W 160: Miniature series for optimum solutions

- Photoelectric proximity switches, BGB
- Photoelectric proximity switches, energetic
- Photoelectric reflex switches

- Through-beam photoelectric switches
- P/e switches w. fibre-optic cable (proximity mode)
- P/e switches w. fibre-optic cable (through-beam mode)

Principal system characteristics are simple handling, large scanning ranges and a reduced number of sensor types thanks to integrated L.ON/D.ON switches. Integrated "intelligence" features such as pre-failure signalling output, test input (cable versions only) or external teach-in (WLL 160 T) increase system reliability under severe environmental conditions.

All W 160 optic variants are available in 2 housing versions with axial or 90° light emission.

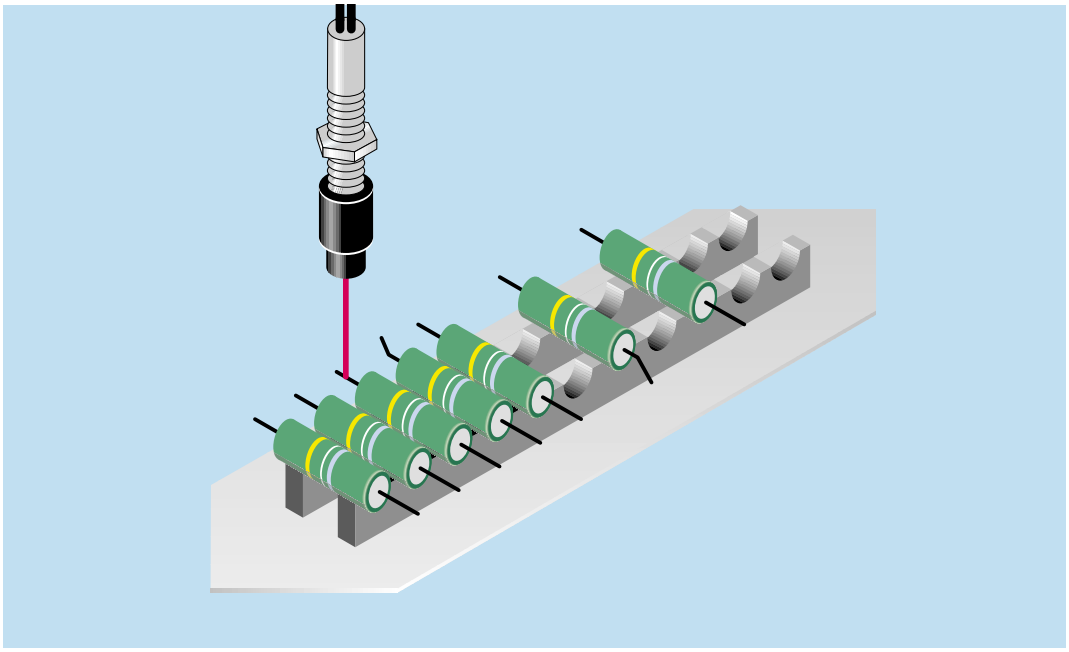
WLL 160 fibre-optic cable photoelectric switches with switching point adjustment (manual using potentiometers or automatic at the push of a button using the teach-in method) complete the W 160 series. LL 3 plastic fibre-optic cables with approx. 50 different configuration options are available as accessories.

W 160 switches have proven particularly successful in the following sectors:

- electronic component and printed circuit board production,
- the packaging and printing industries,
- assembly and handling systems,
- the construction of special-purpose machines, and
- conveyor systems.

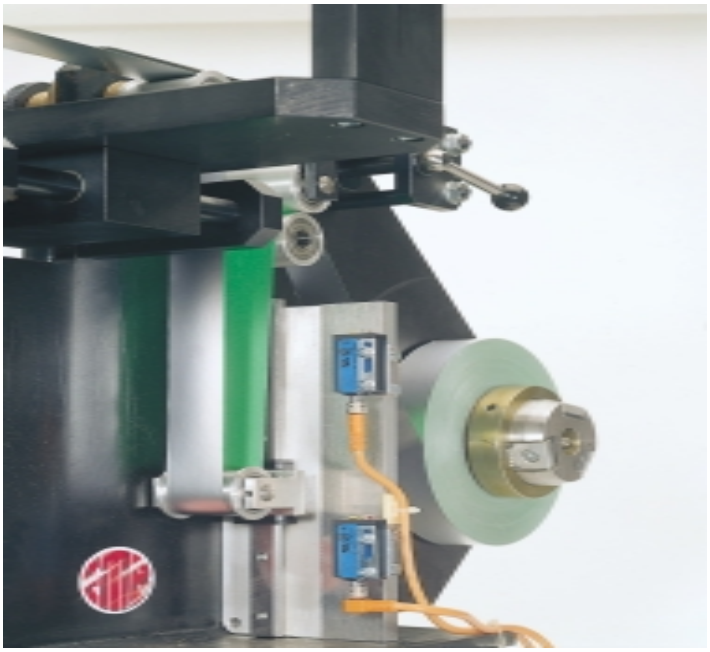
The scanning ranges:

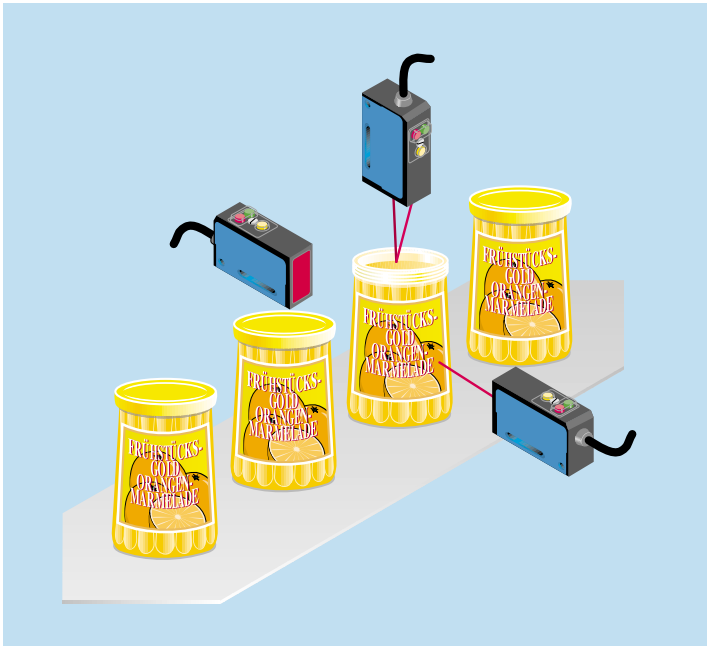
- WS/WE 160 through-beam photoelectric switch: 7 m, slotted mask as accessory,
- WL 160 photoelectric reflex switch: 3 m (PL 80 A), with polarising filter,
- WT 160 photoelectric proximity switch: energetic: scanning distance up to 300 mm (90 % remission), for standard scanning tasks; with focused optics: scanning distance between 8 and 50 mm, background blanking, small light spot, high sensitivity; with divergent optics (angle of dispersion approx. 40°): scanning distance up to 80 mm; ideal for transparent objects.



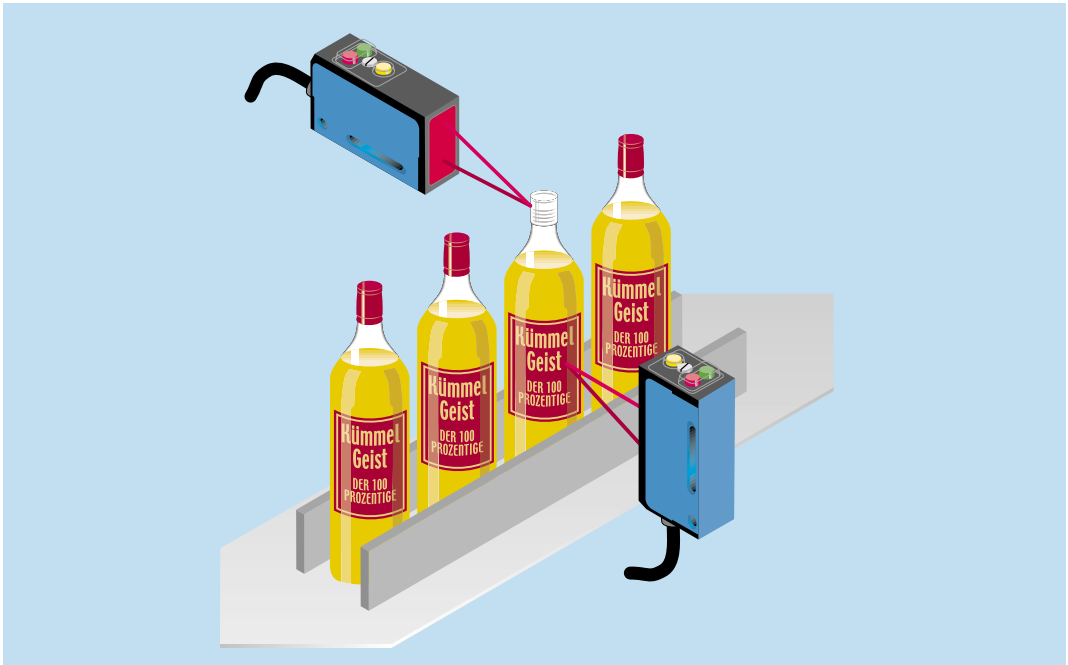
◄ Resistor production: fibre-optic WLL 160 switches can detect even the thinnest of wires without any problem.

