



ECO

Safety Light Curtains

(Series E30, E55, E80)


Connecting and Operating Instructions



Regarding these connecting and operating instructions



These connecting and operating instructions contain information on the appropriate operation of ECO Safety Light Curtains. It is supplied to the customer along with the delivered system.

Safety precautions and warnings are designated by the symbol .

Leuze lumiflex GmbH + Co. is not liable for damage resulting from improper use of its equipment. Acquaintance with these instructions constitutes part of the knowledge required for proper use.

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Contents

1	System Overview and Range of Applications	4
1.1	System Overview	4
1.2	Approvals	4
1.3	Device Types and Range of Applications	5
2	Safety Precautions	6
2.1	General Hazards Caused by Non-observance of Safety Precautions	6
2.2	Special Safety Instructions for Use of Type 2 Protective Devices	7
2.3	Operating Conditions	7
3	Design and Function	8
3.1	System Overview	8
3.2	Operating Mode	9
3.3	Cascading	9
3.4	Display Elements	10
3.5	Separate Transmission Channels to Prevent Mutual Interference	10
3.6	Test Input	11
3.7	OSSD Switch Output	11
3.8	Contamination and Fault Signal Output	11
3.9	Diagnostic Function	11
4	Installation	13
4.1	General Installation Procedures	13
4.2	Mounting Procedures for ECO Light Curtains (Series E30)	15
4.3	Mounting Procedures for ECO Light Curtains used for the Horizontal Safeguarding of Danger Areas (Series E55 and E80)	16
4.4	Mechanical Installation	17
5	Electrical Installation	19
5.1	Installation Procedures	19
5.2	Power Supply	19
5.3	Connecting Cables	19
5.4	Connecting Examples	20
6	Device Start-up	23
7	Cleaning	23
8	Technical Data and Dimensional Drawing	23
9	Selection and Ordering information	28
9.1	Selecting an ECO Safety Light Curtain or Light Curtain	28
9.2	Ordering Information	28
9.3	Scope of Delivery and Accessories	29
10	Declaration of Conformity	31

1 System Overview and Range of Applications

1.1 System Overview

ECO is a product group consisting of testable safety light curtains. In combination with a test monitoring unit such as the Leuze lumiflex TNT 35, MSI-s/R, or MSI-m/R (for muting), ECO devices qualify as an active optoelectronic protective device (AOPD), Type 2, in accordance with IEC 61496-1, -2 or EN 61496-1, -2. ECO light curtains have many outstanding features, including:

- Extremely compact design (17 mm x 33 mm)
- Interference between adjacent devices can be avoided by selecting separate transmission channels
- Simple to connect using an M12 connector
- Possible to integrate a stepping-behind protection by cascading several units
- Functions (e.g. restart interlock, muting) can be flexibly expanded by adding Type 2 test monitoring units TNT 35 or MSI safety interface components
- Self-diagnosis system for PC-supported displays and diagnostics
- Contamination and error signal output to the SPS

1.2 Approvals

EU Prototype Testing (Europe)

TÜV PRODUCT SERVICE GMBH
Ridlerstraße 65
D-80339 Munich
Germany

IEC- respectively EN 61496-2 testing conducted by:

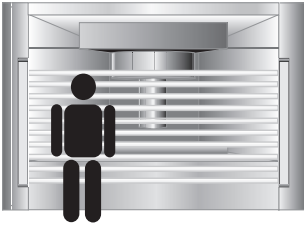
BIA Berufsgenossenschaftliches Institut für Arbeitssicherheit
(Trade Association Institute for Industrial Safety)
Alte Heerstraße 111
D-53757 St. Augustin
Germany



1.3 Device Types and Range of Applications

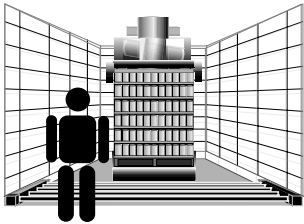
ECO safety light curtains are available in series E30 to provide hand protection, in series E55 and E80 to safeguard danger zones, and in combination as a cascaded design. Typical application areas are:

- Textile machines such as power looms, sectional warping machines or beam warping machines
- Warehouse technology, such as paternosters for shelving
- Automatic assembly machines for circuit boards
- Corpus presses in the timber industry
- Packaging machines
- Shoe machines
- Rotary-cycle machines



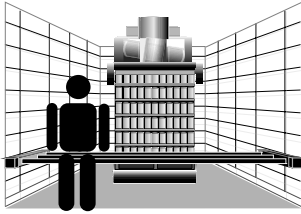
ECO Light Curtains, Series E30, for providing hand protection at danger points

Resolution:	30 mm (hand)
Protection range:	0.3 ... 6 m *)
Protecting heights:	150, 225, 300, 450, 600, 750, ... 1800 mm (up to 3000 mm upon request)



ECO Light Curtains, Series E55, for safeguarding danger zones close to floor level (75 mm and higher)

Resolution:	55 mm (shin)
Protected range:	0.3 ... 6 m *)
Protected heights:	300, 450, 600, ..., 1800 mm (up to 3000 mm upon request)



ECO-Light Curtains, Series E 80, for safeguarding danger zones at heights of 450 mm and above

Resolution:	80 mm (leg)
Protected range:	0.3 ... 6 m *)
Protected heights:	450, 600, 900, 1200, 1500, 1800 mm (up to 3000 mm upon request)



ECO Light Curtains in a cascaded design for providing hand protection and stepping behind protection at danger points

Resolution of Master unit:	30 mm, 55 mm, or 80 mm
Resolution of Slave unit:	30 mm, 55 mm, or 80 mm
Protected range:	0.3 ... 6 m *)
Protected heights/Master:	300, 450, 600, 750, ..., 1800 mm
Protected heights/Slave:	150, 225, 300, 450, 600, 750, ..., 1800 mm

*) Multi-sided danger point protection can be achieved by implementing deflective mirrors. In this case, the range is reduced by approx. 10 % per mirror.

2 Safety Precautions

2.1 General Hazards Caused by Non-observance of Safety Precautions



Leuze lumiflex products are developed and produced with careful attention paid to recognized codes of engineering practice. However, the protective function of the equipment can be impaired if the units are not used for their intended purpose or if they are used improperly. Such instances can jeopardize the health and lives of the personnel operating the machinery.

Safety light curtains do not provide protection against injuries resulting from flying objects.

2.2 Special Safety Instructions for Use of Type 2 Protective Devices



- Type 2 protective devices are only to be implemented where permitted by the machinery-specific C-Standard, or where the evaluation of risk according to EN 1050 or EN 954-1, Figure C1 and E1, results in a slight to medium risk level (II or III), see following examples.

Example for Level II:

Degree of injury:	serious, irreversible
Frequency of the exposure to danger:	rarely to occasionally
Possibility for preventing danger:	possible under certain circumstances

Example for Level III:

Degree of injury:	serious, irreversible
Frequency of the exposure to danger:	rarely to occasionally
Possibility for preventing danger:	virtually impossible

- For Type 2-protective devices, the protective effect is checked by periodic testing. A defect occurring between the test cycles can result in a temporary loss of the protective function which will not be detected until the next test. Hence, shorter intervals between tests ensure higher availability of the protective function. Organizations responsible for machine safety, such as the expert committees of trade associations, can provide assistance in this regard. The Leuze lumiflex test monitoring unit TNT 35 or the MSI safety interface components provide optimal Type 2 functional safety; see Chapter 5 „Electrical installation“.

