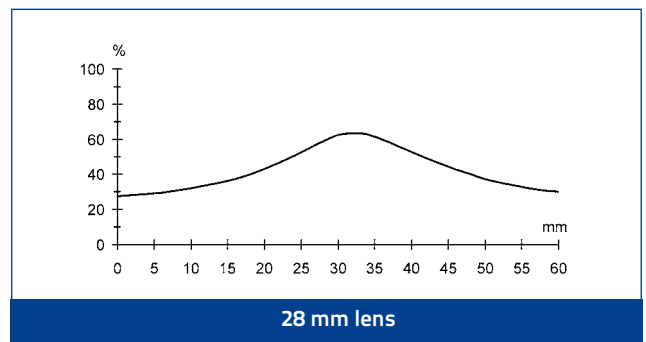
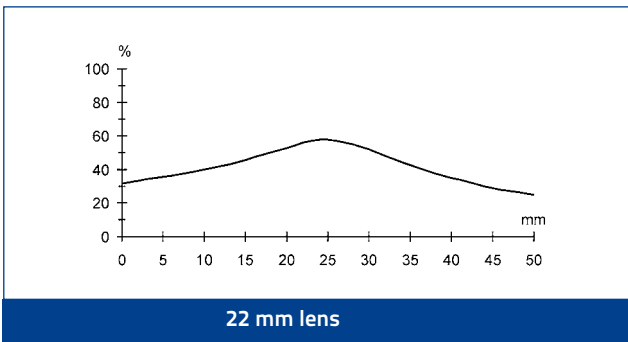
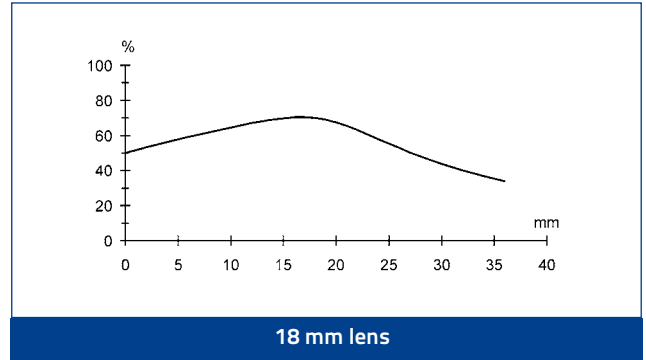
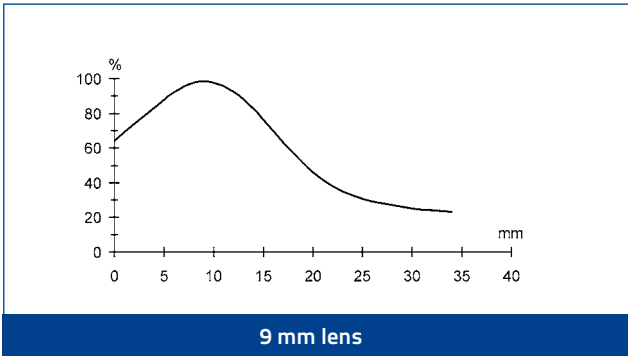
\* = Connect the unused REMOTE wires to 0 V.

\*\* = The cable shield is insulated from the sensor housing; it is recommended to connect the shield to 0 V.

### M12 CONNECTOR



## DETECTION DIAGRAMS



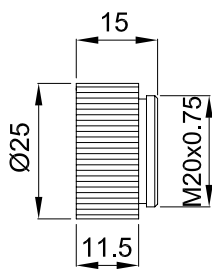
The detection diagrams indicate the typical operating distance.

## MODEL SELECTION AND ORDER INFORMATION

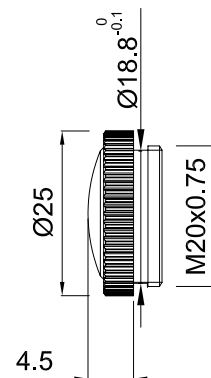
OPTIC FUNCTION	EMISSION	OPTICS	CONNECTION	OUTPUT	MODEL	ORDER No.
Contrast sensor	Red/Green (Vertical spot)	9 mm	3m Cable	NPN	TL $\mu$ -011	964401000
				PNP	TL $\mu$ -111	964401080
			M12 Connector	NPN	TL $\mu$ -015	964401020
				PNP	TL $\mu$ -115	964401100
	Red/Green (Horizontal spot)		3m Cable	NPN	TL $\mu$ -011L	964401010
				PNP	TL $\mu$ -111L	964401090
			M12 Connector	NPN	TL $\mu$ -015L	964401030
				PNP	TL $\mu$ -115L	964401110
	Red/Green (Vertical spot)	18 mm	M12 Connector	NPN	TL $\mu$ -065	964401060
				PNP	TL $\mu$ -165	964401140
	White (Circular spot)	9 mm	M12 Connector	NPN	TL $\mu$ -415C	954151330
				PNP	TL $\mu$ -515C	954151360
NPN				TL $\mu$ -411C	954151410	
3m Cable			PNP	TL $\mu$ -511C	954151420	
			PNP	TL $\mu$ -545	954151380	
			NPN	TL $\mu$ -445	954151350	
Fiber optic contrast sensor	White	Fiber optics	M12 Connector			