▼ Checking the presence of caps and covers: Using a WT 160 photoelectric proximity switch to detect lids and WS/WE 160 through-beam photoelectric switches to monitor system timing.





▲ The WT 160 miniature photoelectric proximity switch is used in film and foil processing to control feed tension.



► Checking caps and labels using WT 160 photoelectric proximity switches.

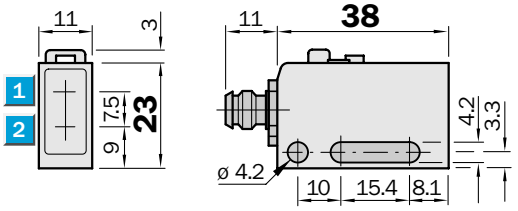
Scanning distance 3…60 mm

Photoelectric proximity switches

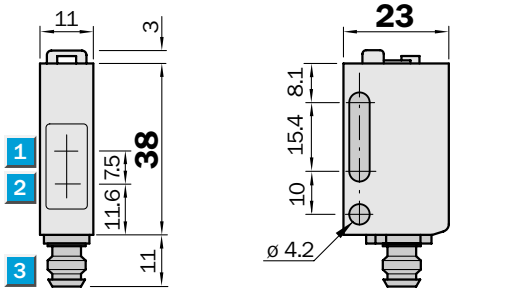
- Horizontal and vertical models
- Focused scanner with background blanking and great sensitivity
- Contamination control with green LED indicator and pre-failure signalling output
- Test input for equipment and system testing

Dimensional drawing

WT160…1.

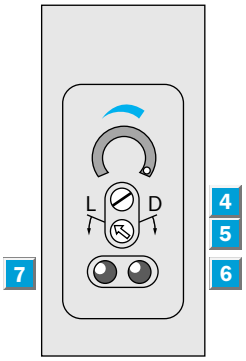


WT160…2.



Adjustments possible

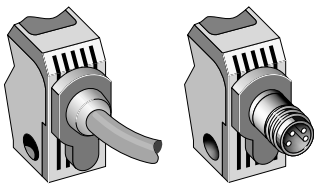
All types



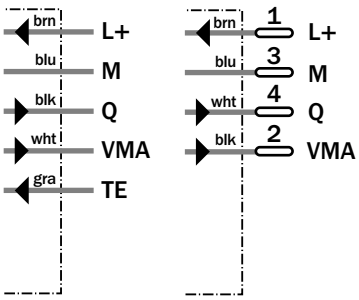
1 Centre of optical axis, receiver
2 Centre of optical axis, sender
3 Plug 4-pin, M 8 or connection cable
4 Sensitivity adjustment
5 Light/dark rotary switch:
L = light-switching
D = dark-switching
6 Red LED signal strength indicator
7 Green LED signal strength indicator

Connection types

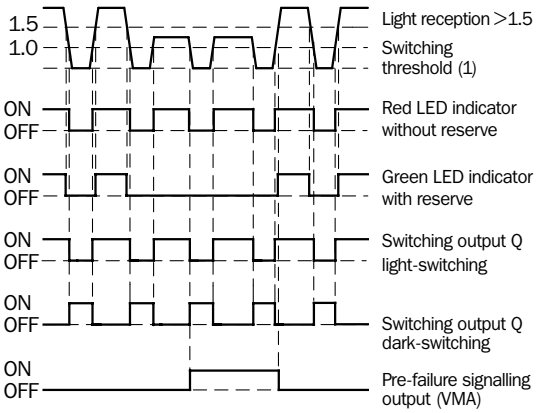
WT 160-P112	WT 160-P410
WT 160-N112	WT 160-N410
WT 160-P122	WT 160-P420
WT 160-N122	WT 160-N420



5 x 0.2 mm²	4-pin, M8



Operating diagram



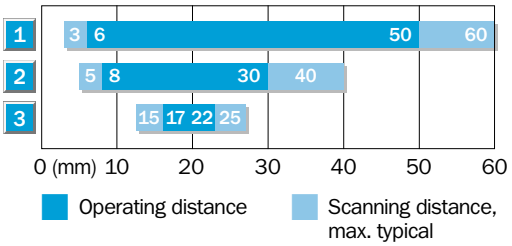
Accessories	page
Cable receptacles	496
Mounting brackets*	510

* included with delivery

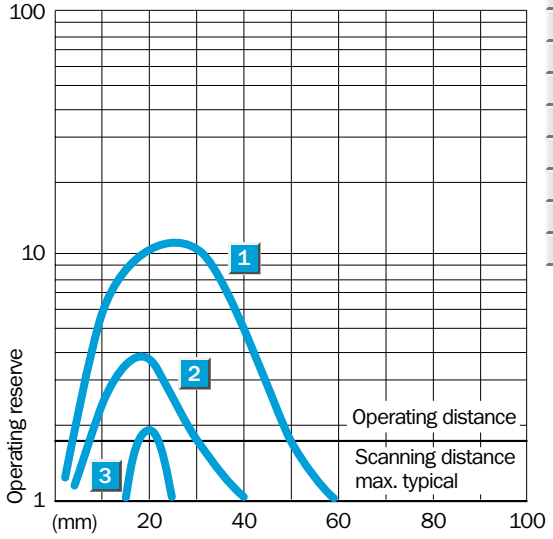
Technical data		WT160-	P112	P410	N112	N410	P122	P420	N122	N420
Housing design		Horizontal	■	■	■	■				
		Vertical					■	■	■	■
Scanning distance, max. typical		3…60 mm [1]	■	■	■	■	■	■	■	■
Operating distance		8…50 mm [1]	■	■	■	■	■	■	■	■
Background blanking		From approx. 100 mm	■	■	■	■	■	■	■	■
		(background 90 % remission) [2]								
Adjustable sensitivity		Potentiometer, 2 turns with scaling 270°	■	■	■	■	■	■	■	■
Light source [3], **light type**		LED, red light	■	■	■	■	■	■	■	■
Light spot diameter		Approx. 3 mm at 25 mm	■	■	■	■	■	■	■	■
Angle of dispersion, sender		Focused, focus 25 mm	■	■	■	■	■	■	■	■
Supply voltage V_S		10…30 V DC [4]	■	■	■	■	■	■	■	■
Ripple [5]		± 10 %	■	■	■	■	■	■	■	■
Current consumption [6]		≤ 30 mA	■	■	■	■	■	■	■	■
Switching outputs		PNP, open collector: Q	■	■			■	■		
		NPN, open collector: Q			■	■			■	■
Output current I_A max.		100 mA	■	■	■	■	■	■	■	■
Light receiver, switching type		Light-/dark-switching via rotary switch	■	■	■	■	■	■	■	■
Response time [7]/max. switching freq. [8]		≤ 0.9 ms / 550/s	■	■	■	■	■	■	■	■
Pre-failure signalling output (VMA)		100 mA, static	■	■	■	■	■	■	■	■
Test input "TE" [9]		Sender off; PNP: TE to +V	■				■			
		Sender off; NPN: TE to 0 V			■				■	
Connection types	cable	PVC, 2 m [10]; 5 x 0.2 mm², ø 4.2 mm	■		■		■		■	
	plug	4-pin, M8		■		■		■		■
VDE protection class [11]		⧈	■	■	■	■	■	■	■	■
Circuit protection [12]		A, B, C, D	■	■	■	■	■	■	■	■
Enclosure rating		IP 67	■	■	■	■	■	■	■	■
Ambient temperature T_A		Operation – 25 °C…+ 55 °C	■	■	■	■	■	■	■	■
		Storage – 40 °C…+ 70 °C	■	■	■	■	■	■	■	■
Weight	with cable	Approx. 60 g	■		■		■		■	
	with plug	Approx. 20 g		■		■		■		■
Housing material		Housing: ABS; optics: PC	■	■	■	■	■	■	■	■

1) Scanned material with 90 % remission (based on standard white according to DIN 5033)
2) Average service life 100,000 h at T_A = + 25 °C
3) Background 90 % remission
4) Limit values
5) May not exceed or fall short of V_S tolerances
6) Without load
7) Signal transit time with resistive load
8) With light/dark ratio 1:1
9) TE not with plug model
10) Do not bend below 0 °C
11) Reference voltage 50 V DC
12) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overload and short-circuit protected

Scanning distance



1	Scanning range on white, 90 % remission
2	Scanning range on gray, 18 % remission
3	Scanning range on black, 6 % remission



Order information

Type	Part no.
WT 160-P112	6 009 511
WT 160-P410	6 009 519
WT 160-N112	6 008 819
WT 160-N410	6 008 827
WT 160-P122	6 009 512
WT 160-P420	6 009 520
WT 160-N122	6 008 820
WT 160-N420	6 008 828

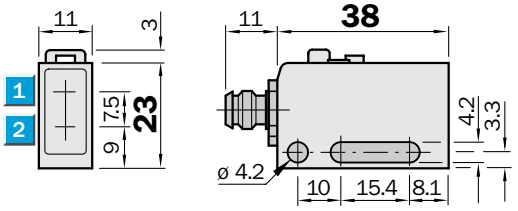
Scanning distance 0…360 mm

Photoelectric proximity switches

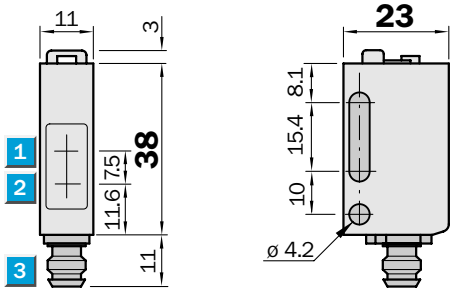
- Horizontal and vertical models
- Energetic scanner for standard applications
- Contamination control with green LED indicator and pre-failure signalling output
- Test input for device and system testing

Dimensional drawing

WT160…7.