2.3 Operating Conditions



The relevant regulations (e.g. machinery-specific C-Standards in the EU or the OSHA and ANSI standards in the USA) apply for the use and installation of ECO safety light curtains. In general, compliance with the following operating conditions is required:

- ECO safety light curtains are to be installed so that there is no possibility of gaining access from above, beneath or behind the sensing zone. If this is not assured, then additional protective measures must be installed.

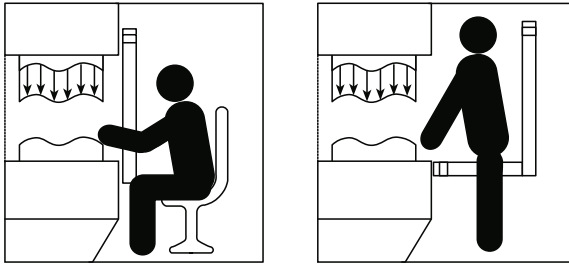


Fig. 1 Access from above, beneath or behind must be impossible

- It must be possible to intervene in the machine controls by electrical means so that potentially hazardous conditions in each working phase can be terminated immediately.
- The safety clearance between the danger point and the sensing zone must be sufficiently large so that the potentially hazardous condition is terminated before the person has reached the danger point (refer to chapter 5).

3 Design and Function

3.1 System Overview

Configured on a modular basis, ECO safety light curtains consist of a transmitter containing a row of IR radiation elements and a receiver containing a row of receiver elements. These elements are sequentially controlled and evaluated in quick succession.

The transmitter and receiver are optically synchronized; it is not necessary to link the two components with a cable. If the ECO is used as a Type 2 protective device, an external test monitoring unit emits a periodic test signal in order to trigger a system test which checks the correct response of the receiver. The Leuze lumiflex TNT 35 or MSI safety interface components, e.g. the MSI-s/R, can function as this test monitoring unit. The particular advantage of these units is that the periodic functional test is performed cyclically in the background, without hindering the production output of the protected machinery.

3.2 Operating Mode

ECO safety light curtains function in the mode „protective operation without restart interlock“. If sufficient receiver signal is present at all light axes, the output voltage at the OSSD output is switched to +24V DC. If one or more light axes are interrupted, the OSSD output is shut off within the system response time. As soon as all the light axes are unobstructed again, the output automatically reverts to +24V DC.

3.3 Cascading

By connecting ECO master and slave units in succession, it is possible to link up two or more sensing zones. Master and slave units with different resolutions can be connected to one another.

Master units M

E30	-300 M, -450 M, -600 M, -750 M, -900 M, -1050 M, -1200 M, -1350 M, -1500 M, -1650 M, -1800 M
E55	-450 M, -600 M, -750 M, -900 M, -1050 M, -1200 M, -1350 M, -1500 M, -1650 M, -1800 M
E80	-450 M, -600 M, -900 M, -1200 M, -1500 M, -1800 M

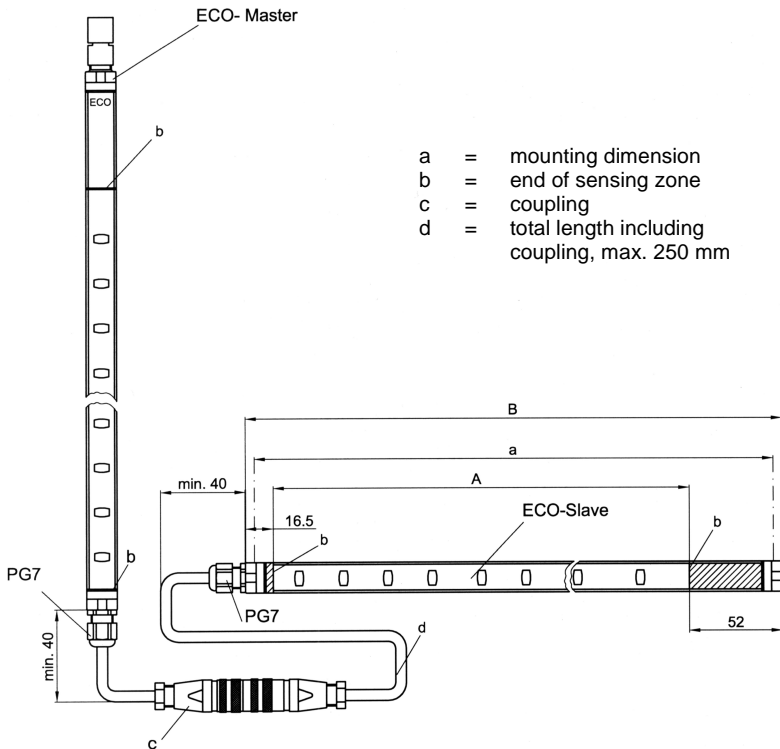


Fig. 2 Dimensional drawing „Cascaded design“

Slave units S

E30	-150 S, -225 S, -300 S, -450 S, -600 S, -750 S, -900 S, -1050 S, -1200 S, -1350 S, -1500 S, -1650 S, -1800 S
E55	-300 S, -450 S, -600 S, -750 S, -900 S, -1050 S, -1200 S, -1350 S, -1500 S, -1650 S, -1800 S
E80	-450 S, -600 S, -900 S, -1200 S, -1500 S, -1800 S

3.4 Display Elements

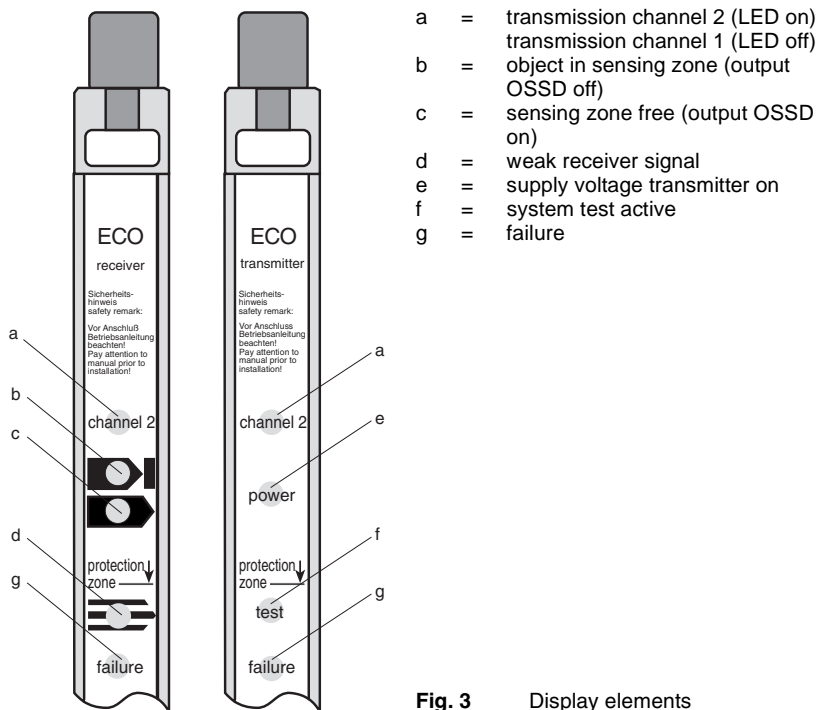


Fig. 3 Display elements

3.5 Separate Transmission Channels to Prevent Mutual Interference

Functional disturbances can result from mutual interference caused by the optical cross-talk of adjacent units. In order to prevent these disturbance, two separate transmission channels can be selected by setting suitable polarities for the supply voltage cables. The transmitter and receiver of one system must each be connected with the same polarity (= transmission channel).