## ACCESSORIES

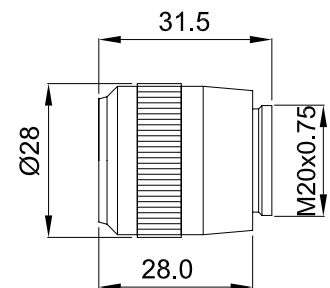
HI-RES LENS



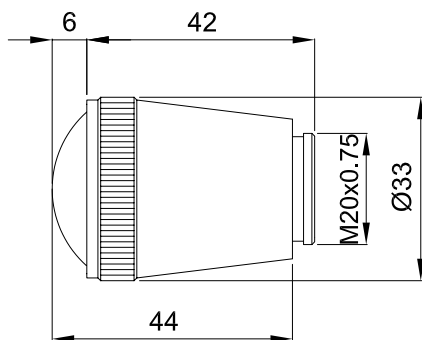
18 mm LENS



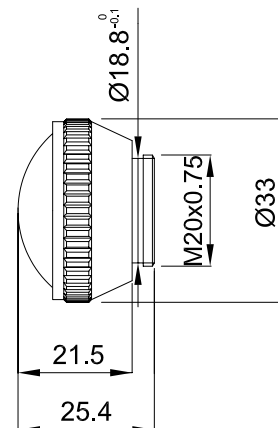
22 mm LENS



28 mm LENS



40 mm LENS



MODEL	DESCRIPTION	ORDER No.
Lens Hi-Res	additional focussing glass lens with 9 mm focus (*)	95ACC1050
Lens No.18	glass lens with 18 mm focus	95ACC2680
Lens No.22	glass lens with 22 mm focus	95ACC1100
Lens No.28	glass lens with 28 mm focus	890000194
Lens No.40	glass lens with 40 mm focus	95ACC2740
Lens No.50	glass lens with 50 mm focus	573030511
OF -30-5	plastic fiber-optic L 50 cm - point-shaped spot proximity	96B001070
OF -31-10	glass fiber-optic L 100 cm - point-shaped spot proximity	96B201000
OF -32-10	glass fiber-optic L 100 cm - rectangular spot proximity	96B211000
OF -33-10	glass fiber-optic L 100 cm - through beam	96B221000
OF -34-10	glass fiber-optic L 100 cm - horizontal spot 90° proximity	96B231000
OF -35-10	glass fiber-optic L 100 cm - vertical spot 90° proximity	96B24100

\* focussing lens to screw between the sensor and the normal 9 mm lens

## CABLES

TYPE	DESCRIPTION	LENGTH	MODEL	ORDER No.
Axial M12 Connector	4-pole, grey, P.V.C.	3 m	CS-A1-02-G-03	95A251380
		5 m	CS-A1-02-G-05	95A251270
		7 m	CS-A1-02-G-07	95A251280
		10 m	CS-A1-02-G-10	95A251390
	4-pole, P.U.R.	2 m	CS-A1-02-R-02	95A251540
		5 m	CS-A1-02-R-05	95A251560
Radial M12 Connector	4-pole, grey, P.V.C.	3 m	CS-A2-02-G-03	95A251360
		5 m	CS-A2-02-G-05	95A251240
		7 m	CS-A2-02-G-07	95A251245
		10 m	CS-A2-02-G-10	95A251260
	4-pole, P.U.R.	2 m	CS-A2-02-R-02	95A251550
		5 m	CS-A2-02-R-05	95A251570
Axial M12 Connector	4-pole, shielded, black, P.V.C.	3 m	CV-A1-22-B-03	95ACC1480
		5 m	CV-A1-22-B-05	95ACC1490
		10 m	CV-A1-22-B-10	95ACC1500
		15 m	CV-A1-22-B-15	95ACC2070
		25 m	CV-A1-22-B-25	95ACC2090
Radial M12 Connector	4-pole, shielded, black, P.V.C.	3 m	CV-A2-22-B-03	95ACC1540
		5 m	CV-A2-22-B-05	95ACC1550
		10 m	CV-A2-22-B-10	95ACC1560
Axial M12 Connector	4-pole, U.L., black, P.V.C.	3 m	CS-A1-02-U-03	95ASE1120
		5 m	CS-A1-02-U-05	95ASE1130
		10 m	CS-A1-02-U-10	95ASE1140
		15 m	CS-A1-02-U-15	95ASE1150
		25 m	CS-A1-02-U-25	95ASE1160
Radial M12 Connector	4-pole, black	Connector- not cabled	CS-A1-02-B-NC	G5085002
		Connector- not cabled	CS-A2-02-B-NC	G5085003