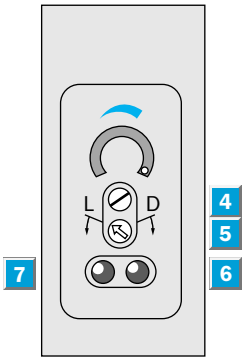


WT160…8.



Adjustments possible

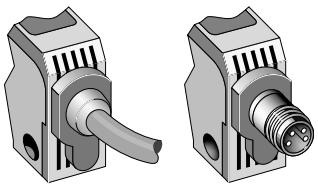
All types



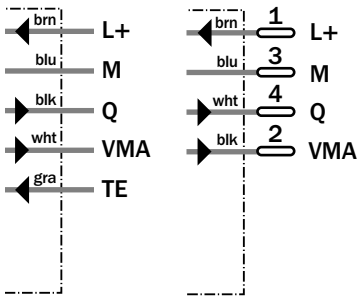
1 Centre of optical axis, receiver
2 Centre of optical axis, sender
3 Plug 4-pin, M8 or connection cable
4 Sensitivity adjustment
5 Light/dark rotary switch:
L = light-switching
D = dark-switching
6 Red LED signal strength indicator
7 Green LED signal strength indicator

Connection types

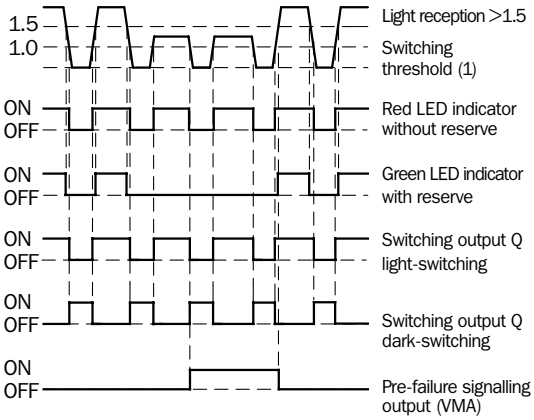
WT 160-P172	WT 160-P470
WT 160-N172	WT 160-N470
WT 160-P182	WT 160-P480
WT 160-N182	WT 160-N480



5 x 0.2 mm²	4-pin, M8



Operating diagram



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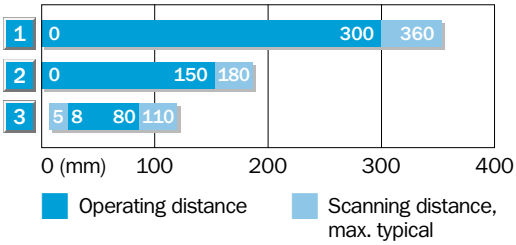
* included with delivery

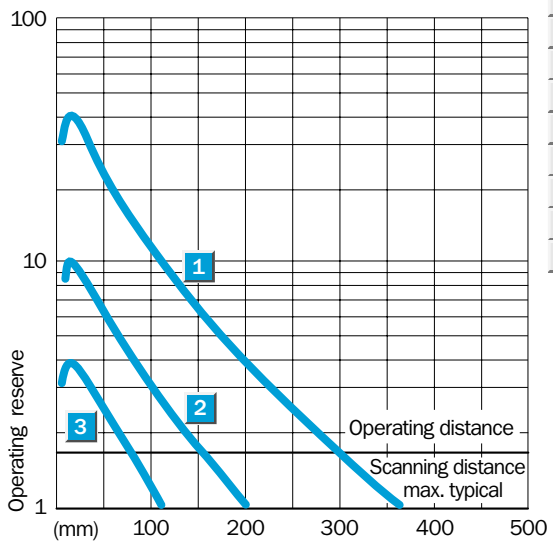
Technical data	WT160-	P172	P470	N172	N470	P182	P480	N182	N480
Housing design	Horizontal	■	■	■	■				
	Vertical					■	■	■	■
Scanning distance, max. typical	0…360 mm[1]	■	■	■	■	■	■	■	■
Operating distance	0…300 mm[1]	■	■	■	■	■	■	■	■
Adjustable sensitivity	Potentiometer, 2 turns with scaling 270°	■	■	■	■	■	■	■	■
Light source[2], **light type**	LED, red light	■	■	■	■	■	■	■	■
Light spot diameter	Approx. 25 mm at 300 mm	■	■	■	■	■	■	■	■
Angle of dispersion, sender	Approx. 4.8°	■	■	■	■	■	■	■	■
Supply voltage V_S	10…30 V DC[3]	■	■	■	■	■	■	■	■
Ripple[4]	± 10 %	■	■	■	■	■	■	■	■
Current consumption[5]	≤ 30 mA	■	■	■	■	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■			■	■		
	NPN, open collector: Q			■	■			■	■
Output current I_A max.	100 mA	■	■	■	■	■	■	■	■
Light receiver, switching type	Light-/dark-switching via rotary switch	■	■	■	■	■	■	■	■
Response time[6]/ Max. switching freq.[7]	≤ 0.9 ms / 550/s	■	■	■	■	■	■	■	■
Pre-failure signalling output (VMA)	100 mA, static	■	■	■	■	■	■	■	■
Test input "TE"[8]	Sender off; PNP: TE to +V	■				■			
	Sender off; NPN: TE to 0 V			■				■	
Connection types cable	PVC, 2 m[9]; 5 x 0.2 mm², ø 4.2 mm	■		■		■		■	
plug	4-pin, M8		■		■		■		■
VDE protection class[10]	⧈	■	■	■	■	■	■	■	■
Circuit protection[11]	A, B, C, D	■	■	■	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■	■	■
Ambient temperature T_A	Operation –25 °C…+55 °C	■	■	■	■	■	■	■	■
	Storage –40 °C…+70 °C	■	■	■	■	■	■	■	■
Weight with cable	Approx. 60 g	■		■		■		■	
with plug	Approx. 20 g		■		■		■		■
Housing material	Housing: ABS; optics: PC	■	■	■	■	■	■	■	■

1) Scanned material with 90 % remission (based on standard white according to DIN 5033)
2) Average service life 100,000 h at T_A = +25 °C
3) Limit values
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) TE not with plug model
9) Do not bend below 0 °C
10) Reference voltage 50 V DC
11) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overload and short-circuit protected

Scanning distance



1 Scanning range on white, 90 % remission
2 Scanning range on gray, 18 % remission
3 Scanning range on black, 6 % remission



Order information

Type	Part no.
WT 160-P172	6 009 517
WT 160-P470	6 009 525
WT 160-N172	6 008 825
WT 160-N470	6 008 833
WT 160-P182	6 009 518
WT 160-P480	6 009 526
WT 160-N182	6 008 826
WT 160-N480	6 008 834

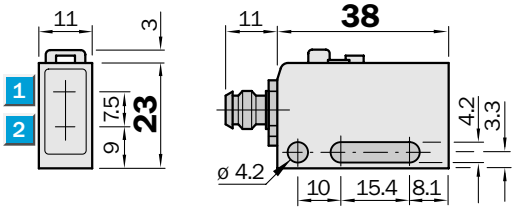
Scanning distance 0…100 mm

Photoelectric proximity switches

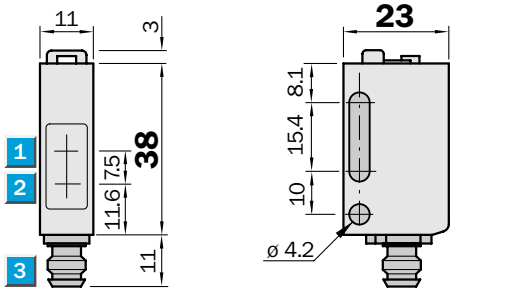
- Horizontal and vertical models
- Scanner with large aperture angle for greater tolerances of target position
- Contamination control with green LED indicator and pre-failure signalling output
- Test input for device and system testing

Dimensional drawing

WT160…5.

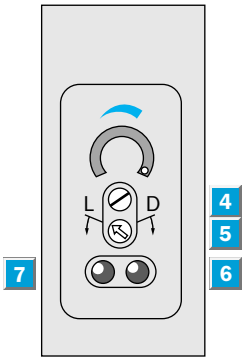


WT160…6.