Channel 1 = white at +24V DC and green at 0 V;
 Channel 2 = white at 0 V and green at +24V DC.

3.6 Test Input

The ECO transmitter is equipped with an input for the periodic functional test (+24V DC = no test; high resistance or 0 V = test).

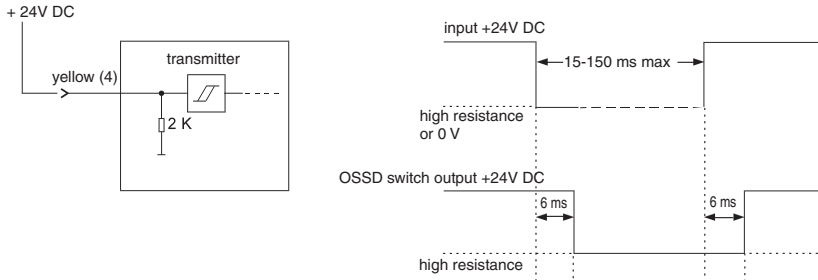


Fig. 4 ECO test input

3.7 OSSD Switch Output

The short circuit-proof +24V DC pnp switch output on the receiver is able to switch earthed loads of up to 0.1 A. Contactors or relays must be wired parallel to the coil with suitable spark absorbers.

3.8 Contamination and Fault Signal Output

This pnp output normally carries +24V DC. In case of a weak receiver signal caused by contamination or misalignment, or in case of a fault, the output is switched to high resistance. The output is short circuit-proof and can carry up to 70 mA.

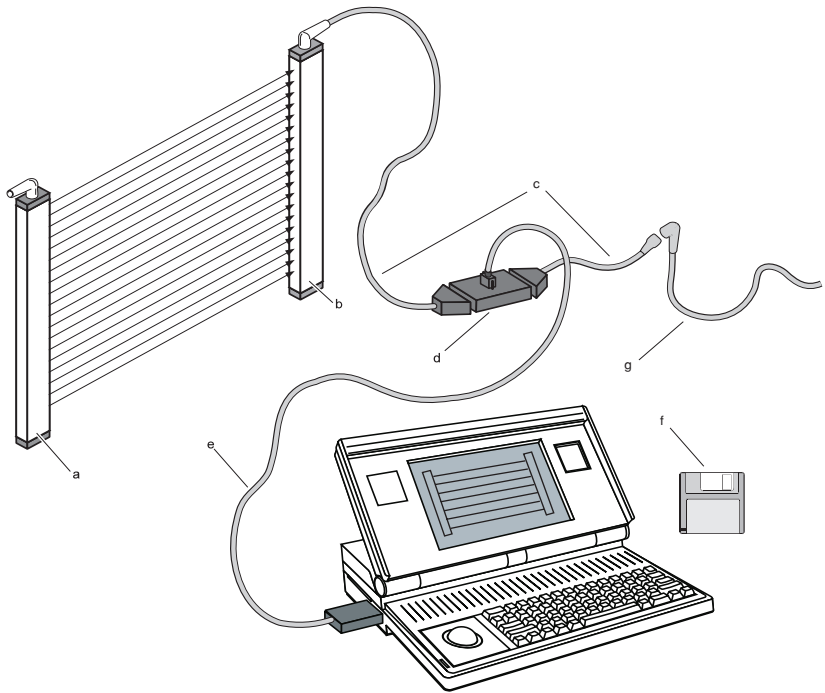
3.9 Diagnostic Function

The self-diagnosis system integrated into the transmitter and receiver facilitates the device start-up as well as on-site fault localization. In case of a defective component, the „failure“ LED of the defective component lights up.

In addition, the receiver is equipped with an RS-485 interface. This allows it to be connected to a PC in the workshop so that the infrared light axes can be visualized on-site and detailed diagnostics can be performed.

The PC must be connected by means of an RS-485 / RS-232 interface converter, and its serial interface must be able to handle a transmission rate of up to 57.6 Kbaud.

The diagnostics software required for visualization can be run on Windows 3.1 and higher versions. Both the software and the interface converter are available as optional accessories.



- a = ECO transmitter
- b = ECO receiver
- c = set of diagnosis cables with straight or angled connector
- d = RS-485/RS-232 Interface converter
- e = RS-232 cable
- f = ECO diagnostic software
- g = ECO receiver connecting cable (is removed for diagnosis, the interface converter is connected in series)

Fig. 5 Visualization and diagnostics by means of serial interface and PC

4 Installation

4.1 General Installation Procedures



Pay close attention to the safety precautions described in Chapter 2. In general, all units must be installed so that the danger point can be reached only by passing through the sensing zone and that a sufficient clearance is maintained between the danger point and the sensing zone (see chapter 4.2 and 4.3).

4.1.1 Distance from Reflective Surfaces



Reflective surfaces within the 8° transmission and reception cone can cause reflections that result in a non-detection of body parts. For this reason, a minimum distance (a) must be maintained between the optical axis of the ECO and reflective objects, such as polished machine parts or material receptacles. The following diagram shows the proper installation and the distance (a) as a dependency of the width of the sensing zone.

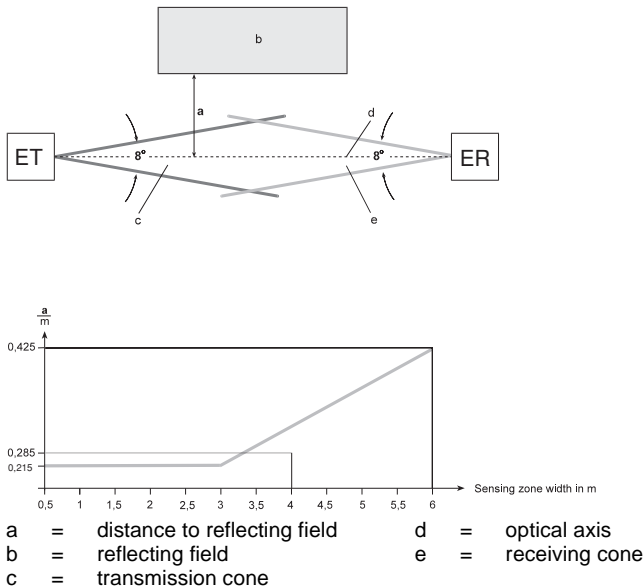


Fig. 6 A sufficiently large distance (a) from reflective surfaces must be assured. a [m] = 0.07 x protection zone width [m] + 0.005 m

4.1.2 Preventing Mutual Interference between Adjacent Devices



When a receiver (receiver cone 8° full angle) is located in the beam path of an adjacent transmitter, the overlapping ranges can result in optical cross-talk. This in turn can lead to faulty switching or, in certain circumstances, even to a temporary breakdown of the protective function. In order to prevent this from happening, two separate transmission channels can be selected for adjacent devices (see chapter 3.5). The units can also be mounted in opposite directions or be separated by appropriate shielding.