Adjustments possible

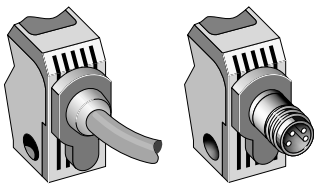
All types



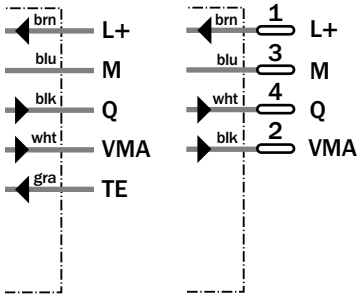
1 Centre of optical axis, receiver
2 Centre of optical axis, sender
3 Plug 4-pin, M 8 or connection cable
4 Sensitivity adjustment
5 Light/dark rotary switch:
L = light-switching
D = dark-switching
6 Red LED signal strength indicator
7 Green LED signal strength indicator

Connection type

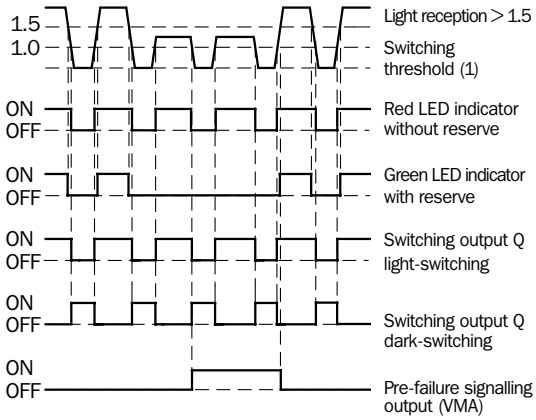
WT 160-P152	WT 160-P450
WT 160-N152	WT 160-N450
WT 160-P162	WT 160-P460
WT 160-N162	WT 160-N460



5 x 0.2 mm²	4-pin, M8



Operating diagram



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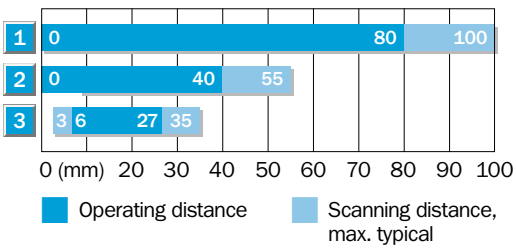
* included with delivery

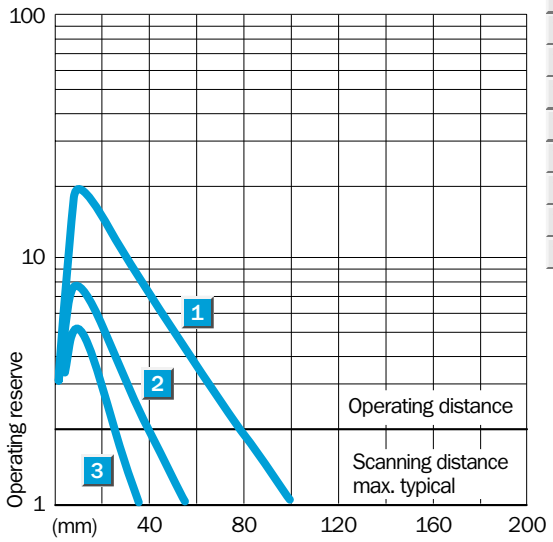
Technical data		WT 160-	P 152	P 450	N 152	N 450	P 162	P 460	N 162	N 460
Housing design		Horizontal	■	■	■	■				
		Vertical					■	■	■	■
Scanning distance, max. typical		0…100 mm [1)2)]	■	■	■	■	■	■	■	■
Operating distance		0…80 mm [1)2)]	■	■	■	■	■	■	■	■
Adjustable sensitivity		Potentiometer, 2 turns with scaling 270°	■	■	■	■	■	■	■	■
Light source [3)], **light type**		LED, infrared light	■	■	■	■	■	■	■	■
Light spot diameter		Approx. 60 mm at 80 mm	■	■	■	■	■	■	■	■
Angle of dispersion, sender		Approx. 40°	■	■	■	■	■	■	■	■
Supply voltage V_S		10…30 V DC [4)]	■	■	■	■	■	■	■	■
Ripple [5)]		± 10 %	■	■	■	■	■	■	■	■
Current consumption [6)]		≤ 30 mA	■	■	■	■	■	■	■	■
Switching outputs		PNP, open collector: Q	■	■			■	■		
		NPN, open collector: Q			■	■			■	■
Output current I_A max.		100 mA	■	■	■	■	■	■	■	■
Light receiver, switching type		Light-/dark-switching via rotary switch	■	■	■	■	■	■	■	■
Response time [7)]/max. switching freq. [8)]		≤ 0.9 ms/550/s	■	■	■	■	■	■	■	■
Pre-failure signalling output (VMA)		100 mA, static	■	■	■	■	■	■	■	■
Test input "TE" [9)]		Sender off; PNP: TE to +V	■				■			
		Sender off; NPN: TE to 0 V			■				■	
Connection type	cable	PVC, 2 m [10)]; 5 x 0.2 mm², ø 4.2 mm	■		■		■		■	
	plug	4-pin, M8		■		■		■		■
VDE protection class [11)]		⧈	■	■	■	■	■	■	■	■
Circuit protection [12)]		A, B, C, D	■	■	■	■	■	■	■	■
Enclosure rating		IP 67	■	■	■	■	■	■	■	■
Ambient temperature T_A		Operation –25 °C…+55 °C	■	■	■	■	■	■	■	■
		Stockage –40 °C…+70 °C	■	■	■	■	■	■	■	■
Weight	with cable	Approx. 60 g	■		■		■		■	
	with plug	Approx. 20 g		■		■		■		■
Housing material		Housing: ABS; optics: PCC	■	■	■	■	■	■	■	■

1) Scanned material with 90 % remission (based on standard white according to DIN 5033)
2) Object size 30 x 30 mm
3) Average service life 100,000 h at T_A = +25 °C
4) Limit values
5) May not exceed or fall short of V_S tolerances
6) Without load
7) Signal transit time with resistive load
8) With light/dark ratio 1:1
9) TE not with plug model
10) Do not bend below 0 °C
11) Reference voltage 50 V DC
12) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overload and short-circuit protected

Scanning distance



1	Scanning range on white, 90 % remission
2	Scanning range on gray, 18 % remission
3	Scanning range on black, 6 % remission



Order information

Type	Part no.
WT 160-P152	6 009 515
WT 160-P450	6 009 523
WT 160-N152	6 008 823
WT 160-N450	6 008 831
WT 160-P162	6 009 516
WT 160-P460	6 009 524
WT 160-N162	6 008 824
WT 160-N460	6 008 832

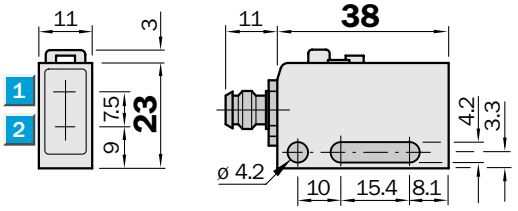
Scanning range 0.01…3 m

Photoelectric reflex switches

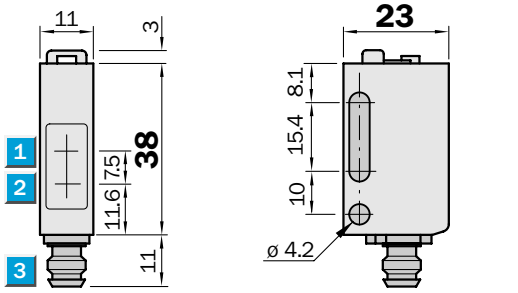
- Horizontal and vertical models
- Polarisation filter for detection of object with reflective surfaces
- Contamination control with green LED indicator and pre-failure signalling output
- Test input for device and system testing

Dimensional drawing

WL 160…3.

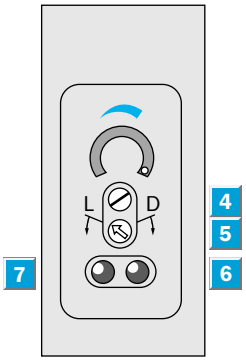


WL 160…4.



Adjustments possible

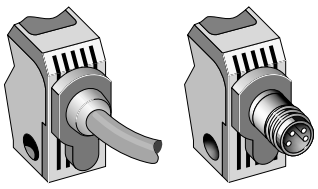
All types



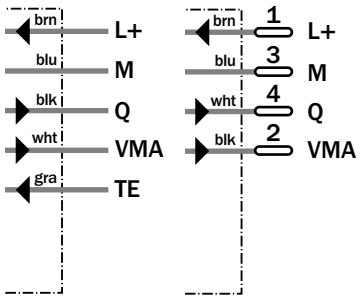
1 Centre of optical axis, receiver
2 Centre of optical axis, sender
3 Plug 4-pin, M 8 or connection cable
4 Sensitivity adjustment
5 Light/dark rotary switch:
L = light-switching
D = dark-switching
6 Red LED signal strength indicator
7 Green LED signal strength indicator

Connection types

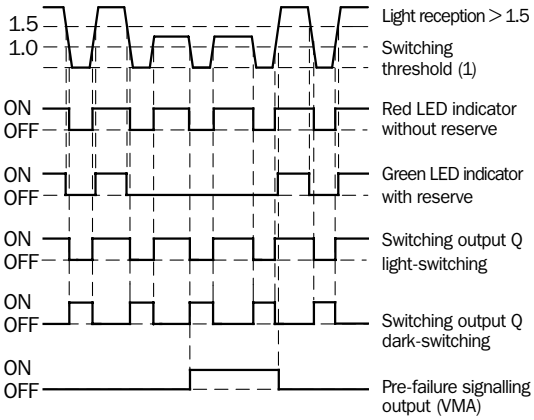
WL 160-P132	WL 160-P430
WL 160-N132	WL 160-N430
WL 160-P142	WL 160-P440
WL 160-N142	WL 160-N440