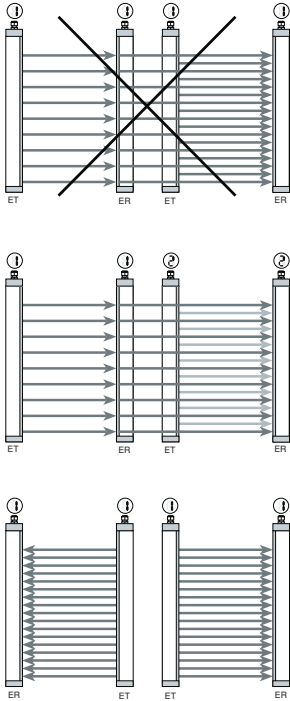


Fig. 7

Preventing mutual interference by selecting separate transmission channels

4.2 Mounting Procedures for ECO Light Curtains (Series E30)



When mounting ECO safety light curtains for hand protection, it is essential that the sensing zone must be made inaccessible from above, below and the side. It must also be impossible to step behind the sensing zone. If necessary, supplemental mechanical grids must be installed, or multiple ECO units must be cascaded. The minimum protective clearance is calculated as follows:

$$S = (K \times T) + C$$

where:

- S** minimum clearance between the sensing zone and the danger point in mm ($S_{\min} \geq 100$ mm)
- K** accessing rate 2 mm/ms
- T** machine lag time + response time of the optoelectronic protective device (AOPD) in ms
- C** 8 (d - 14 mm), but not less than 0
- d** detection capability (resolution) of the AOPD in mm

If this calculation results in a value for S that is greater than 500 mm, then the calculation may be repeated for $K = 1.6$ mm/ms. In this case, the value of S_{\min} must not be less than 500 mm.

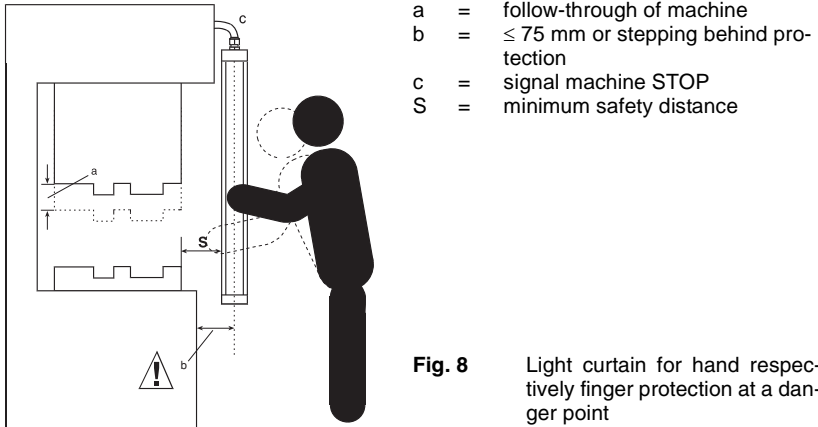


Fig. 8 Light curtain for hand respectively finger protection at a danger point

4.3 Mounting Procedures for ECO Light Curtains used for the Horizontal Safeguarding of Danger Areas (Series E55 and E80)



When the light curtains are mounted horizontally, make sure that the height of the sensing zone does not exceed 1000 mm. If H exceeds 300 mm (200 mm if children are present), an undetected approach underneath the sensing zone is possible. This factor must be taken into account when the risk is assessed. The minimum protective clearance S and the installation height H are calculated as follows:

$$S = (1.6 \text{ mm/ms} \times T) + C$$

$$C = 1200 \text{ mm} - 0.4 \times H$$

where:

H = height of the sensing zone above the plane of reference

C_{min} = 850 mm

H_{max} = 1000 mm

H_{min} = 15 (d - 50 mm)

where:

d resolution of the AOPD

The following admissible heights for the ECO light curtains, as resulting from this calculation, are:

E55: H_{min} = 75 mm H_{max} = 1000 mm

E80: H_{min} = 450 mm H_{max} = 1000 mm

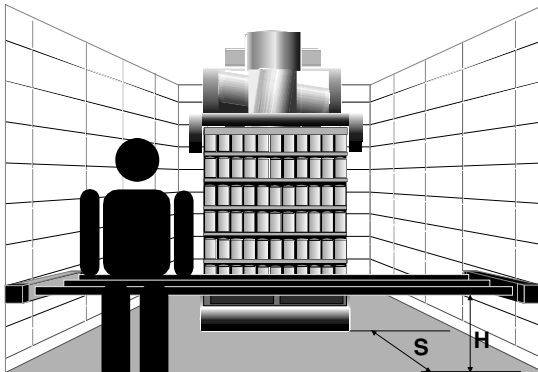


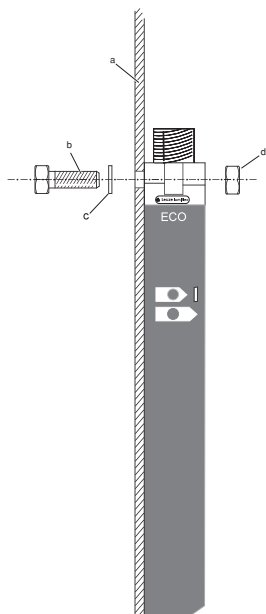
Fig. 9 Safety clearance and installation heights for the horizontal safeguarding of danger zones

4.4 Mechanical Installation

4.4.1 Standard Mounting

ECO units are mounted by means of through holes in the profile end pieces. (For the distance between holes, see the dimensional table on page 25 and the dimensional drawing on page 26). The holes have a diameter of 5.3 mm.

This fixed means of mounting is appropriate only when no adjustment is required (i.e. the mounting areas are located in one plane and the mounting positions are at the same height).