5 x 0.2 mm²	4-pin, M8



Operating diagram



Accessories	page
Cable receptacles	496
Mounting brackets*	510
Reflectors**	520

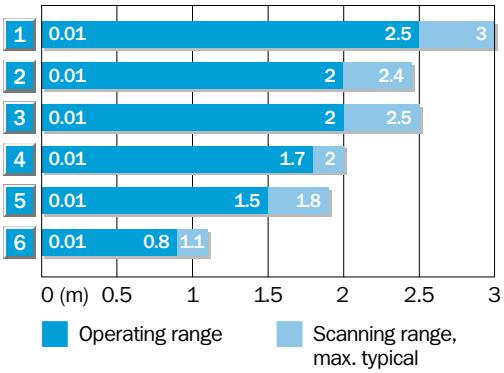
* included with delivery

** Reflector P 250 included with delivery

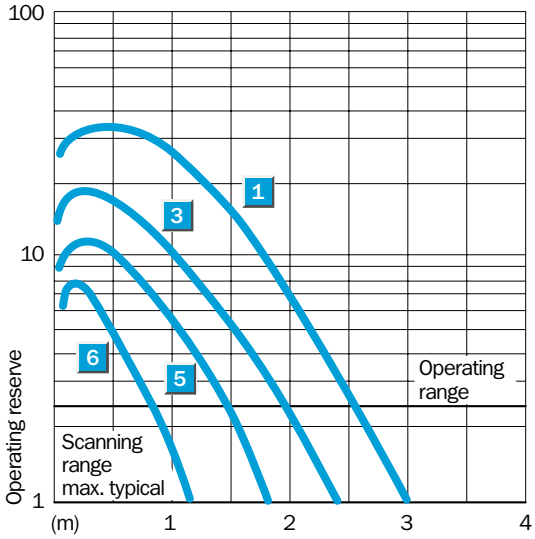
Technical data	WL 160-	P132	P430	N132	N430	P142	P440	N142	N440
Housing design	Horizontal	■	■	■	■				
	Vertical					■	■	■	■
Scanning range, max. typical/on refl.	0.01…3 m/PL 80 A	■	■	■	■	■	■	■	■
max. typical/on refl.	0.005…2.4 m/P 250 (included)	■	■	■	■	■	■	■	■
Operating range	0.01…2.0 m/P 250	■	■	■	■	■	■	■	■
Adjustable sensitivity	Potentiometer, 2 turns with scaling 270°	■	■	■	■	■	■	■	■
Light source[1], **light type**	LED, red light with polarising filter	■	■	■	■	■	■	■	■
Light spot diameter	Approx. 150 mm at 2.0 m	■	■	■	■	■	■	■	■
Angle of dispersion, sender	Approx. 4.5°	■	■	■	■	■	■	■	■
Supply voltage V_S	10…30 V DC[2]	■	■	■	■	■	■	■	■
Ripple[3]	± 10 %	■	■	■	■	■	■	■	■
Current consumption[4]	≤ 30 mA	■	■	■	■	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■			■	■		
	NPN, open collector: Q			■	■			■	■
Output current I_A max.	100 mA	■	■	■	■	■	■	■	■
Light receiver, switching type	Light-/dark-switching via rotary switch	■	■	■	■	■	■	■	■
Response time[5]/max. switching freq.[6]	≤ 0.9 ms / 550/s	■	■	■	■	■	■	■	■
Pre-failure signalling output (VMA)	100 mA, static	■	■	■	■	■	■	■	■
Test input "TE"[7]	Sender off; PNP: TE to +V	■				■			
	Sender off; NPN: TE to 0 V			■				■	
Connection types cable	PVC, 2 m[8]; 5 x 0.2 mm², ø 4.2 mm	■		■		■		■	■
plug	4-pin, M8		■		■		■		■
VDE protection class[9]	⧈	■	■	■	■	■	■	■	■
Circuit protection[10]	A, B, C, D	■	■	■	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■	■	■
Ambient temperature T_A	Operation –25 °C…+55 °C	■	■	■	■	■	■	■	■
	Storage –40 °C…+70 °C	■	■	■	■	■	■	■	■
Weight with cable	Approx. 60 g	■		■		■		■	
with plug	Approx. 20 g		■		■		■		■
Housing material	Housing: ABS; optics: PMMA	■	■	■	■	■	■	■	■

1) Average service life 100,000 h at T_A = +25 °C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) TE not with plug model
8) Do not bend below 0 °C
9) Reference voltage 50 V DC
10) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overload and short-circuit protected

Scanning range and operating reserve



Reflector type	Operating range
1 PL 80 A	0.01…2.5 m
2 P 250	0.01…2.0 m
3 PL 50 A/PL 40 A	0.01…2.0 m
4 PL 30 A/PL 31 A	0.01…1.7 m
5 PL 20 A	0.01…1.5 m
6 Reflective tape Diamond Grade	0.01…0.8 m



Order information

Type	Part no.
WL 160-P132	6 008 813
WL 160-P430	6 008 815
WL 160-N132	6 008 807
WL 160-N430	6 008 809
WL 160-P142	6 008 814
WL 160-P440	6 008 816
WL 160-N142	6 008 808
WL 160-N440	6 008 810

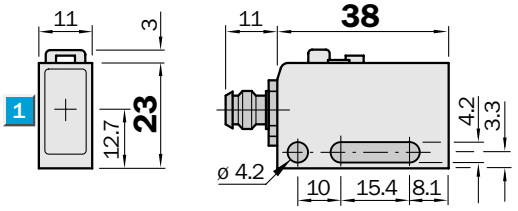
Scanning range 8.5 m

Through-beam photoelectric switches

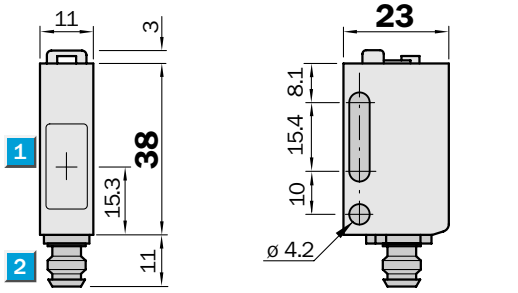
- Horizontal and vertical models
- Slotted masks for increasing switching frequency
- Contamination control with green LED indicator and pre-failure signalling output
- Test input for device and system testing

Dimensional drawing

WS/WE 160…3.

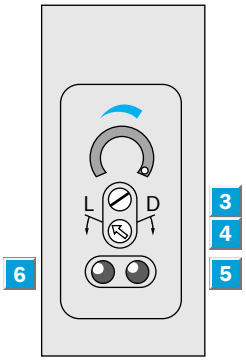


WS/WE 160…4.



Adjustments possible

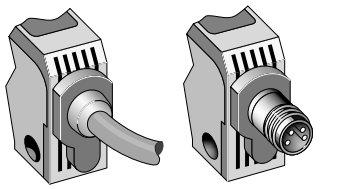
All types



1 Centre of optical axis sender/receiver
2 Plug 4-pin, M 8 or connection cable
3 Light/dark rotary switch:
L = light-switching
D = dark-switching
4 Sensitivity adjustment
5 Indicator, red (sender WS active)
6 Green LED signal strength indicator (receiver WE)

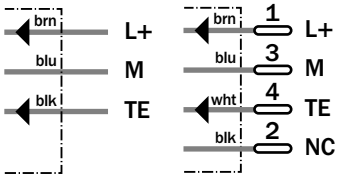
Connection types

WS/WE160-P132	WS/WE160-P430
WS/WE160-N132	WS/WE160-N430
WS/WE160-P142	WS/WE160-P440
WS/WE160-N142	WS/WE160-N440



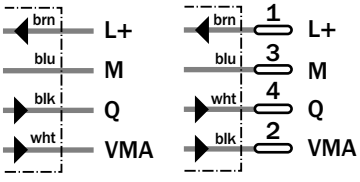
3 x 0.2 mm² | 4-pin, M8

Sender

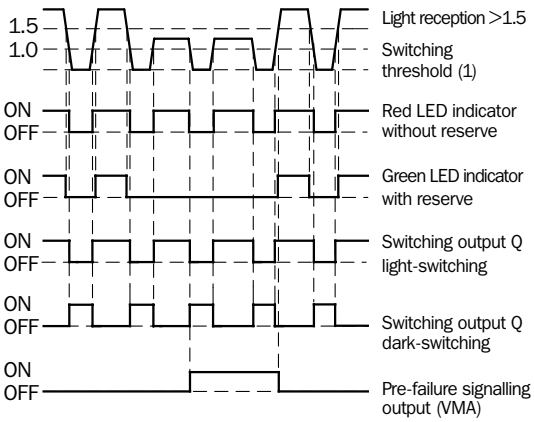


4 x 0.2 mm² | 4-pin, M8

Receiver



Operating diagram



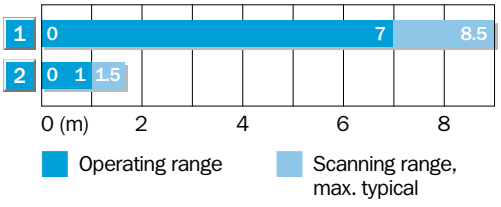
Accessories	page
Cable receptacles	496
Mounting brackets*	510
Slotted mask	556

* included with delivery

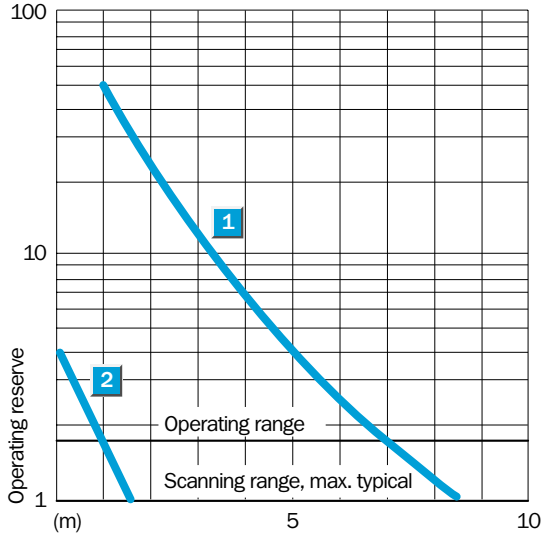
Technical data	WS/WE160-	P132	P430	N132	N430	P142	P440	N142	N440
Housing design	Horizontal	■	■	■	■				
	Vertical					■	■	■	■
Scanning range, max. typical	0…8.5 m	■	■	■	■	■	■	■	■
Operating range	0…7 m	■	■	■	■	■	■	■	■
Operating range with filter, width 1.0 m	0…1 m	■	■	■	■	■	■	■	■
Adjustable sensitivity	Potentiometer, 2 turns with scaling 270°	■	■	■	■	■	■	■	■
Light source[1], **light type**	LED, infrared light	■	■	■	■	■	■	■	■
Light spot diameter	Approx. 400 mm at 7 m	■	■	■	■	■	■	■	■
Angle of dispersion, sender	Approx. 3.3°	■	■	■	■	■	■	■	■
Angle of dispersion, receiver	Approx. 15°	■	■	■	■	■	■	■	■
Supply voltage V_S	10…30 V DC[2]	■	■	■	■	■	■	■	■
Ripple[3]	± 10 %	■	■	■	■	■	■	■	■
Current consumption[4] sender	≤ 20 mA	■	■	■	■	■	■	■	■
receiver	≤ 30 mA	■	■	■	■	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■			■	■		
	NPN, open collector: Q			■	■			■	■
Output current I_A max.	100 mA	■	■	■	■	■	■	■	■
Light receiver, switching type	Light-/dark-switching via rotary switch	■	■	■	■	■	■	■	■
Response time[5]/max. switching freq.[6]	≤ 1.5 ms / 300/s	■	■	■	■	■	■	■	■
Pre-failure signalling output (VMA)	100 mA, static	■	■	■	■	■	■	■	■
Test input "TE"[7]	Sender off: TE to 0 V	■	■	■	■	■	■	■	■
Connection types cable	PVC, 2 m[8]	■		■		■		■	
sender WS	3 x 0.2 mm², ø 4.2 mm	■		■		■		■	
receiver WE	4 x 0.2 mm², ø 4.2 mm	■		■		■		■	
plug	4-pin, M8		■		■		■		■
VDE protection class[9]	⧈	■	■	■	■	■	■	■	■
Circuit protection[10]		■	■	■	■	■	■	■	■
sender WS	A, B	■	■	■	■	■	■	■	■
receiver WS	A, B, C, D	■	■	■	■	■	■	■	■
Enclosure rating	IP 67	■	■	■	■	■	■	■	■
Ambient temperature T_A	Operation – 25 °C…+ 55 °C	■	■	■	■	■	■	■	■
	Storage – 40 °C…+ 70 °C	■	■	■	■	■	■	■	■
Weight with cable	Sender/receiver each approx. 60 g	■		■		■		■	
with plug	Sender/receiver each approx. 20 g		■		■		■		■
Housing material	Housing: ABS; optics: PC	■	■	■	■	■	■	■	■

1) Average service life 100,000 h at T_A = + 25 °C
2) Limit values
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit time with resistive load
6) With light/dark ratio 1:1
7) TE not with plug model
8) Do not bend below 0 °C
9) Reference voltage 50 V DC
10) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overload and short-circuit protected
11) Part no. includes transmitter and receiver

Scanning range and operating reserve



1 Without slotted mask
2 With slotted mask 1 mm, BL-160-10



Order information

Type	Part no.[11]
WS/WE160-P132	6 009 555
WS/WE160-P430	6 009 557
WS/WE160-N132	6 009 549
WS/WE160-N430	6 009 551
WS/WE160-P142	6 009 556
WS/WE160-P440	6 009 558
WS/WE160-N142	6 009 550
WS/WE160-N440	6 009 552

Scanning range max. 2 m

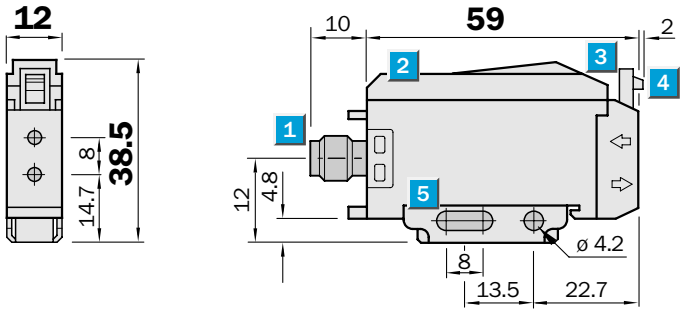
Through-beam systems

Scanning distance max. 70 mm

Proximity systems

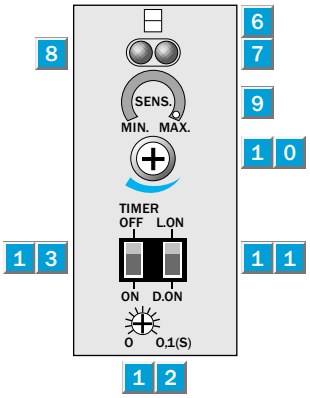
- Sensitivity adjustment with potentiometer, scaled
- Large selection of LL3 fibre-optic cables (accessories)
- Off-delay 0…100 ms
- Pre-failure signalling output and test input for device and system testing

Dimensional drawing



Adjustments possible

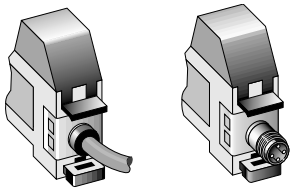
All types



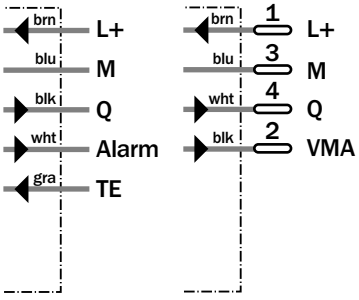
1 Plug 4-pin, M8 or connection cable
2 Protective hood
3 Fibre-optic cable lock (press down)
4 Fibre-optic cable release (press lug)
5 Mounting bracket, supplied with equipment
6 Indication of correct fibre-optic cable mounting
7 Red LED signal strength indicator (lights when switching threshold is exceeded)
8 Green LED signal strength indicator (lights when operating reserve is exceeded > 1.3)
9 Sensitivity scale
10 Sensitivity switch (4 turns)
11 Light-/dark-switching
12 OFF-delay 0…100 ms
13 Time delay on/off switch

Connection types

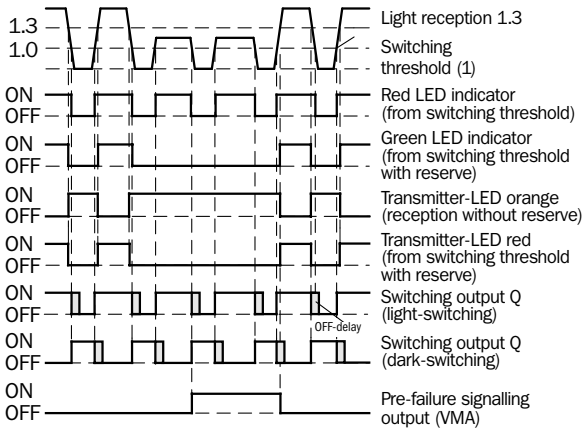
WLL 160-F122	WLL 160-F420
WLL 160-E122	WLL 160-E420



5 x 0.18 mm²	4-pin, M8



Operating diagram



Accessories	page
Cable receptacles	496
Mounting brackets*	510
LL 3 fibre-optic cables	528