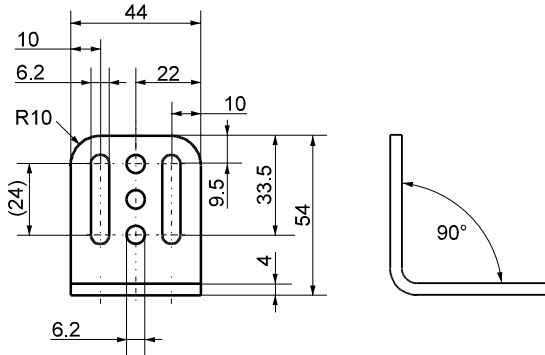
- a = attachment surface
- b = screw M5
- c = disk
- d = nut M5

Fig. 10 ECO standard mounting by using the through holes in the profile end pieces

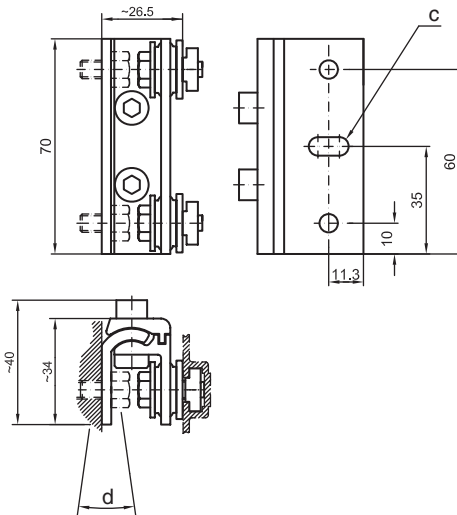
4.4.2 Mounting Using the Protective Mounting Profile

To provide additional mechanical protection, the ECO can be snapped into a protective mounting profile. This is recommended for larger protected heights and when the unit needs to be adjustable. The protective mounting profile can be used with either a standard mounting plate or a swivelling mounting support with vibration damping.

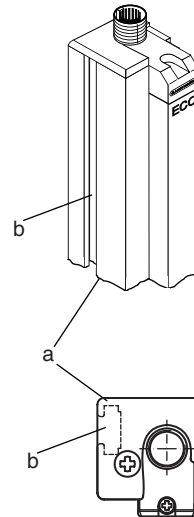
Standard mounting bracket



Swivel mounting support with vibration damping (swivel range $\pm 8^\circ$)



ECO with protective mounting profile



- a = ECO protective mounting profile
- b = longitudinal groove for freely positionable M6 T-slot nuts
- c = slot 13 x 6
- d = swivelling angle $\pm 8^\circ$

Fig. 11 Mechanical mounting by using the ECO protective and mounting profile

5 Electrical Installation

5.1 Installation Procedures



Pay close attention to the safety precautions and operating conditions described in Chapter 2. The electrical installation must be performed by experienced and qualified personnel. **A unit only qualifies as a Type 2 protective device according to IEC-, EN 61496-1 if combined with a test monitoring unit.** The test monitoring unit triggers a functional test of ECO transmitter and receiver via the test input of the transmitter, and it checks the switch-off function of the receiver output. If the receiver output does not respond to the test signal within the system response time, the output of the test monitoring unit assumes the „off“ status. (For suitable Leuze lumiflex test monitoring units or safety interface components, see the connection examples.)

5.2 Power Supply

The power supply to transmitter and receiver must be +24V DC \pm 20 %. The maximum power consumption is 150 mA (without load). The power supply must meet the requirements of IEC 60742, exhibiting a safe mains separation as well as being able to bridge short-term mains failures of up to 20 ms.

5.3 Connecting Cables

The devices are connected by means of prepared shielded connecting cables, 5 m long or 15 m long, with angled or straight M12 sockets (see Accessories). The protective screen has to be connected to PE. The cables must be laid separately from power cables. The following tables show the wiring of the transmitter and receiver.

ECO Transmitter			ECO Receiver		
M12 plug	Wire color	Meaning	M12 plug	Wire color	Meaning
1	white	+24V DC*)	1	white	+24V DC*)
2	brown	PE	2	brown	PE
3	green	0 V*)	3	green	0 V*)
4	yellow	test input (0 V = Test)	4	yellow	OSSD switch output
5	grey	free	5	grey	„weak signal“ „error“
6	pink	free	6	pink	RS 485+
7	blue	free	7	blue	RS 485-
8	red	protective screen/ PE	8	red	protective screen/ PE

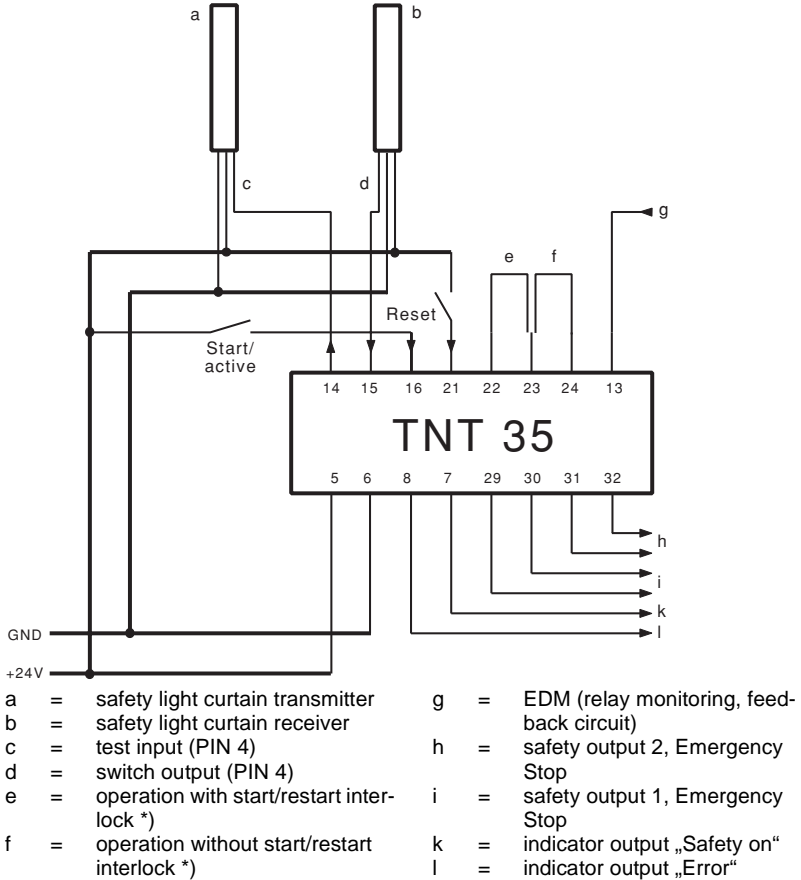
*) To avoid mutual interference by adjacent devices, transmission channel 2 can be chosen by exchanging polarities (white = 0 V, green = +24V DC). The wiring of the transmitter test input (yellow) is not affected.

Fig. 12 ECO Wiring diagram

5.4 Connecting Examples

5.4.1 Test Monitoring with Test Monitoring Unit TNT 35

Up to three pairs of ECO safety light curtains can be connected in series directly to the TNT 35. The safety light curtains receive their power directly from the power supply of the production system/machine. The TNT 35 periodically performs a test monitoring of the light curtains every 2 seconds, without interfering in the production process of the safeguarded machine.