* included with delivery

Technical data	WLL 160-	F122	F420	E122	E420
Suitable fibre-optic cables	LL 3 plastic fibre-optic cable series (p. 528)	■	■	■	■
Scanning ranges	Depend. on fibre-optic cable type used	■	■	■	■
Scanning range, through-beam system	0…500 mm (with tip adapter 0…2 m)	■	■	■	■
Scanning distance, scanner system	0…70 mm [1]	■	■	■	■
Adjustable sensitivity	Potentiometer, 4 turns with scaling 270°	■	■	■	■
Light source [2], light type					
Light reception with operating reserve	LED, visible red light ("spot control")	■	■	■	■
Light reception without operating reserve	LED, visible red-orange light ("spot control")	■	■	■	■
Light spot diameter	Dependent on scanning range	■	■	■	■
Opening angle of fibre-optic cables	Approx. 65°	■	■	■	■
Supply voltage V_S	10…30 V DC [3]	■	■	■	■
Ripple [4]	± 10 %	■	■	■	■
Current consumption [5]	≤ 30 mA	■	■	■	■
Switching outputs	PNP, open collector: Q	■	■		
	NPN, open collector: Q			■	■
Output current I_A max.	100 mA	■	■	■	■
Light receiver, switching type	Light-/dark-switching via slide switch	■	■	■	■
Response time [6]/max. switching freq. [7]	≤ 0.35 ms / 1500/s	■	■	■	■
Pre-failure signalling output (VMA)	100 mA, static	■	■	■	■
Test input "TE" [8]	Sender off; PNP: TE to +V	■			
	Sender off; NPN: TE to 0 V			■	
Time delay T_{OFF} (OFF-delay)	Selectable, per slide switch	■	■	■	■
Time range	Adjust., 0…100 ms; potentiometer 270°	■	■	■	■
Connection types cable	PVC, 2m [9]; 5 x 0.2 mm², ø 4.2 mm	■		■	
plug	4-pin, M8		■		■
VDE protection class [10]	⧈	■	■	■	■
Circuit protection [11]	A, B, C, D	■	■	■	■
Enclosure rating	IP 66	■	■	■	■
Ambient temperature T_A	Operation –25 °C…+55 °C	■	■	■	■
	Storage –40 °C…+70 °C	■	■	■	■
Weight with cable	Approx. 80 g	■		■	
with plug	Approx. 30 g		■		■
Housing material	ABS	■	■	■	■

1) Scanned material with 90 % remission (based on standard white according to DIN 5033)
2) Average service life 100,000 h at T_A = +25 °C
3) Limit values
4) May not exceed or fall short of V_S tolerances
5) Without load
6) Signal transit time with resistive load
7) With light/dark ratio 1:1
8) TE not with plug model
9) Do not bend below 0 °C
10) Reference voltage 50 V DC
11) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overload and short-circuit protected

Order information	
Type	**Part no.**
WLL 160-F122	6 009 989
WLL 160-E122	6 009 981
WLL 160-F420	6 009 990
WLL 160-E420	6 009 982

Scanning range max. 2 m

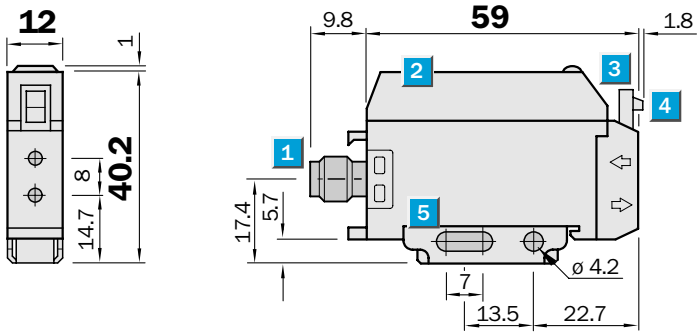
Through-beam systems

Scanning distance max. 70 mm

Proximity systems

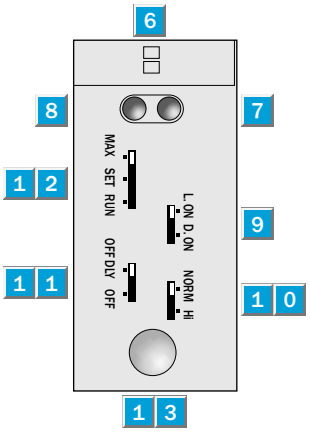
- Automatic setting of the switching threshold and hysteresis with teach-in via button or external control cable ET
- Large selection of LL 3 plastic fibre-optic cables (accessories)
- Switching frequency 830/s or 1660/s, switchable

Dimensional drawing



Adjustments possible

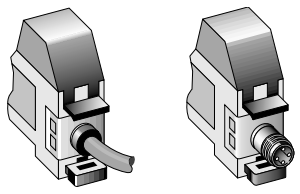
All types



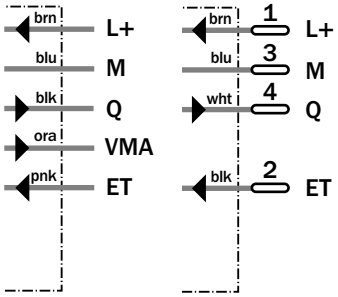
1 Plug 4-pin, M8 or connection cable
2 Protective hood
3 Fibre-optic cable lock (press down)
4 Fibre-optic cable release (press lug)
5 Mounting bracket, supplied with equipment
6 Indication of correct fibre-optic cable mounting
7 LED signal strength indicator, red (lights when switching threshold is exceeded)
8 LED signal strength indicator, green
9 Selector switch light- ("L.ON")/dark-switching ("D.ON")
10 Selector switch response time, NORM (600 µs)/HI (300 µs)
11 Selector switch OFF-delay On ("OFF DLY")/off ("OFF"); 40 ms fix
12 Operating mode selector switch "MAX/SET/RUN"
13 Teach-in button

Connection types

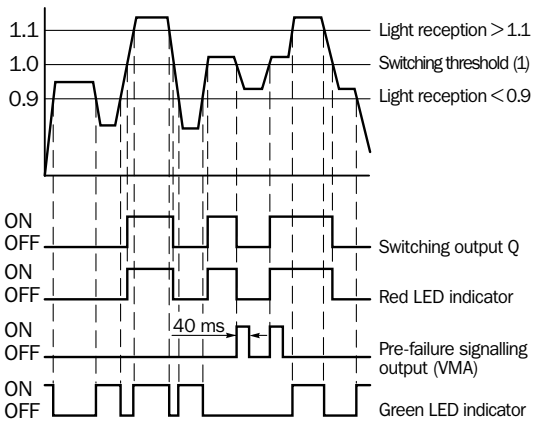
WLL 160T-F132	WLL 160T-F430
WLL 160T-E132	WLL 160T-E430



5 x 0.18 mm²	4-pin, M8



Operating diagram



Accessories	page
Cable receptacles	496
Mounting brackets*	510
LL 3 fibre-optic cables	528

* included with delivery

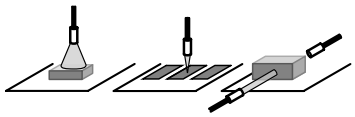
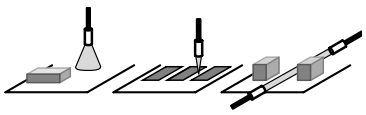
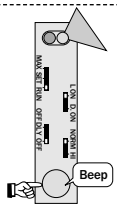
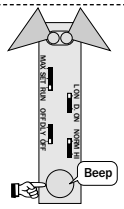
Technical data	WLL 160T-	F132	F430	E132	E430
Suitable fibre-optic cables	LL 3 plastic fibre-optic cable series (p. 528)				
Scanning ranges	Depend. on fibre-optic cable type used				
Scanning range, through-beam system	0…500 mm (with tip adapter 0…2 m)				
Scanning distance, scanner system	0…70 mm [1]				
Adjustable sensitivity	Automatic, via TEACH-IN key or "MAX" mode				
Mode selector switch "MAX" position	Max. range, set permanently				
"SET" position	TEACH-IN key activated				
"RUN" position	TEACH-IN key inactive, equipment in sensor mode				
TEACH-IN manual	Via button (only active if mode switch is in "SET" position				
external TEACH-IN	Only active, if mode switch is in "RUN" position				
	PNP: control wire + V				
	NPN: control wire 0 V				
Light source [2], light type	LED, visible red light				
Light spot diameter	Dependent on range				
Opening angle of fibre-optic cables	Approx. 65°				
Supply voltage V_S	10…24 V DC				
Ripple [3]	≤ 5 V_{SS}				
Current consumption [4]	≤ 50 mA				
Switching outputs	PNP, open collector: Q				
	NPN, open collector: Q				
Output current I_A max.	100 mA				
Light receiver, switching type	Light-/dark-switching via slide switch				
Response time [5]/max. switching freq. [6]	≤ 0.6 ms/830/s, selectable				
Dependent on selected operating mode:					
"Mode"-selector switch in pos. "MAX"					
or selector switch "Response time"					
in "NORM" position					
Selector "response time" in pos. "HI"	≤ 0.3 ms/1660/s [7]				
Pre-failure signalling output (VMA)	30 mA, one shot, pulse length 40 ms				
Time delay T_{OFF} (switch-off delay)	40 ms fixed, selectable, per slide switch				
Connection types cable	PVC, 2 m [8]; 5 x 0.18 mm², ø 4.0 mm				
plug	4-pin, M8				
VDE protection class [9]	⧈				
Circuit protection [10]	A, B, C, D				
Enclosure rating	IP 66				
Ambient temperature T_A	Operation – 25 °C…+ 55 °C				
	Storage – 40 °C…+ 70 °C				
Weight with cable	Approx. 80 g				
with plug	Approx. 30 g				
Housing material	Housing: ABS				