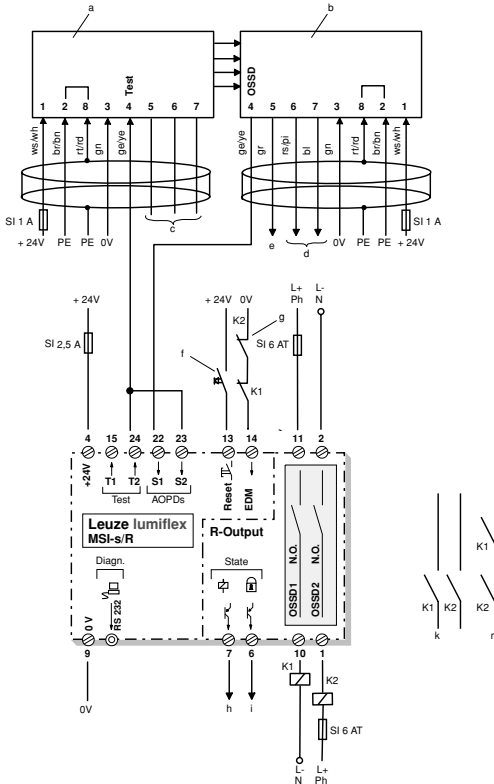


*) Selecting the type of operation through bridge between:
 terminal 22 and 23 (with start/restart interlock) or
 terminal 23 and 24 (without start/restart interlock)

Fig. 13 Test monitoring with TNT 35

5.4.2 Test Monitoring with Modular Safety Interface MSI-s/R

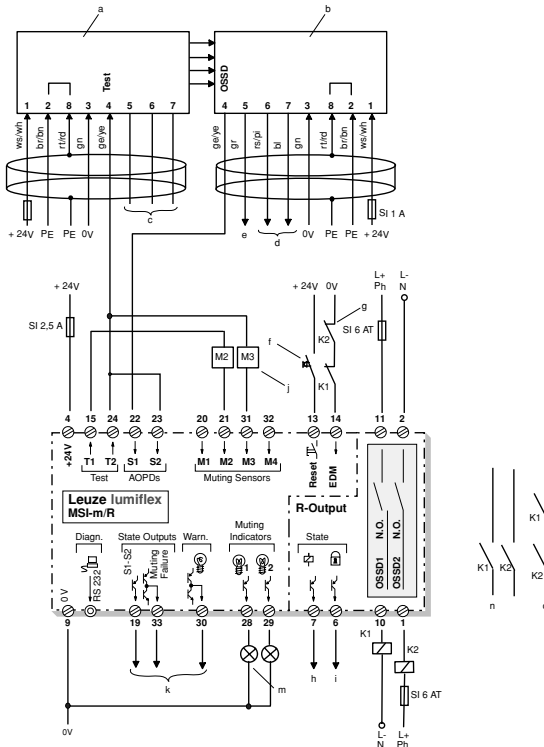
The modular safety interface MSI-s/R performs an automatic functional test of the ECO every 200 ms without impeding the production output of the protected machinery. This quick succession of cyclical functional tests ensures a maximum of Type 2 functional safety. In addition, it expands the functional range of the ECO, adding „start/restart interlock“ and „protection control“ functions.



- | | |
|---|---|
| a = ECO-transmitter | h = indicator output „status safety relay |
| b = ECO-receiver | i = indicator output „status restart interlock“ |
| c = not connected | k = disconnecting path for two-channel control |
| d = RS-485 interface for diagnosis | m = disconnecting path for single channel control |
| e = pnp-signal output „weak signal/error“ | |
| f = button „reset“ | |
| g = feedback circuit for relay monitoring | |

Fig. 14 Connecting example: ECO with Modular Safety Interface MSI-s/R

5.4.3 Test Monitoring and Muting with Modular Safety Interface MSI-m/R (parallel muting)



- a = ECO-transmitter
- b = ECO-receiver
- c = not connected
- d = RS-485 interface for diagnosis
- e = pnp-signal output „weak signal/error“
- f = button „reset“
- g = feedback circuit for relay monitoring
- h = indicator output „status safety relay“
- i = indicator output „status restart interlock“
- j = M2, M3 testable muting sensors
- k = indicator and signal outputs
- m = muting indication lamps (to be connected in any case!)
- n = disconnecting path for two-channel control
- o = disconnecting path for single channel control

Fig. 15 Connecting example: ECO with Modular Safety Interface MSI-m/R

6 Device Start-up

- Before the unit is switched on for the first time, check the supply voltage (+24V DC $\pm 20\%$).
- Turn on the supply voltage (transmitter „power“ LED on, „test“ LED lights up once briefly).
- A self-test is performed in the transmitter and receiver for approx. 2 seconds.
- In case of optimal adjustment, only the green LED in the receiver will still be illuminated.

If the green LED does not light up after 2 seconds, check the following points:

- Make sure that the system test is not constantly activated (i.e. that the transmitter „test“ LED is not constantly illuminated): If it is, connect the test input according to the connection example → the „test“ LED will go off
- Make sure that there is no object in the sensing zone → if so, remove the object.
- If the „weak signal“ LED (striped arrow) in the receiver is illuminated, check the orientation of the units to each other; transmitter and receiver must be mounted at the same height, and the plexiglass front screens must be exactly parallel to each other. As soon as the orientation is optimal, the „weak signal“ LED will go off.
- If the „failure“ LED lights up in the transmitter or receiver, the corresponding component has an internal defect and must be exchanged.

7 Cleaning

The plexiglass front screens in the transmitter and receiver must be cleaned regularly, depending on the amount of dirt that has accumulated. Illumination of the „weak signal“ LED and the signal output of the receiver indicate, at the latest, when cleaning is necessary. We recommend using a mild cleaning solution for cleaning the plexiglass front screens. They are highly resistant to diluted acids and alkalies, and resistant to organic solvents to a limited extent.

8 Technical Data and Dimensional Drawing

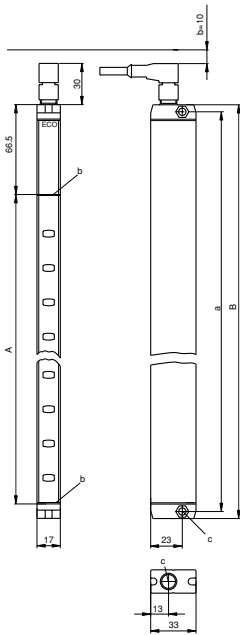
Safety class	Type 2 (testable) in accordance with EN-, IEC 61496-1,-2 combined with an external Type 2 test monitoring unit (e.g. TNT 35 or MSI-s/R)	
Protected heights (Heights of sensing zone)	150 ... 1800 mm for Series 300 ... 1800 mm for Series 450 ... 1800 mm for Series	E30, E30/ S *) E30/M, E55, E55/S *) E55/M, E80, E80/M, E80/S*)
Sensing zone width/range	0.3 ... 6 m	
Detection capability (Resolution)	Series E30: Series E55: Series E80:	30 mm 55 mm 80 mm