1) Scanned material with 90 % remission (based on standard white according to DIN 5033)
2) Average service life 100.000 h at T_A = + 25 °C
3) May not exceed or fall short of V_S tolerances
4) Without load
5) Signal transit period with resistive load
6) With light/dark ratio 1:1
7) Scanning distance reduction approx. 30 %
8) Do not bend below 0° C
9) Reference voltage 50 V DC
10) A = V_S connections reverse-polarity protected
B = Inputs and outputs reverse-polarity protected
C = Interference pulse suppression
D = Outputs overload and short-circuit protected

Order information	
Type	**Part no.**
WLL 160T-F132	6 010 650
WLL 160T-F430	6 010 651
WLL 160T-E132	6 010 648
WLL 160T-E430	6 010 649

1. Precise sensitivity setting (via 2x push of button); WLL 160T

TEACH-IN steps

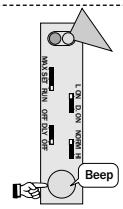
Switching speed	**Slide switch NORM or HI**			
Positioning of the parts	1 START TEACH IN	2 Detection system / Through-beam system  Parts present	3 Detection system / Through-beam system  Parts not present	4 STOP Sensor mode
■ TEACH-IN manual	Reset: RUN SET 	Push button 	Push button 	SET RUN 
■ TEACH-IN external ET via control signal	**MODE switch** in **RUN pos.**	Activate ET 1 signal ≈ 3 s	ET signal pause 3 ≈ 5 s, then activate ET signal > 1 s Alarm impulse 40 ms? TEACH-IN error, signal difference between part present/absent too small. Check application.	Automatically in sensor operation after 2 s

The TEACH-IN button is pressed twice. This operating mode provides **high sensitivity** and is ideal for **very precise switching points.** The WLL 160T optimizes the switching threshold and hysteresis via µ-processor automatically and stores them in EEPROM. No special experience in precise alignment of optoelectronic components necessary.

Applications:
Through-beam system; even thin or transparent objects are detected.
Detection system; strong background interference, small or dark scanning objects, simple marks with contrast differences.

2. Simple sensitivity setting (via 1x push of button); WLL 160T

TEACH-IN steps

Switching speed	**Slide switch NORM or HI**			
Positioning of the parts	1 START TEACH IN	2 Detection system / Through-beam system  Parts in light path / Parts not in light path		3 STOP Sensore mode
■ TEACH-IN manual	Reset: RUN SET 	Push button 		SET RUN 
■ TEACH-IN external ET via control signal	**MODE switch** in **RUN pos.**	Activate ET signal 1 ≈ 3 s No alarm output function in TEACH-IN mode		Automatically in sensor operation after 2 s.

The TEACH-IN button is only pressed once. This operating mode provides **simple handling.** The WLL 160T system detects existing background interference automatically. It optimizes the switching threshold and stores it in EEPROM. No special experience in setting the sensitivity of opto-electronic components necessary.

Applications:
Through-beam system; even small or partially transparent parts, which do not completely interrupt the light path, are detected. Detection system; background interference considered.

3. Max. scanning range, fixed setting; WLL 160T

Scanning range set permanently to MAX

TEACH-IN Steps

		1	2	3
Switching speed	**Always 830 Hz***	**NORM or HI (optionally 830 Hz or 1660 Hz)**		
Positioning of the parts	START → STOP	START TEACH IN	Detection system: Parts not in light path Through-beam system: Parts in light path	STOP Sensor mode
■ TEACH-IN manual	Slide switch to MAX pos. RUN → MAX*	Reset: RUN → SET	**Press button 1x** Beep	SET → RUN
■ TEACH-IN external ET via control signal	Not possible if selector switch is set to MAX, scanning range internally fixed to MAX.	**MODE switch** in **RUN** pos.	Activate ET signal 1 ≈ 3 s No alarm output function in TEACH-IN mode	Automatically in sensor operation after 2 s.

Manual: The **MAXimum scanning range** is set permanently in the MAX pos.with the MODE switch. *The switching speed is always 830 Hz, independent of the operating mode selector switch NORM/HI.
Via TEACH-IN: The **TEACH-IN button** is only pressed once – very simple handling.

The **maximum scanning range** is set via TEACH-IN. The WLL 160 T stores the basic signal in EEPROM and the switching threshold and hysterisis sensor operation. No special experience in precise alignment of optoelectronic components necessary.

Applications:
Very simple handling. This operating mode is ideal for large differences in signals. Through-beam system; objects interrupt the light beam. Detection system; no or little background interference, objects with large differences in contrast.

4. Moving objects; precise sensitivity adjustment (via 2x push of button); WLL 160T

TEACH-IN steps

	1	2		3
Switching speed	**Slide switch NORM or HI**			
Positioning of the parts	START TEACH IN	Detection system: Parts not in light path Through-beam system	Parts move through the light path	STOP Sensor mode
■ TEACH-IN manual	Reset: RUN → SET	**Press button > 1 s** Beep	**Press button > 3 s** Beep	SET → RUN
■ TEACH-IN external ET via control signal	**MODE switch** in Pos. **RUN**	Activate ET signal 1 ≈ 3 s	ET signal pause 3 ≈ 5 s; then activate ET signal > 1 s Alarm impuls 40 ms? TEACH-IN error, signal difference between part present/absent too small. Check application.	Automatically in sensor operation after 2 s.

TEACH-IN for moving objects.
The TEACH-IN button is pressed twice. The simple TEACH-IN handling makes precise sensitivity adjustment possible although objects are moving. The WLL 160T optimizes the switching threshold and hysteresis via µ-processor and stores them in EEPROM. No special experience in precise alignment of optoelectronic components necessary.

Applications:
Objects can only be taught in during movement (rejection check; equipment cannot be stopped precisely).

WLL 160T TEACH-IN functions

Response time/ switching speed

NORM: 830 Hz; max. system scanning distance.
HI: 1660 Hz, system scanning distance 70 %. Select before TEACH-IN!

Off-delay T_{OFF}

For switching output Q. Optional connection, 40 ms fixed. To ensure that your control can also detect shorter events.

Selector switch switching output Q

L.ON: light-switching
D.ON: dark-switching optionally in PNP or NPN.

Connection technique

Optionally M 8 plug, 4-pin (no alarm output) or 5-wire connecting cable.

Alarm output

■ **TEACH-IN mode:** signals TEACH-IN error.
■ **Sensor mode** (RUN): signals insufficient signal reserve, e.g., due to contamination or misalignment (not with plug version M 8 – 4-pin).

WLL 160T Assembly technology

Assembly and disassembly on top hat profile rail mounting by pulling the locking device.

Mounting technique

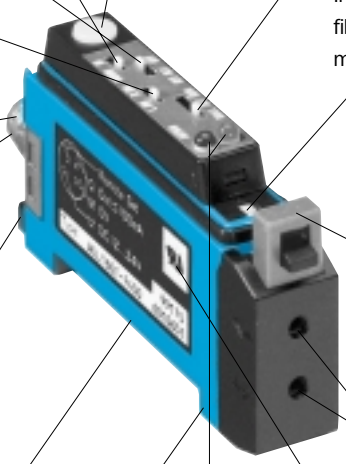
Simple snap-on on top hat profile rails. Mounting bracket supplied with equipment.

µ-processor technique with EEPROM

Permanent storage of taught-in switching threshold and hysteresis, even when there are longer interruptions of voltage.

TEACH-IN button

Sensitivity setting at the push of a button. No special knowledge of photoelectric switches required. Only active if MODE selector switch is set to SET pos. (manipulation protection).

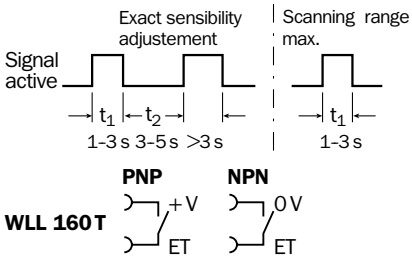


Indicator for correct fibre-optic cable mounting.

LED display red, green

■ **TEACH-IN mode:**
Signalization TEACH-IN process.
Permanently blinking: TEACH-IN error.
Permanently lit: TEACH-IN o.K.
■ **Sensor operation:**
LED red: switching threshold exceeded
LED green: received signal > 1.1 or < 0.9

External TEACH-IN signal ET



TEACH-IN mode selector switch

Separate from operating mode functions, and consequently simple and comprehensible handling; no dual functions.
■ **MAX:** Maximum scanning range set permanently. Caution: switching speed independent of operating mode selection; switching speed always 830 Hz.
■ **SET:** WLL 160T in manual TEACH-IN mode. Optimum switching point setting at the simple push of a button (1 or 2 times).
■ **RUN:** optionally
– TEACH-IN manual: The taught-in switching threshold and hysteresis are stored in EEPROM.
The WLL 160T operates in sensor mode after 2 s.
– External TEACH-IN (ET):
Optimum system adjustment using external control signal. Ideal if the WLL 160T is not accessible or part changes are often aligned automatically.

Fibre-optic cable lock

Press down bracket: fibre-optic cables are locked. Press the lug: fibre-optic cables are released.

Fibre-optic cable attachment

→ Transmitter fibre-optic cable
← Receiver fibre-optic cable
Suitable fibre-optic cable: **plastic fibre-optic cables of the LL3 series** (see the description of the LL3 variants).

BUZZER

For acoustic support. Short tone after TEACH-IN = O.K.
Long tone after TEACH-IN = error or application not suitable.

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