Response time (from the interruption of the sensing zone to the switching off of the OSSD output, without the response time of the test monitoring unit)	Depends on the protected height: Series E30, E30/M, E30/S: 8...29 ms Series E55, E55/M, E55/S: 8...19 ms Series E80, E80/M, E80/S: 8...15 ms For precise response times, see the table page 25
Switch-on time delay (from the release of the sensing zone until the OSSD output is switched on)	From 0.5 ms for all series. In case of very short interruptions of the sensing zone, the OSSD output remains off for at least 100 ms.
Test duration	10 ms
Test input/transmitter	+24V DC = no test, 0 V or high resistance = test via relay (positively driven) make contact or pnp output (signal for triggering test: min. 20 ms)
Enclosure rating	IP 65
Ambient operating temperature	0 ... 55 °C
Protective class	I
Supply voltage	+24V DC \pm 20 % (from an external power supply unit with safe mains separation and 20 ms mains failure bridging)
Current consumption	Transmitter: 75 mA Receiver: 75 mA (without load)
OSSD-output	pnp-output, short circuit-proof, 100 mA max
Contamination and error signal	pnp-output, short circuit, 70 mA max
Diagnostic interface/receiver	RS-485
Electrical connection	8-pin round M12 plug-in connector
Connecting cable	7-pin, 0.25 mm ² , shielded, with injection molded socket, length 5 m or 15 m (see Accessories)
Type of operation	Protective operation without start/restart interlock
Transmitter Class Wave length Pulse duration Pulse pause Output	Light-emitting diodes as defined by EN 60825-1: 1994 + A1:2002 + A2:2001 1 880 nm 7 ms 3,12 ms 11,6 μ W
Synchronization of transmitter/receiver	Optical synchronization, 2 transmission channels can be selected
Dimensions	Cross section 17 mm x 33 mm Length = protected height + 96 mm
Atmospheric humidity	15 ... 95 % (non condensing)
Storage temperature	-25 ... +75 °C

*) Protected heights of up to 3000 mm available upon request

Measures, weights and response time of ECO safety light curtains

Type	Protecting height = Dim. A [mm]	Dim. B [mm]	Mounting Dim. a [mm]	Weight [kg]	Response time [ms]		
					E30-	E55-	E80-
Exx-150	170.5	248.5	238.5	0.156	7.2		
Exx-225	245.5	323.5	313.5	0.1x98	10.8		
Exx-300	320.5	398.5	388.5	0.240	14.6	7.2	
Exx-450	470.5	548.5	538.5	0.324	10.8	10.8	7.2
Exx-600	620.5	698.5	688.5	0.408	14.4	14.6	9.6
Exx-750	770.5	848.5	838.5	0.492	18	9	12
Exx-900	920.5	998.5	988.5	0.576	14.4	10.8	14.6
Exx-1050	1070.5	1148.5	1138.5	0.660	16.8	12.6	8.4
Exx-1200	1220.5	1298.5	1288.5	0.745	19.2	14.4	9.6
Exx-1350	1370.5	1448.5	1438.5	0.830	21.6	16.2	10.8
Exx-1500	1520.5	1598.5	1588.5	0.913	24	18	12
Exx-1650	1670.5	1748.5	1738.5	0.997	26.4	13.2	13.2
Exx-1800	1820.5	1898.5	1888.5	1.080	28.8	14.4	14.4
Exx-2100	2120.5	2198.5	2188.5	1.200	32.4		16.2
Exx-2400	2420.5	2498.5	2488.5	1.360	38.4	19.2	19.2
Exx-2700	2720.5	2798.5	2788.5	1.520	43.2	21.6	14.4
Exx-3000	3020.5	3098.5	3088.5	1.680	48	24	16

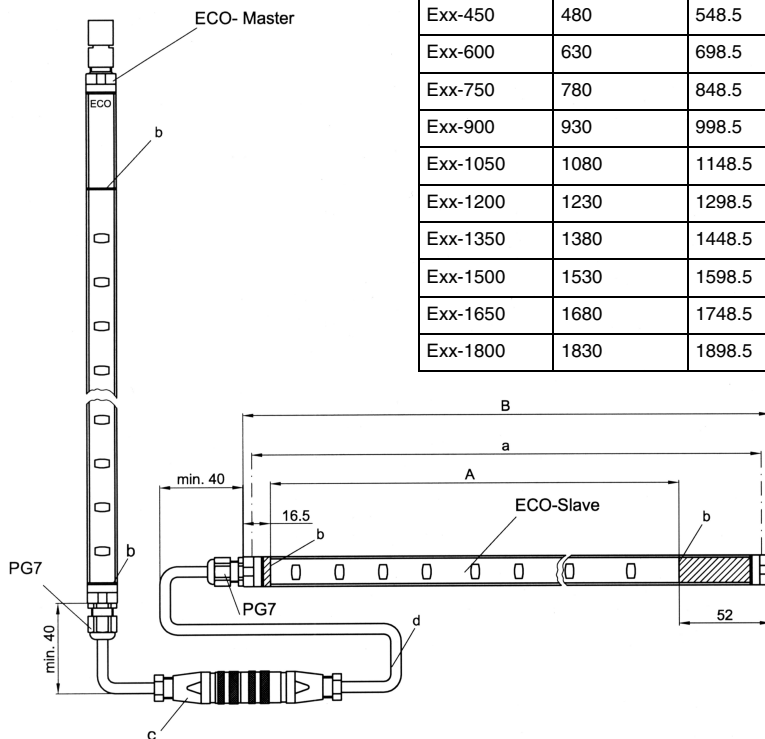


- a = mounting dimension
- b = clearance for removing the plug
- c = screw M4 or M5
- d = end of sensing zone
- e = M12, 8-pin

Fig. 16 Dimensional drawing of ECO Series E30, E55, E80

Dimensional table

Type	Slave Dim. A	Slave Dim. B
Exx-150	180	248.5
Exx-225	255	323.5
Exx-300	330	398.5
Exx-450	480	548.5
Exx-600	630	698.5
Exx-750	780	848.5
Exx-900	930	998.5
Exx-1050	1080	1148.5
Exx-1200	1230	1298.5
Exx-1350	1380	1448.5
Exx-1500	1530	1598.5
Exx-1650	1680	1748.5
Exx-1800	1830	1898.5



- a = mounting dimension
- b = end of sensing zone
- c = coupling
- d = total length including coupling, max. 250 mm

Fig. 17 Dimensional drawing ECO „Cascaded design“

The response times for master and slave units are made of the sum of the partial response times.

9 Selection and Ordering information

9.1 Selecting an ECO Safety Light Curtain or Light Curtain



1. Consult the relevant regulations for the application in question (e.g. machinery-specific C-Standards in the EU, or OSHA and ANSI standards in the USA). Observe the safety precautions described in Chapter 2.
2. Define the protection aim and select the appropriate ECO series accordingly (e.g. hand protection at a danger point ---> E30; refer to Chapters 1.3 and 2.3) and calculate the safety clearance as shown in Chapter 4.
3. Determine the width of the sensing zone (i.e. the distance between transmitter and receiver). Multi-sided safeguarding can be achieved with the use of deflection mirrors; this decreases the maximum range by approx. 10% per mirror.
4. Determine the protected height (i.e. height of the area to be protected for vertical applications; depth for horizontal applications). Be sure to consider the hazards of reaching over, reaching under, crawling under, etc.
5. Select the suitable device type and locate its order number in the selection table.

9.2 Ordering Information

Device designation:

Example	ER30-900 M Ea bb-dddd e
E	ECO
a	T = Transmitter R = Receiver
bb	object sensitivity, resolution [mm]
dddd	protected height [mm]
e	only for cascadable devices M = Master S = Slave

Order numbers

Type	E30 (bb = 30)			E55 (bb = 55)			E80 (bb = 80)		
	Standard	Master	Slave	Standard	Master	Slave	Standard	Master	Slave
ETbb-150 ERbb-150	621301 624301	– –	623301 626301	– –	– –	– –	– –	– –	– –
ETbb-225 ERbb-225	621302 624302	– –	623302 626302	– –	– –	– –	– –	– –	– –
ETbb-300 ERbb-300	621303 624303	622303 625303	623303 626303	621503 624503	– –	623503 626503	– –	– –	– –
ETbb-450 ERbb-450	621304 624304	622304 625304	623304 626304	621504 624504	622504 625504	623504 626504	621804 624804	622804 625804	623804 626804
ETbb-600 ERbb-600	621306 624306	622306 625306	623306 626306	621506 624506	622506 625506	623506 626506	621806 624806	622806 625806	623806 626806
ETbb-750 ERbb-750	621307 624307	622307 625307	623307 626307	621507 624507	622507 625507	623507 626507	– –	– –	– –

ETbb-900 ERbb-900	621309 624309	622309 625309	623309 626309	621509 624509	622509 625509	623509 626509	621809 624809	622809 625809	623809 626809
ETbb-1050 ERbb-1050	621310 624310	622310 625310	623310 626310	621510 624510	622510 625510	623510 626510	– –	– –	– –
ETbb-1200 ERbb-1200	621312 624312	622312 625312	623312 626312	621512 624512	622512 625512	623512 626512	621812 624812	622812 625812	623812 626812
ETbb-1350 ERbb-1350	621313 624313	622313 625313	623313 626313	621513 624513	622513 625513	623513 626513	– –	– –	– –
ETbb-1500 ERbb-1500	621315 624315	622315 625315	623315 626315	621515 624515	622515 625515	623515 626515	621815 624815	622815 625815	623815 626815
ETbb-1650 ERbb-1650	621316 624316	622316 625316	623316 626316	621516 624516	622516 625516	623516 626516	– –	– –	– –
ETbb-1800 ERbb-1800	621318 624318	622318 625318	623318 626318	621518 624518	622518 625518	623518 626518	621818 624818	622818 625818	623818 626818

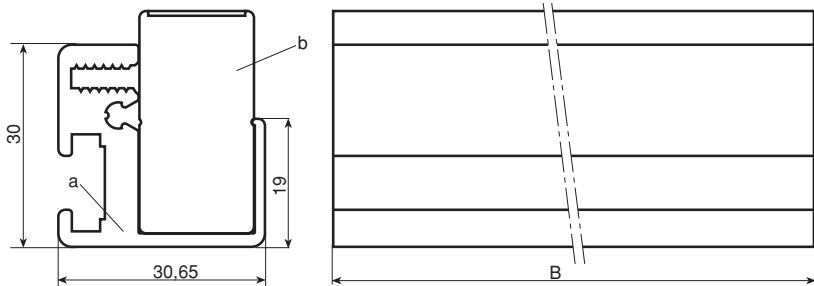
9.3 Scope of Delivery and Accessories

The scope of delivery of an ECO includes:

- 1 ECO transmitter ET...
- 1 ECO Receiver ER ...
- 1 set of instructions for connecting and operating the unit

Accessories: ECO Protective Mounting Profile

The snap-open profile offers additional protection and variable possibilities for mounting using either a standard mounting bracket or a swivelling mounting support.



a = ECO protective mounting profile

b = ECO light curtain

For the dimensions of B, see dimensional table on page 27

Fig. 18 Dimensional drawing ECO protective mounting profile

Order numbers:

Type	Order No.
Connecting cables with M12 socket, 5 m long, straight ³⁾	548405
Connecting cables with M12 socket, 5 m long, angled ³⁾	548305

Type	Order No.
Connecting cables with M12 socket, 15 m long, straight ³⁾	548415
Connecting cables with M12 socket, 15 m long, angled ³⁾	548315
Protective mounting profile ECO-150	426701
Protective mounting profile ECO-225	426702
Protective mounting profile ECO-300	426703
Protective mounting profile ECO-450	426704
Protective mounting profile ECO-600	426706
Protective mounting profile ECO-750	426707
Protective mounting profile ECO-900	426709
Protective mounting profile ECO-1050	426710
Protective mounting profile ECO-1200	426712
Protective mounting profile ECO-1350	426713
Protective mounting profile ECO-1500	426715
Protective mounting profile ECO-1650	426716
Protective mounting profile ECO-1800	426718
Mounting brackets with accessories (sold in sets of two) ^{1), 2)}	560120
Swivelling mounting with vibration damping ^{1), 2)}	560300
Mounting column UDC - 1000 ^{1), 4)}	549810
Mounting column UDC - 1300 ^{1), 4)}	549813
Mounting column UDC - 1600 ^{1), 4)}	549816
Mounting column UDC - 1900 ^{1), 4)}	549819
Deflecting mirror column UMC 1000 ⁴⁾	549710
Deflecting mirror column UMC 1300 ⁴⁾	549713
Deflecting mirror column UMC 1600 ⁴⁾	549716
Deflecting mirror column UMC 1900 ⁴⁾	549719
Test monitoring unit TNT 35	50033058
COMPACT/ECO Diagnostic software (runs on Windows 3.1 and higher versions)	560000
RS 485/232 converter for diagnosis interface	520030
RS 232 cable	426500
Set of diagnosis cables (M12 connector straight)	520040
Set of diagnosis cables (M12 connector straight)	520041

1) Only for use with the protective mounting profile

2) 2 pieces each required for the transmitter and for the receiver

3) 2 pieces required (for transmitter and receiver)

4) Other heights on request

10 Declaration of Conformity



Leuze lumiflex

EC-Declaration of Conformity

according to EC Machinery Directive 98/37/EC, Annex II C

We herewith declare, Leuze lumiflex GmbH + Co. KG
Liebigstr. 4
D-82256 Fürstenfeldbruck, Germany

that the following described protective device complies with the appropriate EC Directive(s) based on its design and type, as brought into circulation by us. In case of alterations of the protective device, not agreed upon by us, this declaration will lose its validity.

Description of the safety component: **Safety Light Curtain**

Safety component Type: **ECO E30, E55, E80**

Serial number: see type plate

Safety type: AOPD type 2 according to EN IEC 61496-1, -2

Safety function: Active Opto-electronic Protective Device

Applicable directives and standards: EC machinery directive (98/37/EC)
EMC directive (89/336/EEC)

Employed standards:

DIN EN 60204-1	1993
EN 50178	1996
DIN EN 50100-1,-2	1994
EN IEC 61496-1	1997
IEC 61496-2	1997
DIN EN 954-1	1997
EN 60825-1	1994 +A1: 2002 +A2: 2001
DIN V VDE 0801	1990
and modification A1	1994


Notified body: TÜV PRODUCT SERVICE GmbH
Zertifizierstelle
Ridlerstr. 65
D-80339 München, Germany

Comissioned: EC - type examination
Examination certificate no. **M6 98 11 22795 012**

Technical report no.: **0513770 2400**, (last valid revision)

CE-marking: The compliance with the directive
89/336/ECC is certified by the CE-mark.

Fürstenfeldbruck, August 2005


ppa./Dr. Holger Lehmitz
Director product unit
Safety at work


ppa. Werner Lehmer
Director product management